Narcissism Predicts Facial Muscle Reactivity During a Body Comparison Threat: The Role of Personality in Shaping Affiliative Behaviour

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Abstract

The facial feedback hypothesis suggests that individuals automatically activate facial muscles that are congruent with an expresser's facial display, which in turn results in a congruent emotional experience within oneself. Although such congruency facilitates empathy and social bonding, susceptibility to facial feedback may depend on one's motivation to differentiate themselves from others who pose a threat to their well-being. Such motivation may be influenced by narcissism, a personality dimension whereby individuals experience emotion dysregulation when faced with a threat to their identity. Body image is one aspect of identity that has implications for the study of threat given that individuals experience negative emotionality when comparing their body to that of another person. The purpose of the program of research was to investigate whether narcissistic tendencies influence one's susceptibility to facial feedback during a body comparison threat. Study 1 first developed novel emotive videos that elicited a congruent subjective emotional experience in viewers. Utilizing the novel stimuli, Study 2 traditionally investigated whether facial feedback could be *physically* modulated by activating incongruent facial muscles. Study 3 subsequently investigated whether the effect could be modulated *cognitively* by way of narcissism and body comparison. Although facial feedback was not evidenced in the program, unique facets of narcissism (grandiosity, vulnerability) differentially interacted with body comparison to predict congruent facial muscle activity in response to happy and sad facial expressions. The findings challenge the longstanding claim that narcissists lack empathy and suggest that such individuals are capable of affiliating with others emotionally under specific social and emotional contexts. Implications for future research into facial feedback and narcissism are discussed in terms of motivational theories.

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Over many centuries, a significant amount of empirical work has endeavoured to explain human emotion. Although the pursuit has ensued in considerable discrepancy, there is a general consensus among scientists that emotions are evolved responses to specific events to help humans adapt to problems in the environment (Eich et al., 2000; Mauss et al., 2005; Pinker, 1997). From this perspective, an emotion such as anger promotes motivation to overcome obstacles to goals. In contrast, happiness motivates an individual to continue engaging in activities that enhance pleasure and goal-attainment (Izard, 2010; Lench, et al., 2015; Levenson, 1999)

One emotional process that is thought to serve an adaptive function is emotional contagion. According to Hatfield and colleagues (1994), individuals automatically “catch” or feel others’ emotions directly within their own body. This process purportedly occurs via two mechanisms. First, the perception of emotion leads to automatic imitation, a phenomenon referred to as emotional mimicry. Second, it is presumed that muscle movements resulting from the imitation are translated into corresponding feelings, which is referred to as afferent (e.g., facial, vocal, postural) feedback. In this way, an individual’s behaviour and emotional state become aligned through mimicry (Hatfield et al., 1994; Hess & Fischer, 2013).

Given that most emotions take place in the context of social interactions (Greenaway et al., 2018), the process of emotional contagion may serve as a “social glue” to help humans facilitate and maintain relationships with others (Chartrand & van Baaren, 2009; Lakin et al., 2003). According to the emotions as social information model (Van Kleef, 2009; Van Kleef et al., 2010), emotional displays are meaningful signals that provide important information about the likelihood of present and future actions, as well as one's intentions, dispositions, and appraisals of social contexts (see also Lench & Carpenter, 2018; Van der Schalk et al., 2011). For example, the expression of sadness communicates to others that we need help, while happiness communicates to others that we are satisfying a goal or experiencing reward. Perceivers of the emotional display can use this information to understand and respond to others appropriately which, in turn, reinforces social bonding. Preliminary support for this model with respect to emotional contagion comes from studies that demonstrate emotional mimicry during the neonatal period of human development. Verbal and motor abilities among infants are very limited and their communication relies mainly on perceiving and mimicking subtle social cues from others (Adolphs, 2001; Simpson et al., 2014; Soussignan et al., 2018). Emotional mimicry is also shown to enhance bidirectional feelings of empathy and bonding among adults who are both mimicking and are being mimicked (Bailenson & Yee, 2005; Chartrand & Bargh, 1999; Kämpf et al., 2017; Stel & Vonk, 2010; Stel et al., 2008). Thus, the more one mimics the emotional behaviours of another person, the more affiliated one becomes with that person.

Facial Feedback Hypothesis

The question of how our emotions are influenced by our behaviour is one of historical significance (Darwin, 1872; Izard, 1971; Niedenthal, 2007; Tomkins, 1962, 1980). One of the earliest arguments came from William James and Carl Lange (Cannon, 1927) who suggested that the direct perception of a particular somatic state (i.e., visceral, postural, facial) is the essence of the experience of emotion. In support, studies demonstrate that people frequently mimic each other's nonverbal emotional behaviours, which in turn influences their own emotional experiences. These actions can include vocalizations (Estow et al., 2007), postures (Tia et al., 2011), and gestures (Goldin-Meadow & Alibali, 2013). Although the James-Lange theory

(Cannon, 1927) pertains to expressions throughout the body, a large body of research has focused on the impact of facial expressions on emotion. This specific form of emotional contagion is captured by the facial feedback hypothesis (Izard, 1971; Tomkins, 1962, 1980) and suggests that facial muscles function as a feedback system for a person's own experience of emotion. That is, by reacting with congruent facial muscle activity in response to an expresser's facial display, the observer gets feedback from their facial muscles that will induce a similar emotion within themselves. Through afferent feedback from one's own muscle movements and changes in arousal, facial feedback helps individuals feel what others are feeling.

Support for the facial feedback hypothesis is derived from studies that measure electrical activity from facial muscles via electromyography (EMG). Facial EMG is frequently recorded from specific muscles that play a prominent role in the expression of elementary emotions such as happiness, surprise, anger, sadness, fear, and disgust. There is some variability in the specific configuration of facial muscle activity associated with these basic emotions, which is partly due to individual differences in the morphology of the facial musculature (Ekman & Friesen, 1978; Larsen et al., 2003). However, positive and negative emotional states are shown to be reliably distinguished on the basis of EMG responses from the corrugator supercilii and zygomaticus major muscle groups. When individuals are exposed to positive and negative emotional facial expressions of another person, they tend to spontaneously react with increased EMG activity in the zygomaticus and corrugator muscle, respectively. Zygomaticus activity elevates the corners of the mouth to form a smile or positive expression, whereas corrugator activity draws the eyebrows together to form a frown or negative expression (Bradley et al., 2001; Dimberg & Thunberg, 2012; Dimberg & Söderkvist, 2011; Lundqvist & Dimberg, 1995; Moody et al., 2007; Sonnby-Borgström et al., 2003; Weyers et al., 2006).

Facial feedback is an unconscious, automatic process that occurs within 500 ms after facial stimulus onset (Dimberg & Thurnberg, 2012; Dimberg et al., 2002; Lishner et al., 2008). It appears that it cannot be suppressed even if one is instructed to do so (Dimberg et al., 2002; Korb et al., 2010). Facial feedback occurs in response to a variety of modalities like pictures (Dimberg & Thurnberg, 2012; Heerey & Crossley, 2013), emotive videos (Hühnel et al., 2014; Künecke et al., 2014), and live interactions within dyads (Hess & Bourgeois, 2010; McIntosh, 2006; Riehle et al., 2017). However, facial feedback is more pronounced in response to dynamic, rather than static, facial expressions (Rymarczyk et al., 2011; Rymarczyk et al., 2016a). Congruent EMG facial muscle activity in response to dynamic emotional expressions also activates neural networks related to emotional processing, including the inferior frontal gyrus and amygdala (Rymarczyk et al., 2018). Although facial feedback is commonly studied in adults, the capacity for facial feedback has been observed in some infants as early as 7 months of age (Datyner et al., 2017; Kaiser et al., 2017; Soussignan, et al., 2018). Thus, facial feedback provides a basic, nonverbal form of communication to facilitate the development of emotional processes.

The basic tenets of the facial feedback hypothesis are predicated on the *passive hypothesis*, whereby individuals demonstrate congruent facial muscle activity while passively viewing emotional stimuli (Mori & Mori, 2007, 2009, 2010). However, there are contrasting versions of the facial feedback hypothesis that make unique claims regarding the relative importance of facial muscle activity in the experience of subjective emotion (Tourangeau & Ellsworth, 1979). According to the *necessity hypothesis*, emotional experience cannot occur without facial feedback. However, the validity of this hypothesis has been ruled out by studies that demonstrate typical emotional responses to emotive stimuli among individuals with facial paralysis (Bogart & Matsumoto, 2010; Keillor et al., 2002). Another version that has been proposed is the *initiation (sufficiency) hypothesis*, which suggests that facial feedback is sufficient to produce an emotional experience, even in the absence of emotive stimuli. Indeed, when verbally directed to contract facial muscles related to a specific facial expression without any visual feedback, individuals report significantly stronger experience of the congruent subjective emotion (Ekman et al., 1983; Flack et al., 1999; Levenson & Ekman, 2002; Levenson et al., 1990; Lewis, 2012). This pattern of responsivity is also associated with emotionally appropriate patterns of physiological change. For example, anger and joy are emotions that are most often “approach” oriented and associated with greater left frontal lobe activity, whereas fear and disgust are “withdrawal” oriented and associated with greater right frontal lobe activity (Harmon-Jones & Amodio, 2012). A study by Coan and colleagues (2001) found that when verbally directed to contract facial muscles related to anger and joy, individuals experience greater relative left frontal lobe activity (i.e., approach motivation). When contracting muscles related to fear and disgust, individuals experience greater relative right frontal lobe activity (i.e., withdrawal motivation). Thus, activating zygomaticus and corrugator muscles in the absence of emotive stimuli results in the appropriate cognitive and physiological experience of the emotion being produced.

Another version of the facial feedback hypothesis that has received substantial attention over the years is the *modulation hypothesis*, which suggests that manipulating facial muscle activity can modify emotional experiences of emotive stimuli. Laird (1974) was the first researcher to investigate the modulation hypothesis by developing a method to test the effects of manipulated facial expressions on emotional states. In this experiment, participants were instructed to move individual muscles to create emotional facial expressions without their explicit awareness. Participants were either shown pictures of Klu Klux Klan (KKK) members or pictures of children smiling while either creating happy or angry emotional expressions. Afterwards, participants completed a mood evaluation questionnaire. The study found that participants reported more anger when forming angry expressions during the KKK pictures, compared to happy expressions. In contrast, participants reported more elation when forming happy facial expressions in response to smiling children, compared to angry expressions. It was concluded that manipulating facial muscles influences one's emotional experience of emotive stimuli.

At the time of publication, researchers interpreted Laird's results with skepticism. Although Laird utilized deception to minimize participants' awareness of the true purpose of the study, it was suggested that the results were influenced by demand characteristics. To address this issue, Strack and colleagues (1988) asked participants to rate how amusing they found a series of cartoons while holding a pen in their mouth in a way that either facilitated or inhibited smiling. The manipulation of facial muscles using a pen was designed to reduce demand characteristics by making participants less aware of the actual configuration of the emotional facial expression itself. Similar to Laird, the researchers found that participants whose smiling was facilitated with the pen reported finding the cartoons more amusing than participants whose smiling was inhibited. Strack and colleagues concluded that emotional facial expressions influence emotive processing and that this process is not explained by demand characteristics. Strack and colleagues' method has since been replicated by other researchers to show that interfering with corrugator and zygomaticus activity (e.g., biting a pen, chewing a piece of gum, holding chopsticks horizontally in the mouth, Botox injections of facial muscles producing flaccid paralysis) can impair facial recognition (Oberman et al., 2007; Niedenthal et al., 2001; Ponari et al., 2012; Stel & van Knippenberg, 2008), attenuate congruent self-report emotion

(Davis et al., 2010; Wiswede et al., 2009), and even influence cortical activity in areas related to emotional processing (Hennenlotter, et al., 2009). Such findings demonstrate that facial muscle manipulation influences one's experience of emotive stimuli.

Motivational and Contextual Factors

While there is considerable support for facial feedback, there are also many studies that report a nonsignificant effect of facial muscle activity on subjective emotional experience (e.g., Blairy et al., 1999; Bogart & Matsumoto, 2010; Bush et al., 1989; Hess & Blairy, 2001; Kappas, 2003; Reisenzein et al., 2013). Noteworthy is a recent replication initiative by Wagenmakers and colleagues (2016) that reported the results of 17 direct replications of Strack and colleauges' (1988) original methodology. Contrary to the findings of the original study, the researchers found no support for the attenuating influence of a pen manipulation on facial feedback. Such findings contradict the core assumption of the facial feedback hypothesis and suggest the possibility that facial muscle activity does not influence one's subjective emotional state.

The discrepancies observed in the literature may be explained in terms of motivational theories of emotion (e.g., Cacioppo et al., 1997, 2000; Davidson et al., 1990; Harmon-Jones & Allen, 1997; Lang et al., 1997; Mogg et al., 2004; Thayer & Lane, 2000; Porges, 2001). According to such theories, emotion is fundamentally organized into two response systems which allow individuals to adapt to their social environment. In the absence of threat, individuals are motivated to activate physiological and/or behavioural responses that promote approach behaviours including sustenance, procreation, care giving, and nurturance. In contexts of threat, however, such systems promote defensive responses including withdrawal, escape, and attack. Motivational theories of emotion are often described within the framework of specific physiological and/or behavioural systems, such as prefrontal cortical activity (Davidson et al., 1990; Harmon-Jones & Allen, 1997), cardiac functioning (Porges, 2001; Thayer, 2000), or attention (Cacioppo et al., 1997; Lang et al., 1997; Mogg et al., 2004). Of relevance to facial feedback is the contextual model of emotional mimicry (Hess & Fischer, 2013; Fischer & Hess, 2017), which proposes that emotional mimicry is goal driven, rather than stimulus driven, and is dependent the contextual meaning of the situation. In this way, emotions not only serve an affiliative function to establish and maintain social bonds with others, they also serve a social distancing function to help individuals differentiate themselves from others who pose a threat to their well-being. Thus, emotional contagion—and more specifically, facial feedback—may depend on numerous motivational and contextual factors that promote social engagement or disengagement. In support, Noah and colleagues (2018) investigated the replication failure by Wagenmakers and colleagues (2016) and hypothesized that the discrepancy may be due to contextual differences between the replication protocol and the original experiment. The authors point out that participants in the replication protocol were informed that they would be monitored by a video camera during the experimental procedures, unlike participants in Strack and colleagues (1988) protocol. Research shows that the presence of a video camera promotes a sense of threat with respect to the perception of one's own performance (Lindon-Morris & Laidlaw, 2014). In accordance with motivational theories, such threat may have encouraged participants in the replication protocol to disengage from the affiliative process of facial feedback. To investigate the latter question, the researchers implemented the same replication protocol as Wagenmakers and colleagues (2016); however, participants completed the protocol under one of two conditions: video camera and no video camera. Indeed, the study found evidence for facial feedback, but only when participants were *not* monitored by a video camera during the procedure. Overall, contextual and motivational factors appear to influence one's susceptibility to facial feedback.

Other studies have similarly assessed motivational factors on facial feedback. Noteworthy are those that have elicited the perception of dissimilarity. For example, activation of congruent facial muscle activity occurs more frequently in response to an *ingroup* member's display of emotion, compared to *outgroup* members (Bourgeois & Hess, 2008). Facial feedback is also less likely to occur between individuals of different age (Ardizzi et al., 2014) and sex (Hess & Bourgeois, 2010). The nature of the relationship between the observer and expresser also influences facial feedback. Individuals are less likely to respond with congruent facial muscle activity if they feel socially excluded (Cheung et al., 2015) or when they are observing a person who is disliked (Likowski et al., 2008), unfamiliar (Fischer et al., 2012), untrustworthy (Fujimura & Okanoya, 2016), or described in negative terms (Blocker et al., 2016). Similarly, attractiveness can impact facial feedback such that individuals experience greater zygomaticus activity in response to attractive faces and greater corrugator activity in response to unattractive faces (Gerger et al., 2011). Taken together, facial feedback depends on the characteristics of the expressor: the more dissimilar and undesirable another individual is perceived to be, the less likely one is to affiliate with the individual by way of facial feedback.

Characteristics of the observer can also influence the facial feedback. For example, women demonstrate greater facial feedback than men (Soussignan et al., 2013), especially in response to dynamic facial expressions (Rymarczyk et al., 2016b). Biological factors may also influence facial feedback. For example, high levels of testosterone (Hermans et al., 2006) and stress-related hormones (Martin et al., 2015) are associated with a reduction in facial feedback. Among women, the follicular phase of menstruation is associated with greater zygomaticus activity while viewing neutral and positive pictures (Armbruster et al., 2018). The current mood state of the observer can also impact facial feedback. When individuals are in a happy mood, they demonstrate congruent facial muscle activity in response to various facial expressions. However, individuals in a sad mood demonstrate a reduction in facial feedback in response to happy and sad facial expressions (Likowski et al., 2011). Research shows that sadness increases self-focused attention (e.g., Green & Sedikides, 1999; Silvia et al., 2006), likely to find out the source and meaning of one's state or to cope with it. Thus, facial feedback may be reduced in those experiencing a sad mood state as their attention is focused inwardly. Psychopathological characteristics of the observer also influence facial feedback. For instance, impairments in social communication and empathetic responding underlie conditions such as schizophrenia (Derntl et al., 2009) and autism spectrum disorder (Gaigg, 2012). Individuals with these conditions also demonstrate incongruency of facial muscle activity and subjective emotion in response to emotional facial expressions, relative to healthy controls (Mathersul et al., 2013; Varcin et al., 2010). Similarly, boys with oppositional defiant disorder and conduct disorder demonstrate an attenuation of corrugator activity in response to sad and angry videos (de Wied et al., 2009). Thus, the capacity to engage in facial feedback is influenced not only by characteristics of the expressor, but also by the observer.

Personality traits represent specific characteristics that may predispose some individuals to be more or less susceptible to facial feedback. Personality is defined as an enduring pattern of inner experience that directs individuals towards specific perceptions, cognitions, and behavioural responses (Cloninger, 1987). In this regard, personality can shape one's tendency to experience and express certain emotions. For instance, individuals with borderline personality disorder (BPD) tend to report more negative emotions and less positive emotions (Staebler et al., 2009). There is also evidence to suggest that this pattern of emotional processing may be associated with facial muscle activity. Matzke and colleagues, (2014) found that BPD patients, compared to healthy controls, experience greater corrugator activity in response to angry, sad, and disgusted facial expressions, and attenuated levator labii superioris activity—a facial muscle associated with smiling—in response to happy and surprised facial expressions. This pattern of facial activity suggests those with BPD may be inclined to disengage from their social environment in response to a broad range of negative emotions.

Trait empathy also has a moderating effect on facial feedback. Individuals with high levels of trait empathy experience congruent facial muscle activity and self-report emotion in response to various emotional facial expressions. In contrast, those low on trait empathy experience a reduction in facial feedback (Balconi & Canavesio, 2012; Dimberg & Thunberg, 2012; Rymarczyk et al., 2016b; Van der Graaff et al., 2016). As such, facial feedback is not a simple reaction to the mere perception of someone else's emotional expression. Rather, it involves the interpretation of emotional signals in a specific social context with specific social goals and motives. Thus, investigating motivational influences on facial feedback is pivotal for emotional contagion theory. While research has begun to explore such factors, there remains a large amount of discrepancy and heterogeneity in the effect sizes in the literature with respect to facial feedback (Coles et al., 2019), suggesting that the effect may be influenced by factors that have yet to be identified.

Narcissism

A personality trait that may impact one's susceptibility to facial feedback is narcissism, a dimension that underlies an individual's need to validate and affirm their self-representation (Pincus et al., 2009). All individuals have narcissistic needs and motives; it is a normal, adaptive facet of personality that contributes to one's self-esteem and sense of personal agency (Sedikides et al., 2004). For example, adaptive facets of narcissism fuel an individual's motivation towards achievement in competitive and work domains (Lukowisky et al., 2007). Most individuals satisfy their narcissistic needs and motives in socially acceptable ways and adaptively regulate their emotions and behaviours in the face of threats to their self-representation. However, narcissistic needs and motivations exist on a continuum that ranges from adaptive to maladaptive. Individuals with greater levels of maladaptive narcissism experience greater emotional dysregulation and difficulty translating their need to affirm and validate their self-representation in socially appropriate ways when faced with threats (Pincus et al., 2009; Roche et al., 2013).[1]

There are two proposed expressions of maladaptive narcissism that are differentiated based on how one responds to perceived threats to self-representation. To the layperson, narcissism is most often associated with the grandiose expression. Grandiose narcissists repress or distort information from the environment that threatens their self-representation (Pincus & Lukowitsky, 2010). Cognitively, such defensive strategies take the form of an inflated self-image without requisite accomplishments and skills (Hart et al., 2017), a sense of personal entitlement (Howell et al., 2011), arrogance (Hart & Adams, 2014), attentional avoidance (Krusemark et al., 2015), as well as engaging in fantasies of unlimited power, superiority, and perfection (Campbell et al., 2002). Behaviourally, grandiosity is often expressed through interpersonal exploitation (Blinkhorn et al., 2015), exhibitionism (Brunell et al., 2011), derogation (Horton & Sedikides, 2009), heightened use of justifications or excuses (Campbell et al., 2000), employment of the third-person perspective (Marchlewska & Chichoka, 2017), reluctance to make apologies to

[1] Although narcissism is a dimensional personality construct, individuals high in trait narcissism will be occasionally referred to as "narcissists" for purposes of brevity.

others (Adams et al., 2014), and the use of self-enhancing humour (Zeigler-Hill & Besser, 2011). Overall, grandiose narcissists possess an arsenal of defensive strategies that are aimed at enhancing a positively biased self-perception to mask feelings of inferiority and inadequacy, often at the expense of others (Campbell et al., 2005; Paulhus, 1998; Sedikides et al., 2013). Though, such defensive strategies have some short-term, adaptive benefits including buffering against psychological distress and increasing self-esteem (Brookes, 2015; Ellison et al., 2013).

Narcissism can also be expressed in terms of vulnerability. Both grandiose and vulnerable narcissists share a common etiology; namely, the need for distinction and admiration (Pincus et al., 2009). However, unlike grandiose narcissists, vulnerable narcissists lack the skills or agentic traits necessary to orchestrate desired outcomes for themselves, which makes them less likely to successfully utilize self-enhancement strategies (Brown et al., 2016; Dickinson & Pincus, 2003; Freis et al., 2015). This lack of personal agency contributes to a cognitive profile characterized by negative mood, anxiety, helplessness, low self-esteem, guilt, shame, insecurity, and paranoia (Graf, 2017; Hansen-Brown & Freis, 2019; Hendin & Cheek, 1997; Krizan & Herlache, 2018; Maciantowicz & Zajenkowski, 2020; Miller et al., 2011; Mota et al., 2019; Pincus et al., 2009; Pincus & Lukowitsky, 2010; Sedikides et al., 2004) and a greater likelihood of seeking out psychotherapeutic treatments compared to grandiose narcissists (Ellison et al., 2013). As they are unsuccessful in regulating their self-esteem by way of self-enhancement strategies, vulnerable narcissists rely upon external feedback from others (i.e., Besser & Priel, 2009; Rogoza et al., 2018). Contingency on social approval combined with self-doubt results in an oversensitivity to others' reactions and feedback (Miller & Campbell, 2010; Miller et al., 2010; Wink, 1991) and even the experience of shame and anger in response to positive feedback (Atlas & Them, 2008; Dickinson & Pincus, 2003; Freis et al., 2015; Malkin et al., 2011).

Behaviourally, vulnerable narcissists may appear empathetic and selfless in relationships as a means of obtaining admiration from others (Kraus & Reynolds, 2001; Pincus et al., 2009; Wink, 1991). However, during distressful states, vulnerable narcissists engage in behaviours that promote escapism, rather than self-enhancement, such as gambling (Di Blasi et al., 2020), excessive use of their mobile phone during social interactions (Grieve & March, 2020), and defection during activities that require cooperation among a group of individuals (Malesza & Poland, 2020). In turn, such behaviours make vulnerable narcissists appear introverted, dysphoric, avoidant, and shy (Dickinson & Pincus, 2003; Pincus et al., 2009). In attempt to regulate their distress, they may also demonstrate aggressive behaviours towards others including intimate partner violence (Valashjardi et al., 2020b), spiteful punishments (Parton & Ent, 2018), and territoriality (e.g., claiming, marking, defending, and blocking access to objects, spaces, and information; Fennimore, 2019). Taken together, vulnerable narcissists, like their grandiose counterparts, exhibit the need for distinction and admiration from others. However, their lack of personal agency prevents them from successfully utilizing self-enhancement strategies, which in turn results in a chronic and pervasive sense of low self-worth and a range of maladaptive behaviours (Brookes, 2015; Brown et al., 2016; Pincus et al., 2009).

Developmental Theories of Narcissism

The etiology of narcissism is primary understood from a social and behavioural perspective, with a large subset of research suggesting that parenting practices play a significant role in shaping narcissistic tendencies. There are two primary theories that link parenting to narcissism. The first theory is based on attachment theory articulated by Kohut (1971, 1977) and Kernberg (1975). Infants have an inborn biological need to be close in proximity to their caregivers and fulfill their need to be protected and loved. Through such proximity, children learn how to regulate their emotions and respond consistently and sensitively to threats and stressors in their environment. Children also develop their self-identity by receiving love and validation from their caregiver. When attachment is disrupted by emotional or physical neglect or abuse by a caregiver, children develop a low sense of self-worth and learn that they must depend on themselves, rather than others, to survive. In order to adapt to such neglectful or abusive environments, children develop a "thin veil" of narcissism as a way to inflate their self-image and conceal their feelings of worthlessness and inadequacy. The caregiver's failure to provide adequate emotional support may also lead children to question their subjective experiences and become dependent upon others' perceptions to develop their self-representation. Such dependence on, and sensitivity to, others' perceptions is thought to foster vulnerable tendencies (for a review, see Bennet, 2005).

While there is support for the attachment theory (e.g., Myers & Zeigler-Hill, 2012), there is a second, more contemporary theory that links parenting to narcissism. According to the social learning theory (Millon, 1969, 1981), grandiose and vulnerable narcissism are related to maladaptive schemas that arise from learned responses to either parental overvaluation or devaluation during upbringing. Extremely permissive parenting and overvaluation from parents is related to the development of grandiose tendencies in children, while parental leniency, overprotection, and maltreatment is associated with vulnerable tendencies (Fiscalini, 1993; van Schie et al., 2020; Van Buren & Meehan, 2015; Zeigler-Hill et al., 2011). Within an attachment framework, children internalize their parents' beliefs that they are superior or inferior to others. In turn, they develop a strong motivational tendency to defend and maintain such beliefs, regardless if those beliefs about their self-representation are positive or negative (Millon, 1969, 1981).

There is additional evidence to suggest the development of vulnerable and grandiose narcissism in men and women is dependent on parenting styles and gender. Specifically, retrospective reports of paternal overvaluation predict greater grandiose traits in men, while reports of maternal leniency and lack of warmth predict vulnerable narcissism in women (Valashjardi et al., 2020a). Gender socialization processes may align with certain parental styles and contribute to gender differences in the development of the narcissistic subtypes. For example, the tendency for males to exhibit grandiose traits may reflect encouragement by the father to adopt self-enhancement strategies to withhold affection (Wood & Eagly, 2012). In this way, parenting styles by fathers and mothers may reinforce gendered behaviours, which in turn may lead to the development of grandiose or vulnerable traits in children.

Measurement of Narcissism

A large portion of narcissism research has focused on grandiosity due to its substantial emphasis in the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5). The American Psychiatric Association (APA, 2013) operationalizes narcissism as Narcissistic Personality Disorder (NPD), with diagnostic criteria that is confined to attributes such as arrogance, entitlement, exploitation, lack of empathy, the need for admiration, and an inflated self-image. Such criteria are captured by the Narcissistic Personality Inventory (NPI; Raskin & Terry, 1988) one of the most popular measures of narcissism in social-personality research (Cain et al., 2008; Miller et al., 2014). Problematically, this has limited our theoretical understanding of narcissism mainly in terms of grandiosity. To address the heterogeneity of narcissistic traits, researchers have developed separate measures of vulnerable narcissism, such as the Hypersensitive Narcissism Scale (HSNS; Hendin & Cheek, 1997), which correlate weakly with the NPI. More recently developed measures include subscales for both vulnerable and grandiose narcissism, including the Pathological Narcissism Inventory (PNI; Pincus et al., 2009), the Five Factor Narcissistic Inventory (FFNI; Glover et al., 2012), and the Narcissistic Admiration and Rivalry Questionnaire (NARQ; Back et al., 2013). The development and use of such measures have led to findings that not only suggest grandiose and vulnerable narcissism are two distinct dimensions (e.g., Maples et al., 2011; Pincus et al., 2013), but also that they are moderately correlated with each other (Thomas et al., 2012; Wright et al., 2010; Zeigler-Hill et al., 2013) and, together, make up the construct of narcissism (Pincus & Lukowitsky, 2010).

Measures of grandiose narcissism are often developed based on the masculine features depicted in the NPD criteria, including leadership, authority, and aggression (Corry et al., 2008). Such basis for the measurement of grandiose narcissism is thought to contribute to observed gender differences in narcissistic subtypes. For example, one meta-analytic review by Grijalva and colleagues (2015) found that males report significantly higher scores on the NPI—a measure developed based on the NPD criteria—and are 75% more likely to be diagnosed with NPD, relative to women. In contrast, measures of grandiosity that are not confined to NPD traits (e.g., PNI, NARQ) have demonstrated equal endorsement of grandiosity among males and females (Back et al., 2013; Pincus et al., 2009; Valashjardi et al., 2020). Unlike grandiosity, vulnerable narcissism is generally found to be either gender neutral (Besser & Priel, 2010; Miller et al., 2010) or greater among women relative to men (Huxley & Bizumic, 2017; Pincus et al., 2009; Wright et al., 2010) across measures of vulnerable narcissism. Thus, measures of narcissism appear to be sensitive to male and female endorsement of narcissistic subtypes.

Threat and Narcissism

Individuals are capable of fluctuating between grandiose and vulnerable narcissistic expressions over time (Gore & Widiger, 2016; Oltmanns & Widiger, 2018; Pincus et al., 2016) and such oscillations appear to be dependent on the type of threat one encounters. In the context of narcissism, threat is the experience of distress in response to a situation or context that is perceived as being significant enough to cause a change in how the self is conceptualized (Besser & Priel, 2010). Typically, grandiose tendencies are adopted to cope with threats related to achievement and performance, while vulnerable tendencies are adopted in response to interpersonal threats. For example, when told to imagine failing to obtain a promotion at work (i.e., achievement/performance threat), individuals high on grandiose narcissism experience greater hostility and anxiety, compared to those high on vulnerable narcissism and low on grandiose narcissism (Besser & Priel, 2010). However, when individuals are told to imagine, or are subjected to, insults from another person (i.e., interpersonal threats), individuals high on vulnerable narcissism experience greater anger and sadness compared to those high on grandiose narcissism and low on vulnerable narcissism (Besser & Priel, 2010; Hart et al., 2017). Together, these findings underscore the importance of assessing specific threats to unveil narcissistic tendencies.

To date, only one study by Czarna and colleagues (2015) has assessed the relationship between narcissism and emotional contagion. Participants in their study first completed a measure of grandiose narcissism (i.e., NPI) and general mood. Participants were then randomized to either view one of two, three-min videos of a man expressing either a positive or negative emotion. After viewing the emotive video, participants completed the same general mood measure that was completed at the start of the procedure. It was found that grandiose narcissists did not experience an increase in positive or negative mood after viewing the positive and negative emotive video, unlike their low-grandiose counterparts who experienced a congruent shift in mood. While the study provides initial evidence that individuals with high levels of narcissism are less susceptible to emotional contagion, further investigation is needed to determine whether the presence of a specific threat modulates emotional contagion processes such as facial feedback among narcissists.

Body Image

Body image is one aspect of self-representation that has implications for the study of threat among narcissists. Indeed, the relationship between narcissism and body image is one of historical significance. The term narcissism originates from the Greek mythological figure Narcissus: a handsome, self-absorbed, young man that became fixated on his own physical appearance. After stopping by the riverside to drink water, Narcissus saw his reflection in the water and fell passionately in love with his own appearance. Entranced and unable to look away from his own reflection, Narcissus eventually pined away by the waterside (see Brummelman et al., 2015). Today, psychologists have come to refer to Narcissus' personality as narcissism. Although the definition has expanded to other aspects of self-representation—including intelligence (Zajenkowski & Czarna, 2015), athleticism (Elman & McKelvie, 2003), altruism (He & Zhu, 2016), and leadership (Grijalva et al., 2015)—the present program of research gravitated towards the investigation of narcissistic threat that is rooted in the historical context of body image.

Body image is a multifaceted, dimensional construct that encompasses an individual's attitudes, perceptions, and behaviours pertaining to their body (Cash & Prunzinsky, 1990). On the one hand, one may have *positive* subjective evaluations of their physical body, which is referred to as body satisfaction. On the other hand, one may experience body dissatisfaction, which is characterized by *negative* subjective evaluations (Stice & Shaw, 2002) and overvaluation or preoccupation with body weight, shape, and appearance (Fairburn, 2008). Body dissatisfaction is typically revealed by a discrepancy between one's current body and one's conceptualization of the thin ideal body (Cash & Szymanski, 1995; Fallon & Rozin, 1985; Fitzsimmons-Craft et al., 2015; Meltzer & McNulty, 2015); however, individuals who are close to the ideal are often not satisfied with their bodies (Cash & Pruzinsky, 2002). This suggests that body dissatisfaction is associated with a disturbance in one's perception of body weight, shape, and appearance (Stephen et al., 2018). Body dissatisfaction is common among adolescent girls, with prevalence rates ranging from 57% to 84% (Almeida et al., 2012; Ferrari et al., 2013; Lawler & Nixon, 2011; Petroski et al., 2012). Such prevalence rates have made body dissatisfaction a growing area of research.

Body dissatisfaction arises from the overvaluation of various bodily aspects: one such aspect is weight. For example, in a nonclinical sample of over 300 women attending university, 87% reported a desire to weigh less (Neighbors & Sobal, 2007). Women in this sample also expressed greater body weight dissatisfaction than men, even though men in the sample weighed significantly more than women. Furthermore, young women prefer a body weight approximately 10% lower than their current weight (Laliberte et al., 2007). The desire to weigh less is associated with various weight-loss behaviours, the most common of which is dieting. Approximately 60% to 80% of students between the ages of 11 and 16 have been on a diet within the previous year (Fonseca et al., 2009), irrespective of age, race, ethnicity, and weight (Laska et al., 2012; Malinauskas et al., 2006). Moreover, normal-weight adolescent females that experience body dissatisfaction have an approximate fourfold increased risk for engaging in extreme weight loss behaviours (i.e., vomiting, laxatives, diet pills), compared to those without body dissatisfaction (Liechty, 2010). These findings suggest that many women—regardless of actual weight—engage in weight loss behaviours in attempt to obtain their ideal weight.

Body shape is another aspect that is highly evaluated. Waist-to-hip ratio (WHR) has been shown to be indicative of health risk, with low WHR, or curvaceous body, being associated with better overall health and fertility (Singh, 1993; Streeter & McBurney, 2003). Among women in Western cultures, low WHR is viewed as more attractive than high WHR (Jasienska et al., 2004). However, recent studies suggest that women are now beginning to favour a more androgynous, slender figure to reflect changing cultural ideals. Over the course of eight generations, women's size preference for waist, bust, underbust, forearm, bicep, calf, and thigh girth have become smaller, while size preference for arms and legs have become longer (Brooks et al., 2015; Crossley et al., 2012).

Women are also generally evaluative of physical appearance and believe their lives would change in important, positive ways if they attained bodily features associated with the ideal beauty standard promoted by the media (Engeln-Maddox, 2006). This can be attested by the large, and growing, number of appearance-enhancing treatments and surgeries currently available (Swami et al., 2009). According to the American Society of Plastic Surgeons (ASPS), approximately 17.7 million cosmetic procedures were undertaken in the United States in 2018. Of this, 92% were undertaken by women, with the most common procedures being breast augmentation, liposuction, nose reshaping, eyelid surgery, tummy tuck, Botox injection, soft tissue filler, chemical peel, laser hair removal, and microdermabrasion. Of these procedures, 226,994 were undertaken by adolescents between 13 and 19 years of age (ASPS, 2018). Trends for such surgeries have also gradually increased since 2000 (ASPS, 2018), further suggesting that women are becoming increasingly motivated towards achieving the ideal physical appearance.

High levels of body dissatisfaction have been associated with a number of mental health issues, including social anxiety (Cash & Fleming, 2002), depression (Paxton et al., 2006), emotional distress (Johnson & Wardle, 2005), and low self-esteem (Stice & Bearman, 2001). However, body dissatisfaction is one of the most common risk factors for the onset and maintenance of eating disorder symptoms (Johnson & Wardle, 2005; Laliberte et al., 2007; Stice & Agras, 1998). In a meta-analytic review of prospective studies pertaining to maintenance factors for disordered eating, body dissatisfaction surfaced as one of the most consistent and robust maintenance factors for eating pathology (Stice, 2002). Eating disorders have the highest mortality rate of any mental illness (Smink et al., 2012), wherein people with anorexia nervosa between the age of 15 and 24 years have a tenfold increased risk of fatality compared to their same age peers (Fichter & Quadflieg, 2016). Such findings underscore the detrimental effects of body dissatisfaction and the need for understanding the potential factors that contribute to its onset.

Body Exposures and Comparisons

One research paradigm that has been frequently implemented to understand body dissatisfaction is a body exposure whereby participants are shown stimuli of their own body. Body dissatisfaction is elicited in response to several types of body exposures. For example, women that engage in a mirror exposure demonstrate an increase in body-checking behaviour; specifically, selective attention towards disliked body parts of their own body and ‘beautiful’ body parts of another person’s body (Jansen et al., 2005; Shafran et al., 2007). Such exposures are also associated with an increase in body dissatisfaction, negative emotionality, and self-critical thought (Frayeh & Lewis, 2018; Moreno-Domínguez et al., 2012; Veale et al., 2016; Vocks et al., 2007). Body dissatisfaction also increases in response to video exposures of oneself, especially among women with eating disorder symptomology. Women experience less subjective pleasure, greater arousal, skin conductance, and cardiac acceleration, and an increase in attentional bias towards unattractive body areas while viewing a video of their own body (Bauer et al., 2017; Ortega-Roldán et al., 2014; Tuschen-Caffier et al., 2003). Together, these findings suggest the uncomfortable nature of body exposure for women on a cognitive, emotional, and physiological level.

Despite the threatening nature of body exposures, individuals paradoxically seek out opportunities to engage in such. This can be attested to by the rise of a new social phenomenon whereby individuals purposefully take self-portraits (i.e., selfies) using digital technology and publish them on social media platforms. The selfie phenomenon is appealed by the rise in social media platforms that enable individuals to construct and display their identities to others. Such personalization has led individuals to become increasingly invested in developing an idealized self to present to other people (see Wagner et al., 2016). In this way, social media provides individuals a means for satisfying their narcissistic needs and motives pertaining to their body image in a socially acceptable way. However, to the contrary, women who regularly share self-images on social media report significantly higher body dissatisfaction, overvaluation of weight and shape, dietary restraint, and internalization of the thin ideal (Cohen et al., 2017; McLean et al., 2015; Mills et al., 2018).

The process of social comparison may explain why women purposely engage in body exposures irrespective of their own body dissatisfaction. Humans are motivated to appraise their attributes and skills to develop their self-identity. Festinger (1954) proposed that individuals do this by engaging in social comparison, which is defined as the process of thinking about one or more other individuals in relation to the self (Wood, 1996). That is, the comparer looks for or notices similarities and/or differences from the target of comparison on some dimension. To make an accurate comparison, individuals typically compare themselves to similar others. For example, students taking the same class are likely to compare their grades to one another (Azmat & Iriberri, 2010). Comparisons can be upward, whereby individuals selectively compare themselves to another person who is perceived as "better-off", or downward whereby they compare themselves to another person who is perceived as "worse-off" (Festinger, 1954; Miller et al., 1988; Wood, 1989). The tendency to engage in either upward or downward comparisons, as well as the impact of the comparison process, depends on the importance of the dimension under comparison to the individual (Wood, 1989).

Body comparison is a specific form of social comparison that refers to the process by which people evaluate themselves by comparing their body to that of another person (Lin & Soby, 2016). Body comparisons, however, diverge from the key tenets of social comparison theory in several notable ways. First, Festinger (1954) posited that individuals are more likely to compare themselves to relevant or similar others. However, women frequently make unfavourable, upward body comparisons to dissimilar or unfamiliar others who exhibit the ideal body. For example, adolescent girls frequently compare their body not only to other adolescents, but also to ideal adult bodies observed in the media (Bell & Dittmar, 2011; Maltby et al., 2005; Perloff, 2014; Tiggemann et al., 2009). Women also compare their bodies to both familiar and unfamiliar individuals in their immediate environment (Fitzsimmons-Craft, 2017; Fitzsimmons-Craft et al., 2015; Krones et al., 2005; McFerran et al., 2010; Tucker et al., 2007), as well as on social media platforms such as Facebook (Eckler et al., 2017; Fardouly & Vartanian, 2015; Park & Beak, 2018) and Instagram (de Vries et al., 2018; Feltman & Szymanski, 2018; Kleemans et al., 2018). Second, Festinger argued that individuals will stop making upward comparisons if they become detrimental to their self-image; however, research in the body image domain suggests otherwise. Although women engage in both upward and downward body comparisons (McKee et al., 2013), they tend to engage in more upward body comparisons even if it results in body dissatisfaction and negative affect (Bessenoff, 2006; Chrisler et al., 2013; Harper & Tiggemann, 2008; Tiggemann & McGill, 2004). More disconcerting is the increase in body dissatisfaction that results from upward body comparisons, which is significantly stronger for women who are already high in body dissatisfaction (Rodgers et al., 2015) and individuals whose self-worth is highly contingent on bodily appearances (Fitzsimmons-Craft et al., 2015). Thus, upward comparisons can be described as a perpetual cycle of dissatisfaction, making women who are already unhappy with their bodies more so.

In nonappearance domains, downward comparisons have been shown to have protective effects on women's body satisfaction. That is, body-dissatisfied women instructed to make downward comparisons to models in nonappearance domains (i.e., relationships, intellect, personality) experience an increase in body satisfaction (Lew et al., 2007). Appearance-related downward body comparisons are also associated with less body dissatisfaction and eating disturbance (Bailey & Ricciardelli, 2010), greater appearance esteem (Leahey et al., 2011), reduced negative affect (Leahey et al., 2007), and greater self-confidence (van den Berg & Thompson, 2007), compared to women who engage in upward body comparisons. On the contrary, there is emerging evidence to suggest that downward body comparisons do not have such compensatory effects (Lin & Kulik, 2002; Rancourt et al., 2016; for a review, see Gerber et al., 2018). For example, Fitzsimmons-Craft (2017) found that downward comparisons had no buffering effects against body dissatisfaction. In fact, downward comparisons were associated with greater eating pathology, including thoughts about food restriction and attempts to restrict food intake. Similarly, Lin and Soby (2016) found that downward body comparisons are associated with a drive for thinness and dietary restraint and no improvement in body dissatisfaction or negative affect. Interestingly, the researchers also found that women who engage in *both* downward and upward comparisons are more likely to experience a drive for thinness, body dissatisfaction, dietary restraint, negative affect, and engage in negative body talk than women who only engage in one direction of comparison. These findings suggest that downward comparisons may increase the negative effects of upward body comparisons (Lin & Soby, 2016). It may be that an individual comes to realize that there is a discrepancy between his or her ideal and actual body via upward *and* downward comparisons (Fitzsimmons-Craft et al., 2015; Lin & Soby, 2016). In a crucial departure from Festinger's social comparison theory, body comparisons are experienced as threatening, regardless of the direction of the comparison.

Women most frequently make body comparisons to other people they see and interact with in-person. Such comparisons occur close to where an individual lives, walks, and eats and with just a few or a handful of other targets of comparison present (Fardouly et al., 2017; Fitzsimmons-Craft, 2017). However, body comparisons that occur with targets on social media result in greater detrimental effects, beyond what occurs on an in-person level (Fardouly et al., 2017). In recent years, the opportunities for body comparison with thin models portrayed in the media has increased due to the rise of social media. Popular platforms such as Facebook and Instagram provide women the opportunity to engage in daily comparisons not only with their close peers, but also with unfamiliar individuals including models and celebrities (Casale et al., 2019; Stronge et al., 2015; Tiggemann & Barbato, 2018). Such boundless opportunities to compare one's weight, shape, and appearance with a variety of comparison targets has contributed to the rise of body dissatisfaction among women (Saunders & Eaton, 2018). With the growing use of social media and ease of access to social media platforms on smart phones and tablets, body comparisons can occur frequently throughout any given day.

Developmental Theories of Body Dissatisfaction

The high prevalence of body dissatisfaction experienced via body exposure and comparison, as well as choice of body comparison targets, may be explained in terms of the widely researched tripartite influence model (Thompson et al., 1999). This model suggests that there are three primary sociocultural variables that influence the development of body dissatisfaction: media, peers, and parents. In Western society, the media frequently depicts thin women (Slevec & Tiggemann, 2011) and over time, this ideal has become increasingly thinner, with the weight of female models in media often thinner than the criteria for anorexia nervosa (Ahern et al., 2008; Sypeck et al., 2004). Extensive exposure to this unattainable ideal is shown to result in body dissatisfaction (for a review, see Grabe et al., 2008). With respect to peers, adolescents create an "appearance culture", partly through peer conversations about appearance. The more conversations girls have with other girls about their appearance, the more likely it is that they will engage in appearance comparisons and become dissatisfied with their bodies (van Tergouw, 2011). During adolescence, appearance attitudes among women are greatly influenced by their peers. However, younger children's attitudes regarding appearance is more strongly influenced by parents, particularly mothers (Salvy et al., 2012). During upbringing, the parent-child relationship is the primary source of influence and plays an important role in shaping children's attitudes and values about body image (Jones, 2011). By establishing lifestyle patterns of diet, exercise, and evaluation of others, parents express their expectations and beliefs—directly or indirectly—about physical appearance to their children from a young age. For example, a parent's negative comments regarding their child's weight and shape in the form of teasing, criticism, and encouragement to lose weight are associated with body dissatisfaction among children (Handford et al., 2018). Similarly, parents may indirectly model their own negative body-related beliefs and dieting behaviour. Children may copy the behaviour of their parent (e.g., make appearance comparisons or engage in dieting) or reiterate parent's self-critical comments about weight and shape. The reverberation of such attitudes and behaviours may teach children to value the importance of being thin and result in children becoming dissatisfied with their appearance (Handford et al., 2018; Rodgers et al., 2009).

The tripartite influence model accounts for robust risk factors known to influence body dissatisfaction. However, not everyone experiences body dissatisfaction or discomfort during a body exposure. Other factors, such as personality traits, are shown to influence one's susceptibility to such responsivity. For example, individuals high on trait body dissatisfaction experience greater elevation of negative emotions during a mirror exposure compared to their body-satisfied counterparts (Veale et al., 2016). Similarly, an unpublished study by Chong (2014) found a positive relationship between trait body satisfaction and self-reported affect among female university students during a photograph exposure. Individuals with high body satisfaction experienced positive affect while viewing photographs of themselves, while those with low body satisfaction experienced negative affect. This relationship was also related to electroencephalographic (EEG) frontal asymmetry, the amount of frontal lobe cortical activity in one hemisphere relative to the other. Those who experienced high body satisfaction experienced greater left frontal asymmetry, which is associated with positive affect and approach motivation. Conversely, those who experienced low body satisfaction experienced greater right frontal asymmetry, which is associated with negative affect and withdrawal motivation. Thus, individual differences in body satisfaction influence the way people emotionally and physiologically respond to a body exposure.

Narcissism and Body Dissatisfaction

The emotional and behavioural tendencies characterized by narcissism may be another factor that differentially influences how one experiences a body exposure and body comparison. Although both expressions of narcissism have been shown to be associated with excessive attention to appearance (Back et al., 2010; Swami et al., 2015; Vazire et al., 2008), vulnerable narcissists are more likely to base their self-worth on appearance and experience body dissatisfaction. This can be understood when considering how vulnerable and grandiose narcissists respond to interpersonal, body-related threats. Vulnerable narcissists are hypervigilant and sensitive to appearance evaluation and rejection (Besser & Zeigler-Hill, 2010). When such body-related threats occur, these individuals experience emotional dysregulation and self-criticism, which in turn places them at risk for body dissatisfaction (Miller et al., 2010; Purton et al., 2018). In contrast, grandiose narcissists endorse positive illusions about the self and distort others' opinions to minimize interpersonal threats to body image (Pincus et al., 2010). Such a response pattern may serve to protect against emotional dysregulation and ensuing body dissatisfaction. In support, research shows that grandiose narcissism is positively correlated with high self-esteem and unrelated to body dissatisfaction and self-objectification (Dryden & Anderson, 2020; MacLaren & Best, 2013; Purton et al., 2018).

The conceptualization of how narcissists respond to body-related threats is predicated mainly upon self-report data. To date, only two studies have experimentally examined a body-related threat among individuals with varying levels of narcissism. The first study by Thomaes and Sedikides (2016) investigated grandiose narcissistic tendencies among young girls between

11 and 15 years of age while viewing models in magazines. Participants in the study were randomized to view 10 pictures of either a thin or close-to-average body size model. Afterwards, they engaged in a taste test of high-calorie food items (i.e., potato chips and chocolate). Participants also completed measures pertaining to grandiose narcissism and wishful identification (i.e., desire to look or be like the model they are viewing). The study found that participants high in grandiose narcissism refrained from identifying with the thin models and reduced their intake of high-calorie food after viewing thin models. These findings highlight the propensity of grandiose narcissists to cognitively disengage from thin-ideal threats, and subsequently adopt a restricted eating pattern to uphold their body image.

Chong and Davis (2017) were the second to experimentally examine a body-related threat among narcissists. In contrast to Thomaes and Sedikides (2016), the study explored attentional processing among narcissists while viewing photographs of oneself. Seventy-nine female undergraduate students completed questionnaires pertaining to body satisfaction and narcissism, followed by two laboratory visits. During the first visit, photographs were taken of the participant. In the second visit, participants engaged in a dot probe task that measured attentional bias towards photographs of oneself. Participants viewed photographs for either 175 ms or 500 ms. A subset of the findings from this study found that vulnerable narcissists with low body satisfaction gradually attended towards their own photographs. These individuals had a decrease in attentional bias towards photographs of themselves at 175 ms and subsequently greater attentional bias towards the same photographs at 500 ms. In conjunction with Thomaes and Sedikides (2016), these findings support the claim that vulnerable narcissists are hypervigilant to body-related threats, while grandiose narcissists disengage from such threats. Given that narcissism is characterized by emotion dysregulation, it could be speculated that such cognitive and behavioural responses to body-related threats are associated with individual differences in emotional processes, such as facial feedback. However, further investigation is needed to determine the role of such emotional processing among narcissists in the context of a body-related threat.

The Program of Research

Humans have a fundamental need to belong and affiliate. One process that may serve to build and maintain social interactions is captured by the facial feedback hypothesis. Activating congruent facial muscle activity in response to the facial expressions of another person is thought to help individuals feel what others are feeling. In support, when individuals are exposed to positive and negative emotional facial expressions of another person, they tend to react with increased EMG activity in zygomaticus (i.e., smiling) and corrugator (i.e., frowning) muscle groups, respectively. Such pattern of congruent facial muscle activity is often accompanied by a congruent self-report experience of emotion.

While there is considerable support for the facial feedback hypothesis, many studies also demonstrate a nonsignificant relationship between facial muscle activity and self-report emotion. One potential explanation for such discrepancy may be that narcissism moderates facial feedback. Narcissism is a personality dimension whereby individuals experience emotional dysregulation when faced with a threat to their self-representation. One aspect of identity that may be threatened is body image. Individuals experience body dissatisfaction and negative emotionality when exposed to their own body, as well as when comparing their body to that of another person. Such a body-related threat may elicit narcissistic tendencies and, in turn, influence facial feedback. The underlying mechanisms of emotional contagion and the facial feedback effect remain largely elusive (Cole & Larsen, 2019; Prochazkova & Kret, 2017; Seibt et al., 2015). Given the variety of cognitive and behavioural strategies narcissists engage in to protect or maintain their self-representation, it can be speculated that narcissistic tendencies may either enhance or reduce susceptibility to facial feedback when faced with an identity threat. To date, no study has investigated facial feedback among narcissists. In addition, few studies have investigated narcissism using an experimental manipulation of identity threat. The purpose of the program of research was to investigate the relationship between body comparison (*X*) and facial feedback (*Y*) and to determine whether this relationship is moderated by narcissism (*W*; see Figure 1). The proposed research question is conceptually one of moderation. However, facial feedback is defined as the more specific relationship between facial muscle activity and self-report emotional experience. To allow for a more precise investigation of the aforementioned variables, the research question was modelled as a moderated mediation; that is, whether body comparison (*X*) causes a change in facial muscle activity (*M*) and self-report emotion (*Y*), and whether this mediational relationship is moderated by narcissism (*W*; see Figure 2).

When designing a program of research, it is important that it will cultivate a pattern of research results that are consistent with existing research and theory (Campbell, 1957; Cook et al., 2002; Hayes, 2018; West & Thoemmes, 2010). Although there is robust support for the elicitation of threat via a body comparison (see Myers & Crowther, 2009), research suggests that the elicitation of congruent facial muscle activity is context dependent (e.g., Noah et al., 2018). As the program of research required the development and use of a unique emotive set of stimuli (see Study 1), it could not be assumed that the novel stimuli would elicit congruent facial muscle activity. Informed by the existing literature, the program of research first assessed whether appropriate EMG facial muscle activity occurs under the specific context of the novel emotive set in Study 2 before subjecting it to the influence of a body comparison in a full-scale study.

Given that facial feedback is most commonly assessed using facial manipulation paradigms (e.g., Strack et al., 1988), Study 2 also attempted to replicate the modulation hypothesis in the context of the emotive stimuli set to assess whether changes in facial muscle activity influence one's subjective emotional experience. After investigating whether facial feedback could be manipulated physically, the program of research then investigated whether facial feedback is cognitively modulated by narcissism in the context of body comparison.

Study 1

The program of research began by conducting a study to develop and validate an emotive stimuli set capable of eliciting a congruent, subjective experience of emotion in viewers. Although there was a wide selection of emotive sets freely available (e.g., Carvalho et al., 2012; Gabert-Quillen et al., 2015; Kanade et al., 2000; Lang et al., 2008; Lucey et al., 2010; O'Toole et al., 2005; Samson et al., 2015; Wingenbach et al., 2016), the program required the development of an original emotive set to increase the internal validity of the Study 3. The purpose of Study 3 was to investigate the facial feedback hypothesis among narcissists in the context of a body comparison threat. In order to elicit such threat, participants were randomized to one of two conditions of body comparison: explicit comparison (EC) and implicit comparison (IC).[2] In the EC group, participants were instructed to compare their weight, shape, and appearance after viewing emotive stimuli of another woman. Participants also engaged in a body exposure (i.e., viewed stimuli of themselves) before viewing the emotive stimuli of the other woman to prime their body image and intensify the body comparison process. In contrast,

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[2] The names of the conditions reflect the methods used to experimentally manipulate the body comparison process. Given that body comparison occurs automatically in response to body stimuli, Study 3 required the body comparison process to be intensified among participants in the experimental condition above what occurs implicitly or while passively viewing bodily stimuli. This is achieved using explicit induction and body exposure methods. See Study 3 for more information.

participants in the IC group simply viewed the emotive stimuli of the other woman and then viewed their own stimuli afterwards. To increase internal validity, the study required the emotive stimuli of the other woman to be developed in an identical manner to participants' own stimuli (e.g., camera angle and frame, lighting, procedural instructions, duration). Such standardization increases confidence that the observations between the experimental groups are due to differences in the manipulation of body comparison, rather than differences in the nature of the stimuli. Study 1 developed and validated a novel emotive set to maximize the latter.

Development of Emotive Stimuli

Emotive stimuli range from music (Ignacio et al., 2019), stories (Paredes et al., 2013), guided imagery (Engen et al., 2018), pictures (Bradley & Lang, 2007), film (Rottenberg, 2007) and social interactions (Roberts et al., 2007). Of these methods, pictures are the most common method of eliciting emotions, especially in facial feedback studies (Coles & Larsen, 2019; Dimberg & Soderkvist, 2011). Problematically, briefly presented pictures compromise ecological validity. In real-life settings, emotional experiences dynamically unfold over a longer period of time within the context of the social environment rather than in briefly presented intervals (Barrett et al., 2007; Boiger & Mesquita, 2012; Frijda, 1988; Scherer, 2009). In the program of research, an ecologically valid emotive stimuli set is integral to the investigation of facial feedback among narcissists. As previously mentioned, eliciting the perception of threat is essential for evoking narcissistic tendencies. To simulate the authenticity of a body comparison—and, thus, intensify the perception of threat among participants—the program required an emotive set with high ecological validity.

Videos are one of the most powerful methods of eliciting emotions in a laboratory setting (Rottenberg et al., 2007; Westermann et al., 1996). Compared to pictures, videos result in better emotion recognition (Ambadar et al., 2005; Trautmann et al., 2009; Weyers et al., 2006), activation of a wider neural network related to emotional processing (Kilts et al., 2003; Sato et al., 2004), more intense and persistent emotional states (Rottenberg et al., 2007; Schaefer et al., 2010), and greater increase in congruent facial muscle activity in response to emotive stimuli (Rymarczyk et al., 2016a; Wilhelm et al., 2017). In addition to capturing the dynamic and evolving nature of real-life emotional events, emotive videos are also standardized and have high levels of attentional capture (Rottenberg et al., 2007). Thus, the program of research utilized videos to elicit emotions.

