THE RELATIONSHIP OF PRE-COMPETITION AROUSAL ASSESSMENTS

TO SELF-PERCEIVED PERFORMANCE COMPETENCIES IN ROWERS

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ABSTRACT

TITLE OF THESIS: The Relationship of Pre-Competition Arousal Assessments
to Self-perceived Performance Competencies in Rowers.

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This study used the technique of self-reporting to examine the
relationship of pre-competition arousal symptoms and assessments to
self-perceived performance competencies in rowers. A modified version
of Rushall's (1977) Pre-Competition Psychological Checklist was
employed allowing each subject to report pre-competition arousal
symptoms, estimate of excitedness, estimate of winning, importance of
event, and control over distractors. Post-race assessments of crew
and individual performances were also noted. The research design
selected was a number of replications of a single subject case study.
The data were analyzed to determine 1) the existence of arousal patterns
that were performance grade specific, 2) arousal (excitedness) -
performance relationships, 3) estimation of winning - performance
relationships, 4) importance of event - performance level relationship,
5) control over distractors - performance relationship, 6) arousal -
estimation of winning relationships, 7) arousal - importance of event
relationships, and 8) arousal - control over distractors relationship.
All subjects exhibited grade specific arousal patterns. The arousal
estimate and performance relationships were idiosyncratic, however,
when all subjects were considered together the relationship was positive
and linear. Linear relationships were evidenced between 1) arousal and

estimation of winning, 2) arousal and importance of event, and 3) arousal and control over distractors. The importance of event and control over distractors variable were related to performance in a more obvious manner than was arousal.

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INTRODUCTION

Purpose

The purpose of this study was to examine the relationship of pre-competition arousal symptoms to self-perceived performance adequacies in rowers.

Significance of the Study

Success in athletics is the result of an optimal combination of physiological, biomechanical, and psychological factors. The need for superior physiological attributes and sound biomechanical techniques is well established. The need for precise psychological preparation prior to competition is a recently recognized phenomenon. In the past, coaches have relied on experience and intuition to develop procedures for the pre-competition preparation. More recently, psychological support staff members have been added to specific national teams evidencing an attempt to produce a more balanced approach for preparing athletes for competition. If athletic performances are to improve in the future, more research needs to be directed towards the psychological component of competition preparation.

The sport of rowing has been well researched in the areas of physiology and biomechanics (DiPrampero, Cortil & Celentano, 1971; Hagerman, Hagerman & Mickelson, 1979; Pyke, Minkin, Woodman, Roberts & Wright, 1979). However, extensive psychological research in rowing has been less than adequate. A lack of scientific data in the psychological domain has led to many assumptions when preparing athletes for competition. The use of psychological support tools may aid in achieving superior performance by providing data directly related

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to specific sports (Rushall, 1979a).

In rowing, pre-race crew meetings and pep talks are common. The outcome of performances could be influenced by the use of these pre-competition meetings. When no data are available it is questionable to judge their effectiveness. Research has shown that individuals respond differently to various pre-competition arousal levels (Barry, 1978; Fiorini, 1978; Rushall, 1976). Through a pre-competition psychological checklist (Rushall, 1975) it is possible to identify arousal pattern indicators for each athlete. Certain arousal patterns may be indicative of a certain grade or standard of performance. It is logical to assume that if arousal patterns could be controlled or manipulated, performances could be predicted.

There is agreement among sport psychologists that a relationship does exist between arousal and performance (Cratty, 1973; Landers, 1980; Oxendine, 1970). Although the topic has been well researched no conclusive statements have been written concerning the exact nature of this relationship. Most of the data have been obtained from untrained individuals in non-athletic events. There has been a preoccupation with personality traits related to arousal (Martens, 1977; Spielberger, 1971) rather than behaviors which occur in the sporting environment. There is a need to study pre-competition arousal and arousal patterns in a sport specific situation.

Several theories have been proposed to explain the arousal-performance relationship. One theory pioneered by Hull (1943) and updated by Spence and Spence (1966) predicted that performance is a multiplicative function of habit times drive. Habit refers to the hierarchical dominance of correct responses, while drive refers to

physiological arousal. According to this theory an increase in drive results in an improved performance. Furthermore, this theory postulated that a poor performance may be a result of a low arousal level.