The content of the emotive videos was premised on theory and research pertaining to facial feedback, subjective emotion, and body comparison. Facial feedback has been found to be greater when individuals are viewing emotional facial expressions of another person of the same sex (e.g., Sonnby-Borgstrom et al., 2008). Additionally, a meta-analysis by Myers and Crowther (2009) found the effect of body comparison paradigms on body dissatisfaction to be larger for women than men, as well as when individuals compare themselves to others similar in age. Accordingly, the emotive videos were enacted and rated by women between the ages of 18 and 40, which is the typical age range of individuals attending Lakehead University where participants were primarily recruited for the program of research (Lakehead University, 2015). Facial feedback also increases when there is greater opportunity for the perceiver of the emotion to make eye contact with the individual displaying the emotion (Rychlowska et al., 2012). As such, facial displays of emotion were recorded from a head-to-shoulders position.

The facial feedback hypothesis is based on a collection of studies demonstrating reliable EMG corrugator and zygomaticus activity in response to *both* positive and negative emotional states, respectively (Bradley et al., 2001; Dimberg & Thunberg, 2012; Dimberg & Söderkvist, 2011; Lundqvist & Dimberg, 1995; Moody et al., 2007; Sonnby-Borgström et al., 2003; Weyers et al., 2006). Accordingly, the emotive video set consisted of two videos: one emulating a negative emotional expression and another emulating a positive expression. In particular, happy and sad emotional expressions were chosen as they are distinguished predominately on observed facial behaviours, relative to other emotions. For example, fear is characterized by increased corrugator activity (Ekman & Friesen, 1978); however, it is predominately distinguished by whole body behaviours that are adaptive when confronting a threat in the environment (i.e., startle, freezing, rigidity, or fleeing; Krypotos et al., 2015). In contrast, happiness is indexed by two important facial actions. The first action, the smile, is activated by the zygomaticus muscles (extends the mouth horizontally) and the orbicularis occuli muscle (contracts the eyes; Ekman, 1992; Ekman et al., 1990; Frank & Ekman, 1993). Activation of both these muscles forms what is called a Duchenne smile which typically occurs involuntarily and signals genuineness of the felt emotion. The second facial action is laughter, which is characterized by vocalized inhalations and a series of aspirations from the mouth (e.g., Meyer et al., 2007; Ross et al., 2009). Likewise, sadness is predominately indexed by facial actions including crying, vocal exclamations or wailing, downward eye-gaze, squinting, and frowning (Darwin, 1872; Ekman & Friesen, 1978).

Zygomaticus and corrugator activity are important for generating happy and sad facial expressions, respectively. However, activation of these muscles *alone* cannot reliably distinguish discrete emotions as these muscles are involved in the formation of other emotions (Ekman & Friesen, 1978; Murata et al., 2016). Accompanying facial behaviours (i.e., tears, laughter) are important for providing contextual cues that distinguish between discrete emotions. In fact, the rudimentary reason for the activation of zygomaticus and corrugator muscles is to produce these contextual cues. The vocalization of laughter when one experiences happiness is preceded by zygomaticus activity. Similarly, shedding tears when one is sad is preceded by squinting and wrinkling of the eyebrows by the corrugator muscle (Ekman, 1999; Krumhuber & Scherer, 2011; Scherer, 1994; Schröder, 2003). This cross-channel simulation of emotional expression suggests that when one perceives emotional contextual cues, the relevant facial muscles and subjective emotional states should also become activated. Indeed, individuals experience an increase in congruent facial muscle activity and self-report emotional response to vocalizations of happiness and sadness in the absence of viewing a happy and sad facial expression (Hawk et al., 2012). Conversely, when viewing facial expressions in the absence of contextual cues (e.g., static images), individuals also demonstrate an increase in activity of relevant facial muscles. However, such changes in self-report emotion are predominately sensitive to broad dimensional aspects of emotion (i.e., negativity, positivity), rather than specific discrete aspects (see Mauss, 2009). As such, when emotions are dynamically presented (i.e., videos, live interactions), self-report experience of emotion is more sensitive to discrete, rather than broad dimensional, measures of emotion as individuals are able to detect the various contextual cues that signal the specific emotion. Together, these findings suggest the importance of incorporating an assortment of contextual cues into the expression of emotion in emotive stimuli to provide context for the activation of zygomaticus and corrugator activity and to elicit the greatest amount of recognition and subjective experience of emotion from viewers. Accordingly, Study 1 required participants to portray contextual cues associated with happy and sad emotions. To increase ecological validity, participants were also instructed to dynamically increase the intensity of the emotion over the course of the recording (Recio et al., 2014; Kaltwasser et al., 2017). Studies investigating emotional responses to dynamic stimuli typically present stimuli for 3 min (Czarna et al., 2015; Davis et al., 2009; de Wied et al., 2009; Likowski et al., 2011; Stel et al, 2008). In addition to promoting gradual and persistent changes in affect (Gross & Levenson, 1995), the duration of approximately 3 min maximizes EMG temporal resolution (Golland et al., 2018). As such, the duration of each emotive video was 3 min to allow for the dynamic unfolding of emotional experience and EMG dynamics.

Neutral facial expressions are often included in studies of emotion to provide a baseline of subjective emotional experience. This expression involves the relaxation of the facial muscles and/or natural facial movements that imply no emotional intensity (Calvo et al., 2016; Sestito et al., 2013). To contrast emotional facial expressions (i.e., neutral versus sad; neutral versus happy), the current study developed a neutral emotive video. Participants were instructed to keep their facial muscles completely relaxed and to incorporate head and eye movements that naturally occur in a nonemotional context: gradual tilts of the head, occasionally moving eye gazes towards and away from the camera lens, and brushing hair away from the face.

Validation of Emotive Videos

After the development phase, the study evaluated whether the emotive video set elicited a congruent experience of emotion in viewers. There is debate among researchers with respect to whether emotions are best conceptualized and measured as discrete categories or as dimensions. According to the discrete theory of emotions (Ekman, 1999; Izard, 1992; Tomkins, 1962), there are several basic emotions (e.g., anger, fear, sad, happy, surprise, interest, disgust) that are universally recognized and have unique physiological profiles that distinguish them from one another. In contrast, the dimensional theory of emotion (Russell, 1980; Russell & Barrett, 1999) assumes that emotions arise from a combination of dimensions including arousal and valence (positivity, negativity). Although facial feedback has been demonstrated using both discrete and dimensional measures, discrete measures of emotion are shown to be more sensitive to dynamic emotive stimuli (Mauss, 2009). Furthermore, effect sizes for facial feedback are greater when measured with discrete measures of happiness (d = .23) and sadness (d = .30), compared to dimensional measures of positivity (d = .18) and negativity (d = .12; Coles et al., 2019). Accordingly, Study 1 validated the videos using a measure of emotion based on the discrete theory of emotion.

Self-report is the most common method of validating an emotive stimulus sets (e.g., Bradley & Lang, 2007; Carvalho et al., 2012; Harmon-Jones et al., 2016) and, thus, was used as the method of validation in the current study. Although the program was interested in facial muscle activity in response to the emotive videos, EMG was not incorporated in Study 1 as a preliminary method of validating the emotive videos. As previously mentioned, facial muscle activity cannot reliably distinguish discrete emotions on their own as these muscles are involved in the formation of a variety of discrete emotions (Ekman & Friesen, 1978; Murata et al., 2016). If EMG activity is to be interpreted in response to emotive stimuli, it is necessary to first validate *what* discrete emotions are being evoked by the stimuli. Validating the emotive videos using a discrete measure of self-report emotion ensures accurate inferences in subsequent studies with respect to the elicitation of EMG zygomaticus and corrugator activity by happy and sad emotional facial expressions.

There are a variety of self-report measures of discrete emotion which are relatively comprehensive (e.g., Pekrun et al., 2011), specific to a discrete emotion (e.g., Lyubomirsky & Lepper, 1999), or limited to a single item (e.g., Gross & Levenson, 1993). Of these measures, the Discrete Emotions Questionnaire (DEQ; Harmon-Jones et al., 2016) was considered the most suitable for the program of research as it was validated as a broad measure of state emotion. The DEQ consists of eight subscales (Anger, Disgust, Fear, Anxiety, Sadness, Desire, Relaxation, and Happiness), each of which contain four words with the highest factor loadings and a small cross-loading on the other factors or subscales. The DEQ was validated in the context of several emotion elicitation procedures, including guided imagery, autobiographical memory, and pictures. In each case, the DEQ was sensitive at assessing discrete emotional responses to discrete emotional events.

The DEQ has several advantages as a measure of discrete emotion, relative to other existing measures (see Harmon-Jones et al., 2016). First, the DEQ measures each discrete emotion using a range of items. This approach considers the fact that individuals may differ in terms of what label they use to describe their emotional state. From a statistical perspective, including several items, rather than one, to measure a construct also increases the reliability of the measure by reducing error variance. Second, the DEQ was developed and validated based on an emotion elicitation procedure, making it an appropriate measure of state emotion. Other measures of discrete emotion have commonly been developed by generating a list of emotional words and having participants endorse items while in a neutral emotional setting. Third, the DEQ measures basic emotions, which are more empirically supported than blended or complex emotions described in other discrete measures (e.g., anger-hostility, irritated, alert). In consideration of these advantages, the DEQ was deemed the most appropriate measure to validate the emotive videos.

As the program of research was concerned with investigating the facial feedback hypothesis, Study 1 aimed to validate the congruency between self-report emotion and the emotional facial expression displayed in the emotive video; that is, whether the sad emotive video elicits self-report sadness and whether the happy emotive video elicits self-report happiness. Accordingly, Study 1 validated the emotive videos using the DEQ Happiness and

Sadness subscales. The Happiness subscale consists of the items “happy”, “satisfaction”, “enjoyment”, and “liking” and the Sadness subscale consists of the items “sad”, “grief”, “lonely”, and “empty”. Although individuals may experience mixed discrete emotions in response to a stimulus, the remaining subscales of the DEQ were excluded from the validation procedure to prevent participants from potentially experiencing fatigue while completing an extensive list of emotional items after each emotive video (Harmon-Jones et al., 2016).

The Present Study 1

The purpose of Study 1 was to develop and validate an emotive video set capable of eliciting a congruent, subjective experience of emotion in viewers. Developing this novel emotive set would increase the internal validity of the experimental manipulation of body comparison threat in Study 3. Specifically, standardizing the participants’ and other woman’s emotive videos would ensure that observations between the experimental conditions in Study 3 are due to differences in the manipulation of body comparison, rather than differences in the nature of the videos. In consideration of the theory and research pertaining to facial feedback, subjective emotion, and body comparison, the emotive video set consisted of the following criteria: (a) the dynamic display of a happy, sad, and neutral facial expression; (b) the enactment of emotions by women between the ages of 18 and 40; (c) the enactment of emotions from a head-to-shoulder position; and (d) a video duration of 3 min. In Harmon-Jones and colleague’s (2016) pictorial manipulation procedure for the DEQ, a sample of participants viewed and rated several sets of photographs, each consisting of five photographs depicting a discrete emotion. In a comparable manner, the current study recruited a sample of five actors to develop happy, sad, and neutral videos to be rated by a separate sample of women. The latter sample of participants viewed and rated each of the emotive videos using the DEQ Happiness and Sadness subscale.

The purpose of this procedure was to assess whether the emotive videos elicit a congruent self-report emotional response, which is necessary for drawing inferences with respect to facial feedback in subsequent studies in the program of research. As the emotive videos were developed in consideration of theories of emotive behavior, it was hypothesized that participants' DEQ Happiness scores would be greater in response to the happy video, relative to the sad and neutral video, and that their DEQ Sadness scores would be greater in response to the sad video, relative to the happy and neutral video. Upon the conclusion of the validation procedure, a set of neutral, sad, and happy videos developed by one of the five participants was chosen to investigate the facial feedback hypothesis in subsequent studies. The emotive video set was selected based on the actor whose happy and sad video elicited the greatest DEQ Happiness and Sadness subscale scores.

Method

Participants

Emotive videos were developed by Sample 1 (actors), which comprised of five women between the age of 18 and 40. Participants were required to have experience in acting or theatre in order to emulate emotional contextual cues associated with happiness and sadness (e.g., crying, laughing). Actors were recruited from community acting associations in Thunder Bay (i.e., Applauze Production, Cambrian Players, Paramount, and Magnus Theatre) via an advertisement (Appendix A) posted to social media platforms by the acting associations. The advertisement instructed interested individuals to contact a member of the research team via e-mail to learn more about the study, receive an electronic copy of the information letter and consent form (Appendix B) and, if interested, arrange an appointment for a videography session in the laboratory with one of the research assistants. Written informed consent was obtained from actors prior to starting the videography session. Actors were also provided with high quality, digital copies of their videos at the end of the videography session to compensate them for their voluntary participation.

Sample 2 (raters) consisted of 36 women between the ages of 18 and 40 who rated the emotive videos developed by actors. The data from six raters were removed from analysis due to computer malfunctions during the laboratory procedure, resulting in a final sample size of 30. Raters were recruited from undergraduate courses at Lakehead University (Thunder Bay Campus) via the SONA Experiment Manager system. SONA is a web-based information system that posts REB-approved Psychology research studies for undergraduate Psychology students at Lakehead University. Students can read about the various studies, choose which among them they wish to voluntary pursue as potential research participants, and schedule an appointment to attend laboratory sessions. SONA provided a brief description of the current study, a hyperlink to the information letter and consent form (Appendix C), and a hyperlink to an online questionnaire consisting of questionnaires unrelated to the current study. Raters received a total of three and a half bonus points towards their final course grade upon completion of the study: one and one-half bonus points for completing the online questionnaire and two bonus points for completing the laboratory session.

A statistical power analysis was performed a priori using G-Power software (Version 3.1.9.2; Faul et al., 2007) to determine the required sample size of raters based on a within-subjects design. Although a large effect size was reported in the original validation study of the DEQ (η_p^2 = .18 – .51; Harmon-Jones et al., 2016), the sample size was calculated based on a more conservative, medium effect size to account for potential overestimation (Lakens, 2013; Perugini et al., 2018). Based on a significance level of $\alpha = .05$ and a power of 80%, the calculated sample size was 28. As 30 exceeds the calculated sample size, the study was sufficiently powered to detect a statistically significant effect.

Measures

Demographics Questionnaire. A demographics questionnaire (Appendix D) was used to collect information regarding participants' age, sex, and academic course enrollment in addition to other information unrelated to the current study.

Discrete Emotions Questionnaire. The Happiness and Sadness subscales of the Discrete Emotions Questionnaire (DEQ; Harmon-Jones et al., 2016; Appendix E) were used to measure raters' subjective experience of emotion immediately after viewing an emotive video. Raters were asked to indicate the extent to which they experienced happy and sad emotions while viewing the actors' videos on a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*an extreme amount*). In the initial validation study of the DEQ (Harmon-Jones et al., 2016), acceptable levels of internal consistency were demonstrated for both the DEQ Sadness (Cronbach's $\alpha = .82 – .85$) and Happiness (Cronbach's $\alpha = .96 – .97$) subscales.

Brief Distractor Task. After viewing a set of neutral, sad, and happy videos from an actor, raters completed a brief distractor task unrelated to emotional processing (Appendix F). The purpose of completing the distractor task was to allow enough time to pass to attenuate the potential carryover of emotional experience from one set of emotive videos to the next. (Rempala, 2013; Rottenberg et al., 2007). The task required raters to view a grid of geometric shapes in different colours, count a particular colour shape in 30 s, and indicate their answer immediately afterwards.

Apparatus

Actor’s emotive videos were recorded using a Canon EOS 7D camera with a Canon EF-S 60mm f/2.8 Macro USM lens mounted to a tripod. Audio for the videos were recorded using an Audio Technica AT803 Lapel microphone, powered by an Audio-Technica AT8531 Power Module. Videos were downloaded and edited using Sony Movie Studio Platinum (Version 12.0) on a Dell Precision T1650 workstation computer. Edited videos were presented to raters using VideoLan VLC media player (Version 2.2.6) and viewed on a 55-inch Toshiba television, situated 1.5 m in front of the seated participant. The experimental room was dark besides the light emitted from the television.

Procedure

Sample 1 actors attended a 30 min videography session in the Department of Psychology. Upon arrival, actors were given the procedural instructions for dynamically enacting and recording a neutral, sad, and happy facial expression (see Appendix G). Actor’s videos were approximately 4 min in duration and trimmed to 3 min using Sony Movie Studio Platinum. Upon completion of the videography session, actors were given a digital copy of their videos, thanked, and dismissed.

Sample 2 raters completed an online questionnaire via SurveyMonkey that included a demographics questionnaire and measures unrelated to the current study. Upon completion, raters were invited to sign up for a 90-min laboratory appointment on SONA Experiment Manager System to view and rate actor’s emotive videos. Upon arrival, raters were shown photographs of the actors and asked to indicate whether they know any of the them. If a rater had indicated that she had more of a passing knowledge of any of the actors, the indication would have been recorded and controlled for in subsequent analyses. Such circumstance did not occur. After viewing actors’ photographs, raters were given the procedural instructions for the laboratory session (Appendix H). During the recording procedure, the researcher was situated in a separate room attending to the computers controlling the video presentation and SurveyMonkey questionnaires.

Presentation Order. The presentation order of the emotive videos in the current study was determined in consideration of how emotive videos would be presented in subsequent studies of the program of research. As only one of the five actor's set of emotive videos would be used in subsequent studies, the current study validated actor's set of videos in the same manner; that is, by presenting each actor's set of neutral, sad, and happy videos together, as opposed to interlacing them among other actors' videos. However, the order of each actor's set of videos was randomized across the viewing presentation to minimize the potential for context effects, whereby one actor's set of videos may change how raters emotionally experience subsequent actors' videos (Lavrakas, 2008).

Regarding the order of the neutral, sad, and happy videos, it is customary to present comparison (i.e., neutral) emotive stimulus first in an emotion elicitation paradigm (Rottenberg et al., 2007). However, determining the order of remaining emotive stimuli posed a challenge as the emotional experience of one stimulus can be influenced by the preceding stimulus (Rempala, 2013; Rottenberg et al., 2007). The issue of order effects is often addressed by adopting a counterbalanced experimental design, whereby an equal number of participants view emotive stimuli in each possible order. For example, with two types of emotive stimuli such as happy and sad in the current study, half of the participants in the sample would view the emotive stimuli in one order (e.g.., sad video followed by happy video) while the other half would view the emotive stimuli in the reverse order (happy video followed by sad video). Counterbalanced designs are advantageous as they increase the internal validity of a study by controlling for and allowing for the assessment of order effects (Lavrakas, 2008). While researchers should strive for such rigorous experimental designs, counterbalanced designs are not always possible or practical as they require a larger sample and longer recruitment period to accommodate for added experimental conditions. In the current program, this would have meant increasing the number of required participants twofold in Study 2 (90 to 180) and fourfold in Study 3 (120 to 480).[3] Given the constraints on laboratory resources, time, and participant and research assistant availability, a counterbalanced design would have been an infeasible feat for the current program. Limited by its practical nature, a counterbalance design was not implemented.

Practical limitations of data collection efforts should not constrain researchers from investigating pivotal research questions provided that researchers design their studies in a manner that is informed by research and theory, recognize the limitations of their data, and couch their interpretations with the appropriate caveats and cautions (Campbell, 1957; Cook et al., 2002; Hayes, 2018; West & Thoemmes, 2010). Accordingly, the order of the happy and sad video was determined based on facial feedback theory and with the goal of designing an emotion elicitation paradigm that would maximize the likelihood of detecting the facial feedback effect to assess whether such effect is moderated by facial manipulation (Study 2) and narcissistic tendencies (Study 3). Although studies have found no differences in the facial feedback effect between positive and negative emotive stimuli (Söderkvist et al., 2018), the hypothesis has been studied most frequently in response to negative, as opposed to positive, emotions (Coles et al., 2019). Furthermore, research shows that negative, relative to positive, emotive stimuli elicit perceptions of threat and discomfort from viewers (Abado et al., 2020; Llera & Newman, 2010; Loannou & Fox, 2009; Prato & John, 1991; Sanford, 2010), which is integral for eliciting

[3] See Participant section in Study 2 and 3 for more information regarding calculated sample size.

narcissistic tendencies in Study 3. Informed by the literature, the program of research presented the sad video first, followed by the happy video, to minimize the possibility of participants' emotional experience in response to the happy video from influencing their emotional experience in response to the sad video. In doing so, the program of research maximized the likelihood of observing the facial feedback effect in response to the sad video, which is theorized to elicit the greatest effect within the context of threat and narcissistic tendencies. Accordingly, an actor's set of videos were presented in the following order in the current study and subsequent studies of the program: neutral, sad, and happy.

The timeline for the viewing presentation for Study 1 is shown in Figure 3. As actors had three, 3-min videos, raters viewed a total of 15 videos, resulting in a total viewing time of 45 min. Raters completed the DEQ after each emotive video, in addition to the Brief Distractor Task at the end of each set of videos from an actor. After completing the viewing presentation, raters were given a debriefing sheet (Appendix I), thanked, and dismissed.

Data Analytic Approach

Computations

DEQ data was entered into SPSS v. 25 from the SurveyMonkey server. No missing data was observed. DEQ subscale scores for each actor's emotive video were calculated as the average of the four items that comprise the subscale with scores for each subscale ranging from 1 to 7. Higher DEQ Happiness and Sadness scores indicate greater subjective intensity of happiness and sadness, respectively.

Reliability

The process of validating a psychometric instrument involves conducting tests of reliability and validity (Boateng et al., 2018). Reliability refers to the ability of a psychometric instrument to measure a construct consistently. In contrast, validity refers to the extent to which a scale measures what it is intended to measure. Reliability and validity of a scale are closely associated with one another such that a scale cannot be valid unless it is reliable. This is because a valid scale is one that *consistently* assigns numbers that reflect an individual's standing on a psychological construct. In the current study, the reliability of the DEQ was assessed before implementing statistical analyses to ensure the inferences made based on such analyses are valid.

The most common measure of scale reliability is internal consistency, which describes the extent to which all the items on a scale measure the same construct and hence is associated with the inter-relatedness of items within a scale. Internal consistency is measured by Cronbach's α (Cronbach, 1951) which assesses the variance within an item and the covariance between an item and other items on the scale. Cronbach's α is calculated as follows:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum V_i}{V_t}\right)$$

where k is the number of items on a scale, V_i is the variance of scores on each item, and V_t is the total variance of overall scores on the entire scale. Values can range from 0 (if no variance is consistent) and 1 (if all variance is consistent). Cronbach's α values of .7 to .8 are considered acceptable and values substantially lower indicate an unreliable scale (Boateng et al., 2018; Field, 2018). Study 1 assessed the reliability of the DEQ via Cronbach's α to investigate whether the DEQ Happiness and Sadness subscales were reliable measures in response to actors' emotive videos.

Construct Validity

After establishing reliability, the study assessed the validity of the DEQ; namely, construct validity. Psychological constructs, such as happiness and sadness, are hypothetical abstractions that are related to observable things or events. To determine whether a psychological instrument provides a good measure of a specific construct, researchers must translate the abstract construct into concrete, behavioural conditions (Boateng et al., 2018). In the current study, this involved establishing whether the DEQ Happiness and Sadness subscales—which measure the psychological construct of happiness and sadness—are sensitive to emotive facial behaviours enacted in the emotive videos.

To analyze construct validity, the study planned to conduct a series of repeated measures analysis of variance (ANOVA) for each actor, with the emotive condition of the actor's video (neutral, sad, happy) as the independent (within-subjects) variable and the DEQ Happiness and Sadness subscale scores as the dependent variable. A series of planned contrasts were to be carried out to assess whether DEQ Happiness scores are greater in response to the happy condition, relative to the sad and neutral condition, and whether DEQ Sadness scores are greater in response to the sad condition, relative to the happy and neutral condition. However, subsequent analyses of internal consistency demonstrated the DEQ subscales to be unreliable in response to *incongruent* emotive conditions for each actor; specifically, the DEQ Happiness subscale in response to the sad condition and the DEQ Sadness subscale in response to the happy condition.[4] This did not raise an issue for the validation procedure in the current study, as the program of research is primarily concerned with the validation of *congruent* self-report emotional responses to the emotive videos in order to investigate the facial feedback hypothesis. To adjust for the removal of one emotive condition, the current study performed a series of paired-samples *t*-test, which is a within-subjects statistical test for two, rather than three or more,

[4] For more information regarding the internal consistency analysis of the DEQ Happiness and Sadness, see Study 1 Reliability Analysis section and Table 2.

conditions of an independent variable. Such analyses investigated whether there is a difference in DEQ scores between the emotion-congruent and neutral condition for each actor. Consistent with the study's initial hypotheses, it was predicted that (a) DEQ Happiness would be greater in response to the happy condition compared to the neutral condition, and (b) DEQ Sadness would be greater in response the sad condition compared to the neutral condition.

Bonferroni Correction

The latter two hypotheses were analysed five separate times for each of the five actors. To minimize the possibility of a type I error, it is recommended that a Bonferroni correction be applied to each comparison (Bland & Altman, 1995; Perneger, 1998). In doing so, the significance level for each comparison is set at α/n, whereby n is the number of tests performed, to maintain a study-wide error rate of $\alpha = .05$. While the Bonferroni correction reduces type I error, it also raises the probability of type II errors (i.e., false negatives) by substantially reducing the power of rejecting the null hypothesis (Bland & Altman, 1995). There is also an unsettled controversy among researchers with respect to when the correction should be used (Armstrong, 2014). As many scientific journals place importance on statistical significance (Franco et al., 2014), researchers often apply the correction *only* when their results remain significant and are reluctant to publish results exceeding the threshold of $\alpha = .05$ but are deemed "nonsignificant" under the Bonferroni correction (Nakagawa, 2004; Perneger, 1998). In this way, the Bonferroni correction may contribute to the dismissal of potentially meaningful findings (Perneger, 1998). To address the issue, it is recommend that observed effect sizes along with exact p values be presented to allow researchers to evaluate the importance of the results in the context of current theories and research (Nakagawa, 2004; Sullivan & Feinn, 2012), especially in circumstances when p values exceed the conventional .05 level but not the Bonferroni corrected α level. In consideration of this issue, a Bonferroni correction (.05/5) was applied to subsequent analyses investigating each hypothesis to reduce the potential for a type I error. However, exact *p* values and observed effect sizes are also reported to allow for theoretical interpretation.

Effect Size

Effect size is a statistical measure that quantifies the strength or magnitude of an observed effect and is measured in different ways depending on the statistical analysis employed (Lakens, 2013). The most common measure of effect size for *t*-tests is Cohen's *d*, which indicates the standardized difference between two means (Cohen 1969, 1988). The standardized mean difference for within-subjects designs (i.e., paired-samples *t*-tests) is referred to as Cohen's d_Z and is calculated as:

$$\text{Cohen's } d_Z = \frac{M_{\text{diff}}}{S_{diff}}$$

where the numerator (M_{diff}) is the difference between the mean of the difference scores and the comparison value μ (i.e., 0), and the denominator (S_{diff}) is the standard deviation of the difference scores. In attempt to help with the interpretation of *d,* Cohen (1988) suggested that values of 0.80, 0.50, and 0.20 represent large, medium, and small effect sizes, respectively. However, Cohen (1988) recognized that what would be considered a large, medium, or small effect size would, in practice, depend on the area of study. As such, Cohen recommends that researchers relate values of Cohen's *d* to other effect sizes reported in the literature. In the original validation study of the DEQ, Harmon-Jones and colleagues (2016) observed a large effect of DEQ Sadness in response to sad pictures (*d* = .94) and a large effect of DEQ Happiness in response to happy pictures (*d* = 2.04). Interpretation of effect sizes in the current study were made in consideration of these reported effect sizes.

Given that effect size provides a quantitative measure of the magnitude of an observed effect, Cohen's *d* was used as the criterion for selecting one actor's set of neutral, sad, and happy videos to investigate the facial feedback hypothesis in subsequent studies. One actor's set of videos was chosen rather than a mixture of several actor's videos. The reason for this was to maintain standardization of the video content and to ensure that inferences made in subsequent studies with respect to emotive conditions are due to differences in emotive facial behaviours rather than the nature of the stimuli (i.e., actor). The emotive video set was selected based on the actor whose happy and sad video demonstrated the highest value of Cohen's *d* and, therefore, the greatest sensitivity or magnitude of congruent self-report emotion. If one actor demonstrated the highest *d* value for the sad video, while another actor demonstrated the highest *d* value for the happy video, the actor with the highest value of *d* for the sad video would have had their set of videos selected. This decision rule was made in consideration of the sad video being presented as the first emotive stimulus in the presentation order across the program of research. Choosing the actor's set of videos with the highest *d* value for the sad, rather than happy, video for the tie breaker would further maximize the likelihood of detecting facial feedback.

Parametric Assumptions

Outliers. Prior to conducting statistical analyses, data were assessed for violations of parametric assumptions to allow for the facilitation of accurate and valid inferences. One assumption of paired sample *t*-tests is that the dependent variable should not contain any outliers. Outliers in the data were defined as *z* scores beyond $\pm$3.29 (Field, 2018). Three outliers were observed for DEQ Happiness from three participants during the happy condition and replaced by the next highest nonoutlier value (Field, 2018).

Normality. Another assumption for paired-samples *t*-tests is normality, which pertains to the sampling distribution of the *differences* between dependent scores. In the current study, this refers to the difference between the of emotion-congruent and neutral condition DEQ scores. Problematically, the assumption of normality is rarely met in practice due to the use of measurements that are bounded on the lower or upper end of the measurement scale (e.g., Likert scale). As the normal distribution is technically a continuous distribution, no linear model (e.g., *t*-test, ANOVA, regression) using a bounded or discrete variable (e.g., DEQ) would likely generate normally distributed data (Hayes, 2018). This assumption was explored in the current study by assessing the normality of the difference between dependent DEQ scores using Z_{skewness}, calculated as skewness / *SE.* Any Z_{skewness} score beyond ± 1.96 was considered significantly skewed at $p < .05$ (Field, 2018). As depicted in Table 1, a significant skew was observed for the difference between dependent DEQ Happiness and Sadness scores among all five actors (Z_{skewness} > 1.98) except for dependent DEQ Happiness scores for actor B. Overall, the DEQ data in the current study violate the assumption of normality.

The most common method for remediating skewness is to apply a data transformation to the data (Hayes, 2018). However, the central limit theorem suggests that estimates from large samples will come from a normal distribution regardless of the shape of the sample or population data. In other words, violations of the assumption of normality should not affect inferential tests provided the sample is large enough (Field et al., 2018). In support, simulation research shows that skewed data do not substantially affect the validity of statistical inferences that are based on within-subject designs unless the sample size is quite small (Edgell & Noon, 1984; Keselman et al., 2001; Mena et al., 2017; for a review, see Howell, 2012). This latter assumption was also confirmed in the current study by conducting paired-samples *t*-tests on both logarithmically transformed and untransformed data; no differences were found with respect to statistical inferences. As such, the untransformed DEQ data are reported for subsequent analyses to facilitate interpretability of the data.

Results

Reliability Analysis

Table 2 presents Cronbach's α for the DEQ Happiness and Sadness subscales for each of the five actors across emotive conditions. The table reveals acceptable levels of Cronbach's α for the DEQ subscales for the emotion-congruent and neutral condition. That is, DEQ Sadness demonstrates acceptable levels of Cronbach's α in response to sad and neutral conditions. Similarly, DEQ Happiness demonstrates acceptable levels of Cronbach's α for happy and neutral conditions. Unacceptable levels of Cronbach's α for the DEQ are observed for the emotion-incongruent condition; specifically, DEQ Sadness in response to happy conditions and DEQ Happiness in response to sad conditions with the exception of actor B.

Construct Validity Analysis

Table 3 and 4 display the means and standard deviations for the DEQ Sadness and Happiness scores, respectively, for each of the five actors across emotive conditions. Construct validity of the DEQ was assessed via a series of paired-samples *t*-tests. The first set of analyses assessed whether DEQ Sadness was greater in response to the sad condition compared to the neutral condition for each actor. As shown in Table 3, DEQ Sadness significantly increased from the neutral to sad condition for each actor after applying the Bonferroni correction (.05/5). The largest effect was observed for actor D ($d = 1.13$), suggesting that DEQ Sadness is most sensitive to this actor's sad video.

The second set of analyses assessed whether DEQ Happiness was greater in response to the happy condition compared to the neutral condition for each actor. As revealed in Table 4, DEQ Happiness significantly increased from the neutral to happy condition for each actor with the application of the Bonferroni correction. This effect was greatest for actor D ($d = 1.87$), indicating that DEQ Happiness is the most sensitive to this actor's happy video.

Discussion

The purpose of the current study was to develop and validate a set of emotive videos capable of eliciting a congruent experience of emotion in viewers. The emotive videos were developed in close liaison with theories of facial feedback, subjective emotion, and body comparison, as they were to be used in subsequent studies of the program of research. Five women between the ages of 18 and 40 developed three, 3-min emotive videos dynamically portraying a neutral, sad, and happy emotional facial expression from a head-to-shoulders position. Once developed, actor's emotive videos were validated by a sample of raters using a discrete measure of state emotion; namely, DEQ Happiness and Sadness.

Reliability

The validation procedure first commenced with tests of internal consistency to investigate whether DEQ Happiness and Sadness are reliable measures of happy and sad emotions in response to each of the actor's emotive videos. The results of the study support the reliability of the DEQ subscales, but only in response to emotion-congruent and neutral videos. That is, the DEQ Happiness subscale is reliable in response to happy and neutral videos and the DEQ Sadness subscale is reliable in response to sad and neutral videos. The lack of reliability of the

DEQ subscales in response to emotion-incongruent videos can be explained in terms of response variability. Psychometric scales are designed to measure individual differences in a measured construct. As such, a reliable scale is one that elicits a pattern of variable responses from a group of individuals consistently under the same circumstances (Traub 1994). Such variability is reflected in the measurement of Cronbach's α, whereby the coefficient is a function of the variances of the item values in the scale and the variance of the values obtained from the total of the scale (Cronbach, 1951). Consequently, if individuals do not differ in terms of their scores on a construct, reliability of the scale will be low. In the current study, DEQ scores in response to emotion-incongruent videos demonstrated relatively low values of standard deviation (i.e., variability), relative to the neutral and emotion-congruent conditions for each actor (see Table 3 and 4). As such, invariable DEQ scores may have contributed to low values of Cronbach's α for the emotion-incongruent conditions.

Reliability measurements that are based on variability, such as Cronbach's α, also raise a paradox. If individual differences on a measure are small, standard deviation and reliability values will also likely be low (Murphy & Davidshofer, 2005). However, a low standard deviation indicates greater accuracy of a measurement such that the mean of scores from a group of individuals is likely representative of the true population mean. When standard deviation increases (i.e., the scores are more spread out), it becomes more likely that the mean is an inaccurate representation of the true score (Field, 2018). Hence, it is possible to have a test that is unreliable as a measure of individual differences but provides an accurate measure of each person's standing on the measured construct (Murphy & Davidshofer, 2005). In the current study, emotion-incongruent videos elicited a floor effect in DEQ scores among raters (approximately a score of 1; see Table 3 and 4). Theoretically, such scores are appropriate as happy facial expressions should elicit low levels of subjective sadness and sad facial expressions should elicit low levels of happiness. As such, low variability may have contributed to low reliability of the DEQ subscales with respect to emotion-incongruent videos; however, low variability also reflects an accurate measurement of emotional experience. Simply put, the DEQ subscales are simultaneously unreliable and accurate in response to the emotion-incongruent videos. Although accurate, such scores were nonetheless removed from validity analyses, as a measure cannot be valid unless it is demonstrated to be reliable (Boateng et al., 2018).

Construct Validity

In consideration of the reliability analysis, the study proceeded with the assessment of construct validity of the DEQ subscales; specifically, whether there was a difference in DEQ subscale scores between the emotion-congruent and neutral video for each actor. In support of initial predictions, the DEQ demonstrated construct validity such that, relative to their neutral video, DEQ Sadness was greater in response to an actor's sad video and DEQ Happiness was greater in response to an actor's happy video. Such effects also exceeded the Bonferroni corrected α level (.05/5), which increases the confidence that such effects do not reflect a type I error (i.e., false positive). Effect sizes were also large in accordance to Cohen's (1988) effect size convention (Cohen's d >.80) and comparable to the effect sizes reported in the initial validation study of the DEQ (Harmon-Jones et al., 2016). Taken together, DEQ Happiness and Sadness appropriately and meaningfully detect manipulated states of emotional facial behaviour. Additionally, the findings extend Harmon-Jones and colleagues' (2016) validation of the DEQ in the context of emotive videos and, in doing so, provide further support of the DEQ as a sensitive measure of state emotion that can be used with a wide selection of emotion elicitation paradigms.

Selection of Emotive Stimuli Set for the Program of Research

The effect sizes observed during the validation procedure were used to inform the selection of one actor's set of neutral, sad, and happy videos to investigate the facial feedback hypothesis in subsequent studies. Although large effect sizes were observed among all actor's videos, the largest effect size was observed for actor D's sad and happy video, suggesting that the DEQ is the most sensitive to this actor's set of videos. As such, actor D's set of emotive videos (neutral, sad, happy) were used in subsequent studies of the program to maximize the likelihood of detecting facial feedback.

The facial feedback hypothesis characterizes the relationship between facial muscle activity and self-report emotion, such that observing another individual's emotional facial expression elicits congruent self-report emotion *and* facial muscle activity. EMG was not included in the current study as method of validating the emotive videos, as facial muscle activity cannot reliably distinguish discrete emotions on their own. Given that these muscles are involved in the formation of a variety of discrete emotions (Ekman & Friesen, 1978; Murata et al., 2016), it was first necessary to establish *what* discrete emotions are being evoked by the emotive videos using a validated measure of self-report emotion. The acquisition of construct validity using the DEQ in the current study verifies that actor D's happy and sad emotive video elicits subjective happiness and sadness from viewers. Hereafter, the current study ensures accurate inferences are made in subsequent studies of the program with respect to the elicitation of EMG activity by actor D's set of emotive videos.

Study 2

Following the validation procedure for the emotive videos, Study 2 proceeded to investigate the facial feedback hypothesis; namely the modulation hypothesis, which suggests that manipulating facial muscles in response to an emotional facial expression attenuates one's congruent subjective emotional experience of emotional stimuli (Laird, 1974; Strack et al., 1988). While the main purpose of the program of research was to investigate whether facial feedback is amenable to the influence of narcissism by way of a body comparison threat (Study 3), the investigation of the modulation hypothesis prior to this main research question was deemed essential. As previously discussed, the program was designed to cultivate a pattern of findings that reflect current research and theory and, when interpreted as a whole, would be able to provide a more thorough, contextual understanding of the facial feedback hypothesis. In this regard, the program first investigated whether facial feedback can be attenuated in a traditional physical manner by way of facial manipulation in Study 2 and then in a novel cognitive manner by way of a body comparison and narcissism in Study 3. Contrasting the findings of both studies provides an opportunity to advance our understanding of the boundary conditions for facial feedback (Söderkvist et al., 2018); namely, physical and cognitive. Although there are a considerable number of studies that demonstrate support for physical manipulation (i.e., modulation; see Coles et al., 2019), using such studies as a point of comparison for the current investigation of cognitive manipulation would have been unparallel. This is because of the lack of standardization with respect to experimental procedures and materials between the program of research and other facial feedback studies. Contrasting physical and cognitive manipulation paradigms through the implementation of a series of standardized studies allows for meaningful comparisons and inferences to be made with respect to boundary conditions. Accordingly, Study 2 implemented a set of facial manipulation paradigms to determine whether physically manipulating facial muscles could modulate one’s emotional response to the set of emotive videos developed in Study 1.

Facial Manipulation Paradigms

When implementing a facial manipulation paradigm, participants are typically randomized to one of two groups: passive viewing and enactment of incongruent facial muscle activity. Participants in the passive viewing group are instructed to simply view emotional facial expressions, thus allowing their facial muscles to vary freely. By contrast, participants in the incongruent facial muscle group are instructed to activate muscles that are incongruent to the muscles of the displayed facial expression. The goal of such paradigms is to demonstrate that activating incongruent facial muscles attenuates one's subjective emotional experience beyond what occurs while passively viewing emotive stimuli.

One type of manipulation paradigms investigates whether experimentally induced alterations in zygomaticus muscle activity causes a change in subjective emotional responses to negative emotive stimuli. These investigations are often modelled after Strack and colleagues' (1988) pen manipulation paradigm. While viewing negative emotive stimuli, participants are instructed to hold a pen or stick-like object in the mouth horizontally and exert a constant pressure with the teeth while not allowing their lips to touch it. Although the pen manipulation paradigm does not produce the Duchenne (i.e., genuine) smile, the constant and conflicting activation of the zygomaticus muscle has been shown to attenuate negative—rather than intensify positive—subjective emotion (e.g., Söderkvist et al., 2018). Accordingly, Study 2 sought to attenuate subjective sadness in response to the sad emotive video by having participants continuously bite down on a disposable chopstick for the duration of the video.

Paradigms may also examine whether the manipulation of corrugator muscles has an influence on emotional responses towards positive emotive stimuli. For example, a study by Davey and colleagues (2013) manipulated corrugator activity by attaching golf tees to the corrugator muscle region of participants' face using double-sided electrode collars. Participants were instructed to either attempt to touch the ends of the tees together to increase corrugator activity or keep the tees apart in a neutral position while listening to ambiguous homophone stimuli (i.e., two words that are pronounced the same, but spelled differently). The contraction of corrugator muscles led participants to interpret more of the stimuli as threatening (e.g., “die” rather than “dye”). The observation was also associated with a trend towards more intense subjective negative emotion, relative to participants who kept the corrugator muscle region neutral. Corrugator muscle activity may also be manipulated without the use of any instruments attached to the face. In such paradigms, participants are instructed to gently draw together the inner edge of the eyebrows towards the center of their forehead and maintain this contraction while viewing positive facial expressions (e.g., Ponari et al., 2012). The constant contraction of the corrugator muscles has been shown to attenuate positive—rather than intensify negative—subjective emotion (Davey et al., 2013; Dimberg & Söderkvist, 2011). As such, Study 2 sought to attenuate subjective happiness in response to the happy emotive video without the aid of an instrument by having participants gently contract the inner edges of their eyebrows together for the duration of the video.[5]

Methodological Considerations

Comparison Group

As previously discussed, facial manipulation paradigms typically consist of two groups: (a) a zygomaticus and/or corrugator manipulation group and (b) passive viewing group (e.g., Davey et al., 2013; Ponari et al., 2012). However, the observed differences between the two groups may potentially be confounded by differences in muscle activation and level of task

[5] Corrugator activity could not be manipulated using golf tees or other instruments as the EMG electrodes for corrugator muscles would be placed in the same locations as the instrument. As such, if one is to measure EMG activity during a facial manipulation paradigm, one must do so without the aid of an instrument.

concentration (e.g., Koch et al., 2014; Maranges et al., 2017; see Söderkvist et al., 2018). Thus, the passive viewing group used in previous studies does not provide an accurate means for comparison in terms of facial muscle activity. In the current study, an additional nonfacial manipulation group was included to account for the influence of such confounds on emotional experience. Based on the methodology of a previous study (Söderkvist et al., 2018), participants viewed the emotive videos while pressing and holding down a button on a keypad with their thumb or index finger. To induce muscle fatigue comparable to that observed in the facial manipulation group, participants were told to keep their remaining fingers and wrist elevated off the table while pressing the button.

EMG Manipulation Check

Facial manipulation studies are primarily concerned with determining whether incongruent facial muscle activity attenuates congruent subjective emotional experience of emotive stimuli. However, it is less clear from such investigations as to whether incongruent facial muscle activity attenuates *congruent facial muscle activity*; that is, whether activating zygomaticus muscles while viewing a negative emotive stimulus attenuates corrugator activity and whether activating corrugator muscles while viewing a positive emotive stimulus attenuates zygomaticus activity (see Coles et al., 2019). The feedback hypothesis is predicated on the assumption that congruent facial muscle activity elicits congruent subjective emotion (Izard, 1971; Tomkins; 1962, 1980). As such, it would be important to know whether incongruent facial activity attenuates congruent facial activity and, in turn, subjective emotion. That is to say, it may be possible for the facial feedback effect to occur even if one activates incongruent facial muscles as the congruent muscles are still free to vary in response to emotive stimuli. One way to investigate congruent facial muscle attenuation is by measuring EMG facial muscle activity during an emotive procedure. This would allow one to determine if incongruent facial muscle activity attenuates *congruent* EMG facial muscle activity and, in turn, congruent subjective emotion. Pursuant to this question, the current study measured EMG facial muscle activity to investigate the attenuation of congruent facial muscles.

Many investigations of the modulation hypothesis are also limited by the exclusion of EMG as a means of checking whether passively viewing emotive stimuli appropriately elicits congruent facial muscle activity from participants (i.e., passive hypothesis; Mori & Mori, 2007, 2009, 2010) and whether participants' facial muscles are appropriately manipulated in the theorized manner (e.g., Davey et al., 2013; Dimberg & Söderkvist, 2011; Ponari et al., 2012; Soussignan, 2002; Söderkvist et al., 2018; Strack et al., 1988). Establishing these basic assumptions regarding facial muscle reactivity is required before initiating investigations into the causal influence of facial muscle activity on subjective emotion (de Weid et al., 2009; de Weid et al., 2012). EMG was also included in the current study to facilitate such manipulation checks.

Baseline EMG Activity

EMG studies contain several methodological challenges with respect to the investigation of emotional processing. One such challenge is measuring baseline EMG facial muscle activity. Although emotional arousal occurs in response to all types of experimental stimuli, a baseline measure of emotion should ideally elicit *minimal* subjective and physiological arousal (Hess, 2009; see Söderkvist et al., 2018). Neutral facial expressions are often utilized to obtain such baseline measures as they involve the relaxation of facial muscles and/or natural facial movements that imply minimal emotional intensity (Calvo et al., 2016; Sestito et al., 2013). When assessing subjective emotion, neutral expressions are reported as less emotionally intense compared to emotional expressions such as happiness, sadness, anger, and fear (Alpers &

Gerdes, 2011; Deckert et al., 2019; Eberhardt et al., 2016; Paulus & Wentura, 2018). This was supported in Study 1 whereby subjective happiness and sadness were greater in response to a dynamic happy/sad facial expression compared to a neutral expression. Such findings underscore the utility of a neutral facial expression as a baseline measure of subjective emotion. However, such is not the case for EMG studies. Unlike subjective measures, EMG corrugator activity is shown to be sensitive to neutral facial expressions, in addition to negatively-valenced emotions such as sadness and anger (Künecke et al., 2014). Such sensitivity is also nonspecific, suggesting that neutral expressions are physiologically experienced in a similar manner as negative emotional events. This lack of differentiation poses a threat to the validity of inferences pertaining to differences in EMG activity during a baseline and emotional event, such that baseline levels may also reflect an intense emotional response. Alternatively, it is recommended that baseline EMG facial muscle activity be measured in response to a stimulus that excludes any content resembling a facial expression to ensure minimal facial activity (Hess, 2009). The stimulus should also elicit minimal arousal, only enough to maintain participants' attention (Rottenberg et al., 2007).

Rather than use the neutral video developed in Study 1, a nonfacial baseline video was developed for the purpose of investigating the facial feedback hypothesis in the program.[6] This novel video was developed in the laboratory to ensure the duration and quality matched the set of emotive videos developed in Study 1. The content of the baseline video was predicated on a set

[6] The nonfacial baseline video was not included as a baseline stimulus in the initial validation procedure for the developed emotive videos (Study 1) as this would have resulted in a confound with respect to temporal order. Recall that each of the five actors' set of videos were presented together and in the same order (neutral, sad, happy) and the position of actors' set of videos were randomized in the presentation sequence across raters. With only one baseline measure, the contrast between actors' happy and sad video with the nonfacial baseline video at the beginning of the presentation would have been temporally inconsistent across raters. Instead, each actor's own neutral video served as a temporally consistent baseline measure of subjective emotion.

of empirically-validated videos from the Emotional Movie Database (EMDB; Clip #6,000 and #6,001; Carvalho et al., 2012) whereby an individual moves Styrofoam packing peanuts around on a table using a black dry-easer. In the original validation study, the videos were rated using the Self-Report Manikin which measured the extent to which the emotive videos influence state emotional arousal (1 = *relaxed, calm, sluggish, sleepy, unaroused* and 9 = *stimulated, excited, jittery, wide awake, aroused*). The videos from the EMBD elicited an average arousal score of 2.33 – 2.44 (*SD* = 1.97 – 2.23). In consideration of these findings, the content was deemed appropriate as a baseline stimulus for the program as it excluded emotional facial content and elicited minimal subjective arousal.

Demand Characteristics

Another notable challenge for facial manipulation and EMG studies is minimizing demand characteristics. Previous research shows that participants' subjective and physiological responses to emotive stimuli are influenced by their knowledge that the study is investigating facial muscle activity (Gross, 1998). For example, participants may be inclined to manipulate their facial muscle activity or subjective emotional ratings to conform to perceived expectations of the study or misrepresent themselves in a socially desirable manner. Such responsivity would compromise the internal validity of the study. To reduce this possibility, a cover story based on the methodology used in a previous study (i.e., Hess & Blairy, 2001) was given to participants in the study. Participants were told that the study is concerned with changes in skin temperature in response to stimuli and that the electrodes affixed to their face were intended for this purpose. Another related issue is manipulating facial muscles without participants knowing they are producing an emotional expression. Favourably, the facial manipulation paradigms that were utilized in Study 2 have been demonstrated to curtail participants' knowledge of the latter as long as manipulation instructions omit words and phrases related to facial muscle activity (e.g., Dimberg & Soderkvist, 2011; Hess & Blairy, 2001). The current study omitted phrases such as "facial expression" and "facial muscle activity" when giving verbal instructions to participants regarding the experimental procedure. Instructions regarding zygomaticus and corrugator activity were also described more generally in terms of "physical actions" rather than "expressions" or "emotions". Maintaining participants' attention towards emotional stimuli over time, even during brief presentations, also poses a challenge (Wright et al., 2001). Taking advantage of the phenomenon of demand characteristics, participants were told that the study is interested in attention towards visual stimuli to encourage them to maintain their attention towards the emotive videos.

Continuous EMG Recording Paradigm

Facial feedback studies most commonly examine individuals' EMG facial muscle activity in response to briefly presented emotional expressions in milliseconds or seconds, rather than minutes (Dimberg & Soderkvist, 2011). The purpose of this is to precisely track dynamic changes in EMG facial muscle activity in response to an emotional facial expression. Such precision is necessary when drawing conclusions pertaining to *facial mimicry* as the observers' facial movements must be in precise alignment with the observed emotional expression. However, the program of research assessed facial feedback in response to emotive videos that are 3 min in duration to increase the ecological and internal validity of the body comparison threat in Study 3. Few studies have implemented the use of emotive videos to assess facial feedback (e.g., de Wied et al., 2012; de Wied et al., 2009; Golland et al., 2018; Golland et al., 2019; Mauss et al., 2005; Stel & van Baaren, 2008). However, such studies demonstrate similar facial muscle activity to that which is demonstrated in studies utilizing briefly presented pictures.

For instance, a recent study by Golland and colleagues (2018) continuously recorded EMG zygomaticus and corrugator activity during the presentation of 5-min positive and negative movie clips. Mean level analyses were calculated by subtracting the mean EMG activity during a baseline period from the mean activity during the movie clip. The study found that participants experienced greater average EMG zygomaticus activity during the positive movie clip and greater average EMG corrugator activity during the negative movie clip. EMG activity was also associated with congruent self-report emotion after each movie clip, thus providing evidence for the facial feedback effect. These findings parallel those of other studies implementing the same mean level analysis for EMG zygomaticus and corrugator activity in response to emotive videos (e.g., de Wied et al., 2009; de Wied et al., 2012; Golland et al., 2019). Although the methodology does not allow for conclusions specific to facial mimicry, these findings demonstrate that individuals experience activation of congruent facial muscle regions while observing the unfolding of a dynamic emotional event. This methodology for measuring facial muscle activity offers novel possibilities for studying the involvement of facial muscles in dynamic emotional processing, which is vital for the investigation in Study 3 of facial feedback as a function of narcissism.

The Present Study 2

The purpose of Study 2 was to investigate the modulation hypothesis (Laird, 1974; Strack et al., 1988) and determine whether physically manipulating incongruent facial muscles attenuates one’s subjective experience of the happy and sad videos developed and selected from Study 1. Although there is considerable support for the modulation hypothesis in the literature, the study included this investigation as part of the program to allow for the contrast between physical and cognitive manipulation paradigms in a standardized manner. In doing so, meaningful inferences could be made with respect to the boundary conditions of the facial feedback hypothesis.

The study implemented both zygomaticus and corrugator manipulation paradigms and incorporated the measurement of EMG to check whether passively viewing the emotive videos elicited congruent facial muscle activity and if facial muscles were manipulated in the theorized manner. Participants were randomized to one of three facial manipulation groups while viewing the emotive videos: facial manipulation (FA; incongruent muscles), finger manipulation (FI; nonfacial muscles), and no manipulation (NO; passive viewing). In accordance with the modulation hypothesis, it was predicted that participants in the FA group (*X*) would experience an attenuation in congruent EMG facial muscle activity (*M*) and congruent subjective emotion (*Y*) relative to participants in the FI and NO group (see Figure 4).

Method

Participants

Participants were required to be female, between the ages of 18 and 40, and fluent in English to be eligible to participate in the study. Participants were recruited from undergraduate courses at Lakehead University (Thunder Bay Campus) via the SONA Experiment Management System. Participants were also recruited from the community dwelling of Thunder Bay via advertised posters on social media platforms. SONA and advertisements provided a brief description of the study, an overview of the eligibility criteria, a hyperlink to the information letter and consent form (Appendix J), and a hyperlink to complete an online questionnaire via SurveyMonkey. Social media advertisements additionally instructed interested individuals to contact a member of the research team by e-mail to schedule a laboratory session with one of the research assistants. Recruitment procedures resulted in a total sample size of 93. However, the data from four participants were removed from analysis due to computer malfunctions during the laboratory procedure. The final sample size consisted of 89 women between the ages of 18 and 40 (*M* = 23.18, *SD* = 6.02) from undergraduate courses (67.4%) and the community dwelling (32.6%). Participants identified as Caucasian (85.7%), Aboriginal (1.2%), South Asian (3.6%), Hispanic (1.2%), African-Canadian/Black (2.4%), and Middle Eastern (2.4%).

Participants were provided the information letter and consent form upon arriving to the laboratory. Written informed consent was obtained prior to starting the laboratory session. Participants that completed both the online questionnaire and laboratory session were entered into a draw to win one of five $100 prepaid Visa gift cards. Participants enrolled in an undergraduate course offering bonus points towards their final grade also received one and one-half (1.5) bonus point for completing the 90-min online questionnaire and two (2) bonus points for completing the 60-min laboratory session.

The sample size for the study was determined a priori based on Fritz and MacKinnon's (2007) empirical simulations of power for mediational methods. Based on a medium effect reported by previous studies investigating the modulation hypothesis (*d* = 0.49 – 0.51; Strack and Colleagues, 1988; Noah et al., 2018; Söderkvist et al., 2018), Fritz and MacKinnon recommend a sample size of 78 participants to achieve a power of 80% at a significance level of $\alpha = .05$. As the simulation study was modeled without measurement error, Fritz and MacKinnon suggest that researchers use the recommended sample sizes from their study as a lower limit of the number of participants needed to achieve 80% power, not as a guarantee. As 89 exceeded the calculated sample size, the study was sufficiently powered to detect a statistically significant effect.

Measures

Demographics Questionnaire. A demographics questionnaire (Appendix D) was used to collect information regarding participants' age, sex, and academic course enrollment, in addition to other information unrelated to the current study.

Baseline Video. Study 2 developed a novel baseline video consisting of woman moving around Styrofoam packing peanuts on a table with a black dry eraser. The 3-min video served as a nonfacial emotive condition to assess participants' baseline levels of EMG facial muscle activity, in addition to subjective emotion.

Emotive Video Set. The set of videos developed by actor D in Study 1 served as emotive conditions to elicit subjective emotion and EMG facial muscle activity from participants. The video set consisted of three, 3-min videos of a woman dynamically enacting a neutral, sad, and happy facial expression recorded form a head-to-shoulders portrait position.

Discrete Emotions Questionnaire. Analogous to Study 1, the Happiness and Sadness subscales of the Discrete Emotions Questionnaire (DEQ; Harmon-Jones et al., 2016; Appendix E) were used to measure participants' state subjective emotion immediately after viewing each video. Participants were asked to indicate the extent to which they experienced happy and sad emotions while viewing the emotive video on a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*an extreme amount*). In Study 1, acceptable levels of reliability were demonstrated for both the DEQ Sadness (Cronbach's $\alpha = .81$) and Happiness (Cronbach's $\alpha = .90$) subscales in response to actor D's sad and happy emotive video, respectively.

Global Local Task. In addition to the completion of the DEQ, participants completed a distractor task unrelated to emotional processing after each emotive video. The purpose of completing the distractor task was to allow enough time to pass to attenuate the emotional experience of one video from carrying over to the next video (Rempala, 2013; Rottenberg et al., 2007). Participants were asked to complete the Global Local Task (GLT; Navon, 1977, 1981; Appendix K), a geometric shape identification task that assesses whether an individual has a bias towards processing figures broadly (i.e., global) or at a more detailed level (i.e., local). The task consists of large geometric shapes constructed of smaller shapes (e.g., one large square made of four smaller triangles). The large element of the stimuli (e.g., square) represents the global perceptual level whereas the smaller elements (e.g., triangles) represent the local perceptual level. Each item on the task consists of three hierarchical stimuli arranged with a target figure on top and two comparison figures on the bottom. For each item, participants are instructed to select one comparison figure that they feel best matches the target figure and to respond as quickly as possible. As the post-video questionnaire consisted of additional measures unrelated to the current study, the length of the GLT was shortened from its original length of 25 to 10 items as lengthy questionnaires can result in participant fatigue, higher nonresponse rates, and less response variability throughout a procedure (Galesic & Gosnjak, 2009).

Brief-Pathological Narcissism Inventory. Although the current study did not implement a cognitive threat (i.e., body comparison), participants were given a measure of narcissism to explore whether narcissism influences facial feedback in the *absence* of threat. The primary measure of narcissism used in the program was the Brief-Pathological Narcissism Inventory (B-PNI; Schoenleber et al., 2015; Appendix L), which is a 28-item self-report measure adapted from the full-scale, 52-item Pathological Narcissism Inventory (PNI; Pincus et al., 2009). The B-PNI produces two subscales—Grandiosity (B-PNI G) and Vulnerability (B-PNI V)—each of which reflect cognitive and behavioural facets of narcissism that are predicated on clinical theory, social-personality research, and psychiatric diagnosis (Pincus et al., 2009). High scores on B-PNI G reflects a manipulative interpersonal orientation, engagement in fantasies about success and admiration, and the use of purportedly altruistic acts to support an inflated self-image. By contrast, high scores on B-PNI V reflects a fragile self-esteem that is contingent on external sources of admiration, an unwillingness to show others faults and needs, disinterest in others who do not provide admiration, and anger when entitled expectations are not met. In this way, the B-PNI provides a comprehensive assessment of the constructs' full range of characteristics unlike other self-report measures that assess only one dimension (e.g., NPI measuring grandiosity or HSNS measuring vulnerability). B-PNI G consists of 12 items, while B-PNI V consists of 16 items. Participants are instructed to indicate how much they agree with each item on a 6-point scale ranging from 0 (*not at all like me*) to 5 (*very much like me*).

In the initial validation study of the B-PNI (Schoenleber et al., 2015), item response theory and confirmatory factor analyses established the best-performing 28 items from the original 52-item PNI. High levels of reliability were demonstrated for both B-PNI G (Cronbach's $\alpha = .83 – .86$) and B-PNI V (Cronbach's $\alpha = .93$). The B-PNI demonstrated convergent validity by correlating with other measures of grandiose and vulnerable narcissism: specifically, B-PNI G was positively correlated with the 16-item NPI ($r = .23 – .35$) while B-PNI V was positively correlated with the HSNS ($r = .49 – .59$). Construct validity was also demonstrated such that the B-PNI subscales correlated with interpersonal and clinical facets that are consistent with theory and research on narcissism (i.e., Cain et al., 2008; Miller & Campbell, 2008; Miller et al., 2007). For example, B-PNI G was correlated with an arrogant disposition whereas B-PNI V correlated with a shameful disposition. B-PNI G and B-PNI V were also associated with symptoms of anxiety and impulsivity, as well as reckless behaviour. The outcomes of the validation study were demonstrated among undergraduate students and members of a community dwelling, suggesting that the B-PNI is sensitive to trait narcissism in a nonclinical population. The outcomes were also comparable to that of the full-scale PNI, which supports the utility of the B-PNI in place of longer measures (Schoenleber et al., 2015). Overall, the B-PNI is a reliable, efficient, multidimensional measure of narcissism, which makes it suitable measure for investigating the moderating influence of narcissism on facial feedback in the present program of research.

Emotional Contagion Scale. As a lack of empathy is cited as one of the primary distinguishing features of narcissism (e.g., APA, 2013), the study also explored whether narcissism is associated with deficits in trait empathy. Two types of trait empathy were measured. The first was *emotional* empathy, which was measured using the Emotional Contagion Scale (ECS; Doherty, 1997; Appendix M). The ECS is 15-item self-report measure that assesses one`s propensity to experience basic emotions displayed by others. The ECS consists of two subscales. The Positive subscale consists of 6 items that measure one's susceptibility to experience happiness and love displayed by others. The Negative subscale consists of 9 items that measure one's susceptibility to experience anger, sadness, and fear displayed by others. Participants are asked to rate their response to each item on a 4-point Likert-scale ranging from 1 (*never*) to 4 (*always*). Cronbach's α for the Positive and Negative Contagion subscales were .82 and .80, respectively, in the initial validation study of the ECS (Doherty, 1997).

Questionnaire of Cognitive and Affective Empathy. The second type of trait empathy measured was *cognitive* empathy, which was measured using the Cognitive Empathy subscale of the Questionnaire of Cognitive and Affective Empathy (QCAE; Reniers et al., 2011; Appendix N). The QCAE Cognitive subscale consists of 19 items that measure an individual's tendency to consider multiple social perspectives and the capacity to understand and predict others' feelings.

Participants are asked to rate statements on 4-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). The subscale demonstrated Cronbach's α levels between .83 – .85 in the initial validation study (Reniers et al., 2011).

Apparatus

Video Recording, Editing, and Viewing. The baseline video was recorded and edited using the same apparatus as the neutral, sad, and happy videos in Study 1. Baseline and emotive videos were also presented during the laboratory session using the same apparatus outlined in Study 1.

Facial Electromyography, Participants' facial muscle activity during the baseline and emotive videos was recorded using EMG. In accordance with guidelines outlined by Fridlund and Cacioppo (1986), bipolar EMG recordings were made from the corrugator and zygomaticus muscle region of the face using Ag/AgCL silver/silver chloride electrodes 4 mm in diameter and 1 cm distance between the centers of bipolar electrodes filled with SignaGel conductive paste and applied with two-sided adhesive collar discs. EMG activity was measured from the left side of the face as studies have demonstrated facial muscle activity to be greater on this side (Dimberg & Petterson, 2000; Lindell, 2018; Zhou & Hu, 2004; see Figure 5 for electrode placement). To reduce impedance at each electrode site, the skin was cleaned with a moist make-up remover and alcohol cloth prior to application and abraded using paper towel. As electrocardiogram was measured for the purposes of another study, a ground electrode was placed 2.5 cm below the left clavicle and 5 cm from the armpit. Signals from electrodes were recorded using a 72-channel amplifier (Advanced Neuro Technology, Enschede, Netherlands). All electrophysiological data were continuously sampled at 1024 Hz during each video presentation (Riniolo & Porges, 1997; Berntson et al., 2007) using Advanced Source Analysis

(ASA; Version 9.2) software from Advance Neuro Technology running on Dell OptiPlex 755 workstation computer.

Procedure

Participants completed an online questionnaire via SurveyMonkey which included the demographics questionnaire, B-PNI, ECS, QCAE Cognitive, and measures unrelated to the current study. Upon completion, participants were invited to sign up for a 60-min laboratory session. For purposes related to another study, participants were instructed to refrain from eating, drinking caffeine, consuming hypertensive medication, and exercising two hours prior to arriving at the laboratory, as well as refrain from consuming alcohol 12 hours beforehand.

Upon arriving to the laboratory, participants were shown a photograph of the actor in the emotive videos and asked to indicate whether they know her. If a participant had indicated that she had more of a passing knowledge of the actor, the indication would have been recorded and controlled for in subsequent analyses. Such circumstance did not occur. Participants were fitted with EMG electrodes and given verbal instructions regarding the experimental procedure (see Appendix O), the timeline for which is depicted in Figure 6. During the procedure, the researcher was situated in a separate room attending to the computers controlling the video presentation and SurveyMonkey questionnaires.

Facial Manipulation Paradigm. Participants viewed the emotive videos in the following order: baseline, neutral, sad, and happy. Participants were instructed to passively view the baseline and neutral video. However, the condition in which participants viewed the sad and happy video differed depending on their randomization to one of three facial manipulation groups (see Figure 6). Participants in the facial manipulation (FA) group were asked to make an incongruent facial muscle action while viewing the sad and happy video. During the sad video, participants placed a disposable chopstick in the mouth horizontally exerting a gentle, but constant, pressure with the teeth while not allowing their lips to touch it. During the happy video, participants gently drew the inner edge of their eyebrows together. Participants randomized to the finger manipulation (FI) group activated nonfacial muscles while viewing the sad and happy videos. During the sad video, participants pressed and held down a button on the keypad using their left thumb while keeping their remaining fingers and wrist elevated off the table. Participants were instructed to do the same during the happy video except with their left index finger. In the no manipulation (NO) group, participants were instructed to simply view the sad and happy video. In all three conditions, participants were instructed to keep their hands gently rested on the table in front of them while viewing each video.

After viewing each video, participants completed a post-video questionnaire consisting of the DEQ, GLT, and questionnaires unrelated to the current study. After the last post-video questionnaire, participants were assisted with removing the EMG electrodes, thanked, and dismissed. Given that Lakehead University is a relatively smaller university community, if just one person were to share the true purpose of the study, it would effectively invalidate future participants' responses during the experimental task and jeopardize the internal validity of the study. To prevent this possibility, participants were not informed of the deception regarding the purpose of the study upon completion of the laboratory session. Rather, participants were e-mailed a debriefing letter (Appendix P) revealing the study's true purpose and the reason for the deception at the conclusion of recruitment.

Data Analytic Approach

Computations

DEQ Subscales. DEQ subscale scores were calculated for each emotive condition as the average of the four items that comprise the subscale. Scores range from 1 to 7, with higher DEQ Happiness and Sadness scores indicating greater subjective intensity of happiness and sadness, respectively. In the Study 1, the sad and happy conditions were validated using the neutral condition as the comparison condition for subjective emotion. However, DEQ scores for the neutral condition were not reported in the current study, as the study is concerned with contrasting the happy and sad emotive conditions with the novel baseline condition.

Researchers often compute reactivity indices (i.e., difference scores) to quantify change over time in some psychometric variable, such as self-report emotion in the current study (Boden et al., 2012; Pictet et al., 2016). Typically, such scores are constructed by subtracting the measured variable at the earlier time from the measured variable at the later time. However, such computations raise an issue with respect to regression towards the mean. That is, initially low scores during a baseline period are correlated with an inevitable increase in scores at a later time in response to an experimental stimulus (Campbell & Kenny, 1999; Jamieson, 2004; Vickers & Altman, 2001). This issue was assessed in the current study via bivariate correlation analyses. As expected, a significant association was observed between DEQ Sadness during the baseline and sad condition, $r = .35$, $p < .001$, and DEQ Happiness during the baseline and happy condition, $r = .22$, $p = .02$. One way to address the issue of regression towards the mean in group analyses is to enter the experimental state variable as the outcome and the baseline value as a covariate (Hayes & Rockwood, 2017). This method enhances the power to detect group effects by removing the baseline score from the error variance in the estimate of the difference between groups. Accordingly, baseline DEQ subscale scores were included as covariates in subsequent analyses assessing group differences.

EMG Ratio Indices. Research suggests that baseline and emotional EMG amplitudes vary considerably within and among individuals due to anatomical and biophysical differences in facial muscle activity (Ekman & Friesen, 1978; Larsen et al., 2003). Thus, when conducting group analyses, individual contributions to the group mean will differ significantly in weight. One method to standardize individual EMG data is to compute amplitudes as a proportion of a baseline value (van Boxtel, 2010), rather than expressing them as difference scores between baseline and response levels. This method resolves the issue pertaining to amplitudes varying considerably over repeated measurement sessions, even when precautions have been taken to place electrodes on the same location of the face.

Based on previous facial feedback studies utilizing emotive videos (e.g., de Wied et al., 2012; de Wied, 2009; Golland et al., 2018; Golland et al., 2019), a mean level EMG analysis was used to explore group differences in congruent EMG facial muscle reactivity for the happy and sad conditions. The EMG ratio index for the sad condition (COR_S) was calculated as:

$$COR_S = \frac{M_{\mathrm{CORs}}}{M_{\mathrm{CORb}}} \times 100$$

whereby the mean EMG corrugator amplitude during the sad condition (M_{CORs}) is expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition (M_{CORb}). Similarly, the EMG ratio index for the happy condition (ZYG_H) was calculated as follows:

$$ZYG_H = \frac{M_{ZYGh}}{M_{ZYGb}} \times 100$$

whereby the mean EMG zygomaticus amplitude during the happy condition (M_{ZYGh}) is expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition (M_{ZYGb}).

Values over 100 indicate an increase in EMG amplitudes in the specified facial muscle region during the emotive condition proportional to the baseline condition. For example, an EMG ratio index of 200 would indicate an average 100% *increase* in EMG amplitudes from baseline to the emotive condition.

Exploratory Psychometric Variables. B-PNI G and B-PNI V were calculated as the average of the 12 and 16 items that comprise the subscales, respectively. Scores range from 1 to 6, with higher B-PNI G and B-PNI V scores indicating greater narcissistic grandiosity and vulnerability. The ECS Positive subscale was calculated as the sum of the 6 items that comprise the subscale, with scores ranging from 6 to 24. Similarly, the ECS Negative subscale was calculated as the sum of the 9 items that comprise the subscales, with scores ranging from 9 to 36. Higher scores on the ECS Positive and Negative indicate greater dispositional susceptibility to vicariously experience positive or negative emotions displayed by others, respectively. The QCAE Cognitive subscale was calculated as the sum of the 19 items that comprise the subscale, with scores ranging from 19 to 76. Higher scores indicate greater capacity to understand and predict the emotional states of others.

Preliminary Analyses

Neutral Expression as Emotional Experience. Prior to investigating the modulation hypothesis, the current study needed to satisfy four assumptions by way of statistical analyses. As previously discussed, EMG facial muscle activity is sensitive to neutral facial expressions (Künecke et al., 2014), suggesting that such expressions are physiologically experienced as an emotional event. The baseline video was developed in consideration of this issue such that it excluded any content resembling a facial expression to ensure minimal EMG facial muscle activity compared to a neutral facial expression. This assumption was tested by conducting a paired-samples *t*-test to investigate whether there is a difference in EMG activity between the baseline and neutral condition. This question was investigated among all participants in the sample as experimental manipulations were not implemented during the baseline and neutral condition. No specific predictions were made with respect to differences in EMG zygomaticus activity given the scarcity of research in the area. However, it was predicted that EMG corrugator activity would be greater in response to the neutral condition compared to the baseline condition (Künecke et al., 2014). Evidence of such was essential in supporting the use of the baseline condition to assess resting levels of EMG facial muscle activity.

Congruent Subjective Emotion Using Baseline Condition. Upon establishing the baseline condition as an appropriate comparison condition for EMG activity, the study sought to investigate whether such was the case for subjective emotion. This investigation was necessary given that the sad and happy conditions were initially validated using the neutral, as opposed to the baseline, condition in Study 1. Accordingly, a series of paired-samples *t*-test were conducted to determine whether there is a difference in DEQ scores between the baseline and sad/happy emotive conditions. This question was explored specifically among participants in the NO group as the emotive conditions were validated under a condition of passive viewing in Study 1. Compared to baseline, it was expected that DEQ Happiness would be greater in response to the happy condition and DEQ Sadness would be greater in response the sad condition. Such evidence was required to support the baseline condition as an appropriate comparison condition not only for EMG facial muscle activity, but also for subjective emotion.

Congruent Facial Muscle Activity. The facial feedback hypothesis is premised on a basic assumption that individuals experience congruent facial muscle activity while passively viewing emotive stimuli (Mori & Mori, 2007, 2009, 2010). To test this assumption, paired-samples *t*-tests were conducted among participants in the NO group (i.e., passive viewing) to determine whether congruent EMG facial muscle activity was appropriately elicited during the sad and happy condition relative to the baseline condition. It was expected that participants would experience greater EMG corrugator activity in response to the sad condition and greater EMG zygomaticus activity in response to the happy condition, relative to the baseline condition. Providing support for this assumption was necessary before initiating more specific investigations of the role of facial muscle activity in the experience of subjective emotion.

Facial Manipulation Check. As the study implemented facial manipulation paradigms, it was essential to determine whether participants' facial muscle activity was manipulated in the theorized manner. A set of one-way ANOVAs were conducted to investigate the pattern of facial muscle activity caused by the facial manipulation paradigms. A planned orthogonal contrast was used to investigate differences specifically between the FA group and the nonfacial manipulation groups (NO and FI). It was expected that participants who furrowed their eyebrows in the FA group would experience greater EMG corrugator activity during the happy condition compared to participants in the nonfacial manipulation groups. It was also expected that participants who held a chopstick between their teeth in the FA group would experience greater EMG zygomaticus activity during the sad video compared to participants in the nonfaical manipulation groups. Such evidence is necessary for facilitating accurate inferences with respect to the influence of facial manipulation on subjective emotional experience.

Main Analyses

The modulation hypothesis was assessed using simple mediation analysis whereby one causal antecedent variable *X* is proposed to have an influencing outcome on *Y* through a single intervening variable *M* (Hayes, 2018). The goal of simple mediation is to identify the mechanism through which *X* exerts its effect on *Y*. The *causal steps approach* (Baron & Kenny, 1986) is the most common method for investigating simple mediation (MacKinnon, 2008; Spencer et al., 2005; Stone-Romero & Rosopa, 2008, 2011), whereby multiple experimental procedures are conducted in sequential steps to establish a specific direction of causal flow. The results of each experiment are used to infer mediation. That is, if it can be demonstrated that (a) changes in *X* cause changes in *Y* in the first study, (b) changes in *X* cause changes in *M* in the second study, and (c) changes in *M* causes changes in *Y* in the third study, then it is logical to conclude that *M* mediates the relationship between *X* and *Y*. However, there is increasing recognition among researchers regarding the limitations of the approach with respect to causal inference (Hayes, 2018; Hayes & Rockwood, 2016; Zhao et al., 2010). Foremost, the approach does not formally quantify an inferential statistical test on the mediational effect. Rather, the effect is *inferred* logically from a set of separate null hypothesis tests. Furthermore, the approach is contingent on successfully rejecting the null hypothesis for multiple, independent experimental procedures. Problematically, every statistical test comes with an inherent false positive, or type I error, rate. Thus, the more independent testing procedures one implements, the more likely one is to incorrectly reject the null hypothesis and make incorrect inferences with respect to the relationship between variables in a mediation model (see Benjamin et al., 2018; Hayes, 2015). The order of experiments implemented in the causal steps approach also assumes that *M* can only mediate an established relationship between *X* and *Y*. However, the relationship between *X* and *Y* may still exist but only through the *indirect* effect of *M*. As such, terminating experimentation after the first step may potentially result in failing to detect a meaningful indirect effect (Hayes, 2018). Even if one successfully rejects the null hypothesis for each discrete experimental procedure, the approach does not account for alternative possibilities such as epiphenomenal associations or confounding variables. For example, the association between *M* and *Y* may be an epiphenomenon such that *X* affects some other variable not included in the model. This unmeasured variable may potentially affect *Y* but because *M* is correlated with that other variable, it appears that *M* is the variable through which *X* exerts its effect on *Y*. Similarly, a causal claim about an association is threatened by confounding if the association between the variables can be attributed to a third variable that causally affects both (Hayes, 2018). Thus, the seemingly logical method employed by the causal steps approach is fraught with limitations that pose threats to validity and causal inference.

Path-Analytic Model. The limitations of the causal steps approach have motivated researchers to improve mediational analysis by conceptualizing mediational effects within a path-analytic framework, as opposed to a set of discrete hypothesis tests (Hayes, 2018; Montoya & Hayes, 2017). Path analysis is a method of analyzing the correlations among a group of variables in terms of a predicted pattern of causal relations. In a path-analytic model for simple mediation (Hayes, 2018; see Figure 7), the paths depict what the researcher predicts to be the cause-and-effect connection between variables. Based on the correlations of these variables, researchers can determine the coefficients of each path to estimate putative causal influences between variables. Specifically, *a* estimates how much two cases that differ by one unit on *X* to differ by *a* units on *M;* the sign determines whether the case higher on *X* is estimated to be higher (+) or lower (−) on *M*. Analogously, the *b* coefficient estimates how much two cases that differ by one unit on *M*—but that are equal on *X*—to differ by *b* units on *Y*. The *c'* path, which is also known as the direct effect, estimates how much two cases that differ by one unit on *X*—but are equal on *M*—to differ by *c'* units on *Y*. In turn, the coefficients allow researchers to estimate the indirect effect, which is fundamental to mediational analysis (Hayes, 2018; Preacher & Hayes, 2004). Quantified as the product of *a* and *b*, the indirect effect estimates how much two cases that differ by one unit on *X* to differ by *ab* units on *Y* as a result of the effect of *X* on *M* which, in turn, affects *Y*. As such, path analysis bases inferences about mediation on the formal quantification of *ab*, rather than on separate hypothesis test for *a* and *b*.

One statistical tool that may be used to estimate the regression coefficients in a path analysis model is SPSS *PROCESS* macro (Hayes, 2018). *PROCESS* utilizes an ordinary least squares (OLS) analytic framework to estimate the unstandardized *a*, *b*, and *c'* regression coefficients, standard errors (SE), and 95% confidence intervals (CIs) for the hypothesized indirect effect of *X* on *Y*. With respect to statistical inference, *PROCESS* uses a resampling method of mediation whereby bootstrap CIs are randomly resampled in *n* cases from the data with replacement to generate an empirically derived representation of the sampling distribution of the indirect effect. A bootstrap sample of 10,000 cases is considered sufficient to obtain an estimation of the latter. A 95% bias-corrected bootstrap CI is then constructed, which defines the 2.5^{th} (lower limit) and 97.5^{th} (upper limit) percentiles of the distribution as a function of the proportion of *k* values of *ab* that are less than the point estimation calculated in the original data. A significant indirect effect is said to exist when the when the 95% bias-corrected bootstrap CI excludes zero.

Although alternative methods are available for making inferences about regression coefficients and mediational effects, a single, explicit inferential test using bootstrapped confidence intervals avoids assumptions of normality pertaining to the sampling distribution of *ab*, provides high statistical power, and reduce the likelihood of Type 1 errors, relative to the Baron & Kenny approach (Hayes, 2018; Preacher & Hayes, 2008). Accordingly, a path-analytic framework was adopted as the analytic strategy for investigating the modulation hypothesis, which tested whether the effect of facial manipulation group (*X*) on subjective emotion (*Y*) is mediated by facial muscle activity (*M*). Two separate mediational models were assessed for each of the emotive conditions: The first investigated whether the relationship between Group (*X*) and DEQ Sadness during the sad condition (DEQ_S; *Y*) is mediated by COR_S (*M*), covarying for baseline DEQ Sadness (DEQ_{Sb}). The second model investigated whether the relationship between Group (*X*) and DEQ Happiness during the happy condition (DEQ_H; *Y*) is mediated by ZYG_H (*M*), covarying for baseline DEQ Happiness (DEQ_{Hb}).

Indicator coding. *PROCESS* assesses regression models with dichotomous or continuous *X* variables. However, the independent variable of facial manipulation in the current study is a multicategorical group (FA, FI, NO). As such, the direct and indirect effects cannot be estimated using a single path-analytic model as there is no single *a* or *c'* that represents *X*'s effect on *M* or *Y*. One method of addressing this issue is to run the mediational analysis using *PROCESS* $k - 1$ times, where *k* is the number of levels of the independent variable, and using $k - 1$ indicator (i.e., dummy) codes that are constructed prior to the execution of the analyses (Hayes, 2018; Hayes & Preacher, 2014). At each run, one of the group codes is used as *X* and the other as a covariate, with the code allowing *X* to be swapped with a covariate at subsequent *PROCESS* runs. Indicator variables are constructed by creating $k - 1$ variables which are referred to as D_i. For example, if the multicategorical *X* variable consists of three groups, such as in the current study, then two indicator variables are created: D_1 and D_2 (see Figure 8). Indicator variables contain either a "0" or "1" in the regression model to denote which group is the stand-in for *X* and which is the covariate. The remaining *k* group (D_{k-1}) is not explicitly coded and receives a "0" on all indicator variables. This group functions as a *reference group* in the mediation analysis and parameters in the model pertaining to group differences are quantified relative to the reference group. Indicator coding yields a mediational model that is mathematically identical to ANCOVA while also reproducing the *k* group means on *M* and *Y.* It also retains all the information about how the *k* groups differ from each other with respect to the model, parameter estimates, and model fit statistics, unlike other approaches that modify data to produce a dichotomous *X* variable or conduct separate analyses to compare groups while discarding residual data (Hayes, 2018; Hayes & Preacher, 2014).

Indicator coding allows for the estimation of several unstandardized regression coefficients, each representing *relative* effects. That is, the regression coefficients quantify the effect of being in one group relative to some reference group. With respect to the indirect effect, there are $k – 1$ ways to get from *X* to *Y* through *M*, each starting at one of the D_i variables (see Figure 8). Paths are multiplied together as you trace from *X* to *M* to *Y*, which in turn yields the *relative indirect effect*. Defined as a_ib, each relative indirect effect quantifies a part of the difference in *Y* between groups resulting from the effect of *X* on *Y* through *X's* effect on *M*. In contrast to mediation analysis with a dichotomous or continuous X variable, there is no single indirect effect. Rather, there are several relative indirect effects and the interpretation of each will depend on how the groups are coded. For example, in the case where there are three groups, and group 1 is the reference, a_1b would quantify the difference in *Y* between group 1 and 2 resulting in the effect of being in group 2 rather than group 1 on *M*, which in turn affects *Y*. Conversely, a_2b would quantify the difference in *Y* between group 1 and group 3 resulting from the effect of being in group 3 rather than group 1 on *M*, which in turn carries its effect to *Y*. It is assumed that *X*'s effect on *Y* is mediated by *M* if at least one of the relative indirect effects is different from zero. In contrast, the direct effect of *X* on *Y* is quantified as the set of $k – 1$ regression coefficients, with each *c'* being a *relative direct effect* that quantifies part of the effect of *X* on *Y* without passing through *M*. In the case of three groups, c'_1 represents the relative direct effect of being in group 2 rather than group 1 on *Y*, and c'_2 represents the relative direct effect of being in group 3 rather than group 1 on *Y*. A relative indirect and direct effect is inferred when the confidence interval does not contain zero.

Simple mediation analyses for the main hypothesis was performed using *PROCESS* macro (model 4) using the multicategorical variable option (indicator coding system). As the study consists of two comparison groups, the simple mediation models were analyzed twice: once with the NO group coded as the reference group and the second with the FI group coded as the reference group (Hayes, 2018).[7] As there were two emotive conditions (sad, happy), and two reference groups (NO, FI), a total of four models were investigated:

1. Model 1: Group (*X*) on DEQ_S (*Y*) mediated by COR_S (*M*), covarying for DEQ_{Sb} (U_1); NO group coded as the reference group
2. Model 2: Group (*X*) on DEQ_S (*Y*) mediated by COR_S (*M*), covarying for DEQ_{Sb} (U_1); FI group coded as the reference group
3. Model 3: Group (*X*) and DEQ_H (*Y*) mediated by ZYG_H (*M*), covarying for DEQ_{Hb} (U_1); NO group coded as the reference group
4. Model 4: Group (*X*) and DEQ_H (*Y*) mediated by ZYG_H (*M*), covarying for DEQ_{Hb} (U_1); FI group coded as the reference group

Bonferroni Correction

[7] The study was interested in contrasting the FA group with the FI and NO group *individually,* rather than collectively using an orthogonal contrast system. Recall the FI group was included in the study as an additional *control* group to account for muscle activation and task concentration, which is absent in the NO group relative to the FA group. Although both the FI and NO group serve as a comparison for the FA group, the elements of each comparison group are theoretically distinct, and, thus, were treated as such using the indicator coding system and by recoding the reference group in each mediational model (Hayes, 2018).

As the described analyses consist of multiple comparisons, a Bonferroni correction was applied to maintain a study-wide error rate of $\alpha = .05$ and reduce the potential for a type I error. The exception to the use of the correction was in the case of the planned orthogonal contrast for one-way ANOVAs. Given that contrasts are equivalent to a prior questions asked to the data, a Bonferroni correction was not implemented in order to achieve maximum power (Abdi & Williams, 2010; Field, 2018). As discussed in Study 1, exact *p* values and observed effect sizes are reported to allow for theoretical interpretation, especially in circumstances when *p* values exceed the conventional .05 level but not the Bonferroni corrected α level.

Effect Size

Cohen's *dz.* Significant effects obtained from paired samples *t*-tests were followed-up with the report of Cohen's *dz* which refers to the standardized difference between *paired* means (Cohen 1969, 1988). The calculation and conventions for Cohen's d_Z are described in Study 1.

Coefficient of Determination. Significant effects obtained from one-way ANOVAs were followed-up with the report of the coefficient of determination ($R^{2;}$ also known as eta squared, η^2), which refers to the proportion of variance in a dependent variable that is accounted for by an independent variable (Cohen, 1988). Formulaically, η^2 is calculated as:

$$R^2 = \frac{SS_M}{SS_T}$$

where SS_M is the sums of squares for the between-group effect and SS_T is the total sums of squares or amount of variation within the data. The metric is interpreted as the percentage. For example, a R^2 value of 0.15 would indicate that 15% of the variance in a dependent variable is accounted for by an independent variable. Cohen's (1988) conventions for R^2 are .01 for a small effect size; .06 for a medium effect; and .14 for a large effect.

Partially standardized *ab*. Many measures of effect size have been proposed for mediation analyses (MacKinnon, 2008; Preacher & Kelley, 2011). However, researchers recommend reporting partially standardized indirect effect (ab_{ps}) for simple mediation models as such measures produce relatively unbiased estimates of effect size, particularly in circumstances where *X* is dichotomous or multicategorical (Hayes, 2018; Miočević et al., 2018). The ab_{ps} is calculated as follows:

$$ab_{ps} = ab/s_Y$$

whereby *ab* is the unstandardized regression coefficient for the indirect effect and S_Y is the standard deviation of the outcome variable. When *X* is a dichotomous variable, such as in the current study, the effect size metric captures the size of the indirect effect in terms of change in standard deviation units of *Y* between the stand-in and reference group.

Parametric Assumptions

Outliers. Linear models, and variations thereof (e.g., *t*-test, ANOVAs, regression), have two basic parametric assumptions. The first is that the dependent variable should not contain any outliers. Outliers in the data were defined as *Z* scores beyond $\pm$3.29 (Field, 2018). Four outliers were observed for DEQ Sadness among four participants during the baseline condition. Regarding EMG data, seven outliers was observed for EMG corrugator amplitudes from seven participants during the sad condition. Three outliers were also observed for EMG zygomaticus amplitudes from three participants during the happy condition. Outlier DEQ and EMG data were replaced by the next highest nonoutlier value (Field, 2018).

Normality. The second parametric assumption of linear models pertains to normality. With respect to regression models, normality refers to the residuals (i.e., errors) between observed and predicted values. Normality of residuals were assessed by visually inspecting predicted-probability (P-P) plots, which plot the cumulative probability of a variable against the cumulative probability of a normal distribution (Field, 2018). No drastic deviations in the residuals were observed with respect to the normality line indicated in the plots, suggesting the data is normally distributed.

Regarding *t*-tests, normality refers to the sampling distribution of the dependent variable (independent means *t*-test) or the difference between dependent scores (paired-samples *t*-test). However, as previously discussed in Study 1, no linear model using a bounded or discrete dependent variable, such as the DEQ, would likely generate normally distributed data as the normal distribution is technically a continuous distribution (Hayes, 2018). Analogous to Study 1, this notion was explored in the current study by assessing Z_{skewness} whereby scores beyond ± 1.96 were considered significantly skewed at $p < .05$ (Field, 2018). As shown in Table 5, a positive skew was observed for all DEQ variables except for DEQ Happiness during the happy condition and the dependent DEQ Happiness score[8]. The table also reveals a positive skew for all EMG corrugator and zygomaticus data and dependent EMG scores, which is consistent with EMG studies (Golland et al., 2018, van Boxtel, 2010). Overall, the DEQ and EMG data violate the assumption of normality pertaining to *t*-tests.

Skewness is commonly remediated by applying a data transformation to the data (Hayes, 2018), especially in EMG studies (Golland et al., 2018, van Boxtel, 2010). However, as discussed in Study 1, simulation studies show that skewed data do not substantially affect the validity of statistical inferences from analyses that are based on the linear model unless the sample size is quite small (Edgell & Noon, 1984; Havlicek & Peterson, 1977; Hayes, 1996;

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[8] Z_{skewness} was not calculated for DEQ emotion-incongruent and neutral conditions as subsequent analyses with respect to the DEQ are concerned with contrasting emotion-congruent condition with the baseline condition.

Keselman et al., 2001; Mena et al., 2017; for a review, see Field, 2018; Howell, 2012; and Hayes, 2018). This assumption was confirmed by conducting analyses on both logarithmically transformed and untransformed data; no differences were found with respect to statistical inferences. As such, the untransformed DEQ and EMG data are reported for subsequent analyses to facilitate interpretability of the data.

Linearity. In addition to assumptions pertaining to outliers and normality, ANOVA and regression analyses have several additional parametric assumptions. The first pertains to linearity whereby the relationship between predictor and criterion variables are demonstrated to be linear. The assumption of linearity was assessed by visually inspecting residual scatterplots for curvature in the standardized residuals (Field, 2018). No curves were observed, indicating that the assumption of linearity was not violated.

Homoscedasticity. Another assumption of regression is homoscedasticity which assumes that the variance of the outcome variable should be stable at all levels of the predictor variable. This assumption was assessed among predictor and criterion data by visually inspecting plots of standardized predicted values against standardized residuals. If homoscedasticity holds true, then there should be no systematic relationship between the errors (Field, 2018). Points were randomly and evenly dispersed throughout the scatterplots, thus revealing no violations of homoscedasticity.

Independence. A final assumption of regression refers to independence whereby the errors in estimation are statistically independent. Independence was assessed statistically using the Durbin-Watson test which identifies any serial correlations between residuals. The test statistic can vary between 0 and 4, with a value of 2 indicating that the residuals are uncorrelated. Values greater than 2 indicate a negative correlation between adjacent residuals whereas a value below 2 indicates a positive correlation. The size of the test statistic varies depending on the number of predictors in the model and the number observations (Durbin & Watson, 1951; Field, 2018). As a rule of thumb, values less than 1 or greater than 3 are considered a cause for concern for the assumption of independence. Durbin-Watson test statistic values were between the range of 1 and 3, thus revealing no violation of independence.

Main Results

Data Preparation

DEQ data were entered into SPSS v. 25 from the SurveyMonkey server. One missing value was observed for one participant for the DEQ Happiness subscale and replaced with the average score of the remaining items of the subscale (Field, 2018). EMG signals were processed offline using ASA (Version 9.2) software in accordance with published EMG guidelines from van Boxtel (2010) and based on the analytic procedures outlined by Golland and colleagues (2018, 2019) for emotive videos. Raw EMG signals were band passed filtered within a frequency range of 45-200 Hz. High-pass filtering at 45 Hz is essential to remove movement artifacts unrelated to emotional influence (i.e., eye movements, activity of neighboring muscles, swallowing). A 60 Hz notch filter was then applied to remove artifacts resulting from power line interference. Additional artifacts in the signal were identified through visual inspection. Data was then segmented into 1 s epochs, with an interval of 0.5 s between epochs. A Fast Fourier Transform (FFT) analysis was performed to derive estimates of spectral power density in the 45-200 Hz frequency band in 1 s windows, resulting in a continuous 1 Hz EMG time-series. The resulting data was then entered into SPSS for analyses. No missing data were observed. The maximum number of epochs per 3-min recording was 366, with the average number of utilizable epochs in the sample being 355 per participant. The percentage of artifact-free epochs for each emotive condition were as follows: 97 % for baseline (*M* = 353.44, *SD* = 17.39); 99% for neutral (*M* = 361.37, *SD* = 21.16); 96 % for sad (*M* = 350.01, *SD* = 17.43); and 97 % for happy (*M* =355.45, *SD* = 11.38).

Reliability and Descriptive Statistics

Since Cronbach's α is a property of the scores from a specific sample of participants, researchers should not rely on α estimates of the scale from previous studies. Rather, they should measure α each time the scale is administered to reflect the overall consistency of the scale with a specific sample of participants (Streiner, 2003). Accordingly, the current study reassessed Cronbach's α for the DEQ subscales during the sad and happy condition, in addition to the novel baseline condition. The study did not report Cronbach's α for the DEQ Happiness and Sadness subscales for the neutral and emotion-incongruent conditions as the study is concerned with the contrast of subjective emotional experience between the baseline and emotion-congruent condition. Table 6 presents the reliability of the DEQ Sadness and Happiness subscales across the emotive conditions. Consistent with Study 1, the DEQ subscales demonstrated adequate levels of Cronbach's α for the sad and happy conditions, in addition to the novel baseline condition.

Means and standard deviations for DEQ and EMG data across the emotive conditions are reported for the study sample in Table 7 and for each manipulation group in Tables 8. The tables exclude means and standard deviations for the DEQ during the neutral and emotion-incongruent condition as inferential analyses were not conducted with such data. Table 9 presents EMG ratio indices across manipulation groups. Examination of this table reveals that participants in each group experienced a proportional increase in EMG corrugator and zygomaticus activity from baseline to the sad and happy condition, respectively.

Preliminary Analyses

Neutral Expression as Emotional Experience. Paired-samples *t*-tests with a Bonferroni correction (.05/2) were conducted to investigate whether there is a difference in EMG activity between the baseline and neutral condition among all participants in the sample. The analyses revealed a significant increase in EMG corrugator activity, $t(88) = 7.39$, $p < .001$, $d = 0.81$, and EMG zygomaticus activity, $t(88) = 4.95$, $p < .001$, $d = 0.54$, from baseline to the neutral condition. These findings suggest that the neutral facial expression was experienced as an emotional event and supports the use the baseline video, as opposed to the neutral video, as a baseline condition for EMG facial muscle activity.

Congruent Subjective Emotion Using Baseline Condition. Paired-samples *t*-test with a Bonferroni correction (.05/2) were conducted to determine whether there is a difference in DEQ scores between the baseline and sad/happy emotive conditions among participants in the NO group. Participants demonstrated a significant increase in DEQ Sadness from baseline to the sad condition, $t(28) = 6.43$, $p < .001$, $d = 1.19$, as well as a significant increase in DEQ Happiness from baseline to the happy condition $t(28) = 3.82$, $p < .001$, $d = 0.78$. These findings further demonstrate the sensitivity of the DEQ subscales during emotion-congruent conditions and support the novel baseline condition as an appropriate comparison condition for subjective emotion, in addition to EMG facial muscle activity.

Congruent Facial Muscle Activity. Paired-samples *t*-tests with a Bonferroni correction (.05/2) were conducted to investigate whether participants in the NO group experienced an increase in congruent EMG facial muscle activity in response to the sad and happy conditions relative to the baseline condition. As expected, participants demonstrated a significant increase in EMG corrugator activity from baseline to the sad condition, $t(28) = 6.11$, $p < .001$, $d = 1.16$, as well as a significant increase in EMG zygomaticus activity from baseline to the happy condition, $t(28) = 5.70$, $p < .001$, $d = 1.07$. These findings lend support to the basic assumption that passively viewing the emotive conditions elicits congruent facial muscle activity.

Facial Manipulation Check. A set of one-way ANOVAs with a Bonferroni correction (.05/2) were conducted to investigate whether participants' facial muscle activity was manipulated in the theorized manner. There was a significant effect of group on EMG zygomaticus activity during the sad condition, $F(2, 86) = 45.99$, $p = <.001$, $R^2 = .53$, and EMG corrugator activity during the happy condition, $F(2, 86) = 40.66$, $p = <.001$, $R^2 = .50$. A planned orthogonal contrast revealed that participants that furrowed their eyebrows in the FA group experienced greater EMG corrugator activity during the happy condition compared to participants in the nonfacial groups (NO, FI), $F(2, 86) = 81.22$, $p < .001$, $R^2 = .50$. Similarly, participants that held a chopstick between their teeth in the FA group experienced greater EMG zygomaticus activity during the sad condition compared to participants in the nonfacial groups, $F(2, 86) = 66.49$, $p < .001$, $R^2 = .45$. Thus, the facial manipulation paradigms resulted in the appropriate activation of incongruent facial muscles during each emotive condition relative to participants whose facial muscle activity was not manipulated.

Main Analyses

The modulation hypothesis was investigated via a series of simple mediational analyses with a Bonferroni correction (.05/4) using *PROCESS* macro (model 4) indicator coding system. Model 1 and 2 investigated whether the regression of DEQ_S (Y) on Group (X) was mediated by COR_S (M), covarying for DEQ_{Sb} (U_1). There was no significant relative indirect effect of the FA group on DEQ_S through COR_S, relative to the NO group, $a_1b = -0.05$; 95% CI [−0.23, 0.05] (see Figure 9 and Table 10) and FI group, $a_1b = -0.02$; 95% CI [−0.19, 0.09] (see Figure 10 and

Table 11), as the confidence intervals straddle zero. Thus, it was concluded that corrugator muscle reactivity does not mediate the relationship between facial manipulation and subjective sadness.

Model 3 and 4 investigated whether the regression of DEQ_H (*Y*) on Group (*X*) was mediated by ZYG_H (*M*), covarying for DEQ_{Hb} (U_1). There was no significant relative indirect effect of FA group on DEQ_H through ZYG_H relative to the NO group, $a_1b = -0.18$; 95% CI [−0.49, 0.01] (see Figure 11 and Table 12) and FI group, $a_1b = -0.23$; 95% CI [−0.57, 0.01] (see Figure 12 and Table 13). As such, it was concluded that zygomaticus reactivity does not mediate the relationship between facial manipulation and subjective happiness. Overall, the results suggest that facial manipulation does not influence subjective emotion and that facial muscle activity does not constitute a mediating influence.

Exploratory Results

Association Between Narcissism and Trait Empathy

A lack of empathy is frequently cited as a primary, distinguishing feature of narcissism (e.g., APA, 2013). For exploratory purposes, the study investigated whether narcissism (B-PNI V and B-PNI G) is associated with deficits in trait empathy (ECS Positive, ECS Negative, QCAE). The psychometric properties and intercorrelations of the exploratory psychometric variables are presented in Table 14. Examination of the intercorrelations reveals that B-PNI V is positively associated with B-PNI G. QCAE Cognitive is positively associated with B-PNI G, in addition to both ECS subscales. No negative associations emerged between narcissism and psychometric measures of trait empathy.

Moderating Influence of Narcissism on Facial Feedback

The purpose of the program of research was to investigate whether narcissism influences facial feedback; specifically, the relationship between congruent facial muscle activity and subjective emotion in response to emotive stimuli. Recall that narcissism is a cognitive and/or behavioural response to threat. Within the realm of narcissism, threat is defined as a situation that is perceived as being significant enough to cause a change in how an individual conceptualizes their self-representation (Besser & Priel, 2010). As such, if one is to investigate narcissism, one must provoke such tendencies by inducing threat. Although the current study did not implement threat, exploratory analyses were conducted to assess whether narcissism influences facial feedback in the *absence* of threat. This question was modeled as a simple moderation whereby the effect of a predictor variable (*X*) on an outcome variable (*Y*) is contingent upon the size, strength, or sign of a third variable (*M*; Hayes, 2018; see Figure 13). In other words, moderation analyses are used to identify the boundary conditions of an effect such that it provides information about the conditions under which an effect can be observed. In the current study, simple moderation analyses explored whether the relationship between congruent facial muscle activity (*X*) and subjective emotion (*Y*) is moderated by narcissism (*W*).

Simple Linear Moderation Model. Multiple linear regression models estimate *Y* from two antecedents *X* and *W* as follows:

$$Y = i_Y + a_1\mathrm{X} + a_2\mathrm{W},$$

where i_Y is the estimate of the intercept, a_1 is the regression coefficient for *X*, and a_2 is the regression coefficient for *W*. However, a regression model in this form is not well-suited to moderation analyses. In moderation, if *X*'s effect on *Y* is moderated by another variable in the model, then *X*'s effect will depend on that other variable. However, multiple linear regression models constrain *X*'s effect to be unconditional on *W*, meaning that it is invariant across all values of *W*. To use regression analysis to test moderation, the constraint of *X*'s effect must be released so that *X*'s effect is function of *W*; that is, for different values of *W, X*'s effect on *Y* is different (Hayes, 2018). This is achieved by arranging the linear regression model as follows:

$$Y = i_Y + (a_1 + a_3W)X + a_2W$$

where b_1 is substituted for $a_1 + a_3W$. In this way, the function of *W* resembles a simple linear regression model where b_1 is the constant and a_3 is the regression coefficient for *W*. However, rather than estimating some consequent variable from *W*, $(a_1 + a_3W)X$ is a model of the effect of *W* on *X* (Hayes, 2018). The resulting equation is a simple linear moderation model which generates estimates of *Y* for various combinations of *X* and *W* (Hayes, 2018; see Figure 14). The equation is mathematically equivalent to the following:

$$Y = i_Y + a_1X + a_2W + a_3XW$$

where a_3 is the regression coefficient for the product term (i.e., interaction) of *X* and *W*. The coefficient a_3 is defined as a *conditional effect* of how much a one-unit change in *X* changes *Y* given a value of *W*. The interpretation of a_1 and a_2 in the model are also conditional effects such that a_1 the conditional effect of *X* on *Y* when $W = 0$, while a_2 is the effect of *W* on *Y* when $X = 0$. Simple moderation models were estimated using SPSS *PROCESS* macro for model 1 (Hayes, 2018). *PROCESS* automatically calculates conditional effects (a_1, a_2, and a_3) and produces the proportion of the variance in *Y* uniquely attributable to the moderation of *X's* effect by *W*. Conditional effects are concluded when the coefficient is statistically different from zero or when the 95% CI excludes zero (Hayes, 2018).

Cohen's *f^2*. *PROCESS* cannot produce effect size measures for simple moderation models. However, it does produce R^2 which can be converted into an effect size metric referred to as Cohen's f^2 as follows:

$$f^2 = R^2 / 1 - R^2$$

Cohen's f^2 represents the standardized average effect in the population across all levels of the independent variable. Cohen (1988) suggest that f^2 effect sizes of 0.02 represent a small effect, 0.15 represents a medium effect, and 0.35 represents a large effect.

Probing Interactions. A significance test for moderation (i.e., a_3) establishes an interaction such that the effect of *X* on *Y* depends on *W*. However, such tests do not answer the question as to *how X*'s effect varies with *W*. To answer this question, significant interactions need to be followed up with a set of additional inferential tests to "probe" the interaction; that is, determine where in the distribution of the moderator *X* is related to *Y* and where it is not. A popular approach to probing an interaction is to use the pick-a-point approach (Hayes, 2018). This procedure involves selecting a value of the *W*, calculating the conditional effect of *X* on *Y* at that value, and then conducting an inferential test or generating a confidence interval. When *W* is a quantitative variable, such as B-PNI in the program of research, a common strategy is to estimate the conditional effect of *X* on *Y* when *W* is equal to the mean, one standard deviation below the mean, and one standard deviation above the mean. A significant limitation of the pick-a-point approach is that it requires the arbitrary selection of values of *W* at which to estimate the conditional effect of *X* on *Y*. Such arbitrary selection is problematic as it can lead to different claims and invite inconsistencies in findings across investigators conducting otherwise identical studies (Hayes, 2018; Hayes & Rockwood, 2017). An alternative approach is to use the Johnson-Neyman (JN) technique, which analytically derives regions of significance (JN_W): the value range(s) of *W* where *X* is significantly related to *Y* and where it is not. In this way, the probing technique does not depend on the values of *W* the investigator chooses.

There are three possible outcomes when using the JN technique. The first outcome is that the JN technique generates a single region of significance; this value is referred to as JN_W. When a single value is produced, this means that the conditional effect of *X* on *Y* is statistically significant at the .05 α level when $W \geq JN_W$ or when $W \leq JN_W$, but not both. The second possibility is that the JN technique generates two solutions for the region of significance, defined as either $JN_{W1} \leq W \leq JN_{W2}$, or alternatively $W \leq JN_{W1}$ *and* $W \geq JN_{W2}$. The former means that the conditional effect is significant when *W* is between JN_{W1} and JN_{W2}, but not beyond those two values. The latter means that the conditional effect of *X* on *Y* is statistically signficant when *W* is less than or equal to JN_{W1} and when *W* is greater than or equal to JN_{W2}, but not between these two values. The final possible outcome is that there are no solutions or significant points of transition within the range of the moderator. This occurs when the region of significance is either the entire range or nowhere in the range of *W*.

Exploratory Analyses. Simple linear moderation using SPSS *PROCESS* macro (model 1; Hayes, 2018) was used to investigate whether narcissism moderates the relationship between congruent facial muscle reactivity and subjective emotion during a state of passive-viewing among participants in the NO group. As the study consisted of two emotive conditions (sad, happy) and measured two expressions of narcissism (grandiose, vulnerable), a total of four models were investigated. In consideration of the significant correlation between B-PNI G and B-PNI V, the residual B-PNI subscale was entered as a covariate into each of the four models to equate participants' scores on the subscale and assess the independent influence of the B-PNI subscale that was entered as a moderator. The investigated models are as follows:

1. Model A1: Regression of DEQ_S (*Y*) on COR_S (*X*) moderated by B-PNI G (*W*), covarying for DEQ_{Sb} (U_1) and B-PNI V (U_2).
2. Model A2: Regression of DEQ_S (*Y*) on COR_S (*X*) moderated by B-PNI V (*W*), covarying for DEQ_{Sb} (U_1) and B-PNI G (U_2).
3. Model A3: Regression of DEQ_H (*Y*) on ZYG_H (*X*) moderated by B-PNI G (*W*), covarying for DEQ_{Hb} (U_1) and B-PNI V (U_2).
4. Model A4: Regression of DEQ_H (*Y*) on ZYG_H (*X*) moderated by B-PNI V (*W*), covarying for DEQ_{Hb} (U_1) and B-PNI G (U_2).

As revealed in Table 15 and Table 16, no significant conditional effects were observed in the four models. Thus, narcissism does not moderate the relationship between congruent facial muscle reactivity and subjective emotion during a condition of passive-viewing.

Discussion

The purpose of the current study was to investigate the modulation hypothesis and determine whether physically manipulating incongruent facial muscles influences congruent facial muscle activity and subjective emotional experience in response to emotive stimuli. Participants were randomized to one of three facial manipulation groups while viewing videos of sad and happy facial expressions: facial manipulation (FA; incongruent muscles), finger manipulation (FI; nonfacial muscles), and no manipulation (NO; passive viewing). In accordance with the modulation hypothesis (Laird, 1974; Strack et al., 1988), it was predicted that participants in the FA group would experience an attenuation of congruent EMG facial muscle activity and, in turn, an attenuation of congruent subjective emotion, relative to participants in the FI and NO group.

Absence of Attenuation by Facial Manipulation Paradigms

Previous investigations of the modulation hypothesis have demonstrated an attenuation effect such that constant and conflicting activation of the zygomaticus muscle attenuates negative—rather than intensifies positive—subjective emotion in response to negatively-valenced stimuli (e.g., Söderkvist et al., 2018) and, conversely, constant contraction of the corrugator muscle attenuates positive—rather than intensifies negative—subjective emotion in response to positively-valenced stimuli (Davey et al., 2013; Dimberg & Söderkvist, 2011). However, as previously discussed, it is unclear from such investigations as to whether activating incongruent facial muscles attenuates *congruent* facial muscle activity. This question was evaluated in the current study by measuring EMG to determine whether facial muscle activity was attenuated, elicited, and manipulated in the theorized manner. Preliminary analyses confirmed that participants' facial muscles were manipulated in the facial manipulation group as intended and that the sad and happy emotive videos appropriately elicited congruent facial muscle activity among participants in the passive-viewing group. However, the current study did not observe an attenuation effect such that there was no difference between the manipulation groups in terms of the proportional increase in congruent EMG facial muscle activity from the baseline to the emotion-congruent video.

The absence of attenuation by the facial manipulation paradigms in the FA group may be explained in terms of automaticity. Research shows congruent facial muscle reactivity can be elicited as quickly as 500 ms after the onset of emotive stimuli (Dimberg & Thurnberg, 2012; Dimberg et al., 2002; Lishner et al., 2008; Mavratzakis et al., 2016; Pizarro-Campagna et al., 2020; Sato & Yoshikawa, 2007; Tamietto et al., 2009). For example, a study by Kaiser and colleagues (2016) presented happy and angry facial expressions for 500 ms while participants' EMG corrugator and zygomaticus activity were recorded. Forced-choice classification of the emotional expressions confirmed that the expressions were not consciously perceived. However, participants activated congruent facial muscles in response to the briefly presented video segments, suggesting that facial muscle reactivity is an unconscious process. Furthermore, several studies have shown that facial feedback cannot be suppressed even if one is instructed to do so. For example, a study by Dimberg and colleagues (2002) instructed participants to either refrain from frowning or smiling in response to angry and happy pictures while having their EMG corrugator and zygomaticus activity recorded. Despite being instructed not to react at all with their facial muscles, participants still produced a congruent pattern of EMG facial muscle activity in response to the angry and happy facial stimuli. Similarly, a study by Korb and colleagues (2010) instructed participants to inhibit facial movement during a picture presentation of happy facial expressions while having their EMG zygomaticus activity recorded. The study found that participants responded with increased zygomaticus activity in response to the happy facial expressions despite being instructed to inhibit their facial muscles. Overall, congruent facial muscles reactivity appears to be an automatic, involuntary process that is difficult to interrupt and restrain. In the current study, participants in the FA group may have experienced such automaticity in response to the emotive videos given that their congruent facial muscles were still free to vary. As emotive videos are one of the most powerful methods of eliciting facial muscle activity in a laboratory setting (Rymarczyk et al., 2016a; 2016b; Wilhelm et al., 2017), it is also possible that such automaticity may have been augmented by the saliency of the stimuli, further contributing to the absence of the attenuation effect.

Constructionist Theories of Subjective Emotion

Contrary to previous findings, subjective emotion was not modulated by facial manipulation or EMG facial muscle activity. Rather, participants across the facial manipulation groups experienced a comparable increase in congruent subjective emotion from baseline to the happy and sad emotive condition. As such, the findings do not lend support to the modulation hypothesis or the broader facial feedback hypothesis. These null findings with respect to subjective emotion may be understood in the context of modern constructionist theories of emotion. From a constructionist perspective, subjective emotion is contrived from the conscious process of appraisal and categorization (e.g., Barrett et al., 2014; Lindquist, 2013; Russell, 2014). Put simply, individuals subjectively experience emotion when they appraise and categorize accessible experiences (e.g., physiological states, semantic knowledge, situational cues) into discrete emotional categories. In this way, cognitive processing is proposed to be the antecedent of subjective emotional experiences. Given the unconscious nature of facial muscle reactivity (Dimberg & Thurnberg, 2012; Dimberg et al., 2002; Lishner et al., 2008; Mavratzakis et al., 2016; Pizarro-Campagna et al., 2020; Tamietto et al., 2009), participants' may have relied on the more conscious process of appraisal and categorization of perceived emotional cues in the videos—as opposed to the proprioceptive cues from their facial muscles—when reporting their subjective emotional experience.

Peak-End Rule. Constructionist theories consist of several, specific theories that describe the circumstances under which individuals may rely on the process of cognitive appraisal and categorization when reporting subjective emotion. One such relevant theory is the *peak-end rule* (Fredrickson & Kahneman, 1993), whereby retrospective reports of an experience tend to be disproportionally affected by the recognition of salient ("peak") content. In support, individuals are more likely to report more intense, congruent subjective emotional experiences when reflecting on salient emotional events compared to less salient ones (Walentynowicz et al., 2018). In the current study, participants viewed emotive videos that displayed a range of dynamic contextual cues related to sad and happy discrete emotions. Happiness was indexed by smiling and laughter, while sadness was indexed by tears, downward gaze, and squinting. Not only do these salient, dynamic facial cues reliably elicit congruent EMG facial muscle activity (Rymarczyk et al., 2016a, 2016b; Rymarczyk et al., 2018), they also enhance one's ability to recognize and appraise the emotion (Ambadar et al., 2005; Trautmann et al., 2009; Weyers et al., 2006). While there is research to suggest that facial manipulation reduces one's capacity to recognize emotions, this effect is demonstrated specifically when manipulating facial muscles that are *congruent* with the emotional content. For example, blocking or manipulating zygomaticus activity attenuates the recognition of positively-valenced facial expressions, but not negatively-valenced ones (Borgomaneri et al., 2020; Ponari et al., 2012; Oberman et al., 2007; Wingenbach et al., 2018). Similarly, blocking or manipulating corrugator activity attenuates the recognition of negatively-valenced expressions, but not positively-valenced ones (Ponari et al., 2012). In the current study, participants incongruent, as opposed to congruent, facial muscles were manipulated in response to sad and happy facial expressions. As such, it is possible that participants were still able to recognize the saliency of the emotion-congruent facial cues and, in turn, categorize and appraise the expression as a discrete emotion. In accordance with the peak-end rule, such categorization may have then prompted participants to report a more intense and congruent experience of emotion, regardless of whether incongruent facial muscles were manipulated.

Temporal Proximity. Another theory that has received considerable attention in the literature pertains to the temporal proximity which refers to the delay between an emotional event and subjective reports. According Robinson and Clore (2002a; 2002b), an individual's ability to accurately report emotional experiences declines quickly with the passage of time.