The inverted-U hypothesis was first discussed by Yerkes and Dodson (1908) and updated by Oxendine (1970). It stated that there is an optimal level of arousal that is related to maximum performance. This optimal level varies with the type and difficulty of the task. Individuals who are over or under-aroused will not achieve a maximal performance. These two theories agree on the relationship between performance and lower arousal states. There is an obvious discrepancy between the two theories concerning elevated arousal levels. Depending on which position the coach supports, he/she will employ different coaching strategies. An alternative theory has been developed, based on the work of Easterbrook (1959), which stated that as the arousal level increases the attentional focus of an individual decreases. This thesis will attempt to clarify these controversial views.

Since this investigator is a national level rower and an apprentice coach, there is a personal interest in investigating the arousal-performance relationship in a practical and applicable manner. Implications of this study may include the enhancement of the rowing performance and coaching skills of this researcher.

In summary, the justification for this thesis lies in the lack of valid scientific research in the area of psychological preparation for competition as well as the conflicting views in arousal performance literature. Results obtained from this study may shed more light on pre-competition arousal patterns in rowers. There also exists a personal interest in the topic.

Delimitations

This thesis was concerned with arousal and its relationship to competitive performance. Specifically pre-race arousal symptoms and arousal estimates were related to self-perceived performance ratings.

The subjects studied were members of the 1982 Thunder Bay Rowing Club. The observations took place over an entire competitive season ranging from late May to late August.

The variables observed and measured were pre-race arousal levels, arousal symptoms, estimation of winning, estimated importance of the event, estimated control over distractors, and a post-race assessment of performance.

The research instrument was a modified version of Rushall's (1975) Pre-Competition Psychological Checklist (PCPC). It consists of:

i) a twenty-three item checklist designed to indicate self-perceived arousal symptoms.

ii) a numerical self-appraisal of pre-race excitedness level on a scale ranging from zero to ten.

iii) a numerical estimation of the probability of winning the race ranging from zero to ten.

iv) a numerical scale estimating the importance of the event to the individual or team.

v) a numerical scale estimating the control that the subject has over distractions ranging from zero to ten.

Limitations

The research instrument is based on the technique of self-reporting. The reliability and validity of the results depended upon the honesty

and accuracy of the report as well as the self-awareness that each individual possessed. Periodic reliability checks and re-stressing of definitions were carried out in an attempt to obtain accurate and reliable data.

The PCPC used in this study has no published empirical validity but it was felt by this writer that it was high in content validity. The PCPC has been reported to be a reliable tool for assessing pre-competition arousal (Rushall, 1975, 1977).

The time interval between filling out the PCPC and race time was a limitation of this study. Due to the nature of the sport, it was necessary to complete the PCPC before warming up on the water. Arousal symptoms and estimates may change after this warm-up period.

Definitions

Arousal. Arousal is defined as the level of excitedness as perceived by the subjects. It is characterized by physiological, psychological, and behavioral reactions to the impending race and is measured with two scales. A list of 23 feelings and behaviors that the subject experienced before the race is the first measure while a second measure is obtained using a numerical scale ranging from zero to ten.

Arousal Symptoms. These being 23 diagnostic phases defined as the self-perceived presence of certain feelings, internal emotional behaviors, external emotional behaviors, and performance expectations as specified by Rushall's (1977) PCPC.

Rowers. The subjects aged 17 to 23 years were members of the Thunder Bay Rowing Club. They trained and competed in a variety of boats including sculling and sweep events. The subjects' ability

ranged from National to Novice calibre and are classified as follows:

a) National - any subject who placed among the top three positions at the 1982 Canadian Amateur Rowing Championships in the single, double, or pair oared events in their respective classifications.

b) Provincial - any subject who placed among the top three positions at the National Championships in the four, quad, or eight events. Also included was any subject who placed in the top three positions at the Provincial Championships in any event.

c) Novice - any subject competing in their first year of rowing.

Distractor. A distractor was defined as anything or anyone that diverted the subjects' concentration from the upcoming race. These included weather conditions, equipment preparations, other competitors, coaches, and well-wishers.

Estimation of Winning. This was defined as the self-perceived probability of placing first in the upcoming race as reported on the PCPC. It was measured on a numerical scale ranging from zero, no chance of winning, to ten, no chance of losing.

Importance of Event. This was defined as the self-perceived rating of the importance of the consequences of the impending race. Both team and individual consequences were considered on this numerical scale ranging from zero, meaning no importance, to ten, indicating an event of the greatest importance.

Performance. This was defined as the subjective rating of the quality of the previous race. Factors such as effort expended, technical excellence, and resulting place were incorporated into this five point rating scale. The terms used on this scale were great, good, normal, poor, and very poor (Barry, 1978).

Chapter 2

REVIEW OF LITERATURE

Arousal

The concept. Behavior is said to have two components, direction
and intensity (Duffy, 1957; Landers, 1980). Arousal refers to the
intensity dimension of behavior (Duffy, 1957; Martens, 1977). The
term arousal has been used interchangably with other terms such as
drive (Hull, 1943), motivation (Murray, 1974), energy mobilization
readiness (Genov, 1976), activation (Duffy, 1957), anxiety (Landers,
1980; Oxendine, 1970), and excitement (Rushall, 1975). Malmo (1959)
made a distinction between arousal and anxiety; anxiety being a
pathological state of over-arousal. Keeping the arousal state high for
extended periods of time can lead to extreme fatigue and this maladaptive
state of anxiety (Duffy, 1957; Malmo, 1959). Regardless of the label,
this pre-competition state in athletes is formed when the athlete uses
past and present experiences to form a situational appraisal (Rushall,
1979).

The possibility of more than one type of arousal was discussed by
Duffy (1959), Kane (1971), and Landers (1980). Duffy (1957) explained
the multidimensional concept of arousal along a continuum ranging from
deep sleep to great excitement. Spielberger (1971) differentiated trait
anxiety from state anxiety. Trait anxiety is a predisposition to
perceive certain situations as threatening while state anxiety refers
to an existing emotional state that is situationally aroused (Martens,
1977). Eysenck (1967) explained the arousal concept in terms of
neurophysiological excitation and inhibition of certain neural impulses.

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Fiske and Maddi (1961) discussed arousal as an energizing mechanism in the central nervous system. Arousal may manifest itself in cognitive, behavioral and physiological reactions (Borkovec, 1976 cited in Landers, 1980; Harris & Katkin, 1975). The multidimensionality of arousal is evidenced by the variety of explanations of the concept in the literature.

The individual and arousal. Optimal levels of arousal for each athlete are idiosyncratic (Barry, 1978; Fiorini, 1978; Rushall, 1976). This optimal arousal level appears to vary with a number of factors. Variations may occur due to drugs or hormonal changes (Duffy, 1957; Levitt, 1977). Personality characteristics such as the individual's trait anxiety and degree of extroversion may influence optimal arousal levels (Klavora, 1975; Moschuk & McCabe, 1981). Task complexity, task expectations, and stress imposed by the impending situation have also been suggested as determinants of optimal arousal level (Cratty, 1973; Genov, 1976; Oxendine, 1970). Arousal level may be influenced by the individual's perception of physical or psychological threat, probability of success and uncertainty of outcome (Fisher & Zwart, 1982). Prior knowledge of the opponent's standard could affect anxiety levels (Gerson & Deshaies, 1978; Sanderson & Ashton, 1981). Genov (1976) stated that optimal arousal level could be affected by personal and social importance of the event. It would be easier for the athlete to mobilize his or her forces as the importance of the event increased. Harmon and Johnson (1952) supported this premise in their findings comparing arousal levels and the importance of the game. In collegiate football players they found a close relationship between importance of the game and measured pre-competition team reactions. Malmo (1957) found that by raising the incentive, it increased the steepness of the EMG in a visual tracking

task. Sanderson and Ashton (1981) reported that perceived importance of the competition was related to pre-competition anxiety levels in badminton players. However, Klavora (1975) found that there was no significant difference in state anxiety levels of high school football and basketball players when he compared regular season games to playoff games.

Lacey (1950) stated that everyone has their own way of responding to environmental stimuli and how the individual perceives those stimuli colours the response. The nature of the individual, nature of the task, and level of confidence may affect arousal.