Consequently, a delay between an emotional episode and its reporting results in the loss of details of the emotional experience and increases the likelihood that ratings will be biased by more accessible semantic information to fill in the gaps (for a review, see Robinson & Barrett, 2010). In a classic example, Mitchell and colleagues (1997) found that individuals retrospectively report that they experience more happiness on their vacations than they actually experience. From a temporal proximity standpoint, the authors interpret the dissociation as resulting from the generally held belief that "vacations are pleasant" to fill in the lapsed details of their emotional experience during their vacation. Expanding upon the peak-end rule, participants in the current study may have recognized the salient facial cues in the emotive videos and, on the basis of such cues, reported their subjective emotions using commonly held semantic beliefs such as "tears are sad" and "laughter is happy."

Indeed, recent empirical studies demonstrate that delayed self-report data—even if the delay is brief—often reflect semantic information (for a review, see Itkes & Kron, 2019). Intriguingly, the degree to which delayed self-report data reflects semantics is influenced by the way individuals understand the task of reporting. For example, a study by Hamzani and colleagues (2019) compared three experimental instruction sets with respect to reporting subjective emotion after viewing emotive pictures: Participants randomized to the *feelings-focused* group were given explicit instructions to report the feelings (not knowledge) they experienced as they viewed the pictures; participants in the *knowledge-focused* group were given explicit instructions to report their semantic knowledge of the emotive content in the pictures (not emotion); and participants in the *feelings-naïve* group were instructed to rate their feelings without explicit instructions regarding the distinction between emotions and semantic knowledge. The researchers compared the ability of the three types of self-report data to predict a variety of physiological data recorded from participants while viewing of the emotive pictures (e.g., facial EMG, heart rate, electrodermal activity). The study demonstrated a stronger prediction of physiological data by the self-report data obtained from the feelings-focused group. Moreover, the strength of the prediction by self-report data in the feelings-naïve group fell in between the feeling-focused and knowledge-focused group. Such findings support the distinction between emotional and semantic representations and suggest that subjective emotional experiences may reflect semantic information depending on one's understanding of the rating task. As participants in the current study were not given explicit details or instructions to differentiate their emotions from their semantic understanding of the content in the emotive videos (e.g., feeling-naïve group; "while viewing the video, what extent did you experience these emotions?"), it is possible that the instruction set may have prompted participants to rely on semantic information when providing a delayed report of their emotional experience of the emotive videos. Such reliance on semantics may have, in turn, led to comparable increases in congruent subjective emotion, irrespective of emotional and/or proprioceptive cues such as facial muscle reactivity.

Narcissism and Trait Empathy

For exploratory purposes, the current study also investigated the association between trait empathy and narcissism. Empathy is a multifaceted construct that consists of both cognitive and affective components. Cognitive empathy refers to one's ability to recognize and understand others' emotions and viewpoints (Batson & Ahmd, 2009; Davis, 1983), while affective empathy refers to the ability to emotionally experience another's emotional state (Davis, 1983; Vreeke & van der Mark, 2003). As individuals with narcissistic tendencies are typically characterized by a general lack of empathy, the current study explored whether narcissism is associated with deficits in trait cognitive and/or affective empathy. This question was particularly intriguing as most studies investigating the narcissism-empathy relationship focus on grandiosity, rather than vulnerability (Baskin-Sommers et al., 2014). Contrary to conventional narratives, a negative association was not observed between narcissism and trait empathy. In fact, grandiose narcissism was associated with *greater* trait cognitive empathy. Overall, these exploratory findings do not support the notion that narcissists experience a decline in empathetic functioning.

Discrepancy in the Narcissism-Empathy Relationship. A lack of empathy is one of the most frequently cited hallmarks of grandiose narcissism (e.g., APA, 2013) given that such individuals demonstrate a tendency towards self-absorption and use self-enhancement strategies at the expense of others (Campbell & Miller, 2011). However, studies demonstrate mixed findings with respect to the nature of the relationship. For example, some studies have shown grandiosity to be negatively associated with trait cognitive empathy such that individuals high on grandiosity report lower levels of perspective taking and empathetic concern (Delič et al., 2011; Hepper et al., 2014a; Jonason et al., 2013; Vonk et al., 2013). Other studies, including those of the current study, have demonstrated a positive association between grandiosity and trait cognitive empathy, which is thought to reflect an inflation in one's ability to infer emotions (Pajevic et al., 2018). A similar, mixed pattern of findings emerges for trait affective empathy and narcissism, with some studies demonstrating grandiosity to be negatively associated with affective empathy (Turner et al., 2019; Wai & Tiliopoulos, 2012), while other studies show no difference in trait affective empathy among those low and high on grandiosity (Marissen et al., 2012; Ritter et al., 2011).

Discrepancies with respect to the association between grandiose narcissism and empathy are also apparent in behavioural studies. For example, a study by Ritter and colleagues (2011) had participants with and without NPD view photographs of emotional expressions. Cognitive empathy was assessed by asking participants to select one of the four emotion words that matched the emotion in the photograph, while affective empathy was assessed by asking participants to rate how aroused the photograph made them and how concerned they were for the person in the picture. Individuals with NPD were able to correctly select the appropriate emotion displayed in the photograph and, thus, demonstrated cognitive empathy. However, participants reported lower ratings of arousal and concern for the person in the photographs relative to healthy controls, which suggests a deficiency in affective empathy. In contrast, Marissen and colleagues (2012) found an opposite pattern of findings with respect to cognitive empathy using a similar emotion elicitation paradigm. Participants with and without NPD completed self-report measures of affective empathy and a facial recognition task designed to measure cognitive empathic abilities. In contrast to Ritter and colleagues, those with NPD demonstrated intact affective empathy and worse emotional facial recognition (i.e., cognitive empathy) than healthy controls, especially for expressions of fear and disgust. Thus, discrepancies between grandiose narcissism and empathy emerge not only for self-report studies, but also for behavioural studies.

Less is known regarding the association between vulnerable narcissism and empathy. As a result of their negative self-image (Miller et al., 2011), vulnerable narcissists are hypervigilant to social feedback as a means to evaluate their self-worth and obtain others' admiration (Zeigler-Hill et al., 2008). Such hypervigilance may increase their tendency to become highly attuned to and overwhelmed by the emotional states of others (i.e., maladaptive affective empathy). Indeed, vulnerable narcissists report higher levels of cognitive empathy and susceptibility to the experience of emotional distress by others (Luchner & Tantleff-Dunn, 2016; Rogoza et al., 2018). However, the current study found no such association between vulnerable narcissism and trait affective and/or cognitive empathy, which further contributes to the observed discrepancy in the narcissism-empathy relationship.

Motivational Theories of Narcissism. The aforementioned discrepancies may be explained in terms of motivational theories of narcissism (Fries, 2018; Sedikides & Campbell, 2017; Sedikides & Gregg, 2001). Such theories emphasize the preliminary role of motivation in narcissistic behaviour—especially grandiosity—and the malleability of such behaviour to achieve social and self-enhancement goals. Indeed, a study by Ashton-James and Levordashka (2013) found that those high on grandiose narcissism demonstrate behavioural mimicry, but only when their interaction partner exhibits high social status. Finkel and colleagues (2009) also found that grandiose narcissists demonstrate commitment to their significant others, but only when communal concerns are primed by their partner. Another study by Hepper and colleagues (2014) found that individuals high on grandiose narcissism experience low autonomic arousal while viewing negatively-valenced emotive stimuli, relative to their low narcissistic counterparts, which suggests that narcissists are less emotionally affected by others' distress. However, when asked to engage in perspective-taking, those high on narcissism experienced comparable levels of autonomic arousal as those low on narcissism. Together, these findings suggest that the narcissism-empathy relationship is not all-or-none as it is often portrayed. Rather, it is a more complex relationship reflecting fluctuations in empathetic behaviour that are dependent on a diverse set of motivational and contextual factors. General dispositional measures of empathy may not capture such diversity in empathetic behaviour among narcissists and, in turn, may explain the absence of a negative association between narcissism and self-report trait empathy in the current study.

Considering the complex interaction between motivation and narcissism, the program set out to investigate a specific form of empathetic behaviour among narcissists—namely, facial feedback—under a condition of threat. Although the current study did not implement threat, exploratory analyses were conducted to assess the antithesis to this assumption; that is, whether narcissism influences facial feedback in the absence of threat. No such moderating influence of narcissism on congruent facial muscle reactivity and subjective emotion was evidenced. The findings may potentially reflect a type II error given that the sample size was small and likely contributed to low statistical power (50% - 57%). However, the purpose of implementing these analyses was not to achieve "statistical proof" for such exploratory hypotheses. Rather the purpose was to provide supplementary data that *generates* hypotheses regarding narcissistic behaviour (Gaus et al., 2015). In view of contemporary motivational theories, the paucity of moderation effects in the current study generates hypotheses concerning the role of context in the elicitation of narcissistic behaviour. Such was the purpose of Study 3.

Study 3

Upon investigating the physical manipulation of facial feedback, Study 3 explored whether facial feedback is modulated cognitively by the perception of threat. Facial feedback is an affiliative process that allows individuals to better understand the mental state of others and to build and maintain relationships (Izard, 1971; Tomkin, 1962, 1980). However, there may be certain interpersonal and situational factors that motivate an individual to either engage or disengage from others emotionally (Fischer & Hess, 2017). One such interpersonal factor may be narcissism, a personality dimension whereby individuals experience emotional dysregulation in response to a perceived threat to their self-representation (Pincus et al., 2009). When narcissists experience emotional dysregulation as a result of threat, they may respond in one of two ways

(Pincus et al., 2009): repress or distort information from the environment related to the threat (grandiose narcissism) or become hypervigilant to the threat (vulnerable narcissism). Given that narcissism is characterized by emotional dysregulation, these response tendencies may be reflected in individual differences in facial feedback as a means of engaging or disengaging from social threats.

Body Comparison Paradigms

The current investigation implemented an experimental manipulation of threat to elicit narcissistic tendencies. One aspect of self-representation that is suited to such experimentation is body image. Individuals, especially women, experience body dissatisfaction and negative emotionality when they are comparing their body to that of another person (Lin & Kulik, 2002; Rancourt et al., 2016). More disconcerting is that the uncomfortable psychological consequences of body comparison occur irrespective of whether the comparison is upward or downward (Lin & Sobey, 2016). This makes body comparison a candidate paradigm for eliciting threat.

The impact of a body comparison paradigm—whether upward or downward—on body dissatisfaction was examined in a meta-analysis by Myers and Crowther (2009). Overall, the authors found a large effect size (d = 0.77), suggesting that comparing oneself to someone else on the basis of physical appearance is associated with greater levels of body dissatisfaction. The authors also found the effect to be particularly evident among women (d = 0.83) and student populations (d = 0.78); when comparisons are made to unfamiliar peers (d = 0.79); and when studies experimentally manipulate body comparison (d = 0.97). The findings of this meta-analysis reveal a strong impact of body comparison on body dissatisfaction and underscore the uncomfortable psychological consequence of comparing one’s body to that of another person.

The current study experimentally manipulated body comparison to elicit such discomfort among individuals with varying dispositions of narcissism.

Methodological Considerations

Automaticity of Body Comparison

Several methods have been used to evoke body comparisons in research studies. The most common and ecologically valid method is an *implicit induction*, whereby individuals are asked to passively view bodily stimuli (Cash et al., 1983). Implicit inductions are shown to have considerable effect on the elicitation of body comparison. In day-to-day life, women are often encouraged to compare their body to that of others. For example, women often drive by billboards, watch TV, or read magazine articles that feature an individual depicting the thin-ideal (Buote et al., 2011). Repetitive exposure to such images may have led body comparison to become an automatic process that can be evoked while passively viewing bodily stimuli. Indeed, research shows that body comparison is an unconscious process. For example, Chatard and colleagues (2017) had women view media images of either the thin-ideal or average body at a subliminal exposure duration of 20 ms. Afterwards, participants completed a measure of appearance anxiety and a task to assess their awareness of the subliminal primes. The awareness task confirmed that participants were unaware of the nature of the stimuli. However, participants reported significantly more appearance anxiety following subliminal exposure to the thin-ideal body, compared to the average body. Extending from these findings, Bocage-Barthélémy and colleagues (2018) investigated the effect of cognitive load on reactions to thin-ideal women. Women were exposed to either images of the thin-ideal or women's fashion accessories while either retaining four digits (low cognitive load) or ten digits (high cognitive load) during the exposure. Afterwards, participants completed a lexical decision task which assessed the accessibility of negative thoughts. Those in the high cognitive load experienced an increase in negative thought accessibility after exposure to the thin-ideal, relative to participants who viewed the fashion accessory stimuli and were under a condition of low cognitive load. As cognitive processes are considered to be automatic if they occur more strongly under cognitive load (Payne, 2012), these findings complement those reported by Chatard and colleagues and suggest that body comparison is an unconscious, automatic process.

The automaticity of body comparison poses a challenge to researchers that wish to determine whether body comparison *causally* influences an outcome, such as facial muscle reactivity and subjective emotion in the current study. The bodily features presented by the target of comparison may automatically evoke body comparison, which in turn poses a threat to the internal validity of the study and inferences of causality. Thus, if one were to manipulate body comparison, it would require intensifying the body comparison process in the experimental group above what occurs while passively viewing bodily stimuli. One method of achieving the latter is by implementing an *explicit induction* method, which involves individuals being explicitly instructed to engage in a body comparison while viewing bodily stimuli. As part of this methodology, individuals may also be asked to rate the extent to which they engage in body comparison after viewing bodily stimuli. Relative to implicit methods, explicit methods intensify adverse consequences such as body dissatisfaction, anxiety, and negative mood (Cattarin et al., 2000; Halliwell & Dittmar, 2005; Tiggemann & McGill, 2004; Tiggemann & Polivy, 2010; Tiggemann & Slater, 2004). To this end, participants in the current study were randomized to one of two experimental groups of body comparison: explicit comparison (EC) and implicit comparison (IC). Participants in the EC group were instructed throughout the experimental procedure to compare their body to that of the actor in the emotive videos previously used in

Studies 1 and 2. Participants were also given a questionnaire after each of these emotive videos asking the extent to which they compared themselves to the actor in terms of weight, shape, and appearance. In contrast, participants in the IC group were instructed throughout the procedure to simply view the emotive videos. In order to maintain standardization in the experimental procedure across groups, participants in the IC group also completed questionnaires about the actor after viewing each emotive video. However, such questions pertained to perceived traits and attributes, rather than bodily features, of the actor in the emotive videos.

Intensifying Body Comparison Via Body Exposures

Other aspects of the body comparison paradigm may be manipulated to intensify the body comparison process in the EC group. One such aspect is body exposure. Meyers and Crowther (2009) found a large effect for body comparison paradigms that induced a body exposure in the experimental condition and not in the control condition ($d = 0.97$). Furthermore, a meta-analysis by Gerber and colleagues (2018) found a sizable effect of general social comparison on negative emotionality when the dimension of comparison is exposed within the participant ($d = -0.80$). In the current study, the dimension of comparisons are body weight, shape, and appearance. As such, in addition to being given explicit comparison instructions, participants in the EC group also engaged in a body exposure before viewing each of the emotive videos to elicit greater body comparison and, in turn, perceived threat when viewing the actor in the video. To maintain standardization across the experimental procedure, participants in both the IC and EC group recorded and viewed their own videos displaying neutral, sad, and happy facial expressions recorded in the same manner as the actor's emotive videos. However, participants in the EC group viewed their own emotive videos before the actor's in an interlaced fashion to increase contrast effects (Kühnen & Haberstroh, 2004). Conversely, participants in the

IC group did not engage in a body exposure before viewing each of the actor's videos. Rather, they were asked to view the actor's set of videos first, followed by their own set of videos. Overall, the current study experimentally manipulated body comparison by way of implicit and explicit induction instructions, in addition to varying the sequential order of body exposure.

Demand Characteristics and Selection Bias

As described in Study 2, a notable challenge for emotion and EMG research is minimizing demand characteristics. The inclusion of body comparison in the current study accrues a similar challenge such that participants may be inclined to manipulate their ratings of subjective emotion and body comparison to conform to perceived expectations of the study or misrepresent themselves in a socially desirable manner (Gross, 1998; Tiggemann & McGill, 2004). Participants' knowledge of the study's purpose also poses a challenge for recruitment. Given the uncomfortable nature of body comparisons, participants may be less inclined to participate if they knew the study was investigating body comparison. This would effectively result in a selection bias whereby the study sample would consist of participants willing to engage in the uncomfortable process (e.g., individuals possibly high in dispositional body satisfaction or narcissistic tendencies). This sample attribute would compromise the internal validity of the study and dampen the intended experimental effect which is to elicit the perception of threat.

To reduce the potential of demand characteristics and a sample selection bias, participants were given the same cover story as participants in Study 2 such that they were told that the study is concerned with changes in skin temperature and that the electrodes affixed to their face were intended for this purpose. However, the cover story was extended in a manner that exploited two psychological phenomena to encourage individuals with a range of body image and narcissistic dispositions to participate. The first was the selfie phenomenon whereby individuals are interested in the purposeful act of taking and viewing self-portraits to develop their self-identity (Wagner et al., 2016). The second phenomenon was media nostalgia whereby individuals are drawn to using digital technology as a tool for creating, archiving, and reflecting on autobiographical memories to elicit an emotional reaction and connection with personal content (Niemeyer, 2014; Özkul & Humphreys, 2015). In consideration of these phenomena, the current study was advertised as the "3-Min Video Booth" whereby participants were told that the purpose of the study was to investigate whether autobiographical memories influencs facial skin temperature while viewing videos of themselves and another person (see Appendix Q for poster advertisement). The laboratory was also configured and decorated as a video booth for purposes of recording participants' emotive videos and increasing the credibility of the cover story.

The Present Study 3

The purpose of the program of research was to investigate the boundary conditions of the facial feedback hypothesis. Study 2 investigated whether physically manipulating incongruent facial muscle activity influences facial feedback, whereas the current Study 3 investigated whether facial feedback could be influenced cognitively by way of body comparison and narcissism. The research question was modeled as a moderated mediation that explores whether the effect of body comparison (X) on congruent facial muscle activity (M) and, subsequently, congruent subjective emotion (Y) is moderated by narcissism (W; see Figure 2).

Participants first completed a self-report measure of narcissism and recorded their own emotive videos in the same manner as the actors' emotive videos in Study 1. Participants then attended a second laboratory session to view their own and the actor's emotive videos in one of two experimental groups: explicit comparison (EC) and implicit comparison (IC). Participants in the EC group were explicitly instructed throughout the procedure to compare themselves to the actor in the emotive video in terms of weight, shape, and appearance. Participants also completed a measure of body comparison following each emotive video and engaged in a body exposure prior to viewing each emotive video in order to prime their body image disposition and intensify the comparison process. Participants in the IC group were instructed to first passively view each emotive video of the actor, and then passively view their own emotive videos. The following hypotheses were offered:

(1) Given that grandiose narcissists use cognitive and behavioural strategies to distort and repress identity threats (Pincus et al., 2009; Thomaes & Sedikides, 2016), it was hypothesized that individuals high on grandiose narcissism and explicitly instructed to engage in body comparison would experience a *decrease* in congruent EMG facial muscle activity and subjective emotion in response to both the actor's happy and sad video, compared to those low on grandiose narcissism.

(2) As vulnerable narcissists are hypervigilant to social cues from the environment to assess threat (Chong & Davis, 2017; Pincus et al., 2009) and have the tendency to become overwhelmed by the emotional states of others (Luchner & Tantleff-Dunn, 2016; Rogoza et al., 2018), it was hypothesized that individuals high on vulnerable narcissism and explicitly instructed to engage in body comparison would experience an *increase* in congruent EMG facial muscle activity and subjective emotion in response to both the actor's happy and sad video, compared to those low on vulnerable narcissism.[9]

[9] Differential predictions with respect to the happy and sad emotive video were not provided given the scarcity of research pertaining to facial feedback among narcissists.

(3) Implicit body comparison inductions are sufficient for inducing the process of comparison (Chatard et al., 2017); however, explicit inductions intensify the adverse consequences of the comparison process above that which is observed in implicit inductions (e.g., Cattarin et al., 2000; Tiggemann & McGill, 2004; Tiggemann & Polivy, 2010). Given that narcissism is defined as the experience of emotion dysregulation in response to threat (Pincus et al., 2009), it was hypothesized that individuals instructed to passively view the actor's sad and happy video would experience less threat that those explicitly instructed to engage in body comparison. Specifically, it was predicted that participants would experience an attenuation of the latter predicted effects outlined in hypothesis 1 and 2.

Method

Participants

Participants were required to be female, between the ages of 18 and 40, and fluent in English to be eligible to participate. Recruitment procedures for the study were identical to those outlined in Study 2. A total of 131 participants completed the first videography session in the laboratory. Four participants did not return for the second viewing session. Another five participants were removed from analysis due to computer malfunctions during the viewing session. Two additional participants were excluded as they stated they had passing knowledge of the actor in the videos (see below). The final sample consisted of 120 women between the ages of 18 and 39 (M = 22.48, SD = 5.01) from undergraduate courses (59.02%) and the community dwelling (40.98%) Participants identified as Caucasian (57.3%), Aboriginal (5.3%), South Asian (9.2%), Hispanic (2.3%), African-Canadian/Black (9.9%), East Asian (10.7%), and Middle Eastern (3.8%).

Participants were provided an information letter and consent form (Appendix R) upon arriving to the first laboratory session. Written informed consent was obtained prior to starting this session. Participants that attended both the videography and viewing session received $20. If participants were enrolled in undergraduate courses offering bonus points towards their final grade, they also received a total of three bonus points. Incentives were divided between the two laboratory sessions such that upon completion of the first 30-min laboratory session participants received $5 and one bonus point, and after the second 60-min laboratory session they received $15 and two bonus points.

The sample size for the study was determined based on Preacher, Rucker, and Hayes' (2007) empirical simulations of power for moderated mediational methods. Based on previous investigations reporting a large effect size of body comparison paradigms (e.g., $d = .97$; Meyers & Crowther, 2009), Preacher and colleagues recommend a sample size of approximately 100 participants to achieve a power of 80% at a significance level of $\alpha = .05$. However, Preacher and colleagues suggest that researchers use the recommended sample sizes for their study as a lower limit of the number of participants needed to achieve sufficient power. As 120 exceeded the calculated sample size, the study was sufficiently powered to detect a statistical effect.

Measures

Demographics Questionnaire. The same demographics questionnaire utilized in Study 2 was used to collect information regarding participants' age, sex, and course enrollment, in addition to other information unrelated to the current study.

Brief-Pathological Narcissism Inventory. Narcissism was measured using the Brief-Pathological Narcissism Inventory (B-PNI; Schoenleber et al., 2015; Appendix L) As described in Study 2, the B-PNI is a 28-item self-report measure that produces two subscales that measure grandiosity and vulnerability. The B-PNI G consists of 12 items, while the B-PNI V consists of 16 items. Participants were instructed to indicate how much they agree with each item on a 6-point scale ranging from 0 (*not at all like me*) to 5 (*very much like me*). Acceptable levels of internal reliability were demonstrated in Study 2 for both B-PNI Grandiosity (Cronbach's α = .87) and Vulnerability (Cronbach's α = .91).

Baseline Video. The 3-min baseline video developed in Study 2 served as a nonfacial emotive condition to assess participants' baseline levels of EMG facial muscle activity and subjective emotion. The video consists of a woman moving around Styrofoam packing peanuts on a table with a black dry eraser.

Emotive Video Set (Body Comparison Videos). The set of videos developed by actor D in Study 1 served as the emotive conditions to elicit subjective emotion and EMG facial muscle activity from participants. The actor in the videos also served as the target of body comparison for participants. The video set consisted of three, 3-min videos of a woman dynamically enacting a neutral, sad, and happy facial expression recorded form a head-to-shoulders portrait position. Herein, actor D's set of emotive videos will be referred to as "body comparison videos" to distinguish them from the emotive videos recorded by participants and connote an added purpose in the current study, which is to elicit body comparison.

Discrete Emotions Questionnaire. The Happiness and Sadness subscales of the Discrete Emotions Questionnaire (DEQ; Harmon-Jones et al., 2016; Appendix E) were used to measure participants' subjective experience of emotion immediately after viewing each body comparison video. Participants were asked to indicate the extent to which they experienced happy and sad emotions while viewing the body comparison video on a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*an extreme amount*). In Study 2, acceptable levels of internal reliability were demonstrated for both the DEQ Sadness (Cronbach's α = .89) and Happiness (Cronbach's α = .96) subscales in response to the sad and happy videos, respectively.

Global Local Task. In addition to the completion of the DEQ, participants completed a distractor task unrelated to emotional processing after each body comparison video. The purpose of completing the distractor task was to allow enough time to pass to attenuate the emotional experience of one video from carrying over to the next video (Rempala, 2013; Rottenberg et al., 2007). As per Study 2, participants completed 10 items of the Global Local Task (GLT; Navon, 1977, 1981; Appendix K), a geometric shape identification task that assesses whether an individual has a bias towards processing figures broadly (i.e., global) or at a more detailed level (i.e., local).

Body Image States Scale. The Body Image States Scale (BISS; Cash et al., 2002; Appendix S) is a 6-item self-report measure of state body image that evaluates how people feel about their bodies *right now* on a 9-point scale. The items pertain to overall weight, shape, and appearance rather than specific body parts. Cronbach's α for the BISS is between .77 - .93 across several studies (e.g., Glashouwer et al., 2020; Thøgersen-Ntoumani et al., 2017; Vocks et al., 2010). Participants in the EC group completed the BISS prior to viewing the body comparison videos to prime their body image disposition and intensify the body comparison process.

Body Comparison Questionnaire. After viewing each body comparison video, participants in the EC group completed the Body Comparison Questionnaire (BCQ; Turner, 2014; Appendix T), which is a 9-item self-report measure that assesses the extent and direction of comparison to that of another person. Participants were asked to rate the extent to which they compared their body to the actor's body in the body comparison videos (Strength subscale) on a 9-point Likert-type scale ranging from 1 *(no comparison)* to 9 *(a lot of comparison)* in reference to overall weight, shape, and appearance. Participants were also asked to rate the direction of body comparison (Direction subscale) on a 9-point scale ranging from 1 *(a lot less favourably)* to 9 *(a lot more favourably)* in reference to overall weight, shape and appearance. For exploratory purposes, participants in the IC group also completed the BCQ once upon viewing the last body comparison video to assess whether the EC and IC groups differed in terms of self-report body comparison.

Mate Value Inventory – Other. Instead of answering questions that pertain to body comparison after each body comparison video, participants in the IC group answered questions about perceived traits and attributes pertaining to the actor in the videos. Specifically, participants completed the Mate Value Inventory – Other (MVI-O; Kirsner et al., 2003; Appendix U), which assesses one's perception of another's mate value. Participants were required to rate others on 17 attributes (e.g., "Ambitious" and "Generous") using a 7-point Likert-type scale ranging from −3 (*extremely low on this trait*) to +3 (*extremely high on this trait*). Two items pertaining to bodily appearance from the MVI-O (i.e., "Attractive Face" and "Attractive Body") were removed to minimize the potential for body comparison (Chatard et al., 2017).

Contingencies of Self-Worth Scale. Theories of social comparison suggest that the tendency to engage in comparison depends on the importance of the dimension under comparison to the individual's self-worth (Festinger, 1954; Miller et al., 1988; Wood, 1989). However, research shows that individuals high on grandiose narcissism seek out opportunities to engage in social comparison as a self-enhancement strategy (Barry et al., 2006; Bogart et al., 2004; Campbell et al., 2000; Golec de Zavala et al., 2019; Krizan & Bushman, 2011; Kong et al., 2020; Raskin et al., 1991; Ruiz et al., 2001). The current study explored whether several domains of self-worth predict strength of body comparison and whether such associations are moderated by grandiose narcissism. As part of the initial battery of online questionnaires, participants completed the Contingencies of Self-Worth Scale (CSWS; Crocker et al., 2003; Appendix V), which is a self-report questionnaire that measures several domains hypothesized to be important sources of self-esteem. For the purposes of the current study, three subscales were administered—Appearance, Others' Approval, and Competition—each of which contain five items that are scored on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Cronbach's α for the CSWS Appearance, Others' Approval, and Competition subscales was reported to be .82, .83, .87, respectively, in the initial validation study (Crocker et al., 2003).

Apparatus

Video Recording, Editing, and Viewing. Participants' own emotive videos were recorded using the same apparatus and procedures described in Study 1. The baseline, body comparison, and participant videos were presented using the same apparatus outlined in Study 1.

Facial Electromyography. Participants' facial muscle activity during the body comparison videos was recorded via EMG. Bipolar EMG recordings were made from zygomaticus and corrugator muscle regions of the face using the same equipment and procedures outlined in Study 2.

Procedure

Participants were given the participant information letter and consent form upon arrival to the first 30-min videography session. After obtaining written informed consent, participants completed a 10-min online questionnaire via SurveyMonkey which included a demographic questionnaire, B-PNI, CSWS, and questionnaires related to another study. After completion, participants recorded three, 3-min videos expressing a neutral, sad, and happy facial expression in the same manner as the actor in the body comparison videos (see Appendix W for procedural instructions). At the end of the videography session, participants signed up for a second laboratory session to view their own videos and the body comparison videos. For purposes related to another study, participants were given a business card that instructed them to refrain from consuming caffeine, nicotine, alcohol, or medication, and engaging in physical exercise two hours prior to the second laboratory session.

Upon arrival to the second, 60-min viewing session, participants were shown a photograph of the actor in the body comparison videos and asked to indicate whether they knew her. Two participants indicated more of a passing knowledge of the actor. The latter participants, who were initially randomized to the EC group, were placed in the IC group and the research assistant running the laboratory session manually skipped over the BCQ and MVI-O in the post-video questionnaires.[10] The purpose of this was to prevent the participant from completing questionnaires that may cause discomfort as a result from rating a known peer. Participants were then fitted with EMG electrodes and given instructions regarding the baseline recording procedure (see Appendix X). Afterwards, the researcher situated herself in a separate back room to attend to the computers controlling the video presentation and SurveyMonkey questionnaires. The baseline procedure began with participants closing their eyes and relaxing for 5 min, the purpose of which was related to another study. Participants then viewed the 3-min baseline video.

Body Comparison Paradigm. After the baseline procedure, the researcher emerged from the back room to give the participant the remaining procedural instructions (Appendix X).

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[10] The two participants proceeded with the laboratory session so that they may receive the bonus point and/or cash incentive(s), rather than exclude and dismiss them from the laboratory. However, their data was not included in data analysis as the randomization protocol was violated.

The instructions and the order of the videos were dependent on the participants' randomization to one of the two groups of the independent variable of body comparison. In the EC group, participants were given the directive by the research assistant, "while viewing the other woman's videos, we would like for you to think about how you compare to the woman in terms of weight, shape, and appearance. After each of her videos, you will be asked to indicate the extent to which you compared yourself and whether it was more or less favourable." The directive was repeated to participants via written instructions on the TV screen prior to viewing each of the body comparison videos. To elicit comparison, participants viewed videos of themselves and the body comparison videos in an interlaced fashion, the timeline for which is depicted in Figure 15. To prime their body image disposition, participants were given the BISS after viewing each their own videos and the BCQ after viewing each body comparison video. In contrast, participants in the IC group were not given explicit comparison directives and did not engage in a body exposure before viewing the body comparison videos. Rather, participants were given the verbal directive by the research assistant to "simply view each video" and were reminded of this directive via written instructions on the TV screen prior to viewing each body comparison video. Participants viewed the set of body comparison videos first, followed by their own set of videos as depicted in Figure 16. In contrast to the EC group, participants in the IC group completed the MVI-O after each of their own and body comparison videos. Participants in the IC group also completed the BCQ once after viewing the set of body comparison videos.

The post-video questionnaire for participants in both groups consisted of the DEQ Happiness and Sadness subscales, the GLT after each of the body comparison videos, and questionnaire unrelated to the current study. After completion of the last video and questionnaire, participants were assisted with removal of EMG electrodes, thanked, and dismissed. Participants were emailed a debriefing letter (Appendix Y) revealing the study's true purpose and the reason for deception at the conclusion of participant recruitment to avoid the possibility of anyone disclosing the true purpose to other prospective participants.

Data Analytic Approach

Computations

B-PNI Subscales. B-PNI G and B-PNI V were calculated as the average of the 12 and 16 items that comprise the subscales, respectively. Scores range from 1 to 6, with higher B-PNI G and B-PNI V scores indicating greater narcissistic grandiosity and vulnerability.

DEQ Subscales. DEQ subscales were calculated for each emotive body comparison condition as the average of the four items that comprise the subscale. Scores range from 1 to 7, with higher DEQ Happiness and Sadness scores indicating greater subjective intensity of happiness and sadness, respectively. DEQ scores for the neutral body comparison condition were not reported in subsequent analyses as the current study is concerned with contrasting the happy and sad body comparison conditions with the baseline condition.

Analogous to Study 2, a significant association was observed between DEQ Sadness during the baseline and sad body comparison condition, $r = .36$, $p <.001$, and DEQ Happiness during the baseline and happy body comparison condition, $r = .38$, $p <.001$. To address the issue of regression towards the mean in group analyses, DEQ scores during the happy and sad body comparison conditions were entered as the outcome variable, while the baseline value entered as a covariate (Hayes & Rockwood, 2017). As described in Study 2, this method enhances the power to detect group effects by removing the baseline score from the error variance in the estimate of the difference between groups.

EMG Ratio Indices. As per Study 2, EMG ratio indices were calculated for the sad body comparison condition (COR_S) and happy body comparison condition (ZYG_H). Details regarding the computation and interpretation of these indices are described in Study 2.

Exploratory Psychometric Variables. CSWS Appearance, Others' Approval, and Competition were calculated as the average of the five items that comprise the subscale, with scores for each subscale ranging from 1 to 7. Higher scores on all subscales reflect higher relevance of that particular contingency of self-worth. BCQ Strength and Direction subscales were calculated as the average of the four items that comprise the subscale, with scores for each subscale ranging from 1 to 9. High scores on the Strength and Direction subscale indicate greater strength and more favourable comparison, respectively. The BCQ was completed by participants in the IC group once after the last (happy) body comparison condition, whereas the BCQ was completed by participants in the EC group after each of the three body comparison conditions. To allow for comparison between groups, the three BCQ subscale scores obtained in the EC group were averaged to obtain one Strength and Direction score.

Preliminary Analyses

Analogous to Study 2, the current study needed to satisfy two basic assumptions of the facial feedback hypothesis by way of statistical analyses before initiating specific investigations into the boundary condition of the effect. Although Study 2 provided evidence of these assumptions, replication was necessary to ensure the assumptions hold true among the specific sample of participants in the current study.

Congruent Subjective Emotion. First, the study needed to demonstrate that individuals experience congruent subjective emotion while passively viewing the emotive body comparison stimuli. A series of paired-samples *t*-test were conducted to determine whether there is a difference in DEQ scores between the baseline and sad/happy body comparison conditions among participants in the IC group. Compared to baseline, it was expected that DEQ Happiness would be greater in response to the happy condition and DEQ Sadness would be greater in response the sad condition.

Congruent Facial Muscle Activity. Second, the study needed to demonstrate that individuals experience congruent facial muscle activity while passively viewing emotive body comparison stimuli (Mori & Mori, 2007, 2009, 2010). To test this assumption, paired-samples *t*-tests were conducted among participants in the IC group (i.e., passive viewing) to determine whether congruent EMG facial muscle activity was appropriately elicited during the sad and happy body comparison condition relative to the baseline condition. It was expected that participants would experience greater EMG corrugator activity during the sad condition and greater EMG zygomaticus activity during the happy condition, relative to the baseline condition.

Main Analyses

The primary analytic technique used in the current study was moderated mediation. This technique integrates the simple mediation and moderation techniques that were described in Study 2 into a conditional process model that assess how an indirect effect may be contingent on the influence of a moderating variable (Edwards & Lambert, 2007; Hayes, 2018; Hayes & Rockwood, 2017; Preacher, Rucker, & Hayes, 2007). For the current study, a conditional process model was used to investigate whether the indirect effect of body comparison group (X) on congruent subjective emotion (Y) through congruent facial muscle activity (M) is dependent on narcissism (W), with the moderation operating in the first stage of the mediation process (i.e., the effect of X on M; see Figure 17).

Conditional Indirect Effect of *X*. A first-stage moderated mediation model consists of a direct and indirect effect of *X*, in addition to a simple moderation effect of *X* on *M*. The simple moderation effect is formulated as follows:

$$\widehat{M} = i_Y + a_1X + a_2W + a_3XW$$

When a_3 is statistically different from zero or excludes zero from the 95% CI, this means that *X*'s effect on *M* is dependent on *W*. However, it does not specify whether the indirect effect is moderated, as a_3 does not quantify the relationship between the indirect effect of *X* on *Y* through *M*. To derive the indirect effect of *X* on *Y* through *M* as a function of *W*, two components of the indirect effect need to be multiplied: the effect of *X* on *M* and the effect of *M* on *Y* controlling for *X*. When multiplied, the result is:

$$\Theta_{X \rightarrow M}{}^{b} = (a_1 + a_3\mathrm{W})b = a_1b + a_3b\mathrm{W}$$

As such, the indirect effect of *X* on *Y* through *M* is no longer fixed to be a single value. Rather, the indirect effect becomes a linear function of *W* and depends on the value of *W* plugged into the equation (see Figure 18). The result is a *conditional indirect effect* that quantifies the indirect effect of *X* on *Y* through *M* at that value of *W*. *PROCESS* estimates conditional indirect effects for values of *W* corresponding to the mean, one standard deviation below the mean, and one standard deviation above the mean. Based on these estimates, *PROCESS* then generates an *index of moderated mediation* through the product of regression coefficients referred to as a_3b, whereby the indirect effect is a linear function of the moderator (Hayes, 2018). For statistical inference, *PROCESS* provides a bootstrap 95% CI for the index of moderated mediation. A significant effect of moderated mediation is said to exist when the CI does not contain zero. In other words, two conditional indirect effects estimated at different values of the moderator are significantly different.

Probing Moderated Mediation. With evidence of moderated mediation, the next step is to probe the effect. As described in Study 2, the JN technique is appropriate for probing a significant simple moderation effect by analytically deriving regions of significance (JN_W) that indicate the value range(s) of *W* where *X* is significantly related to *Y* and where it is not. Problematically, the JN technique cannot be used without making the unwarranted assumption of normality of the sampling distribution of the indirect effect, which is known to be false (Hayes & Rockwood, 2017). This leaves the pick-a-point approach as the only viable option for probing moderated indirect effects. The approach requires selecting value(s) of the moderator (e.g., *M* and ±*SD* of *M*), estimating the conditional indirect effect at those values, and deriving a 95% bootstrap CI of the effect at each value. A CI that does not straddle zero provides statistical evidence that *M* mediates the effect of *X* on *Y* at that value of *W*.

Moderated mediation regression analysis was implemented using SPSS *PROCESS* macro for (model 7; Hayes, 2018). As the study consisted of two emotive body comparison conditions (sad, happy) and measured two expressions of narcissism (grandiose, vulnerable), a total of four models were investigated. In consideration of the positive association between B-PNI G and B-PNI V as revealed in Study 2, $r = .58$, $p < .001$, the residual B-PNI subscale was entered as a covariate into each of the four models to equate participants' scores on the subscale and assess the independent influence of the B-PNI subscale that was entered as a moderator. The investigated models are as follows:

1. Model 1: Group (*X*) on DEQ_S (*Y*) mediated by COR_S (*M*); first-stage moderation by B-PNI Grandiosity (*W*); covarying for DEQ_{Sb} (U_1) and B-PNI Vulnerability (U_2).

2. Model 2: Group (*X*) on DEQ_S (*Y*) mediated by COR_S (*M*); first-stage moderation by B-PNI Vulnerability (*W*); covarying for DEQ_{Sb} (U_1) and B-PNI Grandiosity (U_2).
3. Model 3: Group (*X*) and DEQ_H (*Y*) mediated by ZYG_H (*M*); first-stage moderation by B-PNI Grandiosity (W); covarying for DEQ_{Hb} (U_1) and B-PNI Vulnerability (U_2).
4. Model 4: Group (*X*) and DEQ_H (*Y*) mediated by ZYG_H (*M*); first-stage moderation by B-PNI Vulnerability (W); covarying for DEQ_{Hb} (U_1) and B-PNI Grandiosity (U_2).

Bonferroni Correction

As the described analyses consist of multiple comparisons, a Bonferroni correction was applied to maintain a study-wide error rate of $\alpha = .05$ and reduce the potential for a type I error. As per Study 1 and 2, exact *p* values and observed effect sizes are reported to allow for theoretical interpretation, especially in circumstances when *p* values exceed the conventional .05 level but not the Bonferroni corrected α level.

Effect Size

Cohen's *dz*. Significant effects obtained from paired samples *t*-tests were followed up with the report of Cohen's *dz* which refers to the standardized difference between *paired* means (Cohen 1969, 1988). The calculation and conventions for Cohen's d_Z are described in Study 1.

Partially standardized *ab*. Significant effects pertaining to simple mediation were to be followed up with the report of the partially standardized indirect effect (ab_{ps}). When *X* is a dichotomous variable, such as in the current study, the effect size metric captures the size of the indirect effect in terms of change in standard deviation units of *Y* between the two groups.

Cohen's f^2. Significant effects pertaining to simple moderation were followed-up with the report of Cohen's f^2, which represents the standardized average effect in the population across all levels of the independent variable. Cohen (1988) suggest that f^2 effect sizes of 0.02 represent a small effect, 0.15 represents a medium effect, and 0.35 represents a large effect.

Parametric Assumptions

Outliers. The parametric assumptions for the described analyses are identical to those outlined in Study 2. Outliers in the data were defined as *z* scores beyond $\pm$3.29 (Field, 2018). Seven outliers were observed for DEQ Sadness among seven participants during the baseline condition and five outliers were observed for DEQ Happiness among five participants during the happy body comparison condition. Regarding EMG data, six outliers was observed for EMG corrugator amplitudes from six participants during the sad body comparison condition. Seven outliers were also observed for EMG zygomaticus amplitudes from seven participants during the happy body comparison condition. Outlier DEQ and EMG data were replaced by the next highest nonoutlier value (Field, 2018).

Normality. With respect to regression analyses, the normality of residuals was assessed by visually inspecting P-P plots, which plot the cumulative probability of a variable against the cumulative probability of a normal distribution (Field, 2018). No drastic deviations in the residuals were observed with respect to the normality line indicated in the plots, suggesting the data is normally distributed.

Regarding paired *t*-tests, normality of the difference between dependent scores were assessed using $Z_{skewness}$ whereby scores beyond $\pm$1.96 were considered significantly skewed at $p < .05$ (Field, 2018). A positive skew was observed for the dependent EMG corrugator score ($Z_{skewness} = 2.96$) and a negative skew was observed for the dependent EMG zygomaticus score ($Z_{skewness} = -2.58$).

For descriptive purposes, normality of dependent DEQ and EMG scores were also assessed using $Z_{skewness.}$ As shown in Table 17, a significant skew was observed for all DEQ and EMG variables except for DEQ Happiness during the happy body comparison condition. Consistent with Study 1 and 2, no differences were found with respect to statistical inferences between analyses that utilized logarithmically transformed and untransformed data. As such, the untransformed DEQ and EMG data are reported for subsequent analyses to facilitate interpretability of the data.

Linearity. The assumption of linearity was assessed by visually inspecting residual scatterplots for curvature in the standardized residuals (Field, 2018). No curves were observed, indicating that the assumption of linearity was not violated.

Homoscedasticity. The assumption of homoscedasticity was assessed among predictor and criterion data by visually inspecting plots of standardized predicted values against standardized residuals (Field, 2018). Points were randomly and evenly dispersed throughout the scatterplots, thus revealing no violations of homoscedasticity.

Independence. The assumption of independence was assessed statistically using the Durbin-Watson test which identifies any serial correlations between residuals (Durbin & Watson, 1951; Field, 2018). Durbin-Watson test statistic values were between the range of 1 and 3, thus revealing no violation of independence.

Multicollinearity. Regression models with more than one predictor (i.e., moderation) also assume that there is less than complete multicollinearity, or perfect correlation, between predictors. Multicollinearity between predictors makes it difficult to obtain unique estimates of the regression coefficients and determine the individual importance of a predictor on an outcome. Multicollinearity is analyzed by calculating the variance inflation factor (VIF), which indicates whether a predictor has a strong linear relationship with the other predictor(s). The VIF may be calculated for each predictor by doing a linear regression of that predictor on all other predictors and then obtaining the R^2 from that regression as follows:

$$\text{VIF} = 1/(1-R^2)$$

The resultant value provides an estimate of how much the variance of a coefficient is inflated due to the linear dependence with other predictors. For example, a value of 1.8 indicates that the variance of a particular coefficient is 80% larger than it would bee if that predictor was completely uncorrelated with all other predictors. The VIF has a lower bound of 1 and an infinite upper bound. VIF values greater than 10 are considered a serious concern for multicollinearity (Field, 2018). All VIF values had values less than 10, indicating that there were no multicollinearity concerns.[11]

Main Results

Data Preparation

At the beginning of the second laboratory session, two participants stated that they had more of a passing knowledge of the woman in the body comparison videos. To prevent any discomfort that may have arose from rating a known peer, the two participants were placed into the IC group and did not complete the BCQ and MVI-O. As these two participants violated the randomization protocol, they were excluded from subsequent analyses. Remaining DEQ and

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[11] One common practice when implementing moderation analyses is to standardize or mean center *X* and *W* prior to constructing the product *XW*. The purpose of this is to reduce the negative effects of multicollinearity. However, *XW* will often be highly correlated with *X*, *W*, or both. Although mean centering *X* and *W* will reduce the correlation between *XW* and its components *X* and *W*, doing such will have no effect on the test of interaction. The coefficient for *XW*, its standard error, *p*-value, and CI will remain the same regardless of whether *X* and *W* are mean centered prior to constructing the product *XW* (for a review, see Hayes & Rockwood, 2017 and Hayes, 2018). As such, *X* and *W* were not mean centered or standardized in the current study to retain interpretability in the context of their scales.

BCQ data were entered into SPSS v. 25 from the SurveyMonkey server; no missing data were observed.

EMG signals during the body comparison conditions were processed and analyzed using the same software and procedures outlined in Study 2. No missing data were observed. The maximum number of epochs per 3-min recording was 365, with the average number of utilizable epochs in the sample being 355 per participant. The percentage of artifact-free epochs for each emotive condition were as follows: 98 % for baseline (*M* = 358.48, *SD* = 17.34); 98 % for sad (*M* = 356.34, *SD* = 30.95); and 96 % for happy (*M* =350.86, *SD* = 21.49).

Reliability and Descriptive Statistics

Table 18 presents the reliability of the DEQ Sadness and Happiness subscales across the emotive body comparison conditions. Consistent with Study 1, the DEQ subscales demonstrated acceptable levels of Cronbach's α for each condition. The study did not report Cronbach's α for DEQ Happiness and Sadness during the emotion-incongruent conditions as the study is concerned with the contrast of subjective emotional experience between the baseline and emotion-congruent body comparison condition.

Means and standard deviations for DEQ and EMG data across the emotive body comparison conditions are reported for the study sample in Table 19 and for each body comparison group in Tables 20. The tables exclude means and standard deviations for the DEQ for the emotion-incongruent condition as inferential analyses were not conducted with such data. Table 21 presents EMG ratio indices across body comparison groups. Examination of this table reveals that participants in each group experienced a proportional increase in EMG corrugator and zygomaticus activity from baseline to the sad and happy body comparison condition, respectively.

The psychometric properties and intercorrelations of psychometric variables are presented in Table 22. Consistent with Study 2, the table reveals that B-PNI V is positively associated with B-PNI G. The table also reveals B-PNI V to be positively associated with all CSWS subscales. In contrast, B-PNI G is only positively associated with CSWS Competition.

Preliminary Analyses

Congruent Subjective Emotion. Paired-samples *t*-test with a Bonferroni correction (.05/2) were conducted to determine whether there is a difference in DEQ scores between the baseline and sad/happy body comparison conditions among participants in the IC group. Participants demonstrated a significant increase in DEQ Sadness from baseline to the sad condition, $t(60) = 10.22$, $p <.001$, $d = 1.75$, as well as a significant increase in DEQ Happiness from baseline to the happy condition $t(60) = 6.62$, $p <.001$, $d = 0.95$. These findings further demonstrate the sensitivity of the DEQ subscales during emotion-congruent conditions.

Congruent Facial Muscle Activity. Paired-samples *t*-tests with a Bonferroni correction (.05/2) were conducted to investigate whether participants in the IC group that passively viewed emotive stimuli experienced an increase in congruent EMG facial muscle activity in response to the sad and happy body comparison conditions relative to the baseline condition. As expected, participants demonstrated a significant increase in EMG corrugator activity from baseline to the sad condition, $t(60) = 8.27$, $p <.001$, $d = 1.26$, as well as a significant increase in EMG zygomaticus activity from baseline to the happy condition, $t(60) = 11.51$, $p <.001$, $d = 1.88$. Consistent with Study 2, these findings suggest that passively viewing the emotive body comparison conditions elicits congruent facial muscle activity.

Main Analyses

The main hypotheses were investigated by way of four moderated mediational analyses with a Bonferroni correction (.05/4) using *PROCESS* macro (model 7). In the first analysis, Group (*X*) was investigated in the prediction of DEQ_S (*Y*) through COR_S (*M*) at the levels of B-PNI G (*W*), while covarying for DEQ_{Sb} (U_1) and B-PNI V (U_2). There was no significant index of moderated mediation, $a_3b = -0.02$, $SE = 0.07$, 95% CI [−0.21, 0.09] (see Figure 19 and Table 23), as the CIs straddled zero. Hence, it was concluded that B-PNI G does not constitute a first-stage moderation effect on the indirect effect of Group on DEQ_S through COR_S.

In the second analysis, Group (*X*) was investigated in the prediction of DEQ_S (*Y*) through COR_S (*M*) at the levels of B-PNI V (*W*), while controlling for DEQ_{Sb} (U_1) and B-PNI G (U_2). No significant index of moderated mediation was observed, $a_3b = -0.05$, $SE = 0.11$, 95% CI [−0.33, 0.11] (see Figure 20 and Table 24). Thus, it was concluded that B-PNI V does not constitute a first-stage moderation effect on the indirect effect of Group on DEQ_S through COR_S. With the removal of the Bonferroni correction, a significant interaction was observed such that Group (*X*) interacted with B-PNI V (*W*) to predict COR_S (*M*), $a_3 = -120.66$, $SE = 48.58$, $p = .014$, 95% CI [−216.90, −24.43], $f_2 = 0.16$. The interaction was probed using the JN technique, which revealed the region of significance of *X*'s effect on *Y* to be $1.93 \leq JN_W$. Contrary to initial predictions, the EC group experienced significantly lower COR_S values than the IC group when B-PNI V values were below 1.93 (see Figure 23, panel A).

The third analysis investigated Group (*X*) as a predictor of DEQ_H (*Y*) through ZYG_H (*M*) at the levels of B-PNI G (*W*), while controlling for DEQ_{Hb} (U_1) and B-PNI V (U_2). There was no significant index of moderated mediation, $a_3b = 0.05$, $SE = 0.09$, 95% CI [−0.10, 0.27] (see Figure 21 and Table 25). As such, it was concluded that B-PNI G does not constitute a first-stage moderation effect on the indirect effect of Group on DEQ_H through ZYG_H. With the removal of the Bonferroni correction, a significant interaction was observed such that Group (*X*) interacted with B-PNI G (*W*) to predict ZYG_H (*M*), a_3 = 188.34, *SE* = 87.47, *p* = .033, 95% CI [15.07, 361.61], f_2 = 0.10. The interaction was probed using the JN technique, which revealed the region of significance of *X*'s effect on *Y* to be 2.52 ≥ JN_W. As predicted, the IC group experienced significantly higher ZYG_H values than the EC group when B-PNI G values were greater than 2.52 (see Figure 23, panel B).

The final analysis investigated Group (*X*) as a predictor of DEQ_H (*Y*) through ZYG_H (*M*) at the levels of B-PNI V (*W*), while controlling for DEQ_{Hb} (U_1) and B-PNI G (U_2). There was no significant index of moderated mediation, a_3b = 0.04, *SE* = 0.07, 95% CI [−0.06, 0.21] (see Figure 22 and Table 26). Thus, it was concluded that B-PNI V does not constitute a first-stage moderation effect on the indirect effect of Group on DEQ_H through ZYG_H.

Exploratory Results

Interaction of Narcissistic Subtypes

The main findings demonstrate the independent, moderating influence of a *singular* dimension of narcissism on the relationship between body comparison and facial muscle activity in response to specific emotive conditions. Although grandiosity and vulnerability are well differentiated in terms of stable traits, some researchers and clinicians propose that a between-person typology of narcissism (i.e., grandiose vs. vulnerable) may understate the extent to which distinct dimensions of narcissism interact *within* each individual to produce social behaviours (Pincus & Roche, 2011). The strong, positive association between B-PNI G and B-PNI V that is observed in the current program of research (*r* = .58 and .61, see Tables 14 and 22) and in previous studies (Thomas et al., 2012; Wright et al., 2010; Zeigler-Hill et al., 2013), in addition to qualitative reports of grandiose and vulnerable characteristics coinciding within the same individual (Day et al., 2020), may allude to a within-persons typology of narcissism. Considering the latter, a question was raised as to whether grandiosity and vulnerability interact with body comparison to predict facial muscle reactivity. The exploratory question was modeled as a *moderated moderation* which investigates whether the influence of a primary moderator *W* on *X*'s effect on *Y* is conditional on a secondary moderator *Z* (see Figure 24). In other words, is the moderating influence of one distinct dimension of narcissism (*W*) on body comparison (*X*) and facial muscle reactivity (*Y*) conditional on the other dimension of narcissism (*W*)?

Moderated Moderation Model. Expanding upon the simple moderation regression model, moderated moderation models estimate *Y* from three antecedents—*X*, *W*, and *Z*—as follows:

$$Y = i_Y + a_1\mathrm{X} + a_2\mathrm{W} + a_3\mathrm{Z} + a_4\mathrm{XW} + a_5\mathrm{XZ} + a_6\mathrm{WZ} + a_7\mathrm{XWZ}$$

whereby a_7 represents the product of *XWZ* and thus allows the moderation of *X*'s effect on *Y* by *W* to depend on *Z*. Equivalently, the model can be rewritten as:

$$Y = i_Y + (a_1 + a_5\mathrm{Z})\mathrm{X} + [(a_{4+}\ a_7\mathrm{Z})\mathrm{W}]\mathrm{X} + a_2\mathrm{W} + a_3\mathrm{Z} + a_6\mathrm{WZ}$$

In this form, *X*'s effect on *Y* has two components: One is determined by *Z*, expressed as $a_1 + a_5$Z, and the other is determined by *W*, expressed as $a_{4+}\ a_7$Z. The resulting equation is a moderated moderation model which generates estimates of *Y* for various combinations of *X*, *W*, and *Z* (Hayes, 2018; see Figure 25). Of particular relevance is regression coefficient $a_{7,}$ which represents the *three-way interaction* between *X*, *W*, and *Z* and thus signifies the conditional moderating influence of *W* on *X*'s effect on *Y* by *Z*. Regression coefficients $a_{1,}$ $a_{2,}$ and a_3 represent conditional effects: a_1 estimates the effect of *X* on *Y* when both *W* and *Z* are equal to zero; a_2 estimates the effect of *W* on *Y* when both *X* and *Z* are zero; and a_3 estimates the effect of *Z* on *Y* when both X and W are zero. Regarding interaction effects, a_4 estimates the conditional interaction between X and W when Z equals zero; a_5 estimates the conditional interaction between X and Z when W is zero; and a_6 estimates the conditional interaction between W and Z when X is zero.

Probing Three-Way Interactions. As with simple moderation, significant conditional interactions may be probed using either the pick-a-point approach or JN technique. However, when probing a three-way interaction in a moderated moderation model, the pick-a-point approach is often chosen to facilitate the interpretation of the visual representation of the three-way interaction (i.e., graph). The pick-a-point approach involves conducting an inferential test to estimate the conditional effect of the *XW* interaction at a given value of *Z*. The conditional moderation of X by W is estimated as:

$$\theta_{XW \rightarrow Y} = b_4 + b_7 Z$$

PROCESS automatically implements the pick-a-point approach, estimating $\theta_{XW \rightarrow Y}$ at values of Z corresponding to +1 *SD, M*, -1 *SD* (Hayes, 2018).

Exploratory Analyses. Significant moderation effects observed from the main analyses were followed-up with the test of moderated moderation using SPSS *PROCESS* macro (model 3, Hayes, 2018).[12] The investigated exploratory models are as follows:

1. Model A1: Regression of COR_S (*Y*) on Group (*X*) primarily moderated by B-PNI V (*W*) and secondarily moderated by B-PNI G (*Z*).
2. Model A2: Regression of ZYG_H (*Y*) on Group (*X*) primarily moderated by B-PNI G (*W*) and secondarily moderated B-PNI V (*Z*).

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[12] Moderated mediation models 1 to 4 were re-analyzed using a *moderated, moderated mediation model*, which is a simple mediation model with the moderated, moderation occurring at the first stage of the mediation. No significant effects emerged.

Regarding exploratory model A1, a significant three-way interaction was observed between Group (X), B-PNI V (W), and B-PNI G (Z) in the prediction of COR_S (Y), $a_7 = 173.80$, $SE = 55.93$, $p = .002$, 95% CI [62.98, 284.62], $f_2 = 0.49$ (see Figure 26 and Table 27). Thus, the magnitude of the moderation by B-PNI V on the effect of Group on COR_S depends on B-PNI G. The significant three-way interaction was probed using the pick-a-point approach, which revealed the conditional interaction between Group and B-PNI V to be significant at low and moderate values of B-PNI G (see Figure 28, panel A).