Arousal and skill level. A major consideration in determining the optimal state for each athlete is their skill level. Mahoney and Avener (1977) reported differences in arousal patterns as a function of skill level. At the men's U.S.A. Olympic Gymnastics Trials, competitors were asked to rate their levels of arousal at various stages of the competition. The qualifiers were slightly more aroused immediately prior to the competition while the non-qualifiers felt more anxious during the competition. Barry (1978) and Fiorini (1978) found that higher calibre athletes recorded higher levels of excitedness for specific performance standards and displayed more distinctive arousal pattern responses than did lesser athletes. These findings suggested that some form of arousal control was taking place within the subjects. Reilly (1977) stated that the better performers in his study on cross country runners were higher in moods associated with surgency and vigour in the pre-start environment. He concluded that these moods were indicative of arousal and that although these moods did not cause the superior performances, they probably aided in achieving a positive orientation toward the ensuing competition. Moschuk and McCabe (1981) also found that individual skill

level in hockey was the most important variable in distinguishing differences in pre-game arousal. Daniels, Wilkins, Hatfield and Lewis (cited in Landers, 1982) tested the hypothesis that more experienced shooters were able to perceive their physiological arousal responses such as heart rate and respiration rate, while shooting. Those shooters whose perceptions were the same as the objectively recorded measures had significantly better performance scores than the desynchronous subjects.

> This suggests that better athletes do consciously or
> unconsciously attend to these and perhaps other autonomic
> patterns and use this information to help determine when
> it "feels" right to pull the trigger. (Landers, 1982, p. 278)

In another field study involving female track and field athletes, Huddleston and Gill (1981) suggested that factors such as age and experience may modify the relationship between skill level and pre-competitive anxiety. In their study, the better performers were younger and less experienced athletes. According to Genov (1976) new and unexperienced sportsmen give less time to mobilization than do experienced athletes. The ability to achieve mobilization readiness is created and educated in the process of training and competition.

In summary, the concept of arousal is thought to be a multidimensional one. There is no consensus of opinion in the literature as to what degree and in what direction arousal affects athletes. However, there is general agreement in the literature that arousal is very specific to the individual as well as the situation. Factors such as skill level, task difficulty, self-confidence, and importance of the event are reported to affect arousal in the individual.

Measurement of Arousal

Various methods have been employed to measure pre-competition arousal in laboratory and field studies. In the assessment of arousal one must consider the multidimensionality concept. A single index of arousal may be inappropriate (Fisher, 1976).

Arousal has been measured with many physiological indicies. Heart rate, blood pressure, muscle tension (EMG), galvanic skin response (GSR), and electrical brain activity (EEG) have been used to measure arousal (Duffy, 1957; Harmon & Johnson, 1952; Lacey, 1970; Malmo, 1957). The problem with physiological measures has been in the relatively low intercorrelations among the indices. Ax (1953) (cited in Fisher, 1976) reported a correlation of .12 between heart rate, blood pressure, GSR, respiration rate, and skin temperature. With physiological measures, there has been variability among individual responses and among the quality of those responses. It has been reported that individual patterns of identical reactions occur regardless of the stimuli (Lacey, 1950). Therefore, it is difficult to isolate arousal with physiological measures.

> It is clear that it is the organism, and not a single
> system, or a single aspect of response which shows
> arousal or activation. (Duffy, 1957, p. 266)

This would lend support to the theory that arousal is a multidimensional concept. Due to the imperfect validity of single measures, multiple physiological measures would be necessary to substantiate an arousal state. Multiple physiological measures are impractical in the sporting environment.

Biochemical measures of arousal have also been used. Urinary

excretions of catecholamines and emotional arousal were positively correlated as reported by von Euler (1964) (cited in Reilly, 1977) and Krahenbuhl (1972). The sodium lactate concentration in blood was studied by Pitts (1970) to measure anxiety.

Psychometric tests such as the State-Trait Anxiety Inventory (Spielberger, Gorusch & Lushene, 1970), Sport Competition Anxiety test (Martens, 1977), and the Pre-Competition Psychological Checklist (Rushall, 1976) have been used to measure the degree of arousal that an athlete may be experiencing. The validity of these measures depends upon the truthfulness of the self-report. Thayer (1967) advocated that a general self-report measure of arousal was a better predictor of arousal states than any physiological variables. He found that the Activation-Deactivation Adjective Checklist (AD-ACL) correlated more highly with heart rate and skin conductance than the physiological measures correlated with each other. Dermer and Berscheid (1972) found that an excitedness scale ranging from -10, indicating boredom, to +10, indicating extreme excitement, had some degree of construct and empirical validity as an activation indicant.

Much of the research has been conducted in laboratory settings and the external validity of the results must be scrutinized for use in the sporting environment (Barry, 1978). The competitive environment poses threats to an individual's self-esteem and has potential to evoke changes in arousal levels that may not occur in the laboratory (Klavora, 1975). Bird (1981) found the AD-ACL to be reliable for differentiating situations from quiescence to high level competition in novice and elite orienteering competitors. The excitedness scale developed by Dermer and Berscheid (1972) and the technique of self-report was successfully corroborated with novice and elite wrestlers (Barry, 1978; Rushall,

1976) and freshman to international calibre basketball players (Fiorini, 1978) using the PCPC. Martens (1977) and Spielberger (1971) admitted that some confusion in the literature had developed due to the use of trait-anxiety tests for measuring state anxiety. Spielberger (1971) suggested that self-report scales are criticized because some individual scale items are ambiguous, items mean different things to different people, subjects do not know themselves well enough to answer truthfully, and they are unwilling to admit to less desirable qualities or feelings.

In summary, the physiological measurement of arousal has revealed some problems. Various measurements rarely correlate with each other, individuals respond uniquely to arousal, and the measurements are not practical in the sporting environment. The subjective self-report method has been shown to be a reliable indicator of arousal. It is also acceptable in the pre-competitive environment.

Arousal and Performance

It is well established that arousal increases prior to competition and therefore has potential to influence performance. Increased arousal facilitates performance in speed, strength, and endurance type activities and debilitates performances requiring precision and fine muscle control (Oxendine, 1970). The degree of activiation affects speed intensity and coordination of overt responses (Duffy, 1957). Martens (1977) stated that there is a precise arousal point or narrow band along a continuum that determines whether the athlete succeeds or fails. He cited measurement of arousal as the limiting factor in determining the optimal level. Very few studies have been conducted in relating anxiety or arousal to sports performance.

. . . little research has investigated how A-state

influences sport performance in an actual sport contest.

(Martens, 1977, p. 21)

The arousal-performance relationship. One of the prominent

theories in the arousal-performance literature is labelled the Inverted-

U Theory. This theory assumes that there is an optimal level of arousal

necessary to produce a maximal performance. Working with laboratory

animals, Yerkes and Dodson (1908) found that a medium stimulus was most

favourable to the acquisition of a discrimination task. No mention of

arousal was made in the original research (Fisher, 1976). Oxendine

(1970) re-formulated the Yerkes-Dodson Law to make it more applicable

to sport. Arousal level is task specific. Therefore, if the athlete

is over or under-aroused for a particular task, impaired performance

may result. He stated that complex tasks were performed better when

drive was low while simple tasks were performed better when drive was

high. Oxendine suggested that intra-sport differences in arousal

level may occur depending upon the complexity of the various positions.

He used football as an example stating that guards and tackles, who

must demonstrate speed and power, required a higher arousal level than

a field goal kicker who was required to exhibit balance and agility.

The results of a study by Klavora (1975) found no significant differences

among positions in state anxiety levels of high school football players.

Differences in state anxiety levels were related to trait anxiety levels

rather than task complexity.

The results of Moschuk and McCabe (1981) supported the inverted-

U theory when they investigated pre-game arousal of hockey players

across strong and weak competitive situations. Fenz and Jones (1972)

measured arousal symptoms of heart rate and respiration rate in novice and experienced sport parachutists. All jumpers showed a steady increase in arousal as the jump time neared. When the jump was considered technically good, both novice and experienced subjects had reduced their heart rate and respiration rate to a moderate level. When a jump was rated poor, the arousal level remained quite high throughout the jump. These findings provide support for the theory that moderate levels of arousal are desirable for top performance. Lowe (1973) (cited in Martens, 1977) investigated the relationship between hitting performance and situation criticality in little league baseball players. Heart rates, respiration rates and observational records were used to validate game criticalness as an indicant of arousal. Lowe concluded that an inverted-U relationship existed when arousal and task difficulty were varied simultaneously. The little league players hit best at moderate levels of arousal as opposed to high or low levels.

The Drive Theory predicts a positive linear relationship between arousal and performance. It states that response strength is a result of habit times drive. An increase in drive or arousal would increase the likelihood that the dominant response would be emitted. If the dominant response is the correct one, then performance would be enhanced with an increased arousal level (Spence & Spence, 1966). In other words, if the skill has not been well learned, as in the early stages of skill acquisition, the dominant response would probably be incorrect and increased arousal would impair performance. Pemberton and Cox (1981) postulated that a high degree of arousal in the acquisition phases would lead to a temporary decrease in performance under high arousal conditions but would result in greater ultimate learning. Willis (cited in Landers,

1982) found that subjects initially trained under stress subsequently performed better than subjects initially trained under low stress. The athlete learned to perform with elevated response patterns similar to those experienced under actual competitive situations.