With respect to exploratory model A2, a significant three-way interaction was observed between Group (X), B-PNI G (W), and B-PNI V (Z) in the prediction of ZYG_H (Y), $a_7 = 300.85$, $SE = 92.48$, $p = .002$, 95% CI [117.62, 484.09], $f_2 = 0.19$ (see Figure 27 and Table 28). Thus, the magnitude of the moderation by B-PNI G on the effect of Group on ZYG_H depends on B-PNI V. The significant three-way interaction was probed using the pick-a-point approach, which revealed the conditional interaction between Group and B-PNI G to be significant at moderate and high values of B-PNI V (see Figure 28, panel B).

Difference in Subjective Body Comparison Between Groups

As the current study experimentally manipulated body comparison, a set of exploratory analyses were also conducted to investigate whether the manipulation resulted in greater strength and unfavourable body comparison among participants in the EC group relative to those in the IC group. The means and standard deviations of the BCQ data across the body comparison groups are presented in Table 29. The table also presents the results of independent means *t*-tests investigating the difference in BCQ Strength and Direction subscales between groups. The experimental manipulation did not produce the intended effects upon these two dependent variables: participants in the two experimental groups did not differ in terms of reported strength and direction of body comparison.

Moderation of Grandiosity on Self-Worth Contingencies and Strength of Comparison

A series of simple linear moderation analyses using SPSS *PROCESS* macro (model 1) were used to investigate whether grandiose narcissism moderates the relationship between self-worth contingency and strength of body comparison. As no significant differences were found between the EC and IC group with respect to strength of comparison, the analyses were conducted on participants in both body comparison group. The following three models were investigated:[13]

1. Model B1: Regression of BCQ Strength (Y) on CSWS Appearance (X), moderated by B-PNI G, covarying for B-PNI V (U_1).
2. Model B2: Regression of BCQ Strength (Y) on CSWS Competition (X), moderated by B-PNI G, covarying for B-PNI V (U_1).
3. Model B3: Regression of BCQ Strength (Y) on CSWS Others' Approval (X), moderated by B-PNI G, covarying for B-PNI V (U_1).

Exploratory Analyses. As revealed in Table 30, no significant interaction effects were observed for CSWS Appearance and Competition entered as the predictor. However, a significant interaction was observed such that CSWS Others' Approval (X) interacted with B-PNI G (W) to predict BCQ Strength (Y), $a_3 = -0.37$, $SE = 0.16$, $p = .026$, 95% CI [−0.69, −0.05], $f_2 = 0.09$ (see Figure 29). The interaction was probed using the JN technique. The analysis revealed the region of significance to be $3.84 \leq \text{JN}_W$. When values of CSWS Others' Approval

[13] The three models were also investigated with vulnerable narcissism (B-PNI V) as a moderator. No significant conditional effects were observed.

were less than 3.84, individuals high on grandiose narcissism (+1 = 3.12) reported greater strength of comparison relative to those moderate (*M* = 2.41) and low (−1 *SD* = 1.69) on grandiose narcissism (see Figure 30).

Discussion

The current study investigated whether facial feedback could be cognitively influenced by way of body comparison and narcissism. Different hypotheses were proposed with respect to the effect of body comparison on facial muscle activity and subjective emotion, in addition to the interaction of grandiose and vulnerable narcissism with body comparison to predict such effects. In the EC group, it was hypothesized that grandiose narcissists would demonstrate a *decrease* in congruent EMG facial muscle activity and, subsequently, congruent subjective emotion in response to sad and happy facial expressions, whereas vulnerable narcissists would demonstrate an *increase* in congruent EMG facial muscle activity and congruent subjective emotion in response to happy and sad facial expressions. It was also predicted that these latter effects would be attenuated in the IC group. Consistent with Study 2, no association was found between congruent EMG facial muscle activity and subjective emotion, despite participants demonstrating an appropriate increase in congruent subjective emotion and EMG facial muscle activity from baseline to the emotion-congruent condition. These findings do not provide support for the facial feedback hypothesis and may be explained in terms of constructionist theories of subjective emotion (see Study 2). Albeit, the study evidenced the moderating effect of narcissism on the relationship between body comparison and facial muscle activity. Vulnerable and grandiose narcissism differentially interacted with body comparison to predict congruent facial muscle activity, but in response to specific emotive conditions. The observed interactions could reflect a type I error as they did not reach statistical significance with the application of the

Bonferroni correction. Though, the interactions did exceed the conventional level of significance (p <.05) and represented small to medium effect sizes (f_2 = 0.10 – 0.16). As such, the theoretical plausibility of the findings will be considered to avoid potentially dismissing meaningful effects (Perneger, 1998; Sullivan & Feinn, 2012).

Emotion, Motivation, and Low Narcissism

As a starting point, a differential pattern of congruent facial muscle reactivity emerged between the sad and happy conditions among those low on narcissism (see Figure 23; low B-PNI V in panel A and low B-PNI G in panel B). During the sad condition, participants in the IC group experienced greater congruent (i.e., corrugator) activity than those in the EC group. However, during the happy condition, participants in the EC and IC group experienced similar levels of congruent (i.e., zygomaticus) activity. The contextual model of emotional mimicry (Hess & Fischer, 2013; Fischer & Hess, 2017) may explain the pattern of findings. According to this model, emotions serve an affiliative function to establish and maintain social bonds with others or a social distancing function to help individuals differentiate themselves from those who pose a threat to their well-being. Support for this model emanates from studies that demonstrate an attenuation of congruent facial muscle activity in response to perceived threat, such as when is interacting with someone who is untrustworthy (Fujimura & Okanoya, 2016) or is disliked (Likowski et al., 2008). In a similar manner, explicit instructions to engage in a body comparison with the actor during the sad condition may have motivated participants in the EC group to attenuate their corrugator activity as a way to disengage from such threat and protect their body image. Participants in the IC group may not have been motivated to do such as they were not given explicit instruction to compare themselves to the actor. In the absence of such threat, they may have been motivated to affiliate emotionally with the actor by increasing corrugator activity.

Extending from this model, the increase in zygomaticus activity across the body comparison groups in the happy condition may suggest that emotions influence one's perception of threat. The emotion as social information model (Van Kleef, 2009; Van Kleef et al., 2010) contends that displays of emotion provide meaningful information about the likelihood of present and future actions, as well as one's intentions, dispositions, and appraisals of social contexts. In this way, information conveyed by way of emotional facial expressions may alter our interpretations of threat. Indeed, signals of threat can be reinterpreted as nonthreatening when new information is introduced into the environment (Bublatzky et al., 2019; Bublatzky et al., 2020; Mertens & De Houwer, 2016). As happiness signifies safety, the happy facial expression by the actor may have led participants in the EC group to reinterpret the threat of body comparison as nonthreatening. This reinterpretation may have then motivated participants to socially engage with the actor by way of increasing zygomaticus muscle activity in a comparable manner to those in the IC group who were not exposed to such explicit threat. Taken together, the findings may attest to the power of emotional facial expressions in shaping the construal of social cues of threat and safety in the environment.

Facial Muscle Attenuation Among Narcissists

The aforementioned findings were differentially moderated by vulnerable and grandiose narcissism. To start, vulnerable narcissists demonstrated an attenuation of corrugator activity across body comparison groups (see Figure 23; high B-PNI V in panel A), relative to those low on vulnerable narcissism who demonstrated a difference in corrugator activity between the EC and IC group. Such findings may be explained in terms of an underlying depressive disposition among vulnerable narcissists. Developmental theories propose that narcissistic tendencies arise from a deep sense of low self-worth (Kernberg, 1975; Kohut, 1971, 1977) and traits such as entitlement and need for admiration are regarded as avenues for concealing feelings of worthlessness and inadequacy (Morf et al., 2011; Raskin et al., 1991). However, vulnerable narcissists may be at greater risk than grandiose narcissists for symptoms of chronic and pervasive depression as they lack the personal agency and competency to utilize self-enhancement strategies and obtain desired outcomes for themselves (Atlas & Them, 2008; Brown et al., 2016; Dickinson & Pincus, 2003). In support, clinical research shows that vulnerable, relative to grandiose, narcissists demonstrate greater depressive symptoms (Ellison et al., 2013), anhedonia, feelings of worthlessness, pessimism, and boredom (Dawood & Pincus, 2016, 2018; Pincus et al., 2014). Such a depressive state is related to an increase in self-focused attention (Green & Sedikides, 1999; Sedikides, 1992), social withdrawal (Sharabi et al., 2016), diminished facial affect (Girard et al., 2014), and a reduction in the capacity to show affiliative tendencies, including facial mimicry (Likowitsky et al., 2011). In this regard, an attenuation of corrugator activity among vulnerable narcissists during the sad condition may reflect a depressive disposition and motivation to withdrawal from the environment, irrespective of whether they experienced a body comparison threat. Though, in consideration of their chronic and pervasive sense of low self-worth, one might have expected the pattern of attenuation to have occurred during *both* the sad and happy condition. In view of this, other factors may potentially augment or better account for the pattern of findings.

The distinctiveness model of the narcissistic subtypes (DMNS; Freis, 2018) may provide an alternative theoretical framework for understanding the findings. According to this model, grandiose and vulnerable narcissists share a need for status and distinction. However, the two subtypes diverge in their approach towards regulating their needs. Hypervigilance to threats and anxiety about incurring losses motivates vulnerable narcissists to adopt a *prevention-focused* approach towards threat; that is, to either preserve or defend their distinction. Aggression may reflect a prevention-focused strategy as aggressive behaviours towards others is more frequently observed among vulnerable, rather than grandiose, narcissists (Fennimore, 2019; Parton & Ent, 2018; Valashjardi et al., 2020b) and characterized as a malevolent response to perceived victimization and mistrust (Krizan et al., 2015; Pincus & Lukowitsky, 2010). A lack of emotional congruency may reflect malevolent aggression to the extent that the perceiver may be purposefully disregarding the emotions and intentions communicated by the expressor. With respect to facial expressions, aggression may be exemplified by the absence of congruent facial muscle activity in response to displays of emotion. An aggressive response may also be triggered by emotional behaviour as emotion itself is a meaningful social signal that provides information to others about our intentions and appraisals. In the current study, vulnerable narcissist may have been sensitive to the need for help signaled by the actor's expression of sadness and become anxious about their own needs not being met and losing their distinction. This interpretation may have motivated them to aggressively defend against such threat by attenuating corrugator activity, irrespective of whether they engaged in an explicit body comparison threat. As such, motivational tendencies among narcissists may be sensitive to information conveyed by way of emotion.

A contrasting pattern of findings was observed with respect to grandiose narcissism. Whereas those low on grandiosity experienced an increase in zygomaticus activity regardless of body comparison group, individuals high on grandiosity in the EC group demonstrated an attenuation of zygomaticus activity relative to those in the IC group (see Figure 23; high B-PNI G in panel B). These findings may also be understood using the theoretical framework proposed by the DMNS. Grandiose narcissists are concerned with seeking out rewards and gains that increase their status and distinctiveness (Sedikides et al., 2007, 2013, 2018), which in turn motivates them to adopt a *promotion-focused* approach towards threats (Freis, 2018). On the basis of perceived cues of social status they and others have, grandiose narcissists either elevate their own status by affiliating with others who exude high status and superiority (Ashton-James & Levordashka, 2013; Bogart et al., 2004) or reduce the status of others by engaging in competition or social comparison to make themselves more distinct and superior than others (Campbell et al., 2000, 2002; Fossati et al., 2010; Krizan & Bushman, 2011; Morf & Rhodewalt, 2001; Wallace & Baumeister, 2002). Competitiveness and comparison among grandiose narcissists occurs when their distinction is directly and publicly impeached (Bushman & Baumeister, 1998; Ferriday et al., 2011; Reidy et al., 2008; Smalley & Stake, 1996; Twenge & Campbell, 2003), with little evidence suggesting that such processes occur in the absence of threat (see Bettencourt et al., 2006; Ferriday et al., 2011; Jones & Paulhus, 2010). Emotional signals may provoke such competitive or comparative tendencies. In the current study, grandiose narcissists may have been sensitive to the signal of reward conveyed by the actor's expression of happiness. During a body comparison threat in the EC group, they may have been motivated to attenuate zygomaticus activity in attempt to downplay the actor's body image and make themselves more distinct and superior. The increase in zygomaticus activity by grandiose narcissists in the absence of a body comparison threat in the IC group may reflect the motivation to affiliate with the actor and the rewards conveyed by her expression of happiness (i.e., high body image) to elevate their own body image. Taken together, promotion- and prevention-focused approaches outlined by the DMNS may explain the differential pattern of facial muscle reactivity among grandiose and vulnerable narcissists. The observation of these responses during emotion-specific conditions may also suggest the power of emotional signals in the elicitation of narcissistic tendencies.

Grandiosity, Vulnerability, and Body Comparison Interact to Predict Facial Muscle Reactivity

The current state of the narcissism literature places emphasis on grandiosity and vulnerability as distinct subtypes, with a substantial amount of research supporting such distinction (e.g., Maples et al., 2011; Pincus et al., 2013; Pincus & Lukowitsky, 2010). However, the availability of research speaking to the *interaction* of grandiose and vulnerable tendencies within individuals is minimal (Weiss & Miller, 2018). The exploratory findings of the current study provide support for such interactional effects in the prediction of social behaviour; specifically, the interaction of grandiosity and vulnerability with body comparison in the prediction of facial muscle reactivity. Intriguing is the differential prediction of facial muscle reactivity by such interactional effects across emotive conditions, which may augment the interpretation of attenuating facial muscle effects discussed thus far within the framework of the DMNS. In consideration of the currently underdeveloped theory and research on interactional effects of narcissism subtypes, the findings should be considered strictly exploratory. The interpretations that follow are intended to generate hypotheses regarding narcissistic behaviour that coalesce with, and expand upon, existing theories and research.

As can be seen in Figure 28 (panel A, top graph), no differences in corrugator activity were observed between body comparison groups when both vulnerability and grandiosity levels were low. However, individuals in the IC group with high vulnerability and low grandiosity demonstrated an *increase* in corrugator activity during the sad condition, relative to their counterparts in the EC group. As previously speculated, vulnerable narcissists may regard an individuals' expression of sadness as a threat to their own needs for admiration not being met.

However, vulnerable narcissists may affiliate with such individuals as a prevention-focused strategy to enhance their own and others' feelings of empathy and, thereby, mitigate negative appraisals they and others may have of them. In this way, vulnerable narcissists may use affiliation to self-sooth and mitigate further losses to their status and distinction. Indeed, emotional mimicry enhances bidirectional feelings of empathy and bonding among individuals who are *both* mimicking and are being mimicked (Bailenson & Yee, 2005; Chartrand & Bargh, 1999; Kämpf et al., 2017; Stel & Vonk, 2010; Stel et al., 2008). Vulnerable narcissists also report higher levels of *maladaptive affective empathy*—that is, susceptibility to others' emotional distress—compared to grandiose narcissists (Luchner & Tantleff-Dunn, 2016; Rogoza et al., 2018). In the IC group, the increase in corrugator activity among vulnerable narcissists in response to the actor's expression of sadness may reflect maladaptive affective empathy and the motivation to preserve their body image status by enhancing their own feelings of empathy and bonding with the actor. In contrast, the explicit body comparison threat in the EC group may have provoked vulnerable narcissists to aggressively defend against threats to their body image by acquitting the actor's signal for help and, thereby, attenuating corrugator activity. Overall, vulnerable narcissist's motivation to either preserve or aggress against those who threaten their status may depend on the interplay between emotional signals and the explicit nature of situational threats.

Interestingly, the difference in corrugator activity between the body comparison groups among those high on vulnerable narcissism is diminished with high levels of grandiosity (Figure 28, panel A, bottom graph). A similar interactional effect was evidenced by Roche and colleagues (2013), whereby vulnerability was found to be associated with approach-related behaviour in daily social interactions with others, but only when levels of grandiosity were simultaneously high. In the current study, vulnerable tendencies may have led individuals to become oversensitive to the actor's expression of sadness and interpret the expression as a threat to their status and distinction. However, rather than affiliate with the actor (i.e., increase corrugator activity) to enhance their own feelings of empathy and preserve their body image status in the IC group, the availability of agentic, grandiose tendencies may have motivated individuals to use promotion-focused strategies such as competition or comparison (i.e., decrease in corrugator activity) to make themselves more distinct and superior than the actor in terms of body image. Put simply, if one is able to orchestrate desired outcomes for themselves and pursue opportunities for self-enhancement, they will do such.

A more complex pattern of findings emerges with respect to the interaction between grandiosity and vulnerability in the prediction of zygomaticus activity during the happy condition. As shown in Figure 28 (panel B, bottom graph), individuals with high vulnerability and low grandiosity experienced a decrease in zygomaticus activity in the IC group, relative to their counterparts in the EC group. Recall vulnerable narcissists demonstrate a depressive disposition that is characterized by anhedonia, feelings of worthlessness, shame, helplessness, and pessimism (Dawood & Pincus, 2016, 2018; Ellison et al., 2013; Pincus et al., 2014). Paradoxically, depressive reactions among vulnerable narcissists occur in response to positive, as opposed to negative, feedback from others (Atlas & Them, 2008; Freis et al., 2015; Malkin et al., 2011). In consideration of their self-focused attention (Green & Sedikides, 1999; Sedikides, 1992), positive feedback may elicit discomfort with appraisal that is inconsistent with their negative self-image (Malkin et al., 2011; Robins et al., 2001; Thomaes et al., 2007). Emotional signals—particularly happiness— may provoke such discomfort. In the IC group, vulnerable narcissists may have experienced discomfort with the discrepancy between the actor's positive emotional expression and their own negative self-image. Such discrepancy may have elicited depression and withdrawal from the environment by decreasing zygomaticus activity. In contrast, vulnerable narcissists may have taken a prevention-focused approach to the explicit body comparison threat in the EC group. In consideration of the signal of rewards conveyed by the actor's expression of happiness, they may have been motivated to affiliate with, rather than aggress against, the actor. That is, by congruently increasing zygomaticus activity, vulnerable narcissists may have preserved their body image status by enhancing their feelings of empathy and bonding with the actor.

The additive influence of grandiosity resulted in an opposite pattern of facial muscle reactivity. That is, individuals with high levels of vulnerability and grandiosity experienced an increase in zygomaticus activity in the IC group, relative to those in the EC group (Figure 28, panel B, bottom graph), Roche and colleagues (2013) demonstrated a similar interactional effect whereby those high on vulnerability increased their agentic behaviour (e.g., dominance posturing) during social interactions, but only when grandiosity levels were high *and* their interaction partners were perceived as friendly (nonthreatening). In contrast, when interaction partners were perceived as cold and unfriendly (threatening), individuals decreased their agentic behaviours, but only when vulnerability and grandiosity levels were high. As previously speculated, individuals will orchestrate desired outcomes for themselves and pursue self-enhancement if they have the agentic skills to do so. Rather than rely on vulnerable tendencies, individuals in the EC group may have employed grandiose (promotion-focused) tendencies and engaged in competition or comparison (i.e., decrease zygomaticus activity) to make themselves more distinct and superior than the actor with respect to their body image during a body comparison threat. In the absence of a body comparison threat, individuals in the IC group may have been motivated to affiliate with the actor (i.e., increase zygomaticus activity) and the rewards conveyed by her expression of happiness to elevate their own body image.

Interestingly, the aforementioned interaction *only* exists when levels of vulnerability are high (Figure 28, panel B, top graph), which may reflect the tendency of vulnerable narcissists to become hypervigilant to perceived threats (Campbell & Foster, 2007; Foster & Triimm, 2008; Krizan & Herlache, 2018; Pincus et al., 2009; Tortoriello & Hart, 2019). In other words, vulnerable tendencies may have led individuals to become hypersensitive to the feedback conveyed by the actor's expression of happiness. However, without such hypervigilant tendencies, they may have experienced happiness as nonthreatening and their coinciding grandiose tendencies may not have taken effect. Indeed, there is little evidence to suggest that grandiose tendencies occur in the absence of threat (see Bettencourt et al., 2006; Ferriday et al., 2011; Jones & Paulhus, 2010). This interpretation may also hold true for the pattern of facial muscle reactivity observed during the sad condition (Figure 28, low B-PNI V in panel A). Low levels of vulnerability may have attenuated the tendency of individuals to become hypervigilant to emotional and situational threats, which may explain the lack of difference in corrugator activity between the body comparison groups irrespective of whether grandiose tendencies were high or low. Taken together, it appears that vulnerable narcissism heightens one's perception of threat, while grandiose tendencies act as a catalyst in response to such perceived threat. Furthermore, grandiose tendencies may confer some level of resilience to threat by giving individuals the agentic skills to engage in self-enhancement, rather than anxiously focusing on the loss of status and distinction.

No Difference in Self-Report Body Comparison Between Groups

An exploratory question was raised as to whether explicitly instructing and priming participants to compare themselves to the actor in the body comparison videos resulted in greater and/or less favourable body comparison than participants who passively viewed the videos without priming or instruction. Intriguingly, no significant differences were found between the two body comparison groups in terms of reported direction or strength of body comparison. As previously discussed, body comparison is an automatic process (Chartard et al., 2017; Bocage-Barthélémy et al, 2018) and such automaticity may have lead participants in the IC group to automatically engage in the process of body comparison and, in turn, demonstrate a similar strength and direction of body comparison to that observed in the EC group. Factors such as self-compassion (Homan & Tylka, 2015), coping style (Pinkasavage et al., 2015), self-esteem (Jones & Buckingham, 2005), and sense of control (Michinov, 2001) also increase or decrease one's tendency to engage in body comparison. Individual differences on such unmeasured factors may have additionally moderated the strength and direction of body comparison in both groups.

When contrasted with the moderating and interactional effects of narcissism on body comparison and facial muscle activity, these findings may suggest that subjective and physiological systems are differentially sensitive to the process of body comparison. Individuals may be subjectively oversensitive to, or hyperaware of, the body comparison process. Yet, they may physiologically react to the process in different ways as a function of top-down cognitive processes. Put simply, it is possible for individuals to demonstrate different physiological reactions in response to the same subjective experience. Participants in both body comparison groups may have been overly sensitive to the body comparison process but diverged in facial muscle reactivity as a function of trait narcissism.

Self-Worth Contingencies Among Narcissists

Contingencies of self-worth are defined as personal beliefs about what one must be or do to achieve a sense of self-worth and, in turn, motivate one to seek success and avoid failure in domains in which they have staked their self-worth (Crocker et al., 2003). As narcissism is defined as a maladaptive response to perceived threat to one's self-worth, the current study explored whether facets of narcissism were differentially associated with self-worth contingencies; namely, appearance, others' approval, and competition. Exploratory analyses revealed that grandiose narcissism was only positively associated with competition, while vulnerable narcissism was positively associated with all three self-worth contingencies. A similar pattern of findings has been demonstrated by a previous study (Zeigler-Hill et al., 2008) and may suggest that contingent self-worth is relatively global among vulnerable narcissists and focused among grandiose narcissists. Research shows that endorsement of more self-worth contingencies, especially ones based on the external environment, predict an increase in depressive symptoms (Sargent et al., 2006). Furthermore, people who stake their self-worth in competition report higher self-esteem as competition hinges on self-validation rather than the validation of others (Crocker & Wolfe, 2001). Thus, global endorsement of contingencies may explain an underlying depressive disposition among vulnerable narcissists, while a focused contingency on competitiveness may explain high self-esteem among grandiose narcissists.

Considering competitive nature of grandiose narcissists, the current study explored the prediction of body comparison strength by several domains of self-worth and whether such predictions are moderated by grandiose narcissism. The study revealed the moderating influence of grandiose narcissism on the relationship between contingency on others' approval and strength of body comparison (see Figure 30). When contingency on others' approval was high, individuals with varying dispositions of narcissism reported similar levels of body comparison strength. When contingency on others' approval was low, individuals high on grandiose narcissism reported greater strength of body comparison than those low to moderate on grandiose narcissism. Overall, these findings suggest that staking one's self-worth on others' approval and grandiose narcissistic traits increases one's tendency to engage in a body comparison.

Theories of social comparison suggest that the tendency to compare depends on whether an individual's self-worth is contingent on the domain under comparison (Festinger, 1954; Miller et al., 1988; Wood, 1989). Relative to other contingencies, self-worth that is contingent on others' approval motivates individuals to seek validation and approval from other people (Crocker & Wolfe, 2003). This external basis of self-worth may make individuals more susceptible to engaging in social comparison to obtain others' feedback and evaluate their self-worth. Indeed, research demonstrates a positive association between contingency on others' approval and strength of social comparison (Bailey & Ricciardelli, 2010). That being said, grandiose narcissists purposefully seek out opportunities to engage in social comparison as a way to elevate their status and superiority (Barry et al., 2006; Bogart et al., 2004; Campbell et al., 2000; Golec de Zavala et al., 2019; Krizan & Bushman, 2011; Kong et al., 2020; Raskin et al., 1991; Ruiz et al., 2001). The propensity to use social comparison as a self-enhancement strategy may explain the report of high levels of body comparison among grandiose narcissists irrespective of whether they stake their self-worth on the approval of others. It also provides additional support for the DMNS and further explains the exploratory interactional effects. That is, social comparison is used among grandiose narcissists as a promotion-focused approach to make themselves more distinct from, and superior to, others.

General Discussion

The purpose of the program of research was to investigate the facial feedback hypothesis in the context of narcissism and body comparison. The program began with the development and validation of set of videos consisting of dynamic facial expressions of happiness and sadness. Using the novel stimuli, a set of studies were conducted to assess the boundary conditions of the facial feedback hypothesis. Study 2 investigated whether facial feedback could be modulated physically by way of incongruent facial muscle activity, while Study 3 investigated whether the effect could be modulated cognitively by way of body comparison and narcissism.

Large effect sizes were consistently observed with respect to the congruent increase in both EMG facial muscle activity and subjective emotion from baseline to the emotion-congruent facial expression. However, the association between facial muscle reactivity and subjective emotion was not evidenced. Thus, the program of research does not provide evidence of the facial feedback hypothesis. Though, an intriguing pattern of findings emerged with respect to the effect of physical and cognitive manipulations on facial muscle activity. In Study 2, manipulating incongruent facial muscles did not attenuate congruent facial muscles activity in response to dynamic facial expressions. In contrast, Study 3 found that narcissism interacted with body comparison to predict facial muscle reactivity.

The Facial Feedback Hypothesis

The collection of findings expands our conceptualization of the facial feedback hypothesis in two important ways. First, the findings suggest that it is possible to experience a congruent increase in facial muscle activity and subjective emotion while viewing facial expressions and yet experience a dissociation with respect to the intensity of both responses. This dissociation challenges the notion that facial feedback is the simple association between proprioceptive cues from facial muscles and subjective reports of emotion. Rather, it appears the process is modulated by other factors. Within the framework of constructionist theories of emotion, moderators of facial feedback may include semantic reasoning, level of awareness or consciousness, delayed reporting of subjective emotion, saliency of emotive stimuli, and emotion recognition (see Study 2). The investigation of such moderators in prospective studies may help to explain the incongruence between the intensity of physiological and subjective responses and disentangle the complexity of facial feedback.

Second, the cumulation of findings suggest that facial muscle activity is sensitive to cognitive manipulations. Traditionally, investigations of facial feedback involve physical manipulations of facial muscles to determine whether congruent facial muscle activity and subjective emotion in response to emotive stimuli could be attenuated physically (e.g., Davey et al., 2010; Ponari et al., 2012; Strack et al., 1988). Such attenuation was not evidenced in the program of research and speaks to the cumulation of mixed findings and heterogeneity of effect sizes observed in the literature with respect to facial feedback (Coles & Larsen, 2019). These mixed findings have led researchers to disagree not about whether attenuation effects exist, but rather the specific context in which one can expect to observe attenuation. To this end, the program demonstrated the attenuation of facial muscle activity by cognitive factors; specifically, narcissism and body comparison. The pattern of findings lend support to the notion that facial muscle reactivity is influenced by top-down cognitive processes and underscores the importance of measuring cognitive processes when investigating facial feedback.

Motivation, Social Affiliation, and Narcissism

The program of research also sheds light on the role of motivation in empathetic functioning among narcissists. A lack of empathy is one of the most frequently cited hallmarks of narcissism (e.g., APA, 2013), a conclusion which is often drawn based on the observed tendency of grandiose narcissists to enhance their self-image and obtain admiration at the expense of others (Campbell & Miller, 2011; Pincus & Lukowitsky, 2010). To the contrary, narcissism was not found to be associated with a general lack of trait empathy, nor predictive of facial muscle activity in response to passively viewed emotive stimuli in Study 2. Considered within the framework of motivational theories of narcissism (e.g., Baskin-Sommers et al., 2014; Sedikides & Gregg, 2001), Study 3 set out to investigate whether the specific form of empathetic functioning—namely, congruent facial muscle reactivity— is amenable to contextual and motivational influences. Indeed, narcissists attenuated congruent facial muscle activity under specific conditions of emotion and body comparison. Collectively, these findings challenge the longstanding claim that narcissists lack empathy and support the contemporary notion that they are capable of *behaviourally* demonstrating affective empathy under specific social and emotional contexts (see Hart et al., 2018). The emotion-specific pattern of facial muscle reactivity also demonstrates the power of social threat *and* emotion in shaping affiliative processes like facial expressivity among narcissists.

Limitations and Future Directions

The program of research is not without its limitations. Noteworthy is the presentation of the emotive videos in the same order (sad, happy) for all participants across the studies. As previously discussed in Study 1, practical limitations prevented the implementation of a counterbalanced design. These limits included the significant increase in the required sample size for each study, challenges in participant recruitment, and constraints on laboratory resources and time. Efforts were made to compensate for such effects. A distractor task was included at the end of each post-video questionnaire to reduce the potential for emotional carryover effects. The order of the video was also determined based on facial feedback theory and with the goal of designing an emotion elicitation paradigm that would maximize the likelihood of detecting facial feedback. Nevertheless, a question remains as to what extent the order of the videos influenced subjective emotion and facial muscle reactivity. This question is especially relevant to the observed interaction of narcissism with body comparison in the prediction of facial muscle activity in Study 3. Future studies might consider using a counterbalanced design to investigate whether presentation order influences emotional responding. Replication using a counterbalanced design would help to establish the validity of the differential pattern of facial muscle activity among narcissists, particularly with respect to emotive conditions.

To increase ecological validity and emotional responsivity, facial feedback was assessed using a continuous presentation paradigm whereby facial muscle activity was continuously recorded during each 3-min emotive video. While such methodology yields similar facial muscle activity to that which is demonstrated in studies utilizing briefly presented pictures (e.g., de Wied et al., 2012; de Wied et al., 2009; Golland et al., 2018; Golland et al., 2019; Mauss et al., 2005; Stel & van Baaren, 2008), continuous presentation paradigms do not allow for inferences specific to *facial mimicry*. Such conclusions require a more precise analysis involving the alignment of the observers' facial movements with the expressor's facial display. Thus, inferences with respect to facial muscle activity in the program of research must be made within the framework of a mean level analysis: that is, *average* EMG activity during the emotion-congruent video proportional to the baseline video. Replicating and extending the findings of the program in the context of a brief presentation paradigm would allow for inferences pertaining to facial mimicry.

Study 2 did not evidence physical manipulation by way of incongruent facial manipulation paradigms. However, such null findings do not warrant the overall conclusion that physical manipulations are ineffective in modulating facial feedback. The effect may be physically manipulated using other methods and paradigms. For example, directly manipulating facial muscles by way of Botox injections has been shown to attenuate subjective (Baumeister et al., 2016; Davey, 2010; Hennenlotter et al., 2009) and neural responses (Kim et al., 2014) to emotive stimuli. Physical manipulations may also be nonfacial and organically derived. For instance, attenuation of facial mimicry is observed among populations with neurological deficits including frontotemporal dementia (Marshall et al., 2018), semantic dementia (Kumfor et al., 2018), Huntington's Disease (Kordsachia et al., 2018), and Parkinson's Disease (Balconi et al., 2016). Psychotropic drugs may also modulate facial feedback. For instance, naltrexone (opioid antagonist) attenuates facial mimicry in response to happy facial expressions relative to individuals given a placebo (Meier et al., 2016). Future studies would benefit from investigating these avenues of physical manipulation to clarify the specific physical boundaries of the facial feedback hypothesis.

As previously discussed, subjective reports of self-report emotion may have reflected semantic knowledge, rather than feeling states, due to the basic self-report instructions given to participants (Hemzani et al., 2019) and delay between viewing the emotive stimuli and emotional rating (Itkes & Kron, 2019). Constructionists theories offers several approaches to minimizing the influence of semantic reasoning in reports of subjective emotion. One approach may be to include an instruction set that explicitly differentiates between semantic knowledge and feelings and instructs participants to make reports exclusively on feelings (Hamzani et al., 2019). Another method may be to obtain continuous ratings of subjective emotion in real time. For example, participants may use a joystick, sliding scale, or knob to indicate the intensity of a felt emotion while simultaneously viewing an emotive stimulus (Haratian, 2018; Karashima & Nishiguchi, 2017; for a review, see Korpal & Jankowiak, 2018). Such methods may help clarify the role of semantic reasoning in subjective reports of emotion and rectify the dissociation observed between EMG facial muscle activity and subjective emotion observed in the program.

The emotive videos were rigorously designed to address the specific research question posed by the program in accordance with theories of facial feedback, body comparison, and emotion. However, the specific nature of the videos may pose a limitation with respect to the generalizability of the findings. Foremost, the emotive videos consisted of one actor displaying several emotional facial expressions. Future studies may opt to use several actors to investigate the influence of expressor characteristics on facial feedback in the perceiver (e.g., sex, ethnicity, attractiveness, types of facial cues, intensity of facial expressivity). The videos were also recorded from a head-to-shoulders portrait position. Although research has indicated that body comparisons can occur in response to a variety of bodily related stimuli (Chatard et al., 2017), it would be valuable for future studies to examine whether displaying the full body of a body comparison target elicits greater body comparison among participants relative to a head-to-shoulders portrait. In consideration of the nature of threat, repetitive exposure to the same actor within each study may also have contributed to the habituation of perceived threat of body comparison among participants. As repetitive exposure to threat attenuates symptoms of anxiety (see Abramowitz et al., 2019), the intensity of the body comparison threat may have decreased among participants after repeatedly viewing the actor, which in turn may have influenced emotional responding.

Strengths and Conclusions

The program of research has a number of noteworthy strengths. Premised on the theory of emotional contagion, the facial feedback hypothesis suggests that individuals are able to share the emotions of others directly, without any form of cognitive mediation (Hatfield et al., 1994). However, the findings of the program make a theoretical contribution by advancing our understanding of facial feedback and suggests that cognitive processes pertaining to personality and the perception of threat play a pivotal role in the manifestation of facial muscle reactivity. The program also outline a novel method of investigating facial feedback: namely, body comparison threat. Facial manipulation paradigms are traditionally used to investigate the role of facial muscle activity on subjective emotional experience (e.g., Noah et al., 2018; Ponari et al., 2012; Strack et al., 1988). However, the intrusiveness of facial manipulation has numerous limitations with respect to the types of research questions that may be explored, as well as the generalizability of the findings to real-life settings. The program adds a methodological contribution by describing a novel body comparison paradigm that may be used to investigate the causal impact of body comparison on numerous outcomes, including facial muscle activity. Future studies would benefit by replicating the methods and procedures of the paradigm to help establish its reliability and validity as a paradigm for manipulating body comparison.

The program also contributes to the advancement of psychology by filling an important research gap with respect to narcissism. Foremost, studies of narcissism predominantly use measures of grandiosity (Cain et al., 2008). Not only has this limited our theoretical understanding of the construct of narcissism, but it also impacts the ability for research to inform clinical intervention. This is especially important for vulnerable narcissists who experience significant psychological and interpersonal distress and are more likely to present for psychotherapy, compared to their grandiose counterparts (Ellison et al., 2013). The program uses a multidimensional, self-report measure of narcissism that assesses the constructs' full range of clinical characteristics (B-PNI). Such a comprehensive measure helps elucidate our understanding of how distinct expressions *within* a personality trait differentially influence perceptions of threat and shape affiliative tendencies. The program also provides evidence for the interaction of narcissistic subtypes in the prediction of social behaviour. Research to date is mainly focused on distinguishing grandiosity and vulnerability as distinct, but related, subtypes (Weiss & Miller, 2018). Although the interactional effects in the program were the product of exploratory analysis—and therefore, cannot be interpreted with the same certainty as confirmatory hypothesis testing procedures—they are nevertheless valuable for evidencing the existence of such effects, generating novel hypotheses, and encouraging researchers to explore a phenomenon where psychological theory is underdeveloped.

The findings also have the potential to improve upon case conceptualization and clinical interventions for narcissists. Interventions that are aimed at promoting empathetic functioning often assume empathy arises from a lack of skill and, thus, focus on teaching empathy techniques (Davis & Begovic, 2014; Linehan, 2014). However, the findings of the program suggest that narcissists *do* have the capacity to emotionally affiliate with others, albeit under specific emotional and social contexts. As such, skills training may not be suitable or effective among narcissists whose empathy is driven by motivation factors, rather than a skills deficit. In fact, interventions focused on empathy skills training are shown to have counterproductive effects among narcissists (Ridderinkhof et al., 2017) by increasing opportunities for self-enhancing behaviours (Gebauer et al., 2018). Rather than teach empathy skills, clinicians may benefit by tailoring interventions to address narcissists' underlying motivations for empathy and affiliation (Hart et al., 2018). By evoking intrinsic motivation to affiliate with others, empathetic behaviours such as facial muscle reactivity may be enhanced and, in turn, improve interpersonal functioning.

Research in social and personality psychology relies heavily on self-report data in lieu of behavioural observations (Baumeister et al., 2007). However, narcissism, by its very definition, is a cognitive *and* behavioural response to threat. Conceptualizations of narcissism that are understood exclusively in terms of self-report data can be problematic, as what one says and thinks can be very different from how one actually behaves. The program investigates narcissism under an experimental condition of threat; namely, body comparison. As such, the findings have the potential to contribute to a more accurate understanding of narcissism in terms of behaviour. There is a growing concern among psychologists that the absence of behavioural studies abandons the goal of psychology as being a science of behaviour. The program of research seeks to “try to put a bit more behaviour back into the science of behaviour” (Baumeister et al., 2007, p. 401).

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Table 1

Study 1 – Normality of Dependent DEQ Sadness and Happiness Scores

	Dependent Score	
Actor	DEQ Sadness[a]	DEQ Happiness[b]
A	2.64	2.70
B	3.64	1.68
C	3.17	2.11
D	3.19	1.99
E	3.33	2.42

Note. $N = 30$. The table presents Z_{skewness} for dependent scores.

[a]Dependent score = sad minus neutral condition.

[b]Dependent score = happy minus neutral condition.

Table 2

Study 1 – Reliability of DEQ Sadness and Happiness Subscales for Actors Across Emotive Conditions

	DEQ Sadness			DEQ Happiness		
Actor	Neutral	Sad	Happy	Neutral	Sad	Happy
A	.75	.89	.20	.91	.09	.94
B	.78	.87	.08	.90	.81	.93
C	.84	.83	.12	.92	.57	.95
D	.82	.81	.15	.93	.44	.90
E	.71	.87	.33	.94	.66	.93

Note. $N = 30$. The table presents Cronbach's α.

Table 3

Study 1 – Means and Standard Deviations of DEQ Sadness for Actors Across Emotive Conditions

	Emotive Condition				
Actor	Neutral	Sad	Happy	*t*(29)*	Cohen's *d*
A	2.03 (1.01)	2.86 (1.39)	1.11 (0.28)	4.05	0.74
B	1.64 (0.63)	2.33 (1.22)	1.08 (0.24)	3.47	0.63
C	2.03 (1.04)	2.58 (1.37)	1.09 (0.23)	3.12	0.57
D	1.83 (1.00)	3.30 (1.36)	1.09 (0.30)	6.21	1.13
E	1.70 (0.81)	2.72 (1.32)	1.09 (0.24)	4.77	0.87

Note. $N = 30$. Standard deviations are presented in parentheses. The dependent means *t* test compared neutral to sad emotive condition.

*$p < .001$.

Table 4

Study 1 – Means and Standard Deviations of DEQ Happiness for Actors Across Emotive Conditions

	Emotive Condition				
Actor	Neutral	Sad	Happy	*t*(29)*	Cohen's *d*
A	1.16 (0.49)	1.03 (0.11)	3.67 (1.61)	8.31	1.52
B	1.25 (0.65)	1.14 (0.35)	2.82 (1.30)	5.82	1.06
C	1.37 (0.76)	1.07 (0.21)	3.33 (1.72)	5.87	1.07
D	1.34 (0.72)	1.07 (0.19)	3.91 (1.50)	10.08	1.87
E	1.49 (0.82)	1.15 (0.38)	3.79 (1.57)	7.90	1.44

Note. $N = 30$. Standard deviations are presented in parentheses. The dependent means *t* test compared neutral to happy emotive condition.

*$p < .001$.

Table 5

Study 2 – Normality of DEQ and EMG Variables Across Emotive Conditions

Variable	Emotive Condition				
	Baseline	Neutral	Sad	Happy	Dependent Scores
DEQ Subscale					
Sadness	5.85	_	2.21	_	0.02_a
Happiness	3.21	_	_	0.94	1.92_b
EMG Recording Site					
Corrugator	5.10	5.37	5.21	4.83	5.42_a
Zygomaticus	2.64	4.74	3.71	2.11	6.24_b

Note. $N = 89$. The table presents $Z_{skewness.}$

[a]Dependent score = sad minus baseline condition.

[b]Dependent score = happy minus baseline condition.

Table 6

Study 2 – Reliability of DEQ Sadness and Happiness Subscales Across Emotive Conditions

	Emotive Condition		
DEQ Subscale	Baseline	Sad	Happy
Sadness	.73	.89	–
Happiness	.93	–	.96

Note. N = 89. The table presents Cronbach's α. DEQ = Discrete Emotions Questionnaire.

Table 7

Study 2 – Means and Standard Deviations of DEQ and EMG Data Across Emotive Conditions for the Study Sample

Variable	Emotive Condition			
	Baseline	Neutral	Sad	Happy
DEQ Subscale				
Sadness	1.29 (0.55)	–	3.17 (1.54)	–
Happiness	2.20 (1.11)	–	–	3.57 (1.83)
EMG Recording Site				
Corrugator	19.15 (14.45)	33.27 (21.46)	65.74 (45.60)	61.91 (52.68)
Zygomaticus	15.23 (9.89)	24.06 (17.68)	61.64 (68.37)	66.75 (52.18)

Note. N = 89. Standard deviations are presented in parentheses. EMG corrugator and zygomaticus amplitudes expressed as power spectral densities (μV^2).

Table 8

Study 2 – Means and Standard Deviations of DEQ and EMG Data Across Emotive Conditions for Each Manipulation Group

Group	Variable	Emotive Condition			
		Baseline	Neutral	Sad	Happy
FA (N = 30)	DEQ Subscales				
	Sadness	1.28 (0.46)	–	3.28 (1.66)	–
	Happiness	2.15 (1.07)	–	–	3.40 (1.78)
	EMG Recording Site				
	Corrugator	20.82 (15.83)	34.99 (19.80)	46.82 (27.63)	111.66 (48.82)
	Zygomaticus	15.35 (9.22)	23.75 (15.66)	128.09 (73.71)	47.92 (29.63)
FI (N = 30)	DEQ Subscales				
	Sadness	1.27 (0.56)	–	3.23 (1.64)	–
	Happiness	2.39 (1.23)	–	–	3.58 (1.83)
	EMG Recording Site				
	Corrugator	17.66 (13.42)	31.02 (22.04)	79.38 (51.77)	34.91 (34.25)
	Zygomaticus	15.29 (9.75)	22.14 (19.70)	22.67 (22.11)	80.01 (59.99)
NO (N = 29)	DEQ Subscales				
	Sadness	1.31 (0.65)	–	2.99 (1.35)	–
	Happiness	2.10 (1.07)	–	–	3.73 (1.92)
	EMG Recording Site				
	Corrugator	18.74 (12.67)	33.51 (23.18)	70.94 (49.65)	33.70 (24.73)
	Zygomaticus	15.05 (10.10)	26.19 (18.17)	26.62 (20.98)	74.61 (58.87)

Note. Standard deviations are presented in parentheses. EMG scores denote mean power spectral densities (μV^2). FA = Facial Manipulation Group; FI = Finger Manipulation Group; NO = No Manipulation Group; DEQ = Discrete Emotions Questionnaire.

Table 9

Study 2 – EMG Ratio Indices Across Manipulation Groups

EMG Ratio Indices	Manipulation Group		
	FA (N = 30)	FI (N = 30)	NO (N = 29)
COR_S	393.64 (449.65)	572.10 (431.26)	492.80 (446.53)
ZYG_H	433.55 (367.07)	818.69 (977.69)	649.15 (745.23)

Note. Standard deviations are presented in parentheses.

Table 10

Study 2 – Model 1 Mediation Analysis with Facial Manipulation Group as the Predictor, COR_S as the Mediator, DEQ_S as the Outcome, and the NO Group as the Reference Group

		Consequent						
		M (COR_S)				*Y* (DEQ_S)		
Antecedent		Coeff.	*SE*	*p*		Coeff.	*SE*	*p*
D_1	a_1	−133.15	117.57	.261	c'_1	0.36	0.39	.358
D_2	a_2	43.38	121.99	.723	c'_2	0.13	0.40	.741
sM (COR_S)		–––	–––	–––	*b*	0.00	0.00	.316
U_1 (DEQ_{Sb})	f_1	−46. 24	88.16	.601	g_1	0.94	0.29	.002
Constant	i_M	586.52	143.93	<.001	i_Y	1.63	0.51	.002
		$R^2 = .18$ $F(3,85) = .91, p = .442$				$R^2 = .13$ $F(4,84) = 2.99, p = .024$		

Note. $N = 89$. Mediation analyses conducted with no manipulation (NO) group as the reference group. D_1 = Facial manipulation (FA) group coded as the independent variable; D_2 = Finger manipulation (FI) group coded as the independent variable; COR_S = mean EMG corrugator amplitude during the sad condition expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition; DEQ_S = DEQ Sadness during the sad condition; DEQ_{Sb} = DEQ Sadness during the baseline condition.

Table 11

Study 2 – Model 2 Mediation Analysis with Facial Manipulation Group as the Predictor, COR_S as the Mediator, DEQ_S as the Outcome, and the FI Group as the Reference Group

		Consequent						
		M (COR_S)				*Y* (DEQ_S)		
Antecedent		Coeff.	*SE*	*p*		Coeff.	*SE*	*p*
D_1	a_1	−176.53	119.91	.145	c'_1	0.22	0.39	.572
D_2	a_2	−43.38	121.99	.723	c'_2	−0.13	0.40	.741
M (COR_S)		–––	–––	–––	b	0.00	0.00	.316
U_1 (DEQ_{Sb})	f_1	−46. 24	88.16	.601	g_1	0.94	0.29	.002
Constant	i_M	629.91	140.85	.000	i_Y	0.70	0.77	.364
		R^2 = .03 $F(3,85) = 0.91$, $p = .442$				R^2 = .05 $F(4,84) = 2.99$, $p = .024$		

Note. $N = 89$. Mediation analyses conducted with finger manipulation (FI) group as the reference group. D_1 = Facial manipulation (FA) group coded as the independent variable; D_2 = NO manipulation (NO) group coded as the independent variable; COR_S = mean EMG corrugator amplitude during the sad condition expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition; DEQ_S = DEQ Sadness during the sad condition; DEQ_{Sb} = DEQ Sadness during the baseline condition.

Table 12

Study 2 –Model 3 Mediation Analysis with Facial Manipulation Group as the Predictor, ZYG_H as the Mediator, DEQ_H as the Outcome, and the NO Group as the Reference Group

		Consequent						
		M (ZYG_H)				*Y* (DEQ_H)		
Antecedent		Coeff.	*SE*	*p*		Coeff.	*SE*	*p*
D_1	a_1	−295.87	193.80	.131	c'_1	−0.18	0.47	.698
D_2	a_2	73. 75	202.52	.717	c'_2	−0.46	0.48	.339
M (ZYG_H)		–––	–––	–––	b	0.01	0.00	.066
U_1 (DEQ_{Hb})	f_1	59. 91	73.27	.416	g_1	0. 35	0.18	.049
Constant	i_M	598.62	205.98	.005	i_Y	2.63	0.52	.000
		R^2 = .06 F(3,85) = 1.63, p = .189				R^2 = .120 F(4,84) = 2.68, p = .037		

Note. N = 89. D_1 = FA group coded as the independent variable; D_2 = FI group coded as the independent variable; ZYG_H = mean EMG zygomaticus amplitude during the happy condition expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition; DEQ_H = DEQ Happiness during the happy condition; DEQ_{Hb} = DEQ Happiness during the baseline condition.

Table 13

Study 2 – Model 4 Mediation Analysis with Facial Manipulation Group as the Predictor, ZYG_H as the Mediator, DEQ_H as the Outcome, and the FI Group as the Reference Group

		Consequent						
		M (ZYG_H)				*Y* (DEQ_H)		
Antecedent		Coeff.	*SE*	*p*		Coeff.	*SE*	*p*
D_1	a_1	−369.62	198.35	.066	c'_1	0.28	0.48	.561
D_2	a_2	−73.75	202.52	.717	c'_2	0.46	0.48	.339
M (ZYG_H)		–––	–––	–––	*b*	0.01	0.00	.066
U_1 (DEQ_{Hb})	f_1	59. 91	73.27	.416	g_1	0.35	0.18	.049
Constant	i_M	672.36	230.02	.005	i_Y	1.65	0.68	.017
		R^2 = .06 $F(3,85) = 1.63, p = .189$				R^2 = .12 $F(4,84) = 2.68, p = .037$		

Note. N = 89. D_1 = FA group coded as the independent variable; D_2 = FI group coded as the independent variable; ZYG_H = mean EMG zygomaticus amplitude during the happy condition expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition; DEQ_H = DEQ Happiness during the happy condition; DEQ_{Hb} = DEQ Happiness during the baseline condition.

Table 14

Study 2 – Psychometric Properties and Intercorrelations of Exploratory Psychometric Variables

Variables	*M* (*SD*)	$Z_{skewness}$	Range (Actual)	α	1	2	3	4	5
1. B-PNI Grandiosity	2.35 (0.85)	0.03	0.5 – 4.8	.87	−				
2. B-PNI Vulnerability	1.84 (0.88)	0.44	0.0 – 3.9	.91	−.58**	−			
3. ECS Positive	17.40 (4.38)	−1.25	6 – 24.0	.85	.15	−.14	−		
4. ECS Negative	21.71 (6.69)	−0.66	9 – 36	.80	−.02	−.15	.54**	−	
5. QCAE Cognitive	37.82 (8.03)	0.14	19 – 54	.89	.29**	.01	.44**	.44**	−

Note. *N* = 89. B-PNI = Brief-Pathological Narcissism Inventory; ECS = Emotional Contagion Scale; QCAE = Questionnaire of Cognitive and Affective Empathy; α = Cronbach's α of internal consistency.

*p < .01; **p < .001

Table 15

Study 2 – Exploratory A1 and A2 Moderation Analyses Among Participants in the NO Group with COR_S as the Predictor, DEQ_S as the Outcome, and B-PNI G and B-PNI V as the Moderator

Model	Antecedent		Y (DEQ_S)		
			Coeff.	*SE*	*p*
Model A1	X (COR_S)	a_1	0.00	0.00	.740
	W (B-PNI G)	a_2	−0.20	0.66	.769
	$X \times W$	a_3	0.00	0.00	.939
	U_1 (DEQ_{Sb})	f_1	0.29	0.41	.489
	U_2 (B-PNI V)	g_1	0.65	0.36	.087
	Constant	i_M	1.57	1.87	.410
			$R^2 = .19$ $F(5, 23) = 0.97, p = .458$		
Model A2	X (COR_S)	a_1	0.00	0.00	.979
	W (B-PNI V)	a_2	0.53	0.59	.386
	$X \times W$	a_3	0.00	0.00	.793
	U_1 (DEQ_{Sb})	f_1	0.29	0.41	.484
	U_2 (B-PNI G)	g_1	−0.29	0.49	.569
	Constant	i_M	2.06	1.92	.297
			$R^2 = .19$ $F(5, 23) = 0.99, p = .449$		

Note. $N = 29$. Moderation analyses were conducted on participants in the NO group. B-PNI G = Brief Pathological Narcissism Inventory – Grandiosity subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; COR_S = mean EMG corrugator amplitude during the sad condition expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition; DEQ_S = DEQ Sadness during the sad condition; DEQ_{Sb} = DEQ Sadness during the baseline condition.

Table 16

Study 2 – Exploratory Moderation Analyses Among Participants in the NO Group with ZYG_H as the Predictor, DEQ_H as the Outcome Variable, and B-PNI G and B-PNI V as the Moderator

Model	Antecedent		Y (DEQ_H)		
			Coeff.	*SE*	*p*
Model A3	X (ZYG_H)	a_1	0.00	0.00	.494
	W (B-PNI G)	a_2	0.76	0.80	.352
	$X \times W$	a_3	0.00	0.00	.954
	U_1 (DEQ_{Hb})	f_1	−0.19	0.37	.605
	U_2 (B-PNI V)	g_1	−0.34	0.55	.538
	Constant	i_M	2.41	1.97	.235
			$R^2 = .16$ $F(5, 23) = 0.82, p = .550$		
Model A4	X (COR_S)	a_1	0.00	0.00	.935
	W (B-PNI V)	a_2	−0.69	0.79	.394
	$X \times W$	a_3	0.00	0.00	.556
	U_1 (DEQ_{Sb})	f_1	−0.20	0.36	.572
	U_2 (B-PNI G)	g_1	0.83	0.71	.252
	Constant	i_M	2.75	1.87	.157
			$R^2 = .18$ $F(5, 23) = 0.90, p = .497$		

Note. $N = 29$. Moderation analyses were conducted on participants in the NO group. B-PNI G = Brief Pathological Narcissism Inventory – Grandiosity subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; ZYG_H = mean EMG zygomaticus amplitude during the happy condition expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition; DEQ_H = DEQ Happiness during the happy condition; DEQ_{Hb} = DEQ Happiness during the baseline condition.

Table 17

Study 3 – Normality of EMG and DEQ Variables Across Emotive Conditions

	Emotive Body Comparison Condition		
Variable	Baseline	Sad[a]	Happy[b]
DEQ Subscale			
Sadness	8.85	2.21	−
Happiness	3.21	−	0.94
EMG Recording Site			
Corrugator	4.23	2.46	−
Zygomaticus	3.05	−	−2.66

Note. $N = 122$. The table presents $Z_{skewness.}$ DEQ = Discrete Emotions Questionnaire.
aDependent score = sad body comparison condition minus baseline condition.
[b]Dependent score = happy body comparison condition minus baseline condition

Table 18

Study 3 – Reliability of DEQ Sadness and Happiness Subscales Across Emotive Body Comparison Conditions

	Emotive Body Comparison Condition		
DEQ Subscale	Baseline	Sad	Happy
Sadness	.78	.82	−
Happiness	.92	−	.95

Note. N = 120. The table presents Cronbach's α. DEQ = Discrete Emotions Questionnaire.

Table 19

Study 3 – Means and Standard Deviations of DEQ and EMG Data Across Emotive Body Comparison Conditions for the Study Sample

	Emotive Body Comparison Condition		
Variable	Baseline	Sad	Happy
DEQ Subscale			
Sadness	1.20 (0.49)	2.91 (1.30)	–
Happiness	2.40 (1.45)	–	3.79 (1.64)
EMG Recording Site			
Corrugator	21.80 (11.91)	56.04 (36.40)	–
Zygomaticus	21.32 (11.01)	–	58.15 (35.98)

Note. $N = 120$. Standard deviations are presented in parentheses. DEQ = Discrete Emotions Questionnaire. EMG corrugator and zygomaticus amplitudes expressed as power spectral densities (μV^2).

Table 20

Study 3 – Means and Standard Deviations of DEQ and EMG Data Across Emotive Body Comparison Conditions for Each Body Comparison Group

		Emotive Body Comparison Condition		
Group	Variable	Baseline	Sad	Happy
EC ($N = 59$)	DEQ Subscales			
	Sadness	1.21 (0.35)	2.86 (1.31)	–
	Happiness	2.42 (1.42)	–	3.70 (1.63)
	EMG Recording Site			
	Corrugator	22.74 (11.78)	51.14 (29.09)	
	Zygomaticus	20.99 (9.96)		48.12 (37.06)
IC ($N = 61$)	DEQ Subscales			
	Sadness	1.18 (0.61)	2.96 (1.29)	–
	Happiness	2.38 (1.49)	–	3.89 (1.66)
	EMG Recording Site			
	Corrugator	20.89 (12.06)	60.77 (41.99)	–
	Zygomaticus	21.64 (12.01)	–	67.84 (32.31)

Note. Standard deviations are presented in parentheses. DEQ = Discrete Emotions Questionnaire; EMG scores denote mean power spectral densities (μV^2). EC = Explicit Comparison; IC = Implicit Comparison.

Table 21

Study 3 – EMG Ratio Indices Across Body Comparison Groups.

	Body Comparison Group	
EMG Ratio Indices	EC (N = 59)	IC (N = 61)
COR_S	251.76 (157.51)	343.40 (267.67)
ZYG_H	308.68 (376.54)	410.09 (298.98)

Note. Standard deviations are presented in parentheses.

Table 22

Study 3 – Psychometric Properties and Intercorrelations of Psychometric Variables

Variables	*M*	$Z_{skewness}$	Range (Actual)	α	1	2	4	5
1. B-PNI G	2.43 (0.70)	−1.26	0.75 – 4.08	.87	−			
2. B-PNI V	1.85 (0.81)	0.52	0.0 – 4.00	.91	.61**	−		
4. CSWS Competition	4.23 (1.16)	−1.71	1.00 – 6.80	.84	.44**	.48**	−	
5. CSWS Approval	4.01 (1.32)	−0.94	1.00 – 6.60	.78	.08	.36**	.15	−
6. CSWS Appearance	4.96 (1.04)	−1.14	2.20 – 7.00	.74	.17	.44**	.22*	.53**

Note. *N* = 125. B-PNI = Brief Pathological Narcissism Inventory; BISS = Body Image States Scale; CSWS = Contingencies of Self-Worth Scale; α = Cronbach's α of internal consistency.

Table 23

Study 3 – Model 1 Moderated Mediation Analysis with Group as the Predictor, COR_S as the Mediator, DEQ_S as the Outcome, and B-PNI G as the Moderator

		Consequent						
		M (COR_S)				*Y* (DEQ_S)		
Antecedent		Coeff.	*SE*	*p*		Coeff.	*SE*	*p*
X (Group)	a_1	194.51	142.09	.174	c'_1	0.08	0.25	.747
M (COR_S)		–	–	–	b	0.00	0.01	.416
W (B-PNI G)	a_2	107.51	86.95	.219		–	–	–
X × *W*	a_3	−44.84	55.50	.429		–	–	–
U_1 (DEQ_{Sb})	f_1	−71.95	39.67	.072	c'_2	0.24	0.25	.339
U_2 (B-PNI V)	g_1	−60.65	31.15	.054	c'_3	0.10	0.15	.512
Constant	i_M	108.13	218.78	.622	i_Y	2.18	0.61	.000
		$R^2 = .10$ $F(5, 114) = 2.57, p = .031$				$R^2 = .02$ $F(4, 115) = 0.46, p = .764$		

Note. *N* = 120. B-PNI G = Brief Pathological Narcissism Inventory – Grandiose subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; DEQ_S = DEQ Sadness during the sad body comparison condition; DEQ_{Sb} = DEQ Sadness during the baseline condition; COR_S = mean EMG corrugator amplitude during the sad body comparison condition expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition.

Table 24

Study 3 – Model 2 Moderated Mediation Analysis with Group as the Predictor, COR_S as the Mediator, DEQ_S as the Outcome, and B-PNI V as the Moderator

		Consequent						
		M (COR_S)				*Y* (DEQ_S)		
Antecedent		Coeff.	*SE*	*p*		Coeff.	*SE*	*p*
X (Group)	a_1	310.44	98.26	.002	c'_1	0.08	0.25	.752
M (COR_S)		–	–	–	*b*	0.00	0.01	.469
W (B-PNI V)	a_2	125.19	80.78	.124		–	–	–
X × *W*	a_3	−120.66	48.58	.014		–	–	–
U_1 (DEQ_{Sb})	f_1	−71.13	38.74	.069	c'_2	0.23	0.25	.348
U_2 (B-PNI G)	g_1	33.58	34.51	.333	c'_3	0.15	0.17	.393
Constant	i_M	−61.23	165.45	.712	i_Y	2.04	0.66	.002
		$R^2 = .14$ $F(5, 114) = 3.79, p = .003$				$R^2 = .02$ $F(4, 115) = 0.54, p = .709$		

Note. *N* = 120. B-PNI G = Brief Pathological Narcissism Inventory – Grandiose subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; DEQ_S = DEQ Sadness during the sad body comparison condition; DEQ_{Sb} = DEQ Sadness during the baseline condition; COR_S = mean EMG corrugator amplitude during the sad body comparison condition expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition.

Table 25

Study 3 – Model 3 Moderated Mediation Analysis with Group as the Predictor, ZYG_H as the Mediator, DEQ_H as the Outcome, and B-PNI G as the Moderator

		Consequent						
		M (ZYG_H)				*Y* (DEQ_H)		
Antecedent		Coeff.	*SE*	*p*		Coeff.	*SE*	*p*
X (Group)	a_1	−351.78	219.85	.112	c'_1	0.22	0.29	.443
M (COR_S)		–	–	–	*b*	0.00	0.00	.530
W (B-PNI G)	a_2	−343.15	134.52	.012		–	–	–
X × *W*	a_3	188.34	87.47	.033		–	–	–
U_1 (DEQ_{Hb})	f_1	13.32	21.27	.532	c'_2	0.41	0.10	.000
U_2 (B-PNI V)	g_1	10.26	48.08	.831	c'_3	0.11	0.18	.535
Constant	i_M	981.88	337.21	.004	i_Y	2.17	0.61	.001
		R^2 = .09 $F(5, 114) = 2.19, p = .060$				R^2 = .15 $F(4, 115) = 4.98, p = .001$		

Note. $N = 120$. B-PNI G = Brief Pathological Narcissism Inventory – Grandiose subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; DEQ_H = DEQ Happiness during the happy body comparison condition; DEQ_{Hb} = DEQ Happiness during the baseline condition; ZYG_H = mean EMG zygomaticus amplitude during the happy body comparison condition expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition.

Table 26

Study 3 – Model 4 Moderated Mediation Analysis with Group as the Predictor, ZYG_H as the Mediator, DEQ_H as the Outcome, and B-PNI V as the Moderator

		Consequent						
		M (ZYG_H)				*Y* (DEQ_H)		
Antecedent		Coeff.	*SE*	*p*		Coeff.	*SE*	*p*
X (Group)	a_1	−115.90	155.88	.459	c'_1	0.21	0.29	.471
M (COR_S)		–	–	–	b	0.00	0.00	.443
W (B-PNI V)	a_2	−172.62	128.28	.181		–	–	–
X × *W*	a_3	117.84	77.08	.129		–	–	–
U_1 (DEQ_{Hb})	f_1	19.47	21.29	.362	c'_2	0.41	0.10	.000
U_2 (B-PNI G)	g_1	−67.13	54.76	.223	c'_3	0.25	0.20	.212
Constant	i_M	642.24	253.36	.013	i_Y	1.80	0.70	.013
		$R^2 = .07$ $F(5, 114) = 1.71, p = .139$				$R^2 = .16$ $F(4, 115) = 5.32, p < .001$		

Note. *N* = 120. B-PNI G = Brief Pathological Narcissism Inventory – Grandiose subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; DEQ_H = DEQ Happiness during the happy body comparison condition; DEQ_{Hb} = DEQ Happiness during the baseline condition; ZYG_H = mean EMG zygomaticus amplitude during the happy body comparison condition expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition.

Table 27

Study 3 – Exploratory Model A1 Moderated Moderation Analysis with Group as the Predictor, COR_S as the Outcome, B-PNI V as the Primary Moderator, and B-PNI G as the Secondary Moderator

			Y (COR_S)		
Model	Antecedent		Coeff.	*SE*	*p*
Model A1	X (Group)	a_1	929.15	259.43	.001
	W (B-PNI V)	a_2	528.43	247.21	.035
	Z (B-PNI G)	a_3	177.21	170.50	.301
	$X \times W$	a_4	−599.50	157.94	.001
	$X \times Z$	a_5	−228.79	111.66	.043
	$W \times Z$	a_6	−138.53	85.90	.110
	$X \times W \times Z$	a_7	173.80	55.93	.002
	Constant	i_M	−594.03	395.67	.136
				$R^2 = .29$ $F(7, 112) = 6.55, p < .001$	

Note. $N = 120$. B-PNI G = Brief Pathological Narcissism Inventory – Grandiosity subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; COR_S = mean EMG corrugator amplitude during the sad body comparison condition expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition.

Table 28

Study 3 – Exploratory Model A2 Moderated Moderation Analysis with Group as the Predictor, ZYG_H as the Outcome, B-PNI G as the Primary Moderator, and B-PNI V as the Secondary Moderator

			Y (ZYG_H)		
Model	Antecedent		Coeff.	*SE*	*p*
Model A2	X (Group)	a_1	840.79	428.96	.052
	W (B-PNI G)	a_2	373.73	281.91	.188
	Z (B-PNI V)	a_3	1128.34	408.75	.007
	$X \times W$	a_4	−312.95	184.63	.093
	$X \times Z$	a_5	−772.28	261.15	.004
	$W \times Z$	a_6	−431.71	142.03	.003
	$X \times W \times Z$	a_7	300.85	92.48	.002
	Constant	i_M	–		
				$R^2 = .16$ $F(7, 112) = 3.14, p = .005$	

Note. $N = 120$. B-PNI G = Brief Pathological Narcissism Inventory – Grandiosity subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; ZYG_H = mean EMG zygomaticus amplitude during the happy body comparison condition expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition.

Table 29

Study 3 – Means and Standard Deviations of BCQ Data Across Body Comparison Groups

Variables	Body Comparison Group: EC (N = 59)	Body Comparison Group: IC (N = 61)	t(118)	p
BCQ Strength	3.75 (1.67)	3.52 (1.84)	0.75	.456
BCQ Direction	4.61 (1.35)	4.61 (1.43)	−0.00	.999

Note. Standard deviation is presented in parentheses. BCQ = Body Comparison Questionnaire; IC = Implicit Comparison; EC = Explicit Comparison.

Table 30

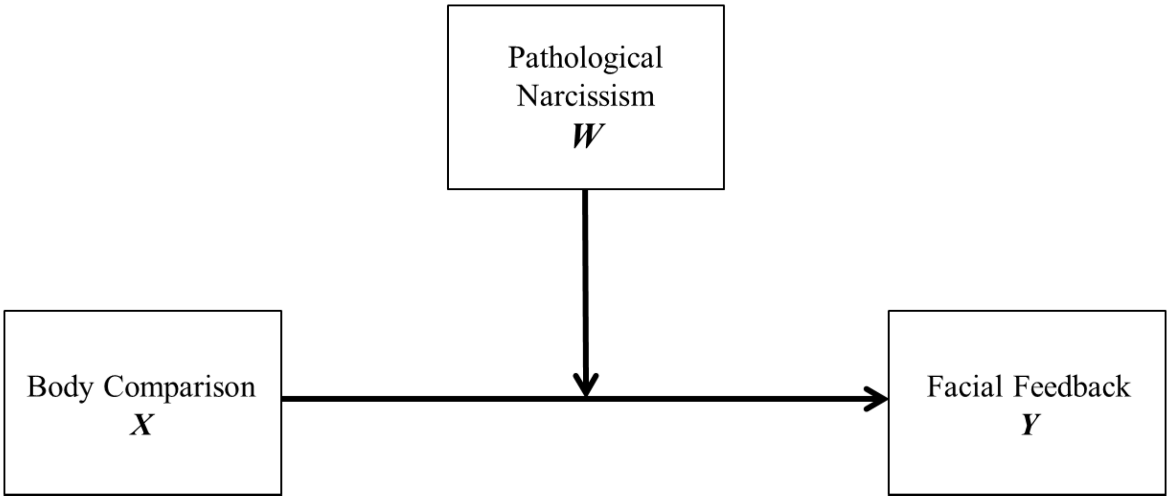
Study 3 – Exploratory B1, B2, and B3 Moderation Analyses with CSWS Appearance, Competition, and Other' Approval as the Predictor, BCQ Strength as the Outcome, and B-PNI G as the Moderator

			Y (BCQ Strength)		
Model	Antecedent		Coeff.	*SE*	*p*
Model B1	*X* (CSWS Appearance)	a_1	−0.55	2.93	.853
	W (B-PNI G)	a_2	1.65	1.16	.285
	X × *W*	a_3	−0.26	0.23	.157
	U_1 (B-PNI V)	f_1	0.65	0.36	.258
	Constant	i_M	0.12	0.27	.669
			R^2 = .04 $F(4, 120) = 1.32$, $p = .267$		
Model B2	*X* (CSWS Competition)	a_1	0.39	0.41	.352
	W (B-PNI G)	a_2	1.19	0.75	.116
	X × *W*	a_3	−0.20	0.17	.254
	U_1 (B-PNI V)	f_1	0.17	0.26	.533
	Constant	i_M	0.94	1.69	.580
			R^2 = .04 $F(4, 120) = 1.35$, $p = .256$		
Model B3	*X* (CSWS Others' Approval)	a_1	1.07	0.43	.015
	W (B-PNI G)	a_2	1.99	0.75	.009
	X × *W*	a_3	−0.37	0.16	.026
	U_1 (B-PNI V)	f_1	−0.40	0.27	.882
	Constant	i_M	−1.74	1.85	.350
			R^2 = .08 $F(4, 120) = 2.59$, $p = .040$		

Note. *N* = 120. B-PNI G = Brief Pathological Narcissism Inventory – Grandiosity subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; BCQ = Body Comparison Questionnaire; CSWS = Contingencies of Self-Worth Scale.

Figure 1

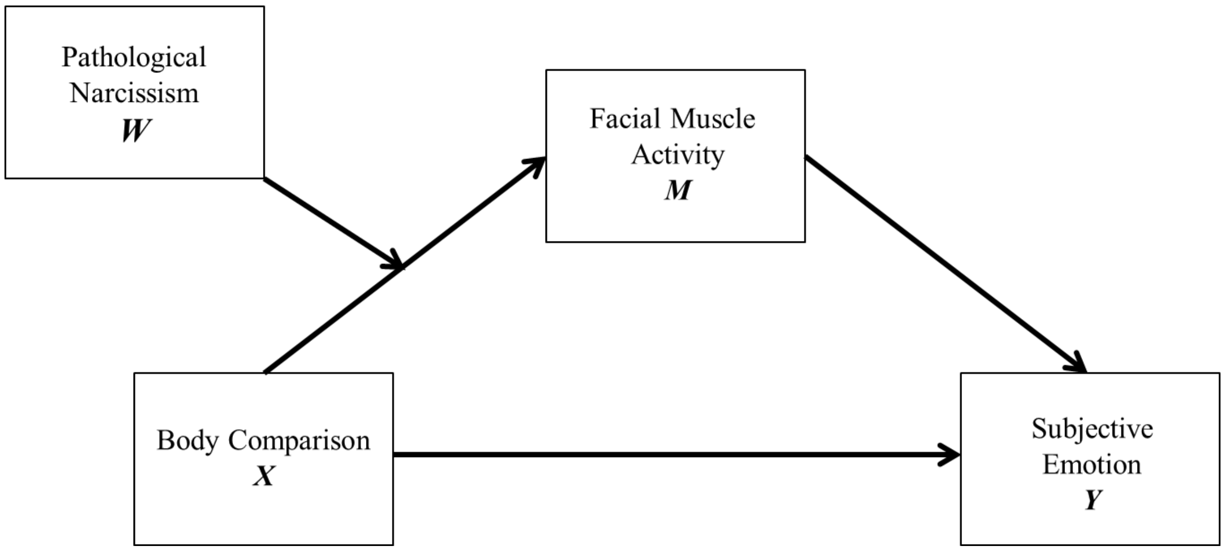
Conceptual Model of the Moderating Effect of Narcissism on the Relationship Between Body Comparison and Facial Feedback



Note. W = moderator effect; *X* = independent variable; *Y* = dependent variable.

Figure 2

Conceptual Model of the Mediating Effect of Facial Muscle Activity on the Relationship Between Body Comparison and Subjective Emotion, Moderated by Narcissism



Note. M = mediator effect; *W* = moderator effect; *X* = independent variable; *Y* = dependent variable.

Figure 3

Timeline of Activities During Study 1 Laboratory Session

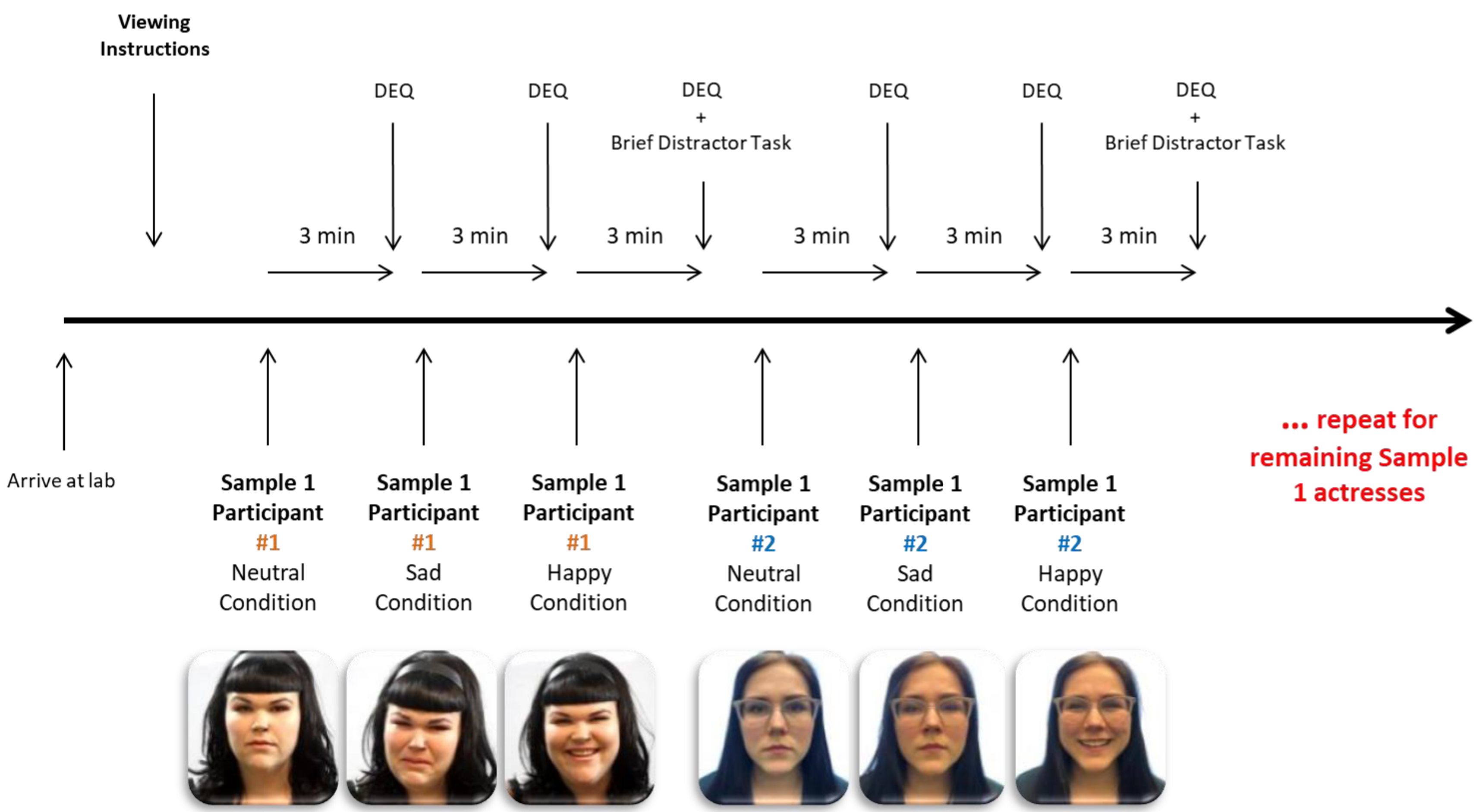
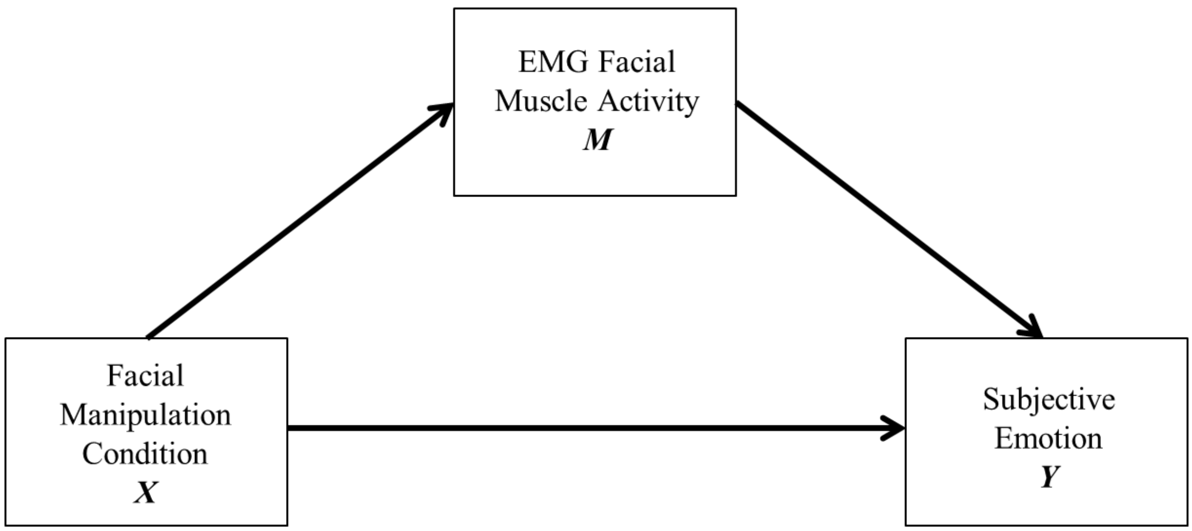


Figure 4

Conceptual Model of the Mediating Effect of EMG Facial Muscle Activity on the Relationship Between Facial Manipulation Group and Subjective Emotion



Note. M = mediator effect; *X* = independent variable; *Y* = dependent variable.

Figure 5

Diagram Illustrating the Placement Site for Bipolar EMG Electrodes for the Corrugator and Zygomaticus Muscle Regions of the Face

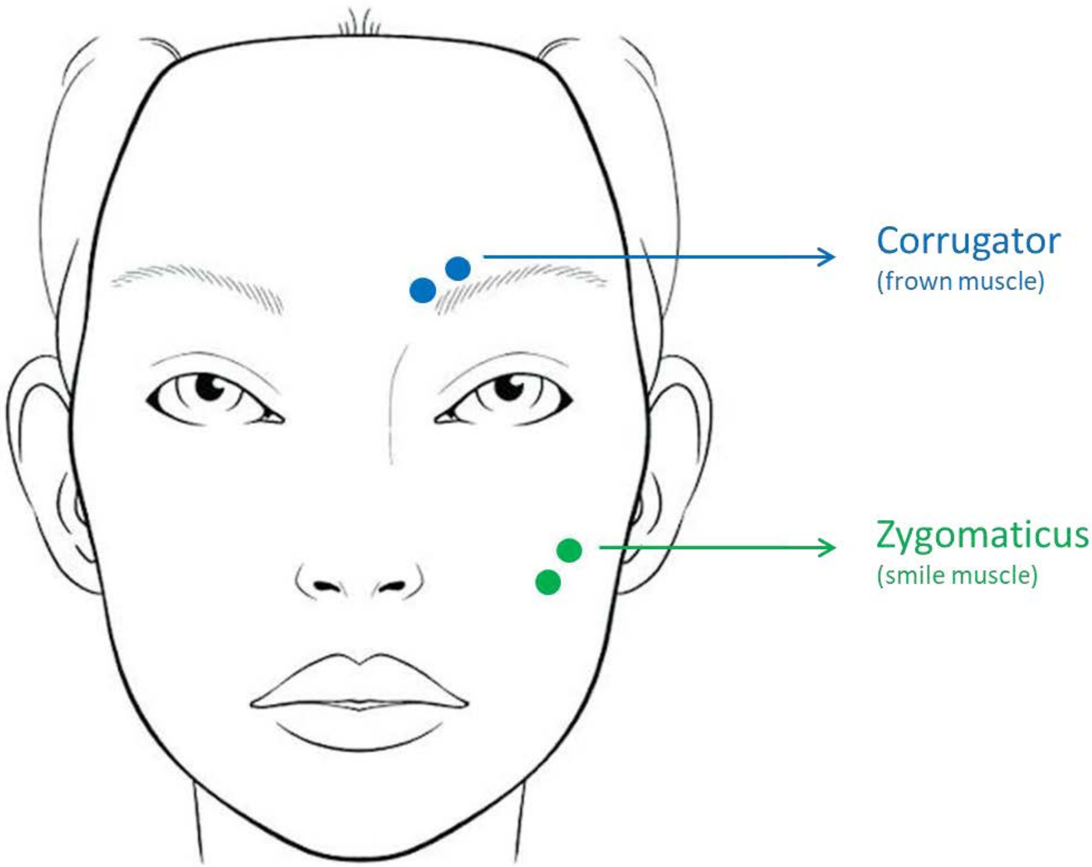


Figure 6

Timeline of Activities During Study 2 Laboratory Session

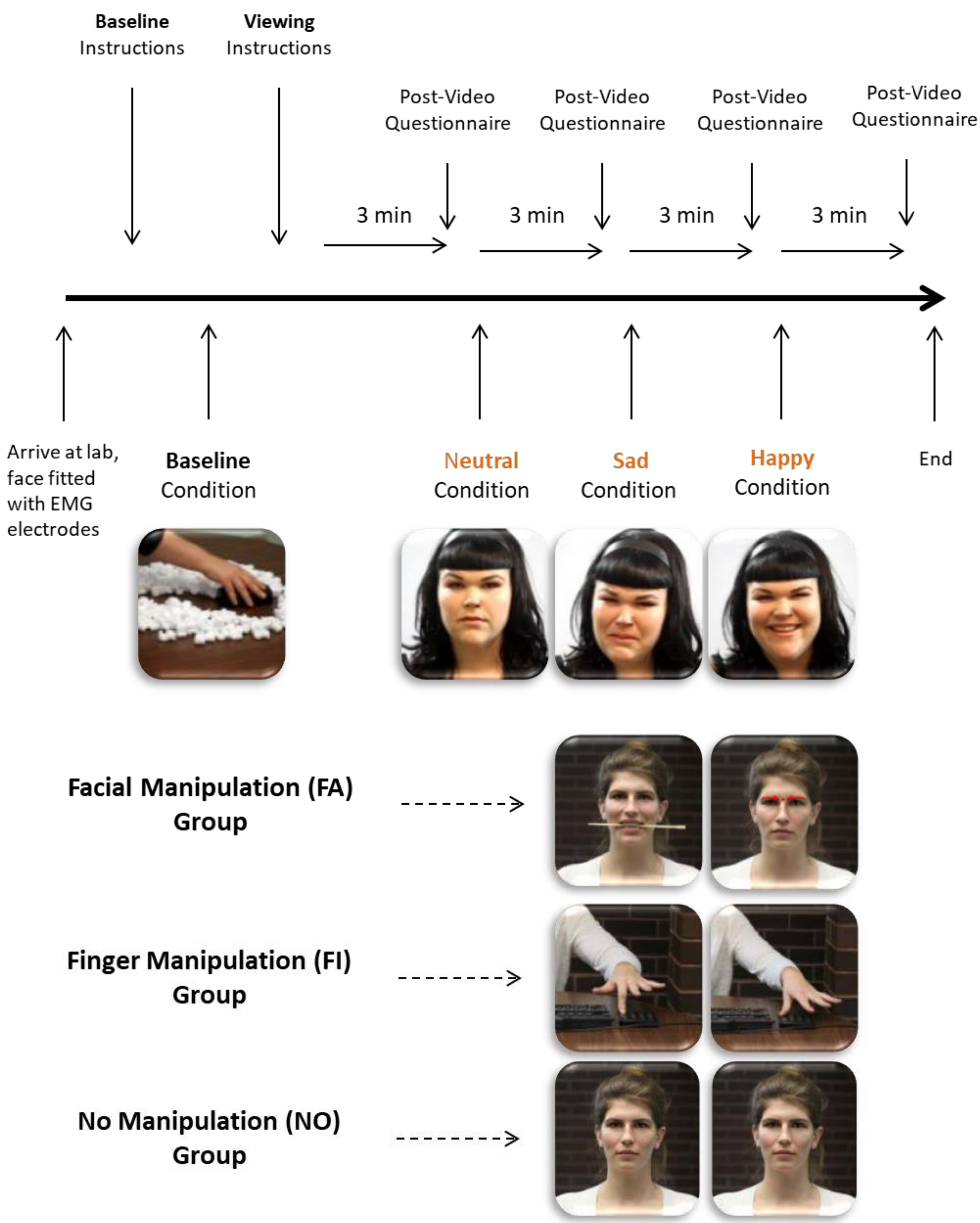
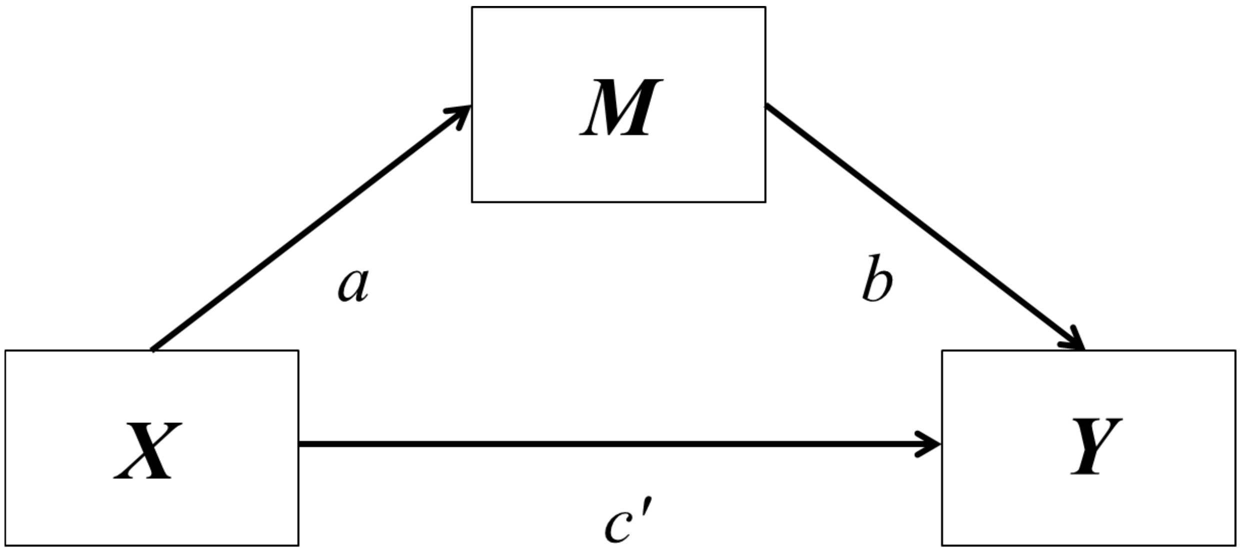


Figure 7

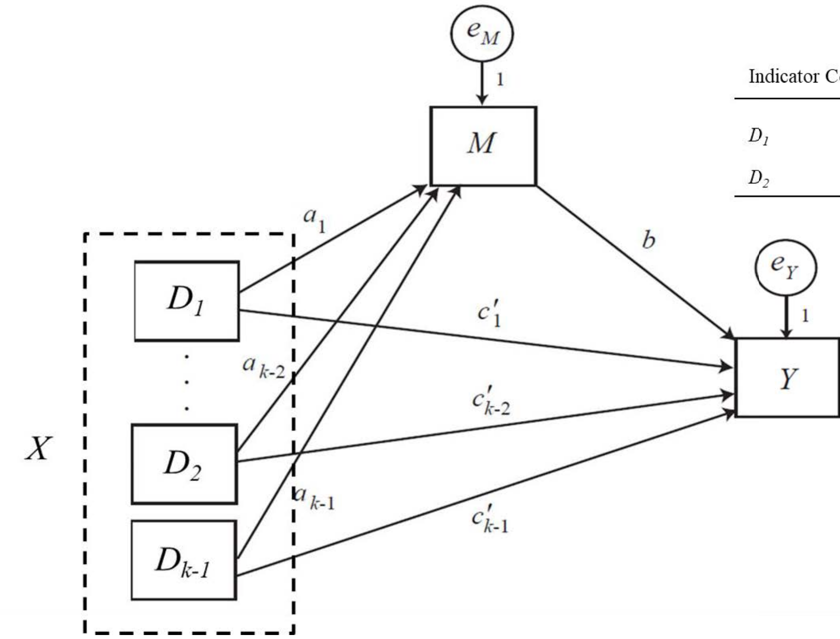
Statistical Diagram of Simple Mediation



Note. *M* = mediator effect. *X* = independent variable; *Y* = dependent variable; *c'* = regression coefficient predicting the influence of *X* on *Y*; *a* = regression coefficient predicting the influence of *X* on *M*; *b* = regression coefficient predicting the influence of *M* on *Y*.

Figure 8

Statistical Diagram of Simple Mediation with a Multicategorical Antecedent X with k Categories



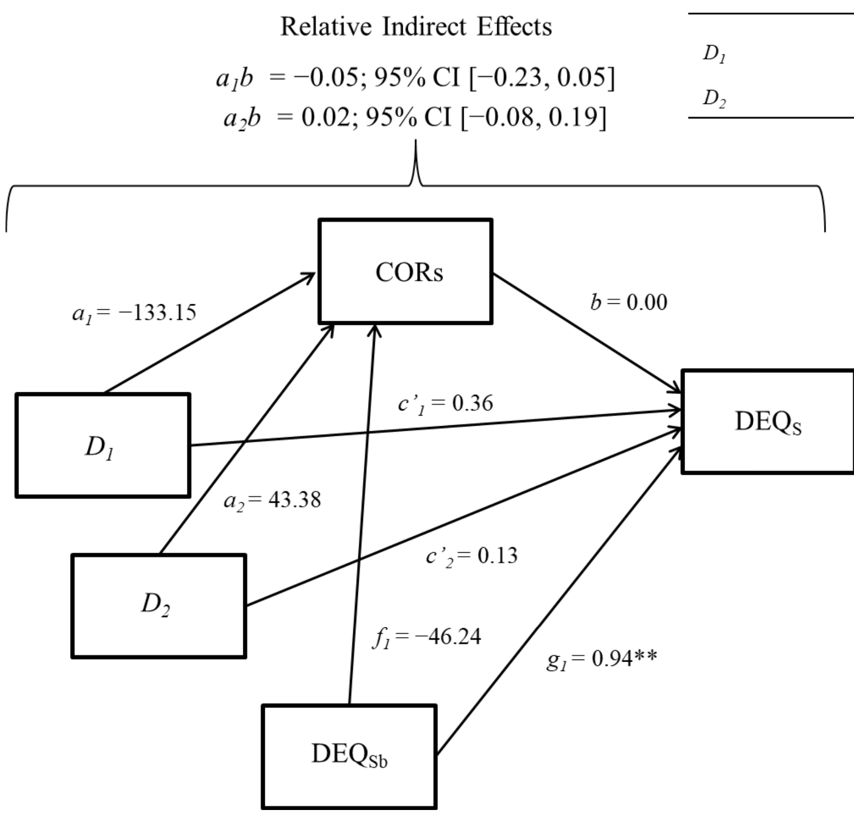
	Group		
Indicator Code	A	B	C
D_1	1	0	0
D_2	0	1	0

Note. Adapted from "Statistical Mediation Analysis with a Multicategorical Independent Variable," by A. Hayes and K. Preacher, 2014, *British Journal of Mathematical and Statistical Psychology*, *67*, p. 457. Copyright 2014 by the American Psychological Association.

Figure 9

Study 2 – Path Diagram of Model 1 Mediation Analysis with Facial Manipulation Group as the Predictor, COR_S as the Mediator, DEQ_S as the Outcome, and the NO Group as the Reference Group

	Facial Manipulation Group		
Indicator Code	FA	FI	NO
D_1	1	0	0
D_2	0	1	0



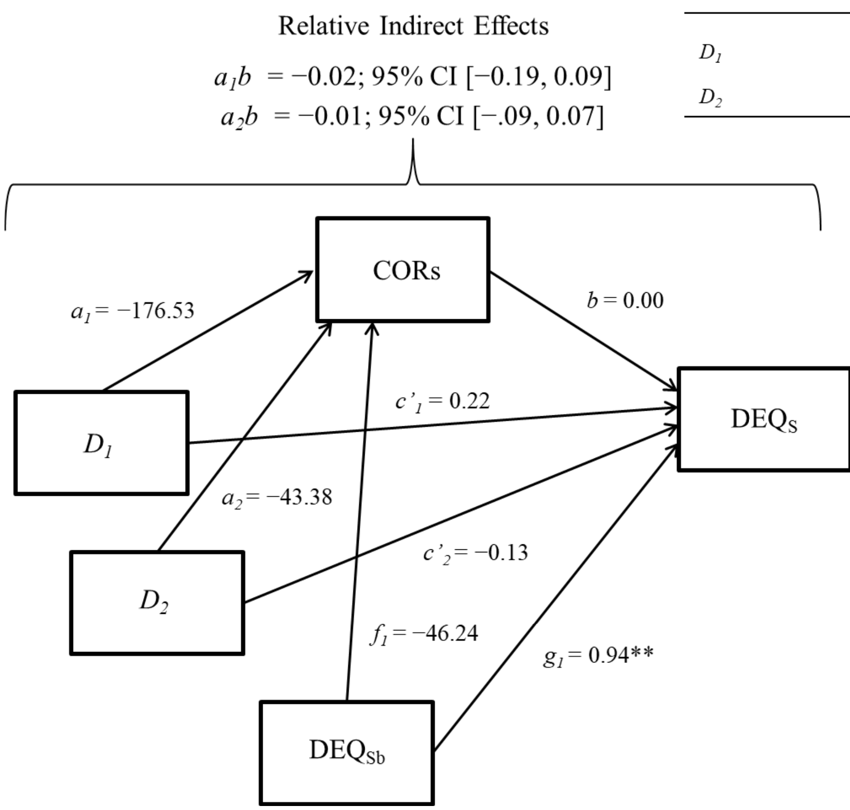
Note. N = 89. FA = Facial manipulation group; FI = Finger manipulation group; NO = No manipulation group; COR_S = mean EMG corrugator amplitude during the sad condition expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition; DEQ_S = DEQ Sadness during the sad condition; DEQ_{Sb} = DEQ Sadness during the baseline condition.

**p* < .05; ***p* < .01.

Figure 10

Study 2 – Path Diagram of Model 2 Mediation Analysis with Facial Manipulation Group as the Predictor, COR_S as the Mediator, DEQ_S as the Outcome, and the FI Group as the Reference Group

	Facial Manipulation Group		
Indicator Code	FA	FI	NO
D_1	1	0	0
D_2	0	0	1

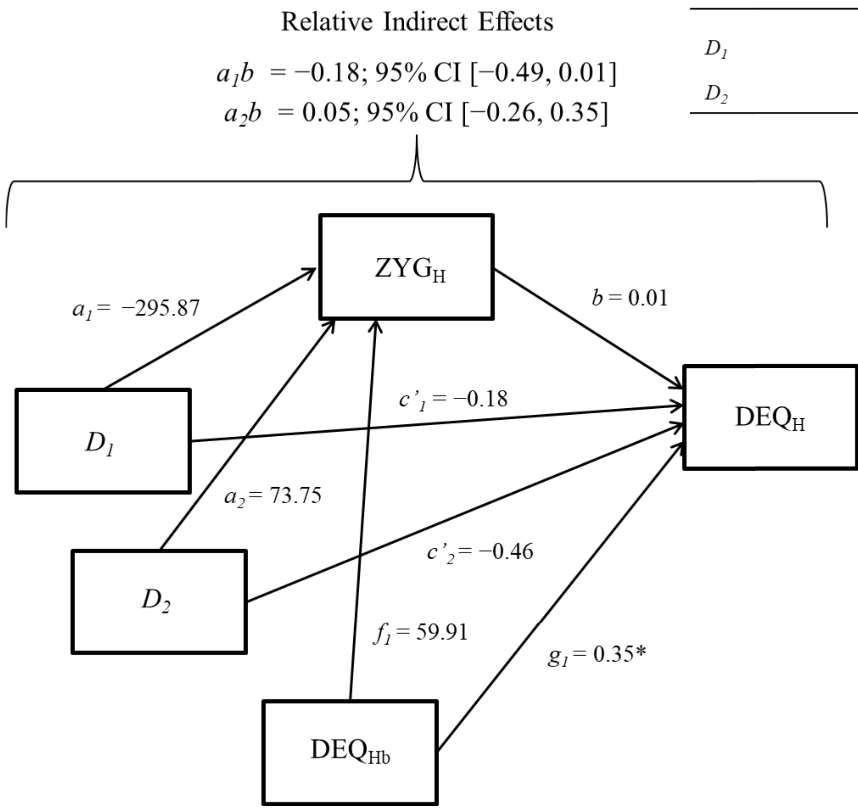


Note. N = 89. FA = Facial manipulation group; FI = Finger manipulation group; NO = No manipulation group; COR_S = mean EMG corrugator amplitude during the sad condition expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition; DEQ_S = DEQ Sadness during the sad condition; DEQ_{Sb} = DEQ Sadness during the baseline condition.
**p* < .05; ***p* < .01.

Figure 11

Study 2 –Path Diagram of Model 3 Mediation Analysis with Facial Manipulation Group as the Predictor, ZYG_H as the Mediator, DEQ_H as the Outcome, and the NO Group as the Reference Group

	Facial Manipulation Group		
Indicator Code	FA	FI	NO
D_1	1	0	0
D_2	0	1	0



Note. N = 89. FA = Facial manipulation group; FI = Finger manipulation group; NO = No manipulation group; ZYG_H = mean EMG zygomaticus amplitude during the happy condition expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition; DEQ_H = DEQ Happiness during the happy condition; DEQ_{Hb} = DEQ Happiness during the baseline condition.
**p* < .05; ***p* < .01.

Figure 12

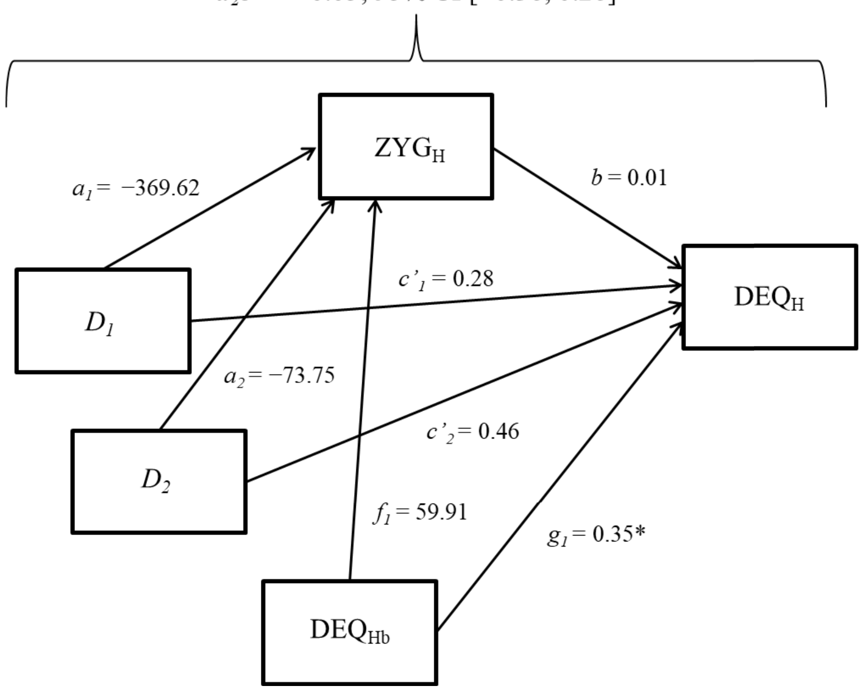
Study 2 – Path Diagram of Model 4 Mediation Analysis with Facial Manipulation Group as the Predictor, ZYG_H as the Mediator, DEQ_H *as the Outcome, and the FI Group as the Reference Group*

	Facial Manipulation Group		
Indicator Code	FA	FI	NO
D_1	1	0	0
D_2	0	0	1

Relative Indirect Effects

a_1b = −0.23; 95% CI [−0.57, 0.01]

a_2b = −0.05; 95% CI [−0.36, 0.26]

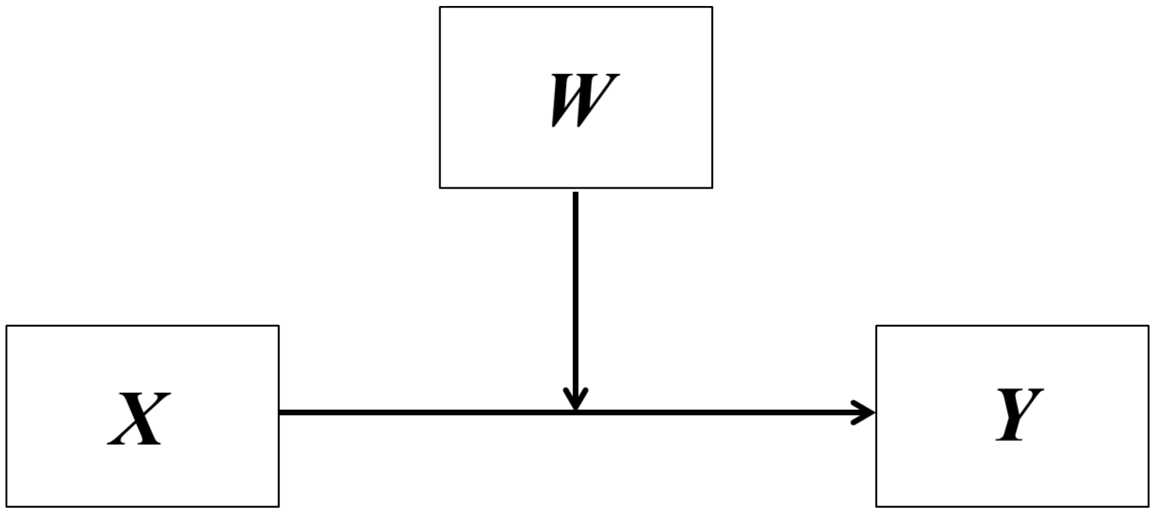


Note. N = 89. FA = Facial manipulation group; FI = Finger manipulation group; NO = No manipulation group; ZYG_H = mean EMG zygomaticus amplitude during the happy condition expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition; DEQ_H = DEQ Happiness during the happy condition; DEQ_{Hb} = DEQ Happiness during the baseline condition.

*p < .05; **p < .01.

Figure 13

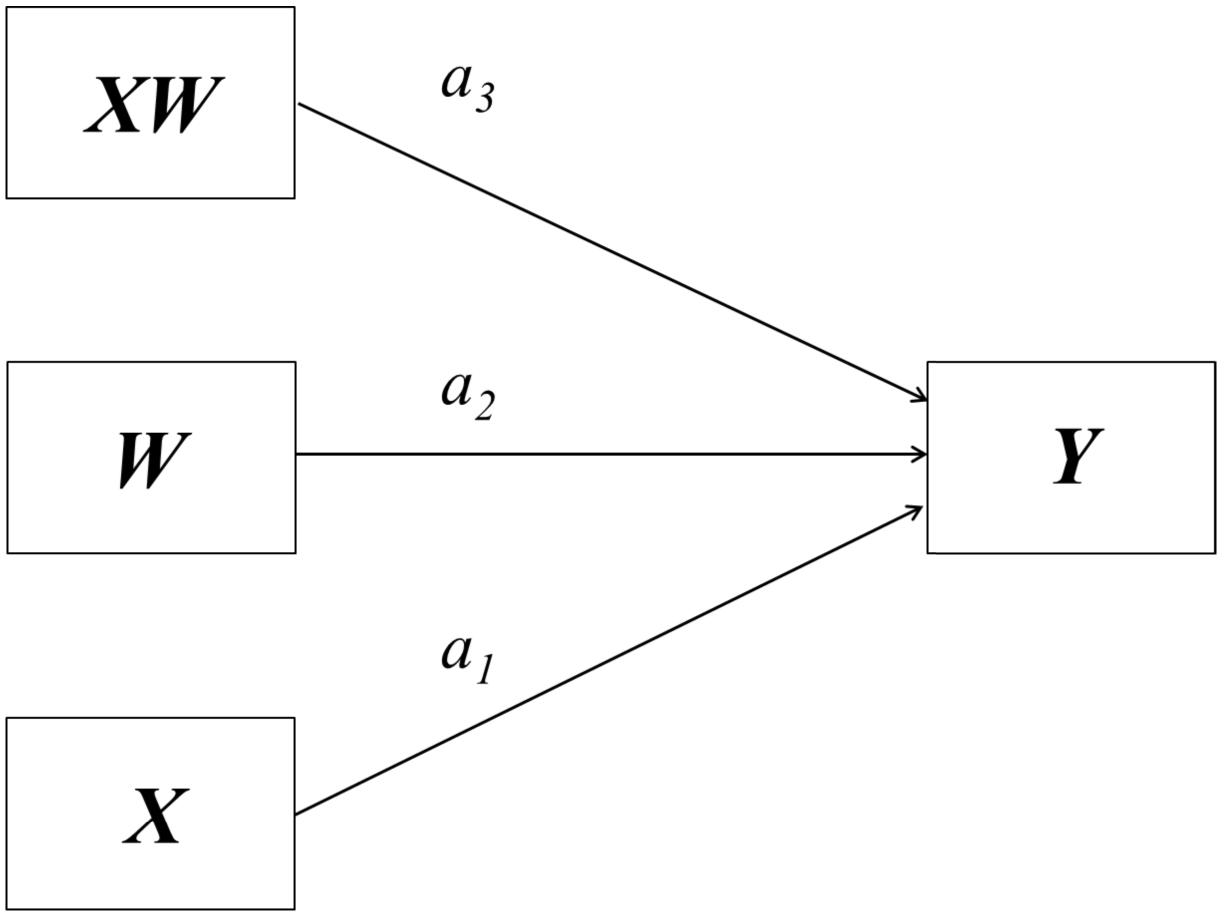
Conceptual Diagram of Simple Moderation



Note. W = moderator effect; *X* = independent variable; *Y* = dependent variable.

Figure 14

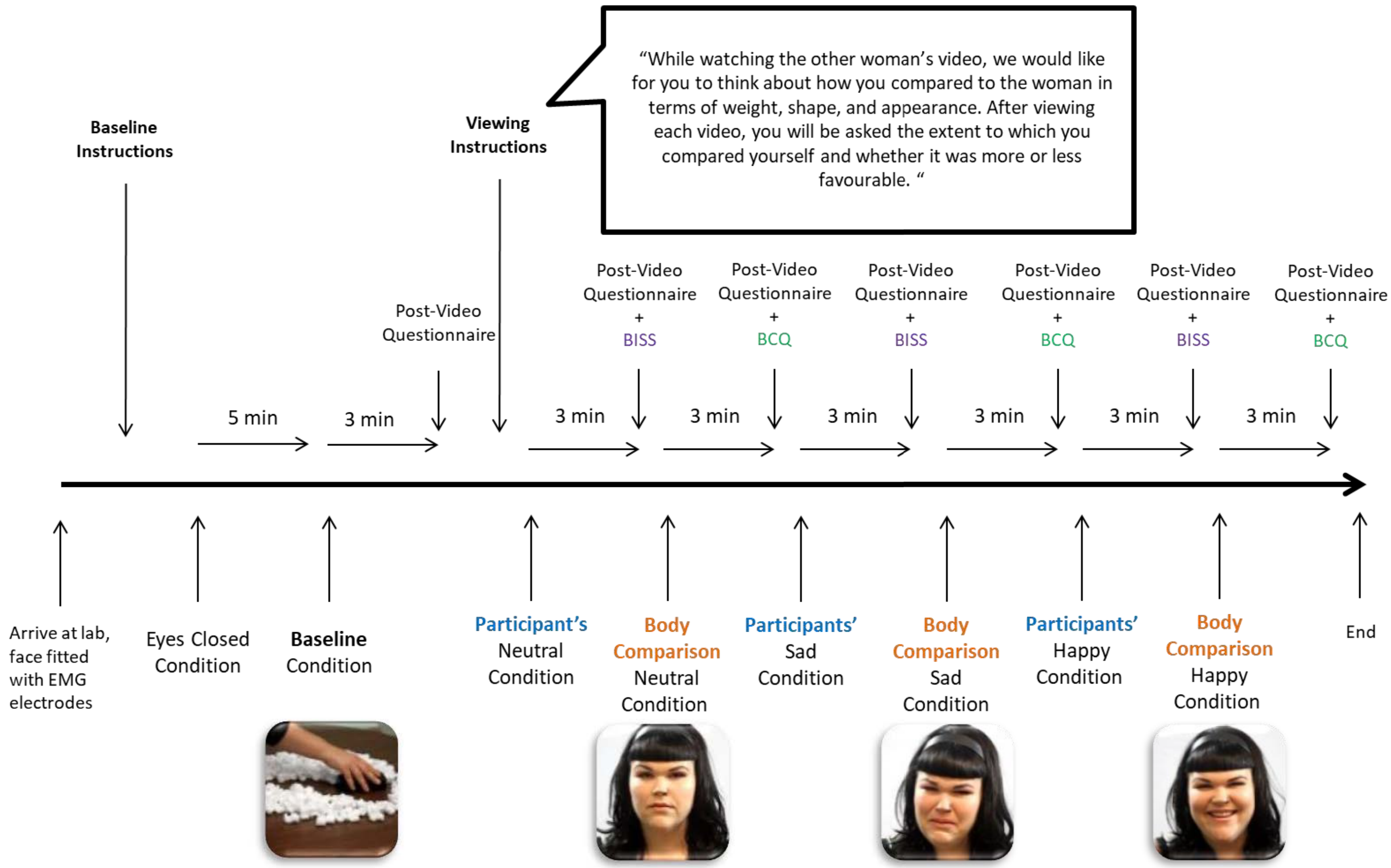
Statistical Diagram of Simple Moderation



Note. *W* = moderator effect; *X* = independent variable; *Y* = dependent variable; a_1 = simple effect of *X* on *Y* when *W* is set at 0; b_2 = simple effect of *W* on *Y* when *X* is set at 0; b_3 = conditional effect or product term of *X* and *W*.

Figure 15

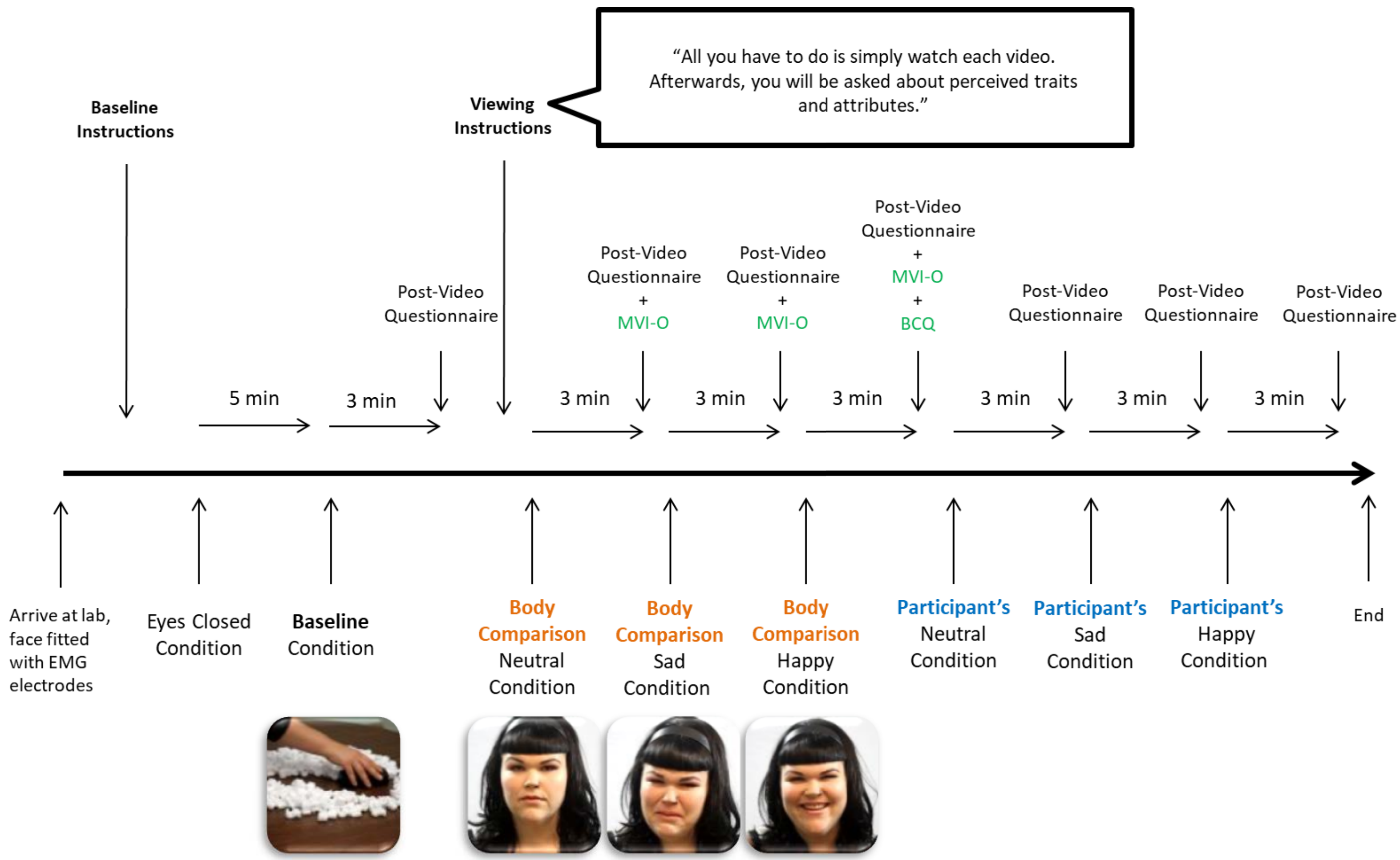
Timeline of Activities During Study 3 Laboratory Session for Participants in the EC Group



Note. EC = explicit comparison; BCQ = Body Comparison Questionnaire; BISS = Body Image States Scale.