Rushall (1976) reported a positive linear relationship between arousal and performance when he used the individual case study approach and the technique of self-reporting with a Canadian Olympic wrestler. The wrestler was observed over 21 matches with the PCPC and estimated his level of excitement ranging from -10 to +10 prior to each match. Following each match, he rated his own performance. Barry (1978) replicated these findings while observing a group of collegiate wrestlers, of various calibre, over an entire season. He reported that a positive linear relationship between arousal and performance was exhibited by the group when all wrestlers were considered. The highest increase in arousal estimates as well as the highest absolute values of arousal estimates were demonstrated by the top wrestlers. Using similar methods of investigation, Fiorini (1978) reported a positive linear relationship between arousal and performance with the more competent and experienced basketball players. Rushall (1979b) interpreted the findings suggesting that elite athletes had learned to control their arousal so that they didn't become over-aroused and perhaps only displayed one half of the inverted-U curve.

Martens (1971) criticized the drive theory hypothesis stating that it was difficult if not impossible to test habit strength. Since the theory is not testable it should be abandoned. Weinberg (1979) stated that no research had been able to clearly define whether the correct or incorrect response is dominant and suggested that arousal may be related

to reactions to success and failure rather than task difficulty.

An alternative to the drive and inverted-U theories was proposed based on the work of Easterbrook (1959). As the arousal level increases, the focus of attention narrows. Emotional arousal acts to consistently decrease the range of cues that an organism uses. Arousal effects depend upon the degree of attention that a task demands since the complexity of the task determines the number of relevant and irrelevant cues (Bacon, 1974). The range of cues is narrower for simple tasks than for complex tasks, therefore a higher arousal level is afforded on simple tasks (Landers, 1980). At low arousal states the athlete has a broad perceptual range and both relevant and irrelevant cues are accepted resulting in low performance standards. Moderately aroused athletes show some perceptual selectivity, eliminating the irrelevant cues but using the task relevant cues. Once the irrelevant cues are discarded, further decreases in relevant cues may impair performance. The loss in sensitivity to peripheral cues may result in a linear or curvilinear arousal-performance relationship (Easterbrook, 1959). Rushall (1981) proposed that elite athletes are able to simplify a task as skill level increases, therefore affording an increased arousal state.

Van Schoyck and Grasha (1981) examined beginning, intermediate and advanced tennis players for attentional style variations. They reported that bandwidth of attentional focus was the most important. The bandwidth had scanning and focusing components. The focus component involved a subjective experience of an inability to concentrate and was thought to be correlated with anxiety.

In summary, the literature reveals conflicting evidence regarding

the arousal performance relationship. The inverted-U theory was supported by Moschuck and McCabe (1981) and Fenz and Jones (1972) while support for the drive theory was given by Rushall (1977), Barry (1978) and Fiorini (1978). The attentional narrowing phenomenon was proposed as an alternative to the drive and inverted-U theories by Landers (1980). The concept of arousal and performance must be further researched (Martens, 1977) with more specific measures of arousal (Landers, 1980).

Chapter 3

METHODOLOGY

Research Design

The research design selected for this study was a number of re-
plications of an individual case study.

The Subjects

The subjects were 12 rowers ranging in age from 18-23 years. The
rowers were members of the Thunder Bay Rowing Club. The calibre of the
subjects ranged from Novice to National. The national calibre rowers
included four female and one male subject. The provincial group also
included four female and one male subject. These subjects had been
training and competing for at least three years. Both novice subjects
were female.

Measurement Technique

The Pre-Competition Psychological Checklist (Rushall, 1977) was
employed to measure pre-competition arousal. Figure 1 is an illustration
of the checklist. It was felt by this writer that the self-report
technique would be most appropriate for this study. The checklist
consists of 23 arousal symptoms (diagnostics), an excitedness (arousal)
scale ranging from zero to 10, an estimation of winning scale ranging
from zero to 10, and a subjective evaluation of the subject's quality
of performance. An estimation of importance of the event scale ranging
from zero to 10, control over distractors ranging from zero to 10, and
a crew performance rating were added to the PCPC. The arousal symptoms
are classified into four general categories: feelings, external