Figure 16

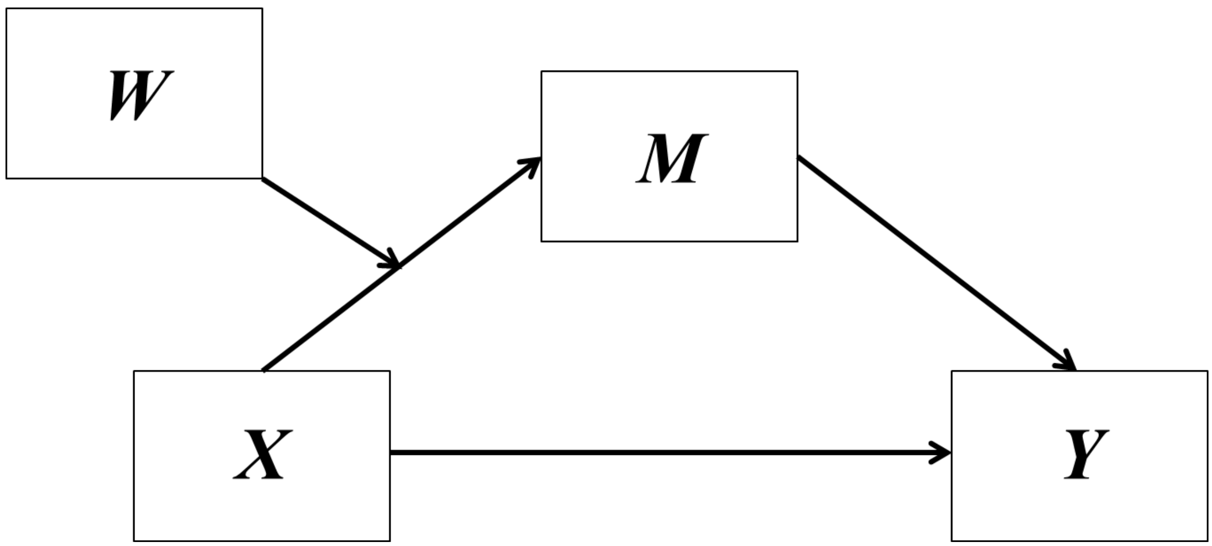
Timeline of Activities During Study 3 Laboratory Session for Participants in the IC Group



Note. IC = implicit comparison; BCQ = Body Comparison Questionnaire; MVI–O = Mate Value Inventory – Other.

Figure 17

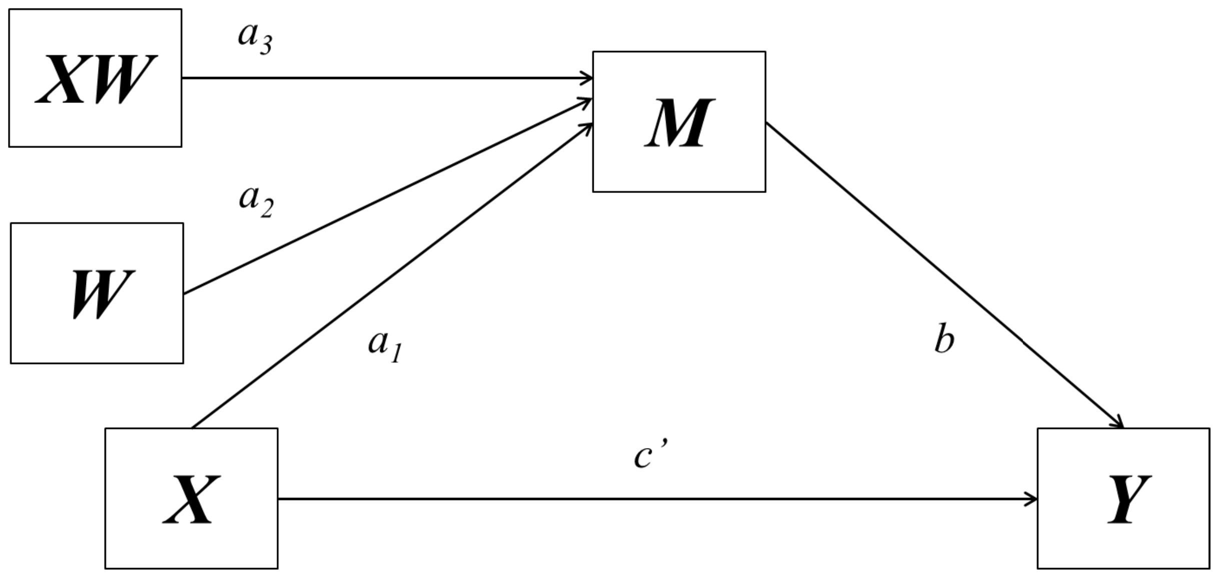
Conceptual Diagram of the Conditional Process Model with the Moderation Operating at the First Stage of the Mediation Process



Note. *W* = moderator effect. *M* = mediator effect; *X* = independent variable; *Y* = dependent variable.

Figure 18

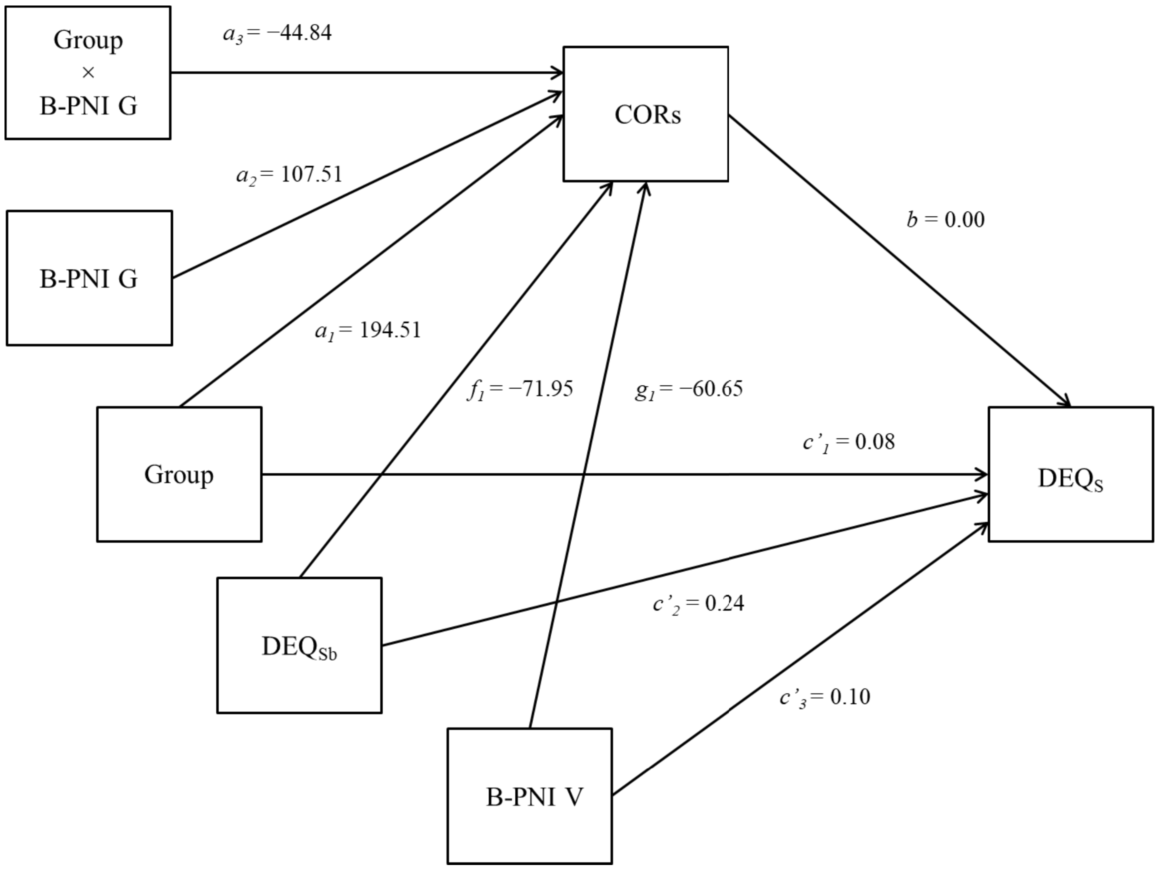
Statistical Diagram of Moderated Mediation



Note. W = moderator effect. *M* = mediator effect; *X* = independent variable; *Y* = dependent variable; *c'* = regression coefficient predicting the influence of *X* on *Y*; a_1 = regression coefficient predicting the influence of *X* on *M;* a_2 = simple effect of *W* on *Y* when *X* is set at 0; a_3 = conditional effect or product term of *X* and *W; b* = regression coefficient predicting the influence of *M* on *Y.*

Figure 19

Study 3 – Path Diagram for Model 1 Moderated Mediation Analysis with Group as the Predictor, COR_S as the Mediator, DEQ_S as the Outcome, and B-PNI G as the Moderator

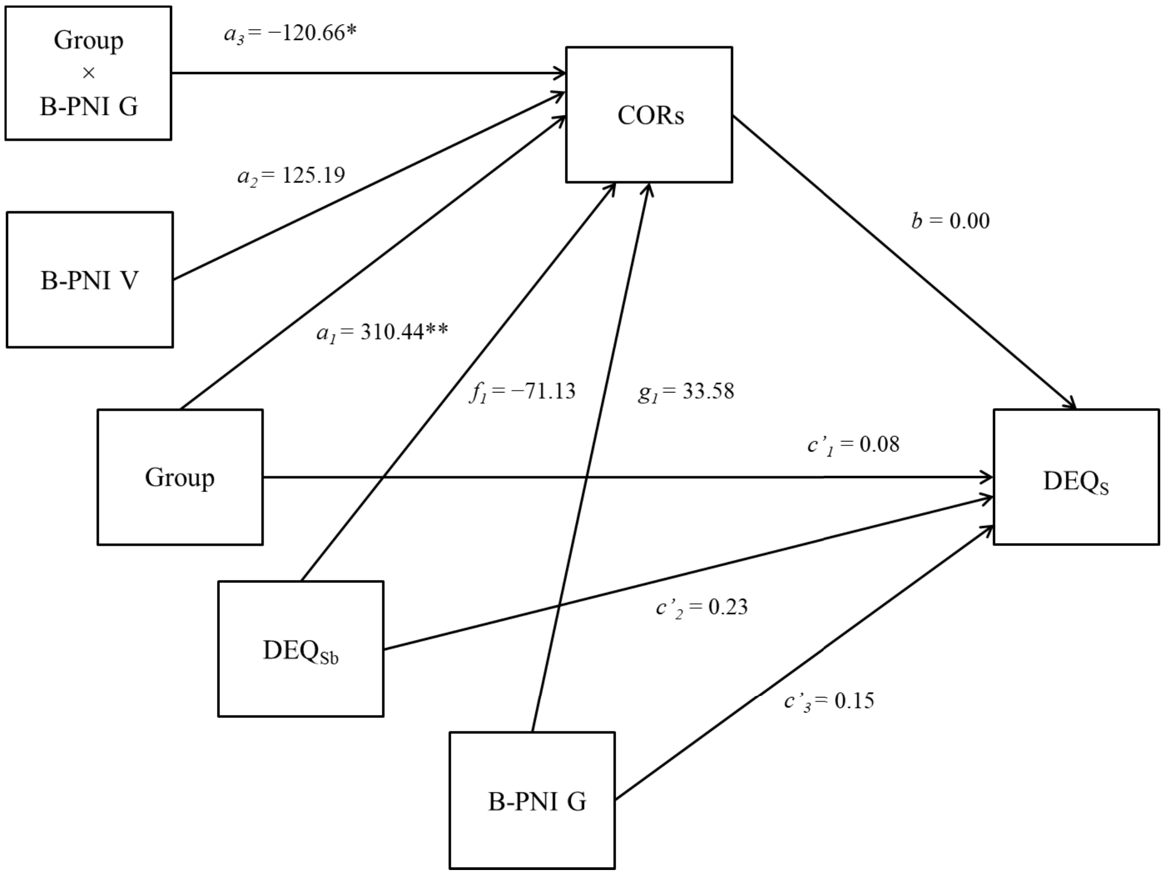


Note. N = 120. B-PNI G = Brief Pathological Narcissism Inventory – Grandiose subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; DEQ_S = DEQ Sadness during the sad body comparison condition; DEQ_{Sb} = DEQ Sadness during the baseline condition; COR_S = mean EMG corrugator amplitude during the sad body comparison condition expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition.

*$p < .05$; **$p < .01$.

Figure 20

Study 3 – Path Diagram for Model 2 Moderated Mediation Analysis with Group as the Predictor, COR_S as the Mediator, DEQ_S as the Outcome, and B-PNI V as the Moderator

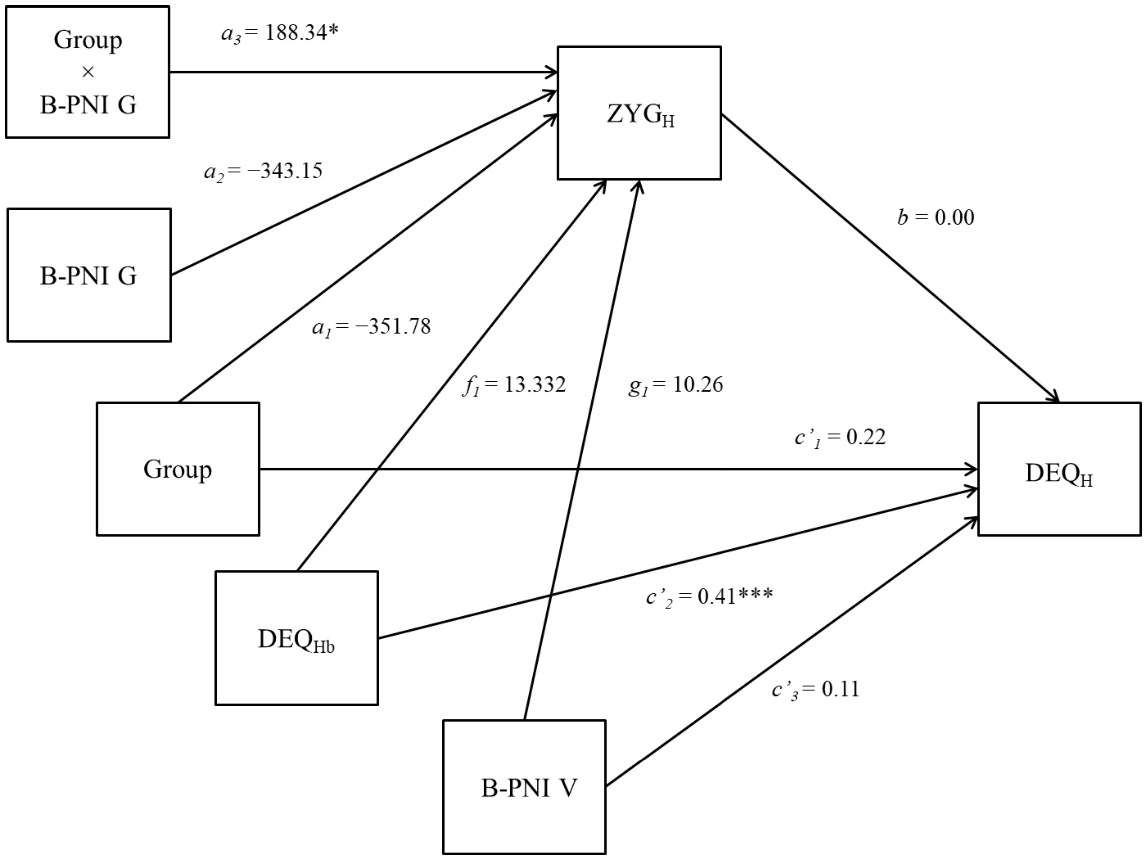


Note. *N* = 120. B-PNI G = Brief Pathological Narcissism Inventory – Grandiose subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; DEQ_S = DEQ Sadness during the sad body comparison condition; DEQ_{Sb} = DEQ Sadness during the baseline condition; COR_S = mean EMG corrugator amplitude during the sad body comparison condition expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition.

**p* < .05; ***p* < .01.

Figure 21

Study 3 – Path Diagram for Model 3 Moderated Mediation Analysis with Group as the Predictor, ZYG_H as the Mediator, DEQ_H *as the Outcome, and B-PNI G as the Moderator*

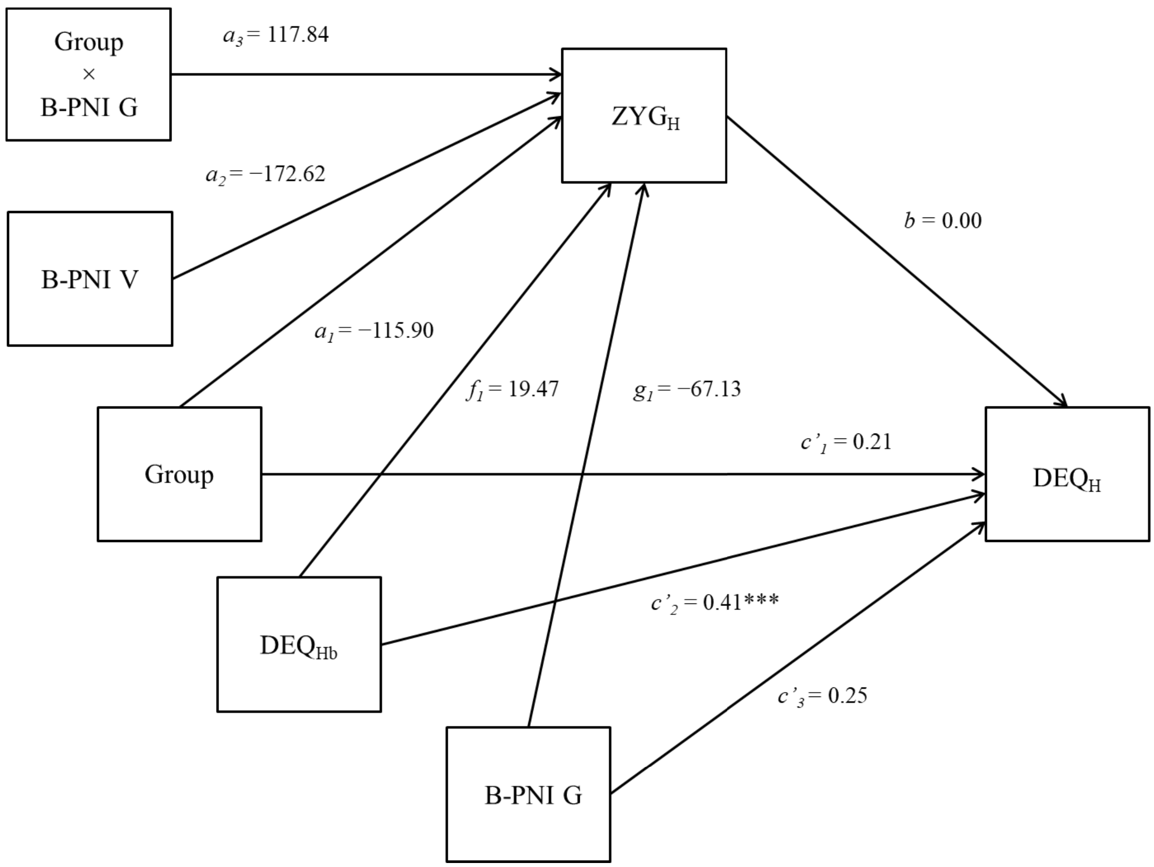


Note. N = 120. B-PNI G = Brief Pathological Narcissism Inventory – Grandiose subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; DEQ_H = DEQ Happiness during the happy body comparison condition; DEQ_{Hb} = DEQ Happiness during the baseline condition; ZYG_H = mean EMG zygomaticus amplitude during the happy body comparison condition expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition.

*$p < .05$; **$p < .01$, ***$p < .001$.

Figure 22

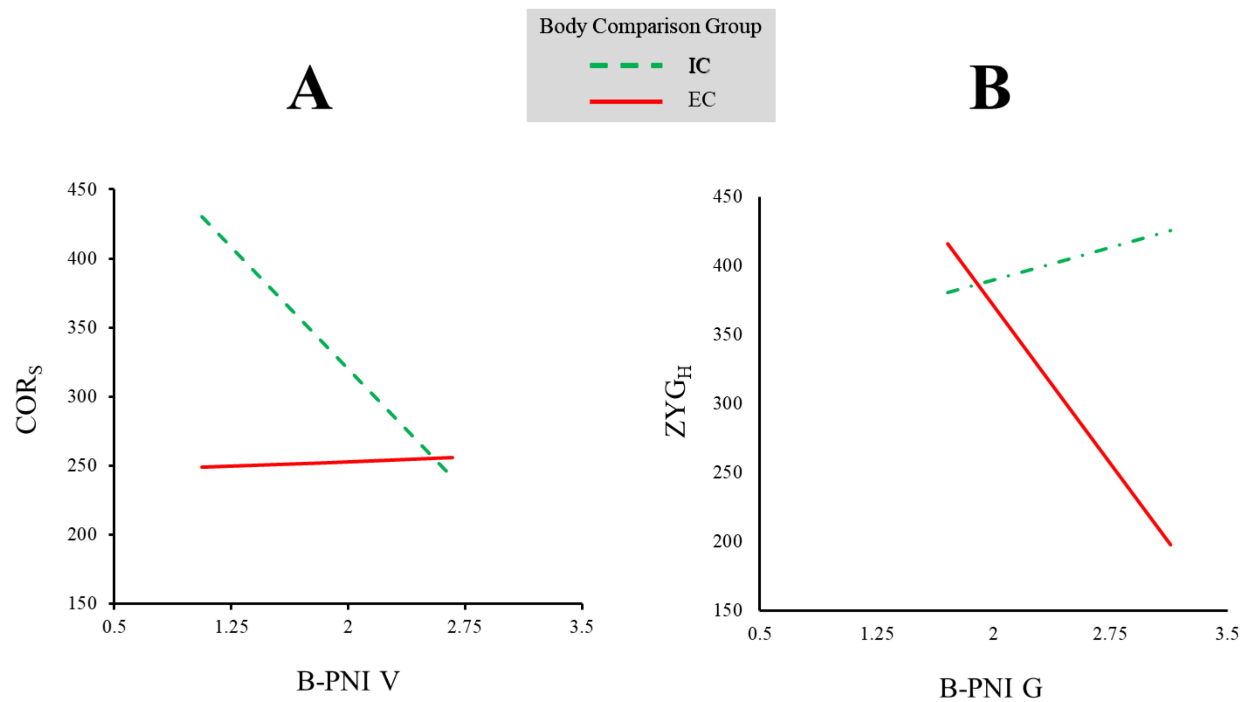
Study 3 – Path Diagram for Model 4 Moderated Mediation Analysis with Group as the Predictor, ZYG_H as the Mediator, DEQ_H as the Outcome, and B-PNI V as the Moderator



Note. N = 120. B-PNI G = Brief Pathological Narcissism Inventory – Grandiose subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; DEQ_H = DEQ Happiness during the happy body comparison condition; DEQ_{Hb} = DEQ Happiness during the baseline condition; ZYG_H = mean EMG zygomaticus amplitude during the happy body comparison condition expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition.
*$p < .05$; **$p < .01$, ***$p < .001$.

Figure 23

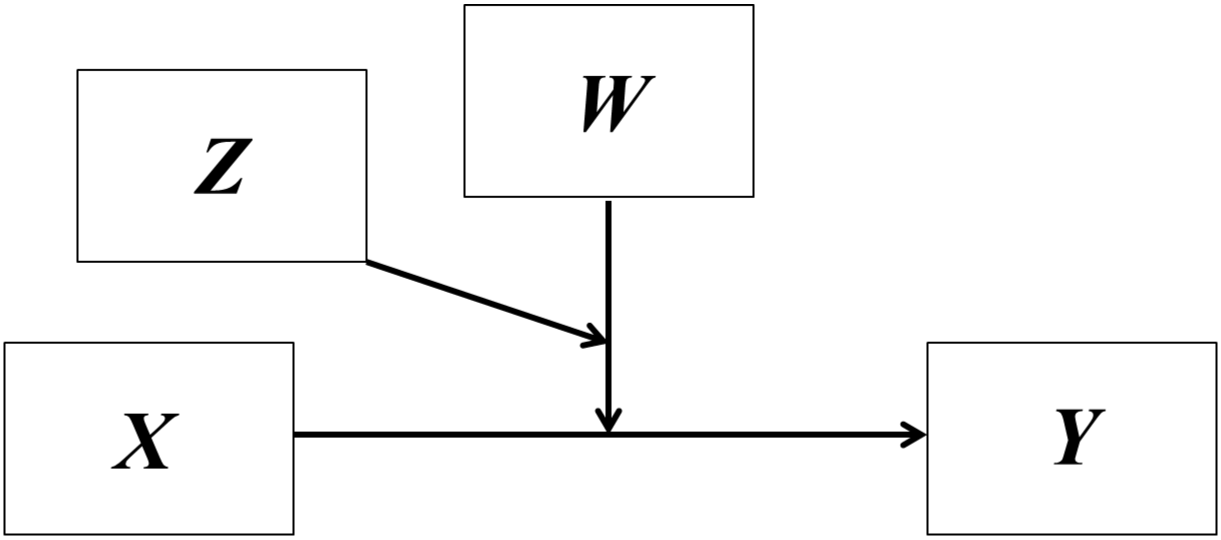
Moderating Influence of Narcissism on the Relationship Between Body Comparison and EMG Facial Muscle Activity Across Emotion Conditions



Note. N = 120. Panel A: COR_S plotted as a function of B-PNI V by body comparison group during sad body comparison condition. Panel B: ZYG_H plotted as a function of the B-PNI G by Body Comparison Group During the Happy Body Comparison Condition. B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; B-PNI G = Brief Pathological Narcissism Inventory – Grandiose subscale; COR_S = mean EMG corrugator amplitude during the sad body comparison condition expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition; ZYG_H = mean EMG zygomaticus amplitude during the happy body comparison condition expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition; IC = implicit comparison; EC = explicit comparison.

Figure 24

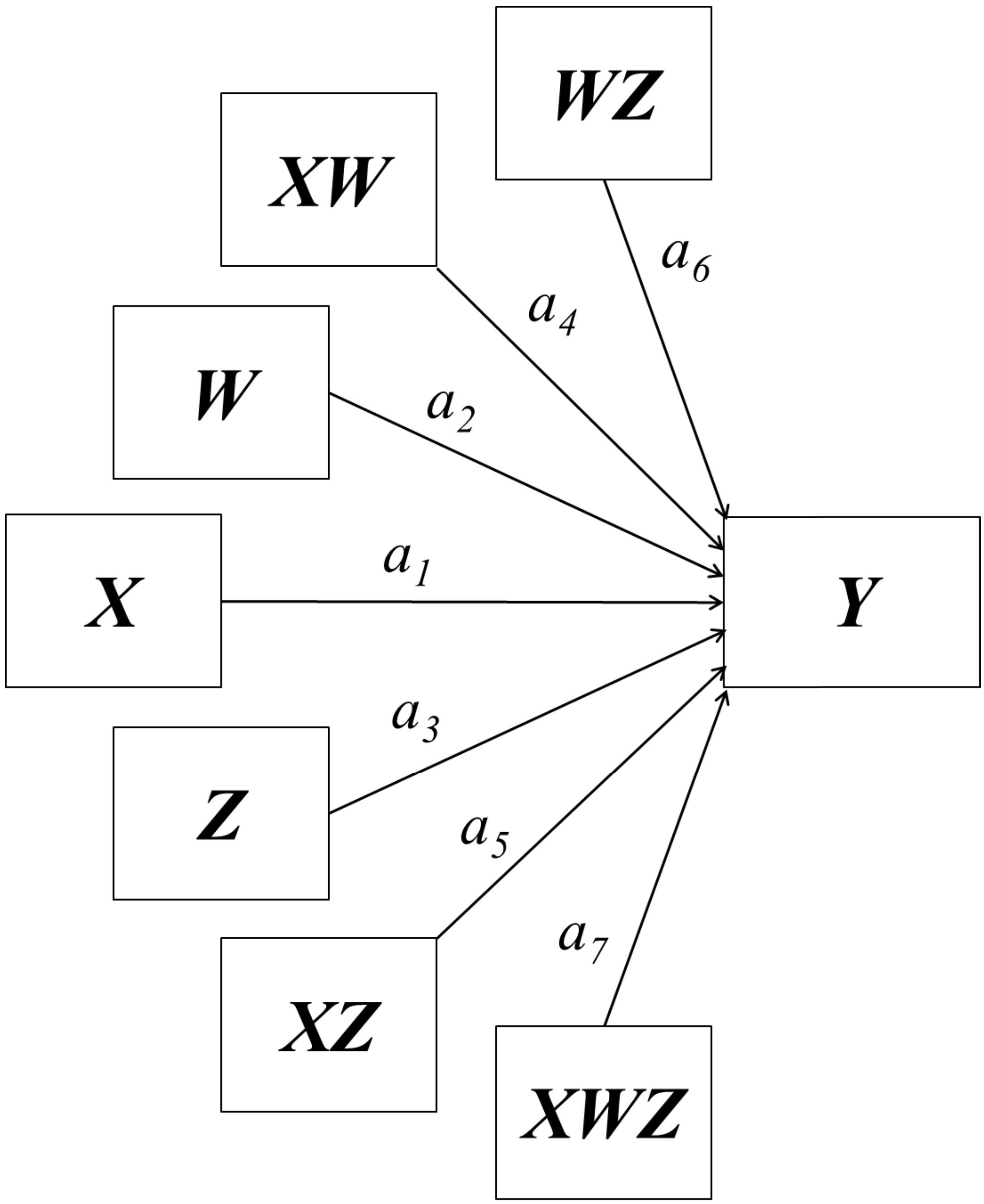
Conceptual Diagram of Moderated Moderation



Note. *W* = primary moderator effect, *Z* = secondary moderator effect; *X* = independent variable; *Y* = dependent variable.

Figure 25

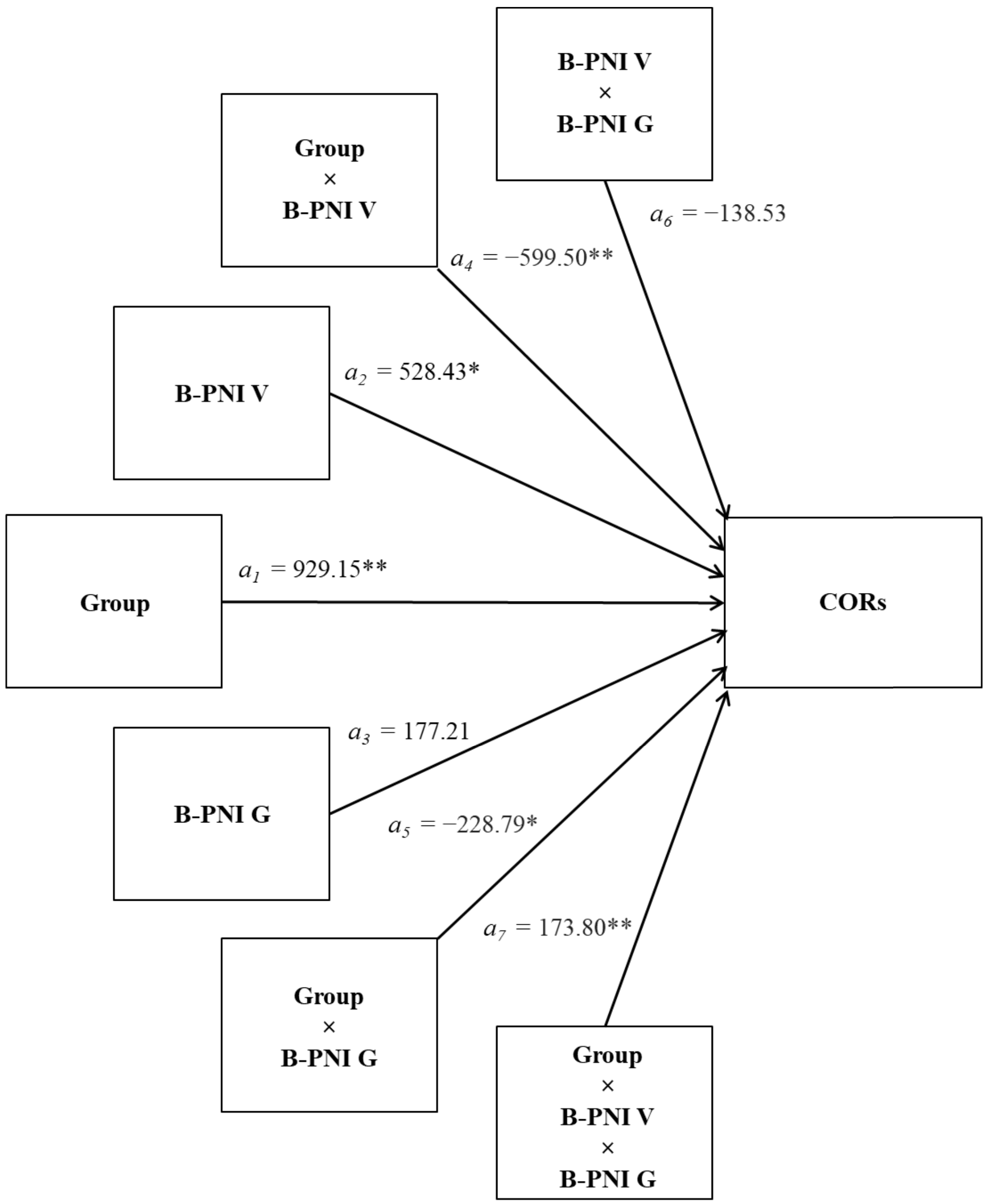
Statistical Diagram of Moderated Moderation



Note. W = primary moderator effect; Z = secondary moderator effect; X = independent variable; Y = dependent variable; a_1 = effect of X on Y when both W and Z are zero; a_2 = effect of W on Y when both X and Z are zero; a_3 = effect of Z on Y when both X and W are zero; a_4 = conditional interaction between X and W when Z equals zero; a_5 = conditional interaction between X and Z when W is zero; a_6 = conditional interaction between W and Z when X is zero; a_7 = conditional moderating influence of W on X's effect on Y by Z.

Figure 26

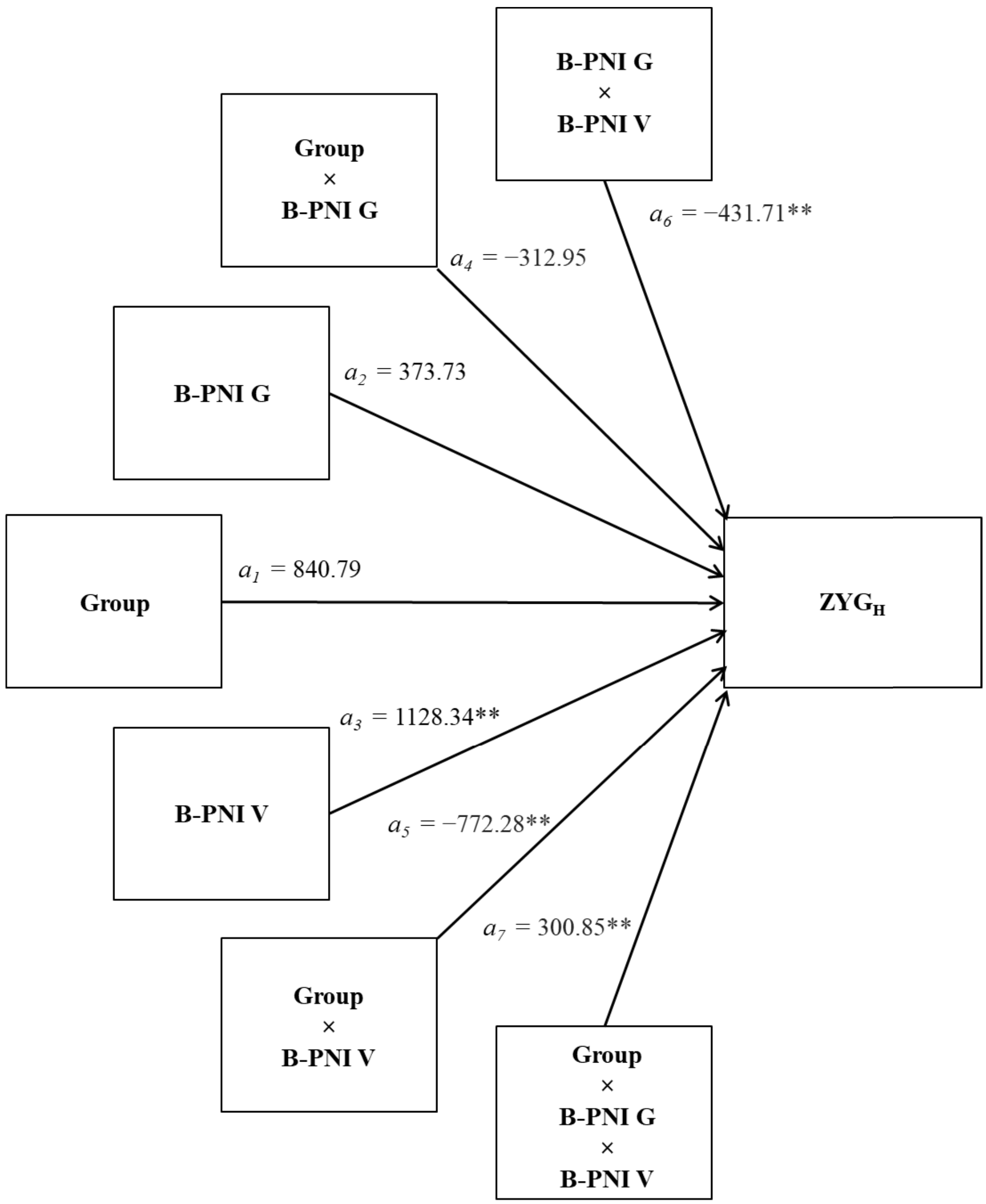
Study 3 – Path Diagram for Exploratory Model A1 Moderated Moderation Analysis with Group as the Predictor, CORs as the Outcome, B-PNI V as the Primary Moderator, and B-PNI G as the Secondary Moderator



Note. *N* = 120. B-PNI G = Brief Pathological Narcissism Inventory – Grandiosity subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; COR_S = mean EMG corrugator amplitude during the sad body comparison condition expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition.
*p < .05; **p < .01.

Figure 27

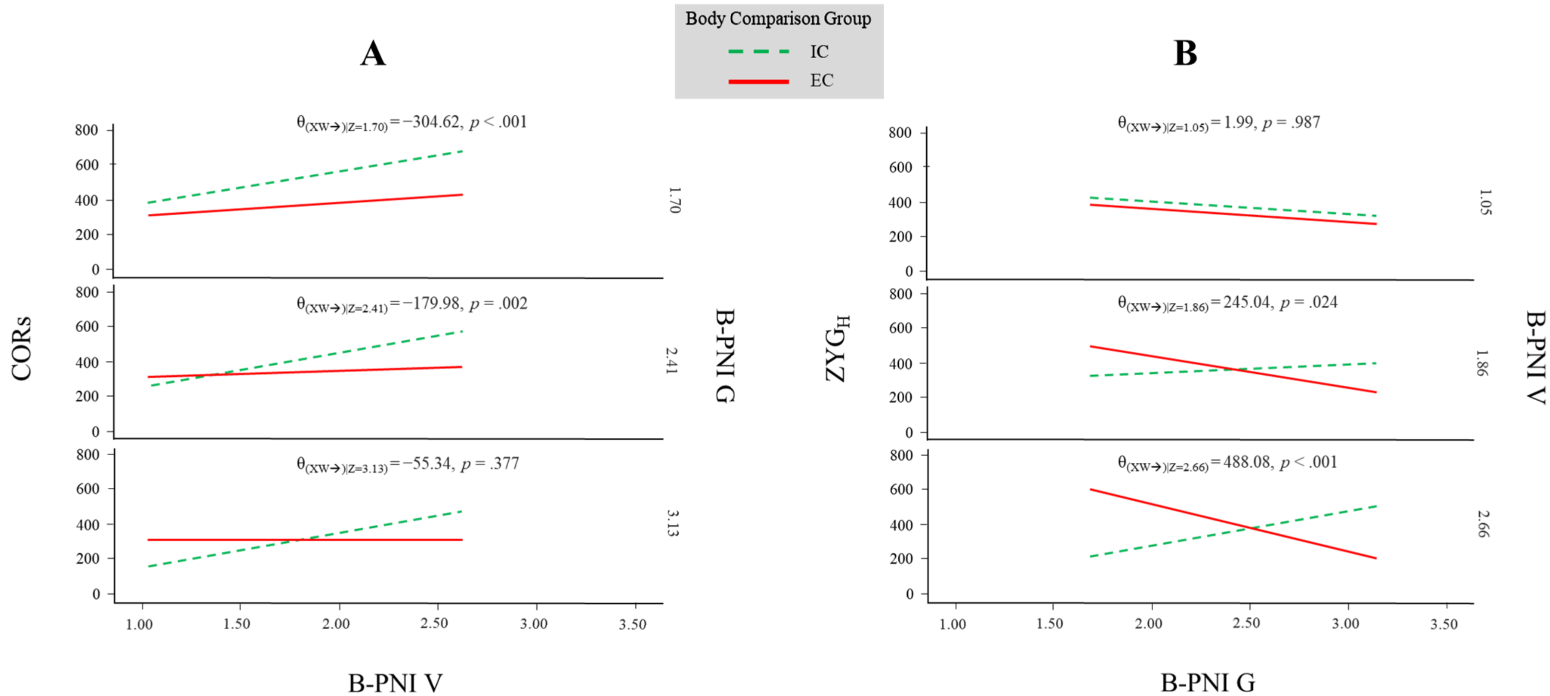
Path Diagram for Exploratory Model A2 Moderated Moderation Analysis with Group as the Predictor, ZYG_H as the Outcome Variable, B-PNI G as the Primary Moderator, and B-PNI V as the Secondary Moderator



Note. *N* = 120. B-PNI G = Brief Pathological Narcissism Inventory – Grandiosity subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; ZYG_H = mean EMG zygomaticus amplitude during the happy body comparison condition expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition.
*p < .05; **p < .01.

Figure 28

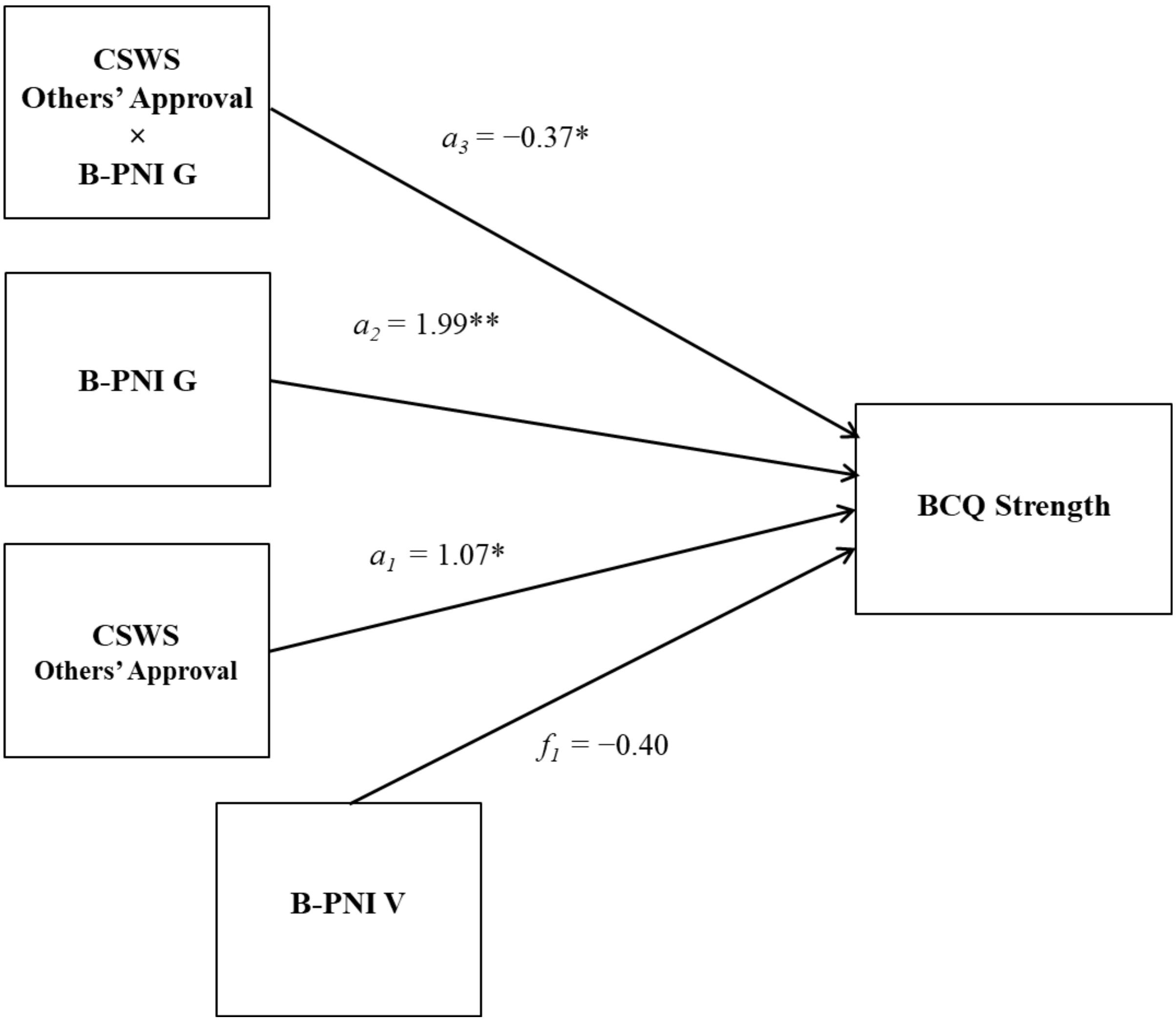
Interaction of Grandiosity, Vulnerability, and Body Comparison Group in the Prediction of EMG Facial Muscle Activity Across Emotive Conditions



Note. *N* = 120. Panel A: COR_S plotted as a function of B-PNI V (primary moderator) and B-PNI G (secondary moderator) by body comparison group during sad body comparison condition. Panel B: ZYG_H plotted as a function of B-PNI G (primary moderator) and B-PNI V (secondary moderator) by body comparison group during the happy body comparison condition. B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; B-PNI G = Brief Pathological Narcissism Inventory – Grandiose subscale; COR_S = mean EMG corrugator amplitude during the sad body comparison condition expressed as a percentage of the mean EMG corrugator amplitude during the baseline condition; ZYG_H = mean EMG zygomaticus amplitude during the happy body comparison condition expressed as a percentage of the mean EMG zygomaticus amplitude during the baseline condition; IC = implicit comparison; EC = explicit comparison.

Figure 29

Study 3 – Path Diagram of Exploratory Model B3 Moderation Analysis with CSWS Others' Approval as the Predictor, BCQ Strength as the Outcome, and B-PNI G as the Moderator

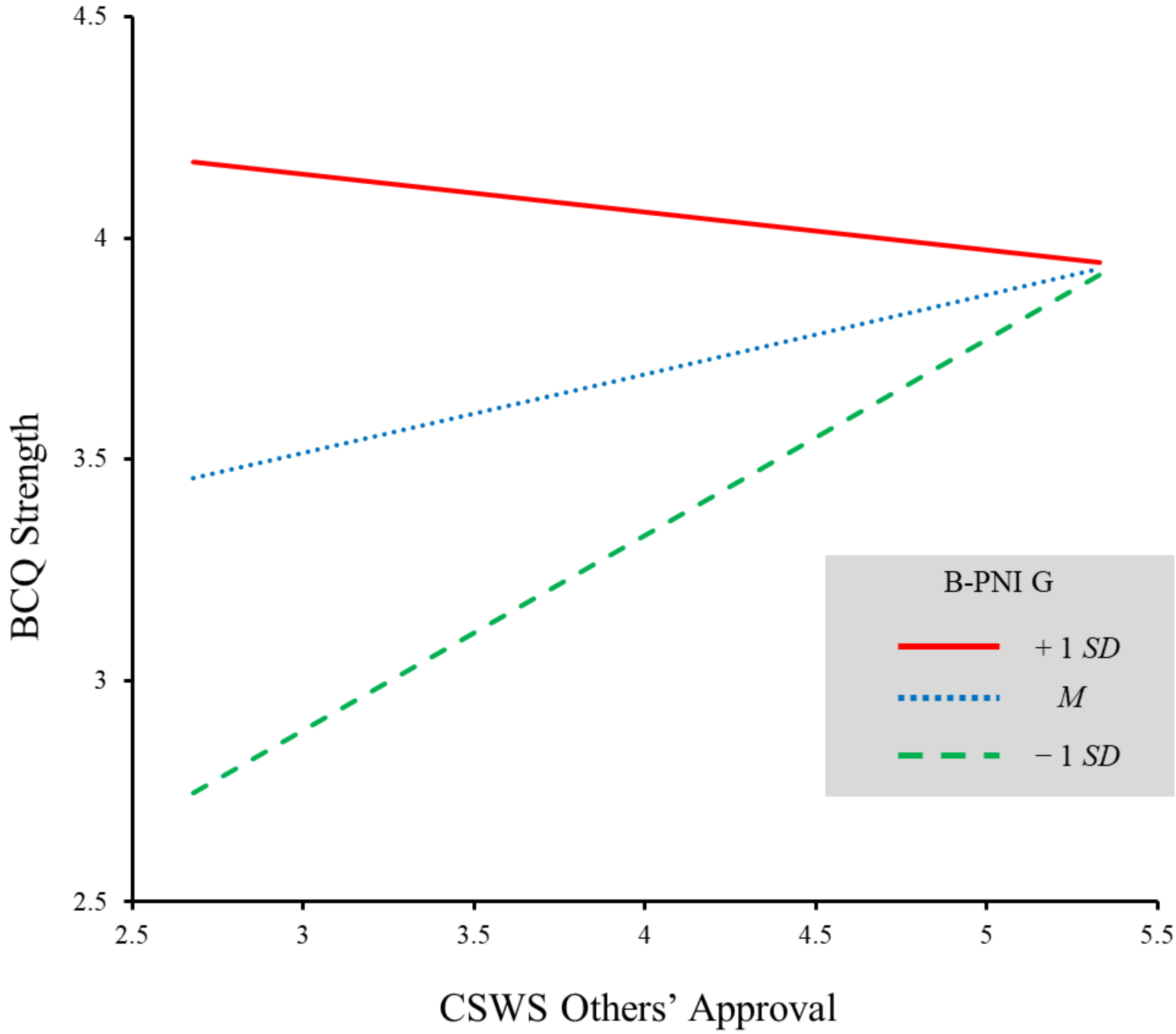


Note. N = 120. B-PNI G = Brief Pathological Narcissism Inventory – Grandiose subscale; B-PNI V = Brief Pathological Narcissism Inventory – Vulnerability subscale; BCQ = Body Comparison Questionnaire; BCQ = Body Comparison Questionnaire; CSWS = Contingencies of Self-Worth Scale.

*p < .05; **p < .01.

Figure 30

Moderating Influence of Grandiose Narcissism on the Relationship Between Contingency on Others' Approval and Strength of Comparison



Note. *N* = 120. BCQ Strength Plotted as a Function of CSWS Others' Approval by B-PNI G. CSWS = Contingencies of Self-Worth Scale; B-PNI G = Brief Pathological Narcissism Inventory – Grandiose subscale; BCQ = Body Comparison Questionnaire.

Appendix A

Study 1: Sample 1 (Actor) Recruitment Advertisement

Lakehead UNIVERSITY

So You Think You Can Act?

Seeking female actors aged 18-40 from Applauze Productions, Cambrian Players, Paramount, and Magnus Theatre who love stepping in front of the camera!

The Department of Psychology is looking to videotape actors expressing a range of emotions as part of a research study that has been approved by the Research Ethics board. Actors must:

- Be able to cry on cue
- Be willing to have any and all their videos viewed by students at Lakehead University.

Actors will be provided with high quality, digital copies of their videos, which may be used for their acting portfolios!

For more information, feel free to contact student researcher Samantha Chong at smchong@lakeheadu.ca

Appendix B

Study 1: Sample 1 (Actor) Participant Information Letter and Consent Form

Lakehead UNIVERSITY

Dear Potential Participant:

My name is Samantha Chong, a student and research assistant working with Dr. Ron Davis in the Department of Psychology at Lakehead University. We are conducting a research project called ***The Video Study***. The purpose of this project is to examine emotional and cardiac responses, and attractiveness towards other people displaying emotional facial expressions. We plan to show university volunteers videos of actors like you. We want to know whether certain personality traits of the viewer (not actor) influences the emotional experience of that viewer when watching an actor portray a strong emotion like sadness and happiness.

Here is where you may be able to help us out. We are looking for people age 18-40 with background training in acting that would serve as models for our project. This is what's involved should you choose to participate:

1. Attend a 30-minute videography session in our lab in the Department of Psychology,
2. Videos of you would be taken (head position, close-up) expressing three emotions: happiness, sadness, and neutral
3. We would also make note of your age.

Your voluntary participation in this project means that you would be consenting to allow us to show any and all of these videos to university students at Lakehead University. To thank you for your participation, we will provide you with high quality, digital copies of your videos upon your request. A summary of the research findings may also be provided to you upon your request via e-mail.

Your participation in this project is completely voluntary and you may withdraw from it at any time without penalty. All personal information that you provide will be kept completely confidential by assigning a code to it without your name. Only ourselves, Dr. Ron Davis and research assistants Samantha Chong, Megan Clark, and Lauren Kushnier, will be permitted to view your information. Your information will be securely stored at Lakehead University for 5 years, as per University regulations. In addition, your identifying information will be kept completely confidential in reports of results and publications. A risk associated with your participation in this study is the possibility of thinking about other participants' task of rating emotions when they view your videos. Such thoughts may arouse a degree of distress as might normally occur when others view videos of yourself in your daily life. If at any point during or after this study you would like to speak to a mental health professional, feel free to contact St. Joseph's Care Group, Mental Health Outpatient Program at 624-3400.

Lakehead UNIVERSITY

Please feel free to contact myself and/or Dr. Ron Davis with any questions that you might have. This study has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact Sue Wright at the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca

Thank you for considering participation in this project.

Sincerely,

Samantha Chong smchong@lakeheadu.ca (XXX) XXX-XXXX
Megan Clark, mjclark@lakeheadu.ca
Lauren Kushnier lkushnie@lakeheadu.ca
Dr. Ron Davis ron.davis@lakeheadu.ca (XXX) XXX-XXXX.

By providing my name and signature below, I indicate that I have read the "Participant Information Letter" and that I have had the opportunity to receive satisfactory answers from the researchers concerning any questions that I might have about my participation in ***The Video Study,*** I understand and agree to the following:

1. I understand the information contained in the "Participant Information Letter";
2. I agree to participate in the videography session AND to allow the researchers to show any and all of my videos to Lakehead University research volunteers;
3. I am a volunteer and can withdraw at any time from this project without penalty or consequence;
4. There are no anticipated physical risks associated with participation in this study. Should I experience any personal distress or discomfort during or following my participation, I know that I may personally contact St. Joseph's Care Group, Mental Health Outpatient Program to speak to a mental health professional;
5. My personal information consisting of my weight, height, and age will remain confidential and will be securely stored in the Department of Psychology at Lakehead University for 5 years as per University regulations;
6. My personal information will remain anonymous should any publications or public presentations come out of this project; and
7. I may receive a digital copy of my videos should I so request.
8. I may receive an e-mail with the summary of this research upon completion if I so request;
9. I understand and agree to this "Consent to Participate"

______________________________ ______________________

Full Name (*please print*) Date

____

Signature *(please sign)*

Appendix C

Study 1: Sample 2 (Rater) Participant Information Letter and Consent Form

Lakehead UNIVERSITY

Dear Potential Participant:

My name is Samantha Chong, student and research assistant working with Dr. Ron Davis in the Department of Psychology at Lakehead University. We are conducting a research project called ***The Video Study***. The purpose of this project is to examine emotional responses towards other people displaying emotional facial expressions. We plan to show university volunteers videos of actors. We want to know whether certain personality traits influence the emotional experience of viewers when they watch an actor dynamically portray an emotion.

If you agree to participate in this study, you would first complete some questionnaires that ask you about certain attitudes, behaviours, and emotions. This questionnaire may be comfortably completed at your own pace, within 60 to 90 minutes. Then you would sign up to attend a separate laboratory visit in the Department of Psychology with one of the research assistants.

During the laboratory visit, you will view videos of other people displaying emotional facial expressions. You will also complete a number of questionnaires pertaining to your emotional experience of the women in the videos. This laboratory visit will take approximately 90 minutes of your time. A summary of the research findings may also be provided to you upon your request via e-mail.

Your participation in this study is completely voluntary and you may withdraw from it at any time without penalty. All information that you provide will be kept completely confidential. Only ourselves, Dr. Ron Davis and research assistants Samantha Chong, Megan Clark, and Lauren Kushnier, will be permitted to view your information. Dr. Davis is never aware of the identities of those who volunteer to participate in this study. All of the information that you provide will be assigned a code unattached to your name and securely stored at Lakehead University for 5 years as per University regulations. In addition, your identifying information will be kept completely confidential in reports of results and publications. A risk associated with your participation in this study is the possibility that thinking about personal issues while completing the questionnaires (e.g., self-esteem, body image) and/or viewing videos may arouse a degree of distress as might normally occur when you view emotional content in your daily life.

You may choose not to answer any question asked in the questionnaires without penalty or consequence. If at any point during or after this study you would like to speak to a mental health professional, feel free to contact the Student Health and Counseling Centre at 343-8361 (UC 1007).