PRE-COMPETITION PSYCHOLOGICAL Name _____
   CHECKLIST
            Date _____

            Event _____

If any of the following descriptions apply to you as you feel now mark them
"yes". If not, then answer "no". Complete this form after you take your
oars to the dock and before seeing your coach.   YES NO

1. Can't be bothered attitude .... _____ _____
2. Drowsy, sleepy feeling .... _____ _____
3. Feeling of being alone .... _____ _____
4. Feeling of weakness .... _____ _____
5. Inadequate attention to preparation .... _____ _____

6. Impatient feeling .... _____ _____
7. Aggressive feeling towards others .... _____ _____
8. I have cried a little .... _____ _____
9. Some shaking and trembling .... _____ _____
10. Poor movement coordination .... _____ _____

11. Trouble seeing and remembering .... _____ _____
12. I have vomited .... _____
13. I have diarrhea ....
14. I have urinated several times .... _____ _____
15. I have had frequent bowel movements .... _____ _____

16. Nervous .... _____ _____
17. Butterflies in the stomach .... _____ _____
18. Lack of confidence .... _____ _____
19. Do not feel well .... _____ _____
20. I don't feel that I will be able to perform well .... _____ _____

21. Very confident .... _____ _____
22. Can't take the competition seriously .... _____ _____
23. Frightened .... _____ _____
24. Other (describe) _____

_____

         Total number of each _____ _____

      Excitedness Scale

0	1	2	3	4	5	6	7	8	9	10

Bored   Normal   Extremely excited
Sleepy   Wild
               Raging mad

     Estimation of Winning

0	1	2	3	4	5	6	7	8	9	10

No chance of   No chance of
winning   losing

  Importance of Event to Individual or Team

0	1	2	3	4	5	6	7	8	9	10

Does not mean   Most important
anything

   Control over Distractors

0	1	2	3	4	5	6	7	8	9	10

Does not mean   Most important
anything

   Control over Distractors

0	1	2	3	4	5	6	7	8	9	10

Very distracted   Attention focused fully
           on performance

Event result _____

Rate how you performed Great__ Good__ Normal__ Poor__ Very Poor__

Crew performance   Great__ Good__ Normal__ Poor__ Very Poor__

Figure 1. The modified version of the Pre-competition
    Checklist that was used in this investigation.

emotional behaviors, internal emotional behaviors, and performance expectations. Definitions of the arousal symptoms and scales were explained to each athlete individually so that the subjects were able to clarify any points of confusion (Appendix A). Frequent re-stressing of definitions throughout the season were conducted to ensure correct completion of the checklist.

The subjects were instructed to complete the pre-race portion of the PCPC after taking his/her oars to the launch site. The subjects were asked to complete the checklist without consulting any other individual. The pre-race procedure of the checklist consisted of checking those arousal symptoms that apply to the subject at that time, estimating their arousal level, estimating their chance of winning the upcoming race, estimating the importance of the event, and estimating the control the subject had over distractors. Following the race, the subjects recorded the race result and made a subjective evaluation of personal and crew performance.

Data Collection

Data were gathered through the 1982 rowing season ranging from late May to late August. The subjects competed at various regional regattas in the United States and Ontario as well as the Canadian Championships and the Royal Canadian Henley Regatta. For various reasons the number of regettas attended and consequently races observed were different for each subject. The pre-race report was completed approximately 30 minutes prior to the start of the race while the post-race portion was completed as soon as the equipment had been put away following a race, usually within 20 minutes.

Subject Control

The subjects were informed that the PCPC was an important part of their pre-competition preparation although the reports were completed on a voluntary basis. Once they agreed to participate in the study, individual interviews were conducted by the investigator to stress the need for honest and conscientious reporting. As mentioned previously, definitions and scales were thoroughly explained to each subject. Three pilot trials were completed under simulated competition conditions prior to the commencement of the study. This allowed the subjects to become familiar with the test instrument. The results of these trials were discussed with the subjects to eliminate confusion and inconsistencies with the definitions. The subjects were instructed not to discuss pre-race reports or post-race assessments with other crew members. This ensured that the reports were personal and were not influenced by group opinions.

Reliability Checks

Three test re-test reliability checks were carried out on the estimation of winning, importance of event, and control over distractors scales at various times during the study. The subjects were asked to complete the scales 15 minutes before they were called to launch and again after they had taken their oars to the launch site. The Pearson-product moment correlation coefficients for these checks were: .923, .925, .885 for estimation of winning, .883, .876, .893 for importance of event, and .895, .945, .879 for control over distractors.