If you are registered in a Psychology undergraduate course eligible for bonus points, your participation by way of questionnaire completion and attending the laboratory visit would lead to 3.5 bonus points credited to your final grade in that course. Please feel free to contact us and/or Dr. Ron Davis with any questions that you might have. This study has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact Sue Wright at the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca

Sincerely,

Samantha Chong, smchong@lakeheadu.ca (XXX) XXX-XXXX
Megan Clark, mjclark@lakeheadu.ca
Lauren Kushnier, lkushnie@lakeheadu.ca
Dr. Ron Davis, ron.davis@lakeheadu.ca (XXX) XXX-XXXX.

By providing my name and signature below, I indicate that I have read the "Participant Information Letter" and that I have had the opportunity to receive satisfactory answers from the researchers concerning any questions that I might have about my participation in ***The Video Study***. I understand and agree to the following:

1. I understand all of the information on the "Participant Information Letter";
2. I agree to participate in this study;
3. I am a volunteer and can withdraw at any time from this study without penalty or consequence;
4. I may choose not to answer any question asked in this online questionnaire without penalty or consequence;
5. There are no anticipated physical risks associated with participation in this study. Should I experience any personal distress or discomfort during or following my participation, I know that I may personally contact the Health and Counselling Centre at Lakehead University (Thunder Bay campus) to speak to a mental health professional;
6. My personal information will be securely stored in the Department of Psychology at Lakehead University for 5 years as per University regulations;
7. Dr. Ron Davis is never aware of the identities of those who volunteer to participate in this study;
8. My personal information will remain anonymous should any publications or public presentations come out of this project;
9. I may receive a summary of this research upon completion if I so request;
10. I give my permission to be contacted by telephone and/or email for the purpose of participation in this study; and
11. I understand and agree to this "Consent to Participate"

____________________________ ____________________________

Full Name (*please print*) Date

____

Signature *(please sign)*

Appendix D

Demographics Questionnaire

1. In order to link your data from this questionnaire with your data from the laboratory sessions, please provide your name below. Your name will NEVER be used other than for this intended purpose. Your name will be removed from your data at the end of the study to ensure anonymity.

   First name: ___________________________________

   Last name: ___________________________________

2. Are you fluent in English?
   a. Yes
   b. No (I understand that to be eligible to participate in this study, I must be fluent in English in order to comprehend the Participation Information Letter, items on the questionnaires, and the verbal/written instructions during the laboratory sessions. By choosing this option, I acknowledge that I am not eligible to participate.)

3. How old are you? ______________

4. My biological sex at birth is:
   - Male
   - Female
   - I prefer not to disclose (I understand that to be eligible to participate in this study, I must be a biological female at birth. By choosing this option, I acknowledge that I am not eligible to participate).

5. Are you currently enrolled as a student at Lakehead University?
   - Full-time
   - Part-time
   - Non-enrolled

6. What subject are you majoring in? _________________________

7. What is your current year of study?
   - 1
   - 2
   - 3
   - 4
   - Other (please specify) ___________________
   -

Appendix E

Discrete Emotions Questionnaire

Did you close your eyes or look away during any part of the video clip? Yes/No

Please indicate your response using the scale provided.
While viewing the video, what extent did you experience these emotions?

1	2	3	4	5	6	7
Not at all	Slightly	Somewhat	Moderately	Quite a bit	Very much	An extreme amount

______ Sad

______ Happy

______ Grief

______ Lonely

______ Satisfaction

______ Empty

______ Enjoyment

______ Liking

Appendix F

Brief Distractor Task

EXAMPLE QUESTION:

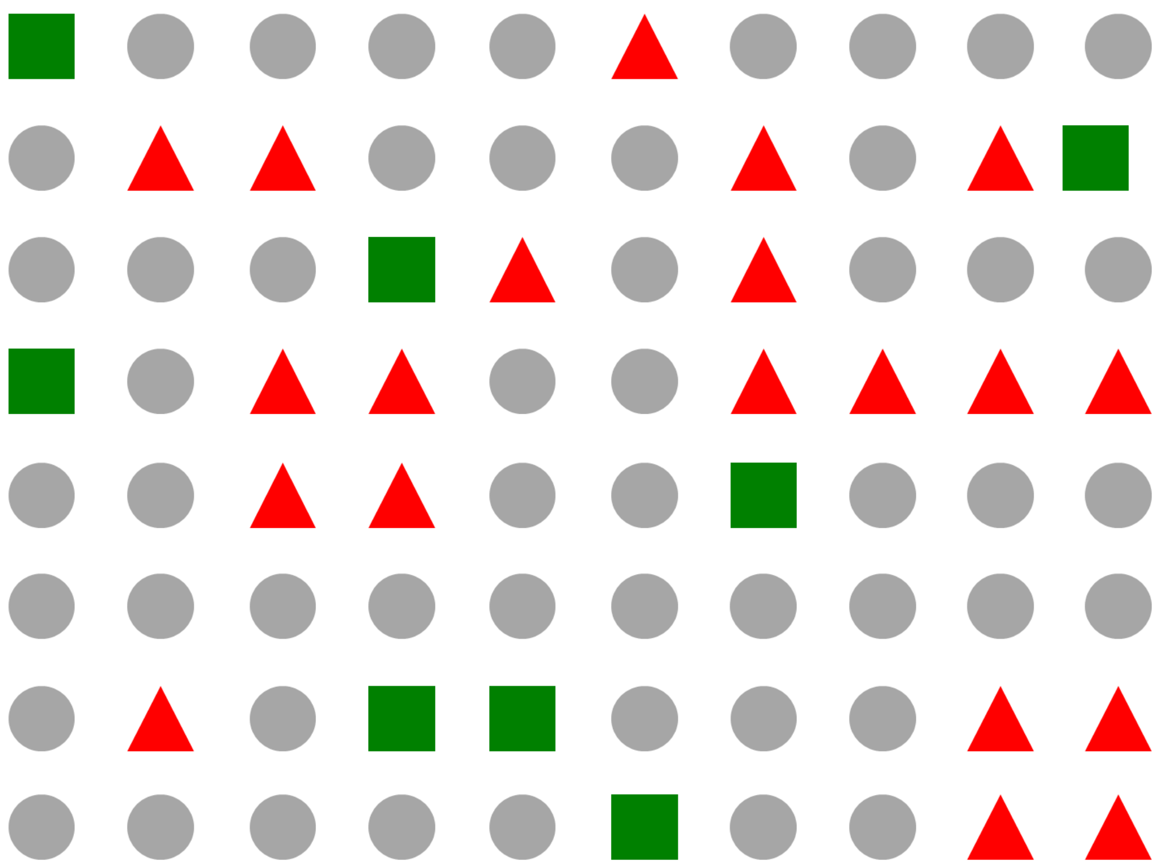
You will be asked to look at a picture that contains various geometric shapes in different colours.

The picture will be presented for *only 30 seconds.*

Your task is to **count the number of <u>RED TRIANGLES</u> in the picture.**

When you are ready to begin the task, please press 'next'.

[Picture below shown to participant for 30 s]



How many red triangles were in the picture? ___________

Appendix G

Study 1: Sample 1 (Actor) Videography Instructions

Welcome to the lab! Thank you for volunteering to participate! My name is __________. I'm going to take care of you during this recording session. This is my research assistant ___________. She will be in the back for the duration of our session doing video editing.

Participant Letter and Consent Form

Here I have the Participant Information Letter/Consent Form. You should have read this prior to coming to the lab session today. Did you have a moment to read the letter? [Would you like a moment to read it?]. Before signing the consent letter, do you have any questions or concerns that you would like addressed?

Recording Instructions

Today, you are going to be putting your acting skills to work by recording three, 3-min videos expressing neutral, sad, and happy emotions. For each video, you will look into this camera lens and pretend it is a person with whom you wish to share your emotion with. My camera here will record from the top of your head to the top of your shoulders, so the emotional displays you make will be from this part of your body only.

Before each video recording, I'll ask that you take a moment to reflect on the most happy/sad/neutral experience of your life (depending on which video we're recording) to help you get into character.

> For the **NEUTRAL VIDEO**, all you have to do is simply look into the camera and maintain a neutral facial expression – as if you were taking a really long passport photo.
>
> For the **HAPPY VIDEO**, simply smile and/or casually giggle as if you were reflecting on or reliving a funny moment.
>
> For the **SAD VIDEO**, lots of frowning and, ***if you are able to***, shed tears or become teary-eyed.
>
> For the happy and sad videos, you **do not** have to express the maximum amount of that emotion **right off the bat**. You can gradually develop or transform the emotion over the 3 minutes, beginning with expressing a small amount of that emotion to expressing the greatest amount towards the end. For example, you do not have to cry right off the bat. You can slowly develop the "sad" emotion; perhaps starting with some light frowns, then a more pronounced sulk, then (if you can) building up teary-eyes, then shedding some tears, and perhaps sobbing at the end.

> For most people, it is difficult to express sadness. If you find it difficult to cry or become teary-eyed, that is okay as long as you express the maximum amount of that emotion at some point (ideally near the end), **whatever that maximum might be for you AND for as long as you are able to.**

You can record your videos in any order that you would like! Before stating each recording, I'll give you a minute to think about the movements/sounds that you want to portray. When you are ready, I will start the camera and timer on my phone, and quietly go to the back room for the duration of the recording. When the 3-min is up, I will quietly come out of the back room and stop the recording.

If at any point you would like to stop the recording, get up and leave, take a break, or go to the washroom, just ring the bell to let me know. Do you have any questions or concerns before we begin?

Appendix H

Study 1: Sample 2 (Rater) Laboratory Instructions

For the next 60 min or so, you will be engaging in a number of computer tasks. Using the mouse and keyboard, you will follow the instructions displayed on the screen, which will guide you through each task.

For example, when given an instruction that say “Now press ‘next”, you click “next” using the mouse.

For the course of this lab session, I will be in the back room controlling the presentation of the tasks.

Viewing Instructions

What you will be doing today is rating videos of actors displaying various emotional expressions.

These are the actors here on the page: [Show Photographs of Models]

> Do you know any of these actors?
>
> [If yes, make note of it in SPSS]

Each actor will display 3 different emotions, each lasting 3 min in length. In total, there are 15 videos.

Post-Video Questionnaire Instructions

After each video, you will be asked a number of questions about your experience:

After watching an actor’s set of 3 videos, you will also be asked to complete a counting task.

> For this, you’ll be instructed to count a specific geometric shape of a particular colour and have 30 seconds to do so.
>
> After the task, you will be asked to indicate your answer in a box on the screen. Simply type the answer in using the keyboard here.

Wrap-Up Instructions

At any point while I am in the back, if you have any questions or concerns, need to get up and leave, or go to the washroom, please ring the bell in front of you to let me know.

After the last video and counting task, I will come out of the back room to wrap things up

Do you have any questions or concerns?

For the duration of the presentations, I will turn off the lights in the room.

I will retreat to the back room now. Once I close the door, please begin to read and follow the instructions on the screen. By clicking "next", I will know that you are ready.

Appendix I

Study 1: Sample 1 (Rater) Debriefing Sheet

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Dear Participant:

This sheet gives you a brief summary of the experience that you just completed in this study on our reactions to viewing videos clips of facial expressions.

Research shows that individual differences in personality can influence one's susceptibility to emotional contagion – the ability to "catch" or experience the emotions of people around them. In this study, the online questionnaire that you completed before the start of the study assessed numerous personality facets. Emotional contagion was assessed by your ratings of emotions after each video.

If you have any questions about the study, please ask now.

Do you want a brief summary of the results of this study? If so, tell the researcher who will send it to you via email when it becomes available.

Again, thank you for participating in our study and helping us out!

955 Oliver Road, Thunder Bay, ON, Canada, P7B 5E1 | lakeheadu.ca

Appendix J

Study 2: Participant Information Letter and Consent Form

Dear Potential Participant:

If you are a nonsmoking, right-handed female at Thunder Bay campus, and you are between 18 and 40 years of age, then this study might be of interest to you.

Our names are Samantha Chong and Lauren Kushnier, student and research assistants working with Dr. Ron Davis in the Department of Psychology at Lakehead University. We are conducting a research project called ***The Video Study***. The purpose of this project is to examine whether certain personality traits and physical actions influence skin temperature, heart activity, and attention while viewing videos of another woman portraying various physical actions.

If you are eligible and agree to participate in this study, you would first complete some questionnaires that ask you about certain attitudes, behaviours, and emotions. This questionnaire may be comfortably completed at your own pace, within 60 minutes. Then you would sign up to attend a separate laboratory visit in the Department of Psychology with one of the research assistants. During this laboratory visit, you will be fitted with electrodes to measure heart activity and sensors to measure facial skin temperature while you view videos of another woman portraying various physical actions. This laboratory visit will take approximately 60 minutes of your time. A summary of the research findings may also be provided to you upon your request via e-mail.

Your participation in this study is completely voluntary and you may withdraw from it at any time without penalty. In order to link your data from the online questionnaire to your data from the laboratory session, you will be asked to indicate your name on the online questionnaire. Your name will only be used for this purpose. Once the study is completed, you name will be removed from the data to ensure anonymity. All information that you provide will be kept completely confidential. Only Dr. Davis and the research assistants, Samantha Chong and Lauren Kushnier, will be permitted to view your data. Dr. Davis is never aware of the identities of those who volunteer to participate in this study. As such, he will only be permitted to view the data from the study once the data is anonymized. All of the information that you provide will be securely stored at Lakehead University for 5 years as per University regulations. When publishing the results from this study in research journals and conferences, your data will be presented in aggregate form and your identifying information will be kept completely confidential. A risk associated with your participation in this study is the possibility that thinking about personal issues while completing the questionnaires (e.g., self-esteem) and/or viewing videos, which may

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arouse a degree of distress as might normally occur when you view video content in your daily life. You may choose not to answer any question asked in the questionnaires without penalty or consequence.

If you are registered in a Psychology undergraduate course eligible for bonus points, your participation by way of questionnaire completion and attending the laboratory visit would lead to 3.5 bonus points credited to your final grade in that course. Please feel free to contact us and/or Dr. Ron Davis with any questions that you might have. If at any point during or after this study you would like to speak to a mental health professional, feel free to contact the Student Health and Counseling Centre at 343-8361 (UC 1007). This study has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact Sue Wright at the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca

Sincerely,

Samantha Chong, smchong@lakeheadu.ca (XXX) XXX-XXXX
Lauren Kushnier, lkushnie@lakeheadu.ca
Dr. Ron Davis, ron.davis@lakeheadu.ca (XXX) XXX-XXXX.

By providing my name and signature below, I indicate that I have read the "Participation Information Letter" and that I have had the opportunity to receive satisfactory answers from the researchers concerning any questions that I might have about my participation in ***The Video Study***. I understand and agree to the following:

1. I understand all of the information on the "Participation Information Letter";
2. I agree to participate in this study;
3. I am a volunteer and can withdraw at any time from this study without penalty or consequence.
4. In order to link my data from the online questionnaire to my data from the laboratory session, I must indicate my name on the online questionnaire. My name will only be used for this purpose. Once the study is completed, my name will be removed from the data to ensure anonymity.
5. I may choose not to answer any question asked in this online questionnaire without penalty or consequence;
6. There are no anticipated physical risks associated with participation in this study. Should I experience any personal distress or discomfort during or following my participation, I may choose not to participate without penalty or consequence. I may also personally contact the Health and Counselling Centre at Lakehead University (Thunder Bay campus) to speak to a mental health professional;
7. My personal information will be securely stored in the Department of Psychology at Lakehead University for 5 years as per University regulations;
8. Dr. Ron Davis is never aware of the identities of those who volunteer to participate in this study;
9. My data will be presented in aggregate form and my identifying information will be kept completely confidential and anonymous should the results from this study be published in research journals and conferences;
10. I may receive a summary of this research upon completion via e-mail if I so request;
11. I give my permission to be contacted by email for the purpose of participation in this study; and
12. I understand and agree to this "Consent to Participate"

____
Full Name (*please print*)

Date ______________________________

____
Signature *(please sign)*

Summary of Results: (check one)

☐ I do not wish to receive a summary of the results of this research

☐ Please check this box if you like to receive a summary of the results of this research upon its completion. Please provide an e-mail address as to where the summary should be sent. You will not be identified directly or indirectly through this process.

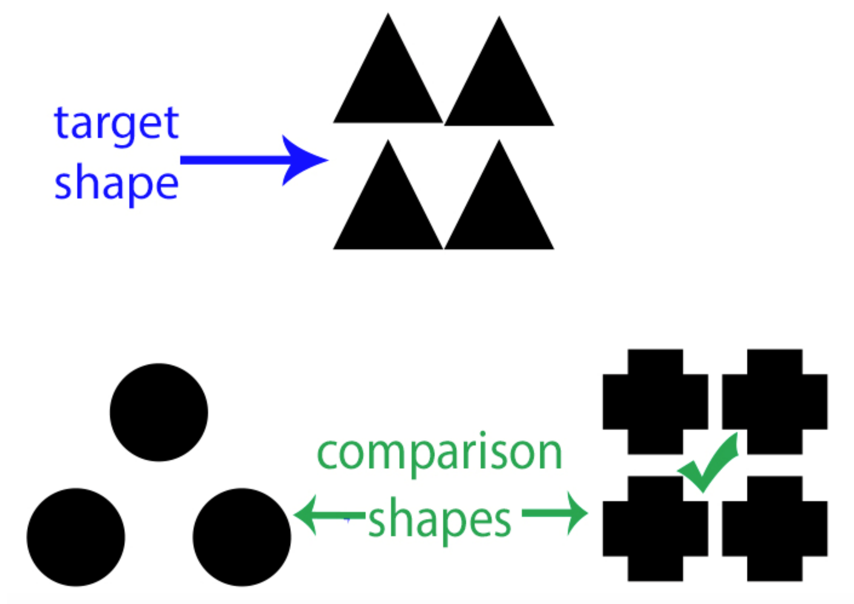
E-mail Address: ____

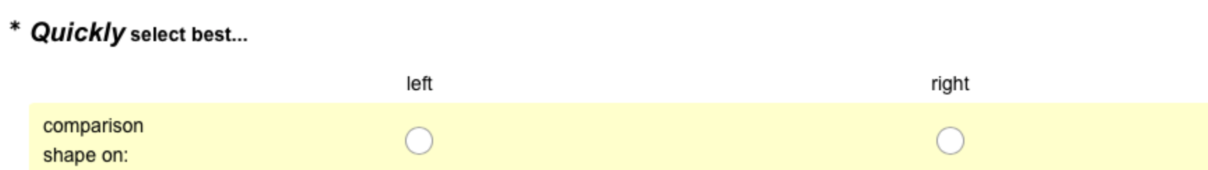
Appendix K

Global Local Task

Instructions: For each of the next 25 questions, ***quickly*** select one of the two comparison shapes below that best corresponds to the target shape at the top of each question. Do not overthink your answer. Go with your first impression. Scroll down to make your selection.

EXAMPLE QUESTION:




* ***Quickly*** **select best...**

	left	right
comparison shape on:	○	○

Appendix L

Brief-Pathological Narcissism Inventory

Below is a collection of statements about your everyday experience. Please read each statement. Using the scale below, indicate the extent to which you agree with each statement. In other words, how well does the statement describe you?

0 = Not at all like me
1 =Not much like me
2 = Very little like me
3 = Moderately like me
4 = Mostly like me
5 = Very Much like me

1. I can usually talk my way out of anything.	0	1	2	3	4	5
2. When people don't notice me, I start to feel bad about myself.	0	1	2	3	4	5
3. I often hide my needs for fear that others will see me as needy and desperate.	0	1	2	3	4	5
4. I can make anyone believe anything I want them to.	0	1	2	3	4	5
5. I get annoyed by people who are not interested in what I say or do.	0	1	2	3	4	5
6. I find it easy to manipulate people.	0	1	2	3	4	5
7. Sometimes I avoid people because I'm concerned that they'll disappoint me.	0	1	2	3	4	5
8. I typically get very angry when I'm unable to get what I want from others.	0	1	2	3	4	5
9. When others don't meet my expectations, I often feel ashamed about what I wanted.	0	1	2	3	4	5
10. I feel important when others rely on me.	0	1	2	3	4	5
11. I can read people like a book.	0	1	2	3	4	5
12. Sacrificing for others makes me the better person.	0	1	2	3	4	5
13. I often fantasize about accomplishing things that are probably beyond my means.	0	1	2	3	4	5
14. Sometimes I avoid people because I'm afraid they won't do what I want them to do.	0	1	2	3	4	5
15. It's hard to show others the weaknesses I feel inside.	0	1	2	3	4	5
16. It's hard to feel good about myself unless I know other people admire me.	0	1	2	3	4	5

17. I often fantasize about being rewarded for my efforts.	0	1	2	3	4	5
18. I am preoccupied with thoughts and concerns that most people are not interested in me.						
19. I like to have friends who rely on me because it makes me feel important.	0	1	2	3	4	5
20. Sometimes I avoid people because I'm concerned they won't acknowledge what I do for them.	0	1	2	3	4	5
21. It's hard for me to feel good about myself unless I know other people like me.	0	1	2	3	4	5
22. It irritates me when people don't notice how good a person I am.	0	1	2	3	4	5
23. I will never be satisfied until I get all that I deserve.	0	1	2	3	4	5
24. I try to show what a good person I am through my sacrifices.	0	1	2	3	4	5
25. I often fantasize about performing heroic deeds.	0	1	2	3	4	5
26. I often fantasize about being recognized for my accomplishments.	0	1	2	3	4	5
27. I can't stand relying on other people because it makes me feel weak.	0	1	2	3	4	5
28. When others get a glimpse of my needs, I feel anxious and ashamed.	0	1	2	3	4	5

Appendix M

Emotion Contagion Scale

This is a scale that measures a variety of feelings and behaviours in various situations. There are no right or wrong answers, so try very hard to be completely honest in your answers. Please read each statement. Using the scale below, indicate the extent to which you agree with each statement. In other words, ***how well does the statement describe you***?

4 = Always true for me
3 = Often true for me
2 = Usually true for me
1 = Rarely true for me
0 = Never true for me

1. If someone I'm talking with begins to cry, I get teary-eyed.	0	1	2	3	4
2. Being with a happy person picks me up when I'm feeling down.	0	1	2	3	4
3. When someone smiles warmly at me, I smile back and feel warm inside.	0	1	2	3	4
4. I get filled with sorrow when people talk about the death of their loved ones.	0	1	2	3	4
5. I clench my jaws and my shoulders get tight when I see the angry faces on the news.	0	1	2	3	4
6. When I look into the eyes of the one I love, my mind is filled with thoughts of romance.	0	1	2	3	4
7. It irritates me to be around angry people.	0	1	2	3	4
8. Watching the fearful faces of victims on the news makes me try to imagine how they might be feeling.	0	1	2	3	4
9. I melt when the one I love holds me close.	0	1	2	3	4
10. I tense when overhearing an angry quarrel.	0	1	2	3	4
11. Being around happy people fills my mind with happy thoughts.	0	1	2	3	4
12. I sense my body responding when the one I love touches me.	0	1	2	3	4
13. I notice myself getting tense when I'm around people who are stressed out.	0	1	2	3	4
14. I cry at sad movies.	0	1	2	3	4
15. Listening to the shrill screams of a terrified child in a dentist's waiting room makes me feel nervous.	0	1	2	3	4

Appendix N

The Questionnaire of Cognitive and Affective Empathy

Please select the appropriate answer per item. Use the following scale:

0 = Strongly disagree
1 = Slightly disagree
2 = Slightly agree
3 = Strongly agree

1. I sometimes find it difficult to see things from the "other guy's" point of view.	1	2	3	4
2. I am usually objective when I watch a film or play, and I don't often get completely caught up in it.	1	2	3	4
3. I try to look at everybody's side of a disagreement before I make a decision.	1	2	3	4
4. I sometimes try to understand my friends better by imagining how things look from their perspective.	1	2	3	4
5. When I am upset at someone, I usually try to "put myself in his shoes" for a while.	1	2	3	4
6. Before criticizing somebody, I try to imagine how I would feel if I was in their place.	1	2	3	4
7. I often get emotionally involved with my friends' problems.	1	2	3	4
8. I am inclined to get nervous when others around me seem to be nervous.	1	2	3	4
9. People I am with have a strong influence on my mood.	1	2	3	4
10. It affects me very much when one of my friends seems upset.	1	2	3	4
11. I often get deeply involved with the feelings of a character in a film, play, or novel.	1	2	3	4
12. I get very upset when I see someone cry.	1	2	3	4
13. I am happy when I am with a cheerful group and sad when the others are glum.	1	2	3	4
14. It worries me when others are worrying and panicky.	1	2	3	4
15. I can easily tell if someone else wants to enter a conversation.	1	2	3	4

16. I can pick up quickly if someone says one thing but means another.	1	2	3	4
17. It is hard for me to see why some things upset people so much.	1	2	3	4
18. I find it easy to put myself in somebody else's shoes.	1	2	3	4
19. I am good at predicting how someone will feel.	1	2	3	4
20. I am quick to spot when someone in a group is feeling awkward or uncomfortable.	1	2	3	4
21. Other people tell me I am good at understanding how they are feeling and what they are thinking.	1	2	3	4
22. I can easily tell if someone else is interested or bored with what I am saying.	1	2	3	4
23. Friends talk to me about their problems as they say that I am very understanding.	1	2	3	4
24. I can sense if I am intruding, even if the other person does not tell me.	1	2	3	4
25. I can easily work out what another person might want to talk about.	1	2	3	4
26. I can tell if someone is masking their true emotion.	1	2	3	4
27. I am good at predicting what someone will do.	1	2	3	4
28. I can usually appreciate the other person's viewpoint, even if I do not agree with it.	1	2	3	4
29. I usually stay emotionally detached when watching a film.	1	2	3	4
30. I always try to consider the other fellow's feelings before I do something.	1	2	3	4
31. Before I do something I try to consider how my friends will react to it.	1	2	3	4

Appendix O

Study 2: Participant Laboratory Instructions

For the next 40 min or so, you will be engaging in a number of computer tasks. Using the mouse and keyboard, you will follow the instructions displayed on the screen, which will guide you through each task.

For example, when given an instruction that say "Now press 'next", you click "next" using the mouse.

For the course of this lab session, I will be in the back room controlling the presentation of the tasks.

General Viewing Instructions

What you will be doing today is viewing videos of another participant portraying various physical actions while we record your heart activity and skin temperature.

This is the woman that you will be viewing: [Show Photographs of Actors]
Do you know this participant?
[If yes, make note of it in SPSS]

There are four videos, each last 3 minutes in duration.

Baseline Instructions

Before viewing the videos, we need to record your baseline heart functioning and skin temperature.

For this recording, you will watch a 3-min video of a woman moving around Styrofoam chips on a table. Afterwards, I will bring up a few questions for you to answer about attention and how you are feeling.

After you complete the last question, I will come back out and explain the rest of the procedure.

Wrap-Up Instructions

At any point while I am in the back, if you have any questions or concerns, need to get up and leave, or go to the washroom, please ring the bell in front of you to let me know.

For the duration of the presentations, I will turn off the lights in the room.

I will retreat to the back room now. Once I close the door, please begin to read and follow the instructions on the screen. By clicking "next", I will know that you are ready.

[Retreat from the Back Room and Read Appropriate Group Instruction to Participant]

*** FACIAL MANIPULATION (FA) GROUP***

Before the start of each video, you will be instructed on the TV screen to do one of three physical actions**: (1) SIMPLY RELAX, (2) BITE CHOPSTICK, or (3) PULL EYEBROWS:**

- When given the <u>**SIMPLY RELAX**</u> instruction:
    - **S**imply relax into a comfortable position and keep your hands rested on the table in front of you for the duration of the 3-min video.
    - [DEMONSTRATE]

- When given the <u>**BITE CHOPSTICK**</u> instruction:
    - Take the chopstick here, place it horizontally in your mouth, and gently bite down with your teeth while not allowing your lips to touch the chopstick.
    - [DEMONSTRATE]
    - For the duration of the 3-min video, hold the chopstick in your mouth like this and keep your hands rested gently on the table in front of you.
    - Once the video is done, you may take the chopstick out of your mouth.

- When given the <u>**PULL EYBROW**</u> instruction:
    - Pull the inner edge of each of your eyebrows together towards your nose and keep your hands rested on the table in front of you. When you pull your eyebrows together, make sure to pull them inward towards each other, and not upwards towards your forehead.
    - [DEMONSTRATE]
    - Once the video is done, you may relax your eyebrows.

It's important that you gently rest both of your hands on the table in front of you while viewing each of the videos. This is to prevent any accidental disturbance of these delicate wires attached to the amplifier here.

* FINGER MANIPULATION (FI) GROUP*

Before the start of each video, you will be instructed on the TV screen to do one of three physical actions: **(1) SIMPLY RELAX, (2) PRESS INDEX FINGER, or (3) PRESS THUMB:**

- When given the **SIMPLY RELAX** instruction:
  - **S**imply relax into a comfortable position and keep your hands rested gently on the table in front of you for the duration of the 3-min video clip.
  - [DEMONSTRATE]

- When given the **PRESS INDEX FINGER** instruction:
  - Simply extend your index finger and then press and hold the "enter" button on the keypad here. Be sure to keep your other fingers and wrist elevated off the table.
  - [DEMONSTRATE]
  - Hold the button down for the duration of the 3-min video.
  - Once the video is done, release your finger and rest your hand/wrist.

- When given the **PRESS THUMB** instruction:
  - Simply extend your thumb and then press and hold the "enter" button on the keypad here. Be sure to keep your other fingers and wrist elevated off the table.
  - [DEMONSTRATE]
  - Hold the button down for the duration of the 3-min video.
  - Once the video is done, release your thumb and rest your hand/wrist

It's important that you gently rest both of your hands on the table in front of you while viewing each of the videos. This is to prevent any accidental disturbance of these delicate wires attached to the amplifier here.

* NO MANIPULATION (NO) GROUP*

All you have to do is simply watch each view.

For the duration of the 3-min video, relax into a comfortable position, keep your hands rested on the table in front of you.

[DEMONSTRATE]

It's important that you gently rest both of your hands on the table in front of you while viewing each of the videos. This is to prevent any accidental disturbance of these delicate wires attached to the amplifier here.

Post-Video Questionnaire Instructions

After you view each video, you will be asked a number of questions about your experience:

In addition to completing these questions, you will also be asked to complete a shape task. The instructions for this task will be given to you on the screen when the time comes.

Wrap-Up Instructions

At any point while I am in the back, if you have any questions or concerns, need to get up and leave, or go to the washroom, please ring the bell in front of you to let me know.

After the last video and counting task, I will come out of the back room to wrap things up

Do you have any questions or concerns?

For the duration of the presentations, I will turn off the lights in the room.

I will retreat to the back room now. Once I close the door, please begin to read and follow the instructions on the screen. By clicking “next”, I will know that you are ready.

Appendix P

Study 2: Participant Debriefing Letter

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Dear Participant:

Thank you for your participation in the study entitled "**The Video Study"**! During your participation, you were informed that the purpose of the study was to examine whether certain personality traits and physical actions influence skin temperature, heart activity, and attention while viewing videos of another woman portraying various physical actions. Though the study *was* interested in examining the personality traits and heart activity while watching the actor in the videos, you will likely recall that she was also displaying emotional expressions. **The TRUE purpose of this study was to examine whether personality traits, heart rate, and facial muscle activity have an impact on our emotional experience while viewing video content of another person displaying various emotions.**

Research shows that individual differences in personality can influence one's susceptibility to emotional contagion – the ability to "catch" or experience the emotions of people around them. In this study, the online questionnaires you completed before attending the laboratory session assessed numerous personality facets. Emotional contagion was assessed by your ratings of emotions after each video block during the laboratory session.

Individuals can also experience numerous bodily reactions to others' emotional facial expressions. One such bodily reaction is facial mimicry. Research suggests that by mimicking an expresser's facial display, the perceiver gets feedback from their own facial muscles that will induce a similar affective experience within themselves. As such, facial mimicry helps individuals understand the mental states of others. We assessed facial mimicry in response to the actor's facial expressions by recording your *facial muscle activity* (not skin temperature) from the electrodes that you wore on your face.

Individuals can also experience changes in heart rate variability (HRV) in response to others' emotional facial expressions. HRV refers to the variation in time between successive heart beats. Research shows that greater HRV is a biomarker for enhanced emotion regulation and responsivity to emotional stimuli. We assessed HRV in response to the actor's facial expression by recording your heart rate from the electrodes that you wore on your chest.

The true purpose of the study was not revealed to you at the time you participated in the study for multiple reasons. Firstly, previous literature has indicated that individuals may alter their physiological and emotional behaviour when they know that it is under scrutiny in a laboratory situation. In addition, when the predicted response under particular conditions is clearly stated, it is possible that some individuals participating in a psychological study may act in a way that is contrary to what their natural response would have been. Some individuals may feel inclined to deliberately act in a way that confirms predictions and to do what they believe the researchers want them to do. By contrast, others may deliberately act in a way that would purposefully contradict predictions. In either situation, the reactions expressed by individuals would not provide a good indication of their natural response tendency. Therefore, to properly address the research question and ensure valid results were obtained, it was necessary to provide an alternative cover story about the purpose of this study.

This study has the potential to benefit society, as the findings seek to answer the question, “How do we interact with each other and the world around us?” Given that personality traits can shape one’s tendency to experience and express certain emotions, the findings from this study can help us gain a better understanding of which personality traits result in more or less susceptibility to emotional contagion during social interactions. In turn, these findings may better inform health care professions to develop empirically supported interventions to help improve others’ social lives.

As per your original consent, all information that you provided is kept completely confidential. Only the research assistants (Samantha Chong and Lauren Kushnier) and Dr. Ron Davis will be permitted to view your data. Dr. Davis is never aware of the identities of those who volunteer to participate in this study. All of the information that you provided is assigned a code unattached to your name and securely stored at Lakehead University for 5 years as per University regulations. In addition, your identifying information will be kept completely confidential in reports of results and publications.

Please feel free to contact Samantha Chong and/or Dr. Ron Davis with any questions that you might have. This study has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact Sue Wright at the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca.

Your participation in this study is greatly appreciated. Over the next many months we plan to analyze the way in which personality traits are related to emotional processing in individuals like you who participated in this study. If you would like a brief summary of the results of this study, please let us know and we will e-mail it to you when it becomes available.

Sincerely,

Samantha Chong, smchong@lakeheadu.ca (XXX) XXX-XXXX
Dr. Ron Davis, ron.davis@lakeheadu.ca (XXX) XXX-XXXX.

Appendix Q

Study 3: Poster Advertisement

Appendix R

Study 3: Participant Information Letter and Consent Form

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Dear Potential Participant:

Our names are Samantha Chong and Rachel McKay, students and research assistants working with Dr. Ron Davis in the Department of Psychology at Lakehead University. We are conducting a research project called ***The 3-Min Video Booth***. The purpose of this project is to examine whether autobiographical memories and personality traits influence heart activity and facial skin temperature while viewing videos of yourself and another person.

To be eligible to participate, you must be female, between the ages of 18 and 40, and fluent in English. If you are eligible and agree to participate in this study, you would sign up to attend two separate laboratory visits in the Department of Psychology with one of the research assistants. During the first visit, you would complete a brief questionnaire that asks you about certain attitudes and behaviours. You would then record three, 3-min videos portraying various physical actions related to neutral, happy, and sad memories. This first visit will take approximately 30 minutes of your time. During the second laboratory visit, you will be fitted with electrodes to measure heart activity and facial skin temperature while you view videos of yourself and another person portraying various physical actions. This laboratory visit will take approximately 60 minutes of your time. A summary of the research findings may also be provided to you upon your request via e-mail.

Your participation in this study is completely voluntary and you may withdraw from it at any time without penalty. You will be asked to indicate your name on the online questionnaires during the first and second laboratory visit in order to link your data from both sessions. Your name will only be used for this purpose. Once the study is completed, your name will be removed from the data and assigned a code for purposes of anonymity. All information that you provide will be kept confidential. Only Dr. Davis and the research assistants, Samantha Chong, Rachel McKay, and Allison Payette, will be permitted to view your data. Dr. Davis is never aware of the identities of those who volunteer to participate in this study and your participation will therefore not result in any bias for or against you in his undergraduate course at Lakehead University. Dr. Davis will only be permitted to view the data from the study once the data is anonymized. All of the information that you provide will be securely stored at Lakehead University for 5 years as per University regulations. Please note that the online survey tool used in the study, SurveyMonkey, is hosted by a server located in the USA. The US Patriot Act permits U.S. law enforcement officials, for the purpose of anti-terrorism investigation, to seek a court order that allows access to the personal records of any person without the person's knowledge. In view of this, we cannot absolutely guarantee the full confidentiality and

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anonymity of your data. With your consent to participate in this study, you acknowledge this.

When publishing the results from this study in research journals and conferences, your data will be presented in aggregate form and your identifying information will be kept completely confidential. A risk associated with your participation in this study is the possibility that thinking about personal issues while recalling memories, completing the questionnaires (e.g., self-esteem), and/or viewing videos. The latter may arouse a degree of distress that may normally occur when you recall or view such content in your daily life. You may choose not to answer any question asked in the questionnaires without penalty or consequence.

To compensate you for your voluntary participation, you would receive a total of $20 in the form of cash for completing both laboratory visits ($5 at the end of the first laboratory visit and $15 as the end of the second laboratory visit). If you are registered in a Psychology undergraduate course eligible for bonus points, your participation by way of attending both laboratory visits would also lead to 3 bonus points credited to your final grade in that course. Please feel free to contact us and/or Dr. Ron Davis with any questions that you might have. If at any point during or after this study you would like to speak to a mental health professional, feel free to contact the Student Health and Counseling Centre at 343-8361 (UC 1007). This study is being funded by the Social Sciences and Humanities Research Council (SSHRC) and has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact Sue Wright at the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca

Sincerely,

Samantha Chong, smchong@lakeheadu.ca (XXX) XXX-XXXX
Rachel McKay, rmmckay1@lakeheadu.ca
Dr. Ron Davis, ron.davis@lakeheadu.ca (XXX) XXX-XXXX.

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By providing my name and signature below, I indicate that I have read the "Participant Information Letter" and that I have had the opportunity to receive satisfactory answers from the researchers concerning any questions that I might have about my participation in ***The 3-Min Video Booth***. I understand and agree to the following:

1. I understand all of the information on the "Participant Information Letter";
2. I agree to participate in this study;
3. I am a volunteer and can withdraw at any time from this study without penalty or consequence;
4. In order to link my online questionnaire data from both laboratory sessions, I must indicate my name on the online questionnaires. My name will only be used for this purpose. Once the study is completed, my name will be removed from the data and assigned a code to ensure anonymity.
5. I may choose not to answer any question asked in the questionnaires without penalty or consequence;
6. There are no anticipated physical risks associated with participation in this study. Should I experience any personal distress or discomfort during or following my participation, I may choose not to participate without penalty or consequence. I may also personally contact the Health and Counselling Centre at Lakehead University (Thunder Bay campus) to speak to a mental health professional;
7. My personal information will be securely stored in the Department of Psychology at Lakehead University for 5 years as per University regulations;
8. The online survey tool used in this study, SurveyMonkey, is hosted by a server located in the USA. Under the US Patriot Act, US law enforcement officials may seek a court order that allows access to the personal records of any person without the person's knowledge for purpose of anti-terrorism investigation. As such, we cannot absolutely guarantee the full confidentiality and anonymity of your data.
9. Dr. Ron Davis is never aware of the identities of those who volunteer to participate in this study and your participation will therefore not result in any bias for or against you in his undergraduate course;
10. My data will be presented in aggregate form and my identifying information will be kept completely confidential and anonymous should the results from this study be published in research journals and conferences;
11. I may receive a summary of this research upon completion if I so request;
12. I give my permission to be contacted by email for the purpose of participation in this study; and
13. I understand and agree to this "Consent to Participate"

____________________________________ __________________________
Full Name (*please print*) Date

____
Signature *(please sign)*

Appendix S

Body Image States Scale

For each of the 6 items below, check the box beside the one statement that best describes how you feel **RIGHT NOW, AT THIS VERY MOMENT** after viewing your videos. Read the items carefully to be sure the statement you choose accurately and honestly describes how you feel right now.

1. Right now I feel…
    - ☐ ***Extremely dissatisfied*** with my physical appearance
    - ☐ ***Mostly dissatisfied*** with my physical appearance
    - ☐ ***Moderately dissatisfied*** with my physical appearance
    - ☐ ***Slightly dissatisfied*** with my physical appearance
    - ☐ ***Neither dissatisfied nor satisfied*** with my physical appearance
    - ☐ ***Slightly satisfied*** with my physical appearance
    - ☐ ***Moderately satisfied*** with my physical appearance
    - ☐ ***Mostly satisfied*** with my physical appearance
    - ☐ ***Extremely satisfied*** with my physical appearance

2. Right now I feel…
    - ☐ ***Extremely satisfied*** with my body size and shape
    - ☐ ***Mostly satisfied*** with my body size and shape
    - ☐ ***Moderately satisfied*** with my body size and shape
    - ☐ ***Slightly satisfied*** with my body size and shape
    - ☐ ***Neither dissatisfied nor satisfied*** with my body size and shape
    - ☐ ***Slightly dissatisfied*** with my body size and shape
    - ☐ ***Moderately dissatisfied*** with my body size and shape
    - ☐ ***Mostly dissatisfied*** with my body size and shape
    - ☐ ***Extremely dissatisfied*** with my body size and shape

3. Right now I feel…
    - ☐ ***Extremely dissatisfied*** with my weight
    - ☐ ***Mostly dissatisfied*** with my weight
    - ☐ ***Moderately dissatisfied*** with my weight
    - ☐ ***Slightly dissatisfied*** with my weight
    - ☐ ***Neither dissatisfied nor satisfied*** with my weight
    - ☐ ***Slightly satisfied*** with my weight
    - ☐ ***Moderately satisfied*** with my weight
    - ☐ ***Mostly satisfied*** with my weight
    - ☐ ***Extremely satisfied*** with my weight

4. Right now I feel…

☐ ***Extremely*** physically attractive
☐ ***Very*** physically attractive
☐ ***Moderately*** physically attractive
☐ ***Slightly*** physically attractive
☐ ***Neither*** attractive nor unattractive
☐ ***Slightly*** physically unattractive
☐ ***Moderately*** physically unattractive
☐ ***Very*** physically unattractive
☐ ***Extremely*** physically unattractive

5. Right now I feel…

☐ ***A great deal worse*** about my looks than I usually feel
☐ ***Much worse*** about my looks than I usually feel
☐ ***Somewhat worse*** about my looks than I usually feel
☐ ***Just slightly worse*** about my looks than I usually feel
☐ ***About the same*** about my looks as usual
☐ ***Just slightly better*** about my looks than I usually feel
☐ ***Somewhat better*** about my looks than I usually feel
☐ ***Much better*** about my looks than I usually feel
☐ ***A great deal better*** about my looks than I usually feel

6. Right now I feel that I look…

☐ ***A great deal better*** than the average person looks
☐ ***Much better*** than the average person looks
☐ ***Somewhat better*** than the average person looks
☐ ***Just slightly better*** than the average person looks
☐ ***About the same*** as the average person looks
☐ ***Just slightly worse*** than the average person looks
☐ ***Somewhat worse*** than the average person looks
☐ ***Much worse*** than the average person looks
☐ ***A great deal worse*** than the average person looks

Appendix T

Body Comparison Questionnaire

STRENGTH SUBSCALE

1. **In general, to what extent did you compare yourself to the woman in the video clip?**

No Comparison — A Lot of Comparison

1 2 3 4 5 6 7 8 9

2. **In general, to what extent did you compare yourself to the woman based on *appearance*?**

No Comparison — A Lot of Comparison

1 2 3 4 5 6 7 8 9

3. **In general, to what extent did you compare yourself to the woman based on *body shape*?**

No Comparison — A Lot of Comparison

1 2 3 4 5 6 7 8 9

4. **In general, to what extent did you compare yourself to the woman based on *body weight*?**

No Comparison — A Lot of Comparison

1 2 3 4 5 6 7 8 9

DIRECTION SUBSCALE

5. **In general, did you compare yourself more/less favourably to the woman in the video clip?**

A Lot Less Favourably								A Lot More Favourably
1	2	3	4	5	6	7	8	9

6. **In general, did you compare yourself more/less favourably based on *appearance*?**

A Lot Less Favourably								A Lot More Favourably
1	2	3	4	5	6	7	8	9

7. **In general, did you compare yourself more/less favourably based on *body shape*?**

A Lot Less Favourably								A Lot More Favourably
1	2	3	4	5	6	7	8	9

8. **In general, did you compare yourself more/less favourably based on *body weight*?**

A Lot Less Favourably								A Lot More Favourably
1	2	3	4	5	6	7	8	9

Appendix U

Mate Value Inventory–Other

How well do you feel that these attributes apply to [YOU/OTHER WOMAN], after viewing the video?

Please rate each attribute on the following scale:

-3 ---------- -2 ---------- -1 ---------- 0 ---------- +1 ---------- +2 ---------- +3

Extremely low on this trait | Extremely high on this trait

Ambitious	____
Desires children	____
Faithful/value fidelity	____
Generous	____
Good sense of humour	____
Healthy	____
Independent	____
Intelligent	____
Kind and understanding	____
Loyal	____
Financially secure	____
Responsible	____
Enthusiastic about sex	____
Sociable	____
Emotionally stable	__

Appendix V

Contingencies of Self-Worth Scale

Please respond to each of the following statements by selecting your answer using the scale below. If you haven't experienced the situation described in a particular statement, please answer how you think you would feel if that situation occurred.

1 = Strongly disagree
2 = Disagree
3 = Disagree somewhat
4 = Neutral
5 = Agree somewhat
6 = Agree
7 = Strongly agree

1	When I think I look attractive, I feel good about myself
2	I feel worthwhile when I perform better than others on a task or skill
3	My self-esteem is unrelated to how I feel about the way my body looks
4	I don't care if other people have a negative opinion about me
5	I can't respect myself if others don't respect me
6	Knowing that I am better than others on a task raises my self-esteem
7	I don't care what other people think of me
8	My self-esteem is influenced by how attractive I think my face or facial features are
9	Doing better than others gives me a sense of self-respect
10	My sense of self-worth suffers whenever I think I don't look good
11	What others think of me has no effect on what I think about myself
12	My self-worth is affected by how well I do when I am competing with others
13	My self-esteem does not depend on whether or not I feel attractive
14	My self-worth is influenced by how well I do on competitive tasks
15	My self-esteem depends on the opinions others hold of me

Appendix W

Study 3: Participant Videography Instructions

Welcome to the 3-Min Video Booth ! Thank you for volunteering to participate today! My name is __________. I'm going to take care of you during this recording session. This is my research assistant ___________. She will be in the back for the duration of our session doing video editing.

Participant Letter and Consent Form

Here I have the Participant Information Letter/Consent Form. You should have read this prior to coming to the lab session today. Did you have a moment to read the letter? [Would you like a moment to read it?]. Before signing the consent letter, do you have any questions or concerns that you would like addressed?

Online Questionnaire

Before getting started today, I have a very short questionnaire for you to fill out. It asks you questions about *demographics* and certain *attitudes/behaviours* that you may have. It should only take about 5 to 10 min. Try not to think too hard about your answers. Just go with your gut feeling. We'll be in the back room here with the door shut while you do the questionnaire. When you are finished, just ring this bell here to let us know!

Recording Instructions

The purpose of a video/photo booth is to create and relive memories! For example, people at weddings may use a video booth to leave a nice message for the bride/groom or share a memory with them, or simply to be goofy! There's no skill required other than being yourself.

Our Video Booth is unique in two ways. First, each video you make is limited to 3 minutes. Second, unlike other video booths where people can talk, there is no talking in this booth. You can make sounds (e.g., laughter, crying) which is why we will put a microphone clip on your shirt, but you cannot verbalize words/phrases. Essentially, what you are doing is reliving your memories ONLY USING MOVEMENTS/SOUNDS

Today, you will be creating three, 3-min videos expressing a neutral, sad, and happy memory. For each video, you will look into this camera lens and pretending it's a person with whom you wish to share your memory with. The video booth only records from the top of your head to the top of your shoulders, so the movements/sounds that you will make will be from this part of your body only.

> For the **NEUTRAL VIDEO**, all you have to do is simply look into the camera and maintain a neutral facial expression – as if you were taking a really long passport photo.
>
> For the **SAD VIDEO**…You would reflect on sad memories that make you want to frown, cry, sob, gaze downward… etc. By no means do you have to shed tears. If you can, that's great! But it's not a requirement! All you have to do is make movements/sounds that reflect sad memories, so that when you watch your video later in the next session, you know that you were reflecting on sad memories.
>
> For the **HAPPY VIDEO**, You would reflect on happy memories that make you want to smile, giggle, laugh… etc. Essentially, make movements/sounds that reflect happy memories so that when you watch your video later in the next session, you know that you were reflecting on happy memories.
>
> For the happy and sad videos, you do not have to express the maximum amount of that emotion right off the bat. You can gradually develop or transform the emotion over the 3 minutes, beginning with expressing a small amount of that emotion to expressing the greatest amount towards the end. For example, you do not have to try to shed tears right off the bat. You can slowly develop the emotion; perhaps starting with some light frowns, then a more pronounced sulk, then (if you can) building up teary-eyes, then shedding some tears, and perhaps sobbing at the end.
>
> For most people, it is difficult to express sadness. If you find it difficult to cry or become teary-eyed, that is okay as long as you express the maximum amount of that emotion at some point (ideally near the end), whatever that maximum might be for you AND for as long as you are able to.

You can record your videos in any order that you would like! Before stating each recording, I'll give you a minute to think about the movements/sounds that you want to portray. When you are ready, I will start the camera and timer on my phone, and quietly go to the back room for the duration of the recording. When the 3-min is up, I will quietly come out of the back room and stop the recording.

If at any point you would like to stop the recording, get up and leave, take a break, or go to the washroom, just ring the bell to let me know. Do you have any questions or concerns before we begin?

Appendix X

Study 3: Participant Viewing Instructions

For the next 60 min or so, you will be engaging in a number of computer tasks. Using the mouse and keyboard, you will follow the instructions displayed on the screen, which will guide you through each task.

For example, when given an instruction that say “Now press ‘next”, you click “next” using the mouse.

For the course of this lab session, I will be in the back room controlling the presentation of the tasks.

General Viewing Instructions

What you will be doing today is viewing those videos that you made in the 3-min Video Booth, as well as another woman’s videos. This woman was a participant in a previous study and created videos just like yours. She gave us permission to show her videos to participants in this study, and so we have included them here or your viewing!

This is the other woman that you will be viewing: [Show Photographs of Actors]
Do you know this participant?
[If yes, randomize to IC group, if not already done so and make note of it in SPSS]

Baseline Instructions

Before viewing the videos, we need to record your baseline heart functioning and skin temperature.

There are two types of baseline recordings:

- For the FIRST recording, you will be asked to simply close your eyes, relax, and remain as still as possible for 5 min. When you hear a bell ring, you may open your eyes and then I will bring up a few questions for you to answer here on the screen about attention and how you are feeling.
- For the SECOND recording, you will watch a 3-min video of a woman moving around Styrofoam chips on a table. Afterwards, I will bring up a few questions for you to answer again about attention and how you are feeling.

After you complete the last question, I will come back out and explain the rest of the procedure.

Wrap-Up Instructions

At any point while I am in the back, if you have any questions or concerns, need to get up and leave, or go to the washroom, please ring the bell in front of you to let me know.

For the duration of the presentations, I will turn off the lights in the room.

I will retreat to the back room now. Once I close the door, please begin to read and follow the instructions on the screen. By clicking "next", I will know that you are ready.

[Retreat from the Back Room]

For the rest of the procedure, you will watch the videos of both yourself and another woman. There is a total of 6 videos, each lasting 3-min in duration. You will see this picture before the start of each video to remind you to keep your hands rested gently on the table in front of you. This is because you are hooked up to some fine wires – and this hand placement ensures that you do not move any wires, which can happen if we feel a bit fidgety over time.

[Read Appropriate Group Instruction to Participant]

*** EXPLICIT COMPARISON (EC) GROUP***

With respect to the presentation order, you will watch videos of yourself and the woman in an interlaced fashion: first yourself, then the woman, then yourself, then the woman… etc. etc.

While you watch the other woman's videos, we would like for you to think about how you compare to the woman in terms of weight, shape, and appearance.

After watching the other woman's video, you will be asked the same questions as before about attention, feelings… as well as the extent to which you compared yourself to the woman and whether it was more or less favourable.

*** IMPLICIT COMPARISON (IC) GROUP***

With respect to the presentation order, you will first watch the set of videos of the other woman and then watch your set of videos.

All you have to do is simply watch each video.

After watching each video, you will be asked the same questions as before about attention, feelings, as well as your impressions of traits and attributes.

Wrap-Up Instructions

At any point while I am in the back, if you have any questions or concerns, need to get up and leave, or go to the washroom, please ring the bell in front of you to let me know.

After the last video and counting task, I will come out of the back room to wrap things up

Do you have any questions or concerns?

For the duration of the presentations, I will turn off the lights in the room.

I will retreat to the back room now. Once I close the door, please begin to read and follow the instructions on the screen. By clicking “next”, I will know that you are ready.

Appendix Y

Study 3: Participant Debriefing Letter

Lakehead UNIVERSITY

Dear Participant:

Thank you for your participation in the study entitled ***The 3-Min Video Booth***! During your participation, you were informed that the purpose of the study was to examine whether autobiographical memories and personality traits influence heart activity and facial skin temperature while viewing videos of yourself and another person portraying various physical actions. Though the study *was* interested in examining the personality traits and heart activity while watching the video clips, **the TRUE purpose of this study was to examine whether certain personality traits influence heart rate and *facial muscle activity* while viewing videos of another person displaying various emotional facial expressions. The study further explored whether such physiological responses are influenced by body comparison.**

Individuals can experience numerous bodily reactions to others' emotional facial expressions. One such bodily reaction is facial feedback. Research suggests that by activating facial muscles that are congruent with an expresser's facial display, the perceiver gets feedback from their own facial muscles that will induce a similar affective experience within themselves. We assessed facial feedback in response to the actor's facial expressions by recording your *facial muscle activity* (not skin temperature) from the electrodes that were affixed to your face.

Individuals can also experience changes in heart rate variability (HRV) in response to others' emotional facial expressions. HRV refers to the variation in time between successive heart beats. Research shows that greater HRV is a biomarker for enhanced emotion regulation and adaptive responsivity to emotional content in our lives. We assessed HRV in response to the actor's facial expression by recording your heart rate from the electrodes that you wore on your chest.

The physiological changes described above are also shown to be influenced by the perception of threat. We assessed the specific threat of body comparison by randomizing participants to one of two experimental conditions. If you were in the body comparison condition, you would have been asked to compare yourself to the actors in the videos and indicate the extent to which you compared yourself more/less favourably in terms of bodily appearance after each of the actor's videos. If you were in the no-comparison condition, you would have been asked to simply view the videos.

The true purpose of the study was not revealed to you at the time you participated. Previous literature indicates that participants may alter their facial muscle movements in a way that is contrary to their natural response tendency. This is because facial muscle activity can be easily controlled by the participant if they are consciously aware of such activity. If aware, some participants may feel inclined to deliberately activate facial muscles in a way that confirms to the study's predictions and to do what they believe the researchers want them to do. In contrast, others may deliberately activate facial muscles in a way that would purposefully contradict predictions. In either situation, facial muscle reactions expressed by the participant under conscious awareness would not provide a good indication of their natural response tendency. Therefore, to properly address the research question and ensure valid results were obtained, it was necessary to provide an alternative cover story about the purpose of this study. You were told that the study is interested in facial skin temperature to conceal the intended use of the electrodes affixed to your face without compromising the integrity of your facial muscle movements. Facial skin temperature, in particular, was chosen as the cover story as temperature is not under the control of participants.

This study has the potential to benefit society, as the findings seek to answer the question, "How do we interact with each other and the world around us?" Not only do emotions serve an affiliative function to establish and maintain social bonds with others; they also serve a social distancing function to help individuals differentiate themselves from others who pose a threat to their social standing and well-being. Thus, facial feedback—a form of behaviour that helps us to communicate and understand others' mental states—may depend on the moderating influence of situational, biological, and interpersonal factors (e.g., body comparison, heart rate variability, personality). These findings may better inform health care professions to develop empirically supported interventions to help improve others' social lives.

As per your original consent, your participation in this study is completely voluntary. All information that you provided is kept completely confidential. Only Dr. Davis and the research assistants, Samantha Chong, Rachel McKay, and Allison Payette are permitted to view your data. Dr. Davis is never aware of the identities of those who volunteer to participate in this study and your participation will therefore not result in any bias for or against you in the course. All of the information that you provided will be securely stored at Lakehead University for 5 years as per University regulations. When publishing the results from this study in research journals and conferences, your data will be presented in aggregate form and your identifying information will be kept completely confidential. If you would like to withdraw your data from the study, you may do so without penalty by emailing Samantha Chong within 15 days of receiving this debriefing letter.

Please feel free to contact Samantha Chong and/or Dr. Ron Davis with any questions that you might have. This study has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact Sue Wright at the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca.

Your participation in this study is greatly appreciated. Over the next many months we plan to analyze the way in which personality traits are related to emotional processing in individuals like you who participated in this study. If you would like a brief summary of the results of this study, please let us know and we will e-mail it to you when it becomes available.

Sincerely,

Samantha Chong, smchong@lakeheadu.ca (XXX) XXX-XXXX
Dr. Ron Davis, ron.davis@lakeheadu.ca (XXX) XXX-XXXX.