Data Analysis

Descriptive statistics were used to report the data. After a

visual inspection of the data, the binomial test was employed to assess the statistical significance of suggested trends and differences among the subjects. Considerable inter-subject variation and lack of control over the competition setting (each race and regatta was different) justified the use of descriptive and simple non-parametric procedures.

The data analyses for each subject yielded a psychological check-list summary and summary graphs for the following relationships: arousal and performance, estimation of winning and performance, importance of event and performance, control over distractors and performance, arousal and estimation of winning, arousal and importance of event, and arousal and control over distractors. For analysis of the above relationships, a minimum number of three data points were required to calculate the factor averages except in the extreme levels and categories of performance where two data points were felt to be sufficient. An arbitrarily defined appreciable change from one factor level to another was set at .5 unit on the ordinal scales. If the minimum level was not demonstrated in the data, then the factor variation was not considered to be of practical significance.

Psychological checklist summary. The various arousal symptoms reported by each subject were summarized for each of the five performance categories on the checklist summary sheet (Figure 2). This was used to determine whether or not arousal patterns were specific to a certain performance rating. An arousal pattern was considered to be demonstrated if the following three conditions were satisfied. First, the frequency of occurrence within a specific performance category for any diagnostic had to be 64 percent or better. This value was selected since it is equivalent to the amount of common variance between two distributions

PRE-COMPETITION PSYCHOLOGICAL CHECKLIST SUMMARY

Athlete: _____

Diagnostic	Performance Rating				
	Great	Good	Normal	Poor	Very Poor
1. Can't be bothered					
2. Drowsy, sleepy					
3. Feels alone					
4. Feels weak					
5. Inadequate preparation					
6. Impatient					
7. Aggressive feelings					
8. Cried					
9. Shaking, trembling					
10. Poor coordination					
11. Trouble seeing, remembering					
12. Vomited					
13. Diarrhea					
14. Urinated frequently					
15. Frequent bowel movements					
16. Nervous					
17. Butterflies					
18. Lack of confidence					
19. Did not feel well					
20. Thinks will not perform well					
21. Very confident					
22. Can't be serious					
23. Frightened					
24. Other					

EXCITEDNESS ESTIMATE

Figure 2. The symptom summary sheet for the Pre-competition Psychological Checklist.

within a correlation of .80. The value of .80 was considered to be the lower limit for a diagnostic to have significance as a "performance pattern indicator". This rule was relaxed to 60 percent occurrence with low total frequencies. Second, if the performance pattern indicator was present only in one category it was considered a "performance category discriminator". A diagnostic had to first be considered a pattern indicator before it was a performance category discriminator. Third, a diagnostic had to occur three times in order for it to have reliability as a performance pattern indicator. This qualification was relaxed to two occurrences in the extreme categories of performance due to the decreased likelihood that these would be checked. These conditions provided a clear method of determining whether or not the subject demonstrated a consistent pattern of symptoms specific to each performance category.

Arousal estimate and performance. Summary graphs were constructed for each subject with performance ratings along the horizontal axis and arousal estimate along the vertical axis. Points were plotted for each race using the excitedness scale and the subjective race evaluation of the PCPC. The mean arousal estimate for each category was calculated.

Estimation of winning and performance. Summary graphs were constructed for each subject with performance ratings along the horizontal axis and estimation of winning along the vertical axis. Points were plotted for each race using the estimate of winning and the subjective race evaluation of the PCPC. The mean estimation of winning for each performance category were calculated.

Importance of event and performance. Summary graphs were constructed

for each subject with performance rating along the horizontal axis and importance of event along the vertical axis. Points were plotted for each race using the importance of the event estimate and the subjective race evaluation of the PCPC. The mean importance of the event for each performance category was calculated.

Control over distractors and performance. Summary graphs were constructed for each subject with performance ratings along the horizontal axis and the estimate of control over distractions along the vertical axis. Points were plotted for each race using the control over distractors estimate and subjective race evaluation on the PCPC. The mean control over distractors estimate for each performance category was calculated.

Arousal estimate and estimation of winning. Summary graphs were constructed for each subject with arousal level along the vertical axis and estimation of winning along the horizontal axis. Points were plotted for each race using the estimation of winning scale and arousal scale data from the PCPC. The mean arousal estimate for each estimation of winning level was calculated from this summary.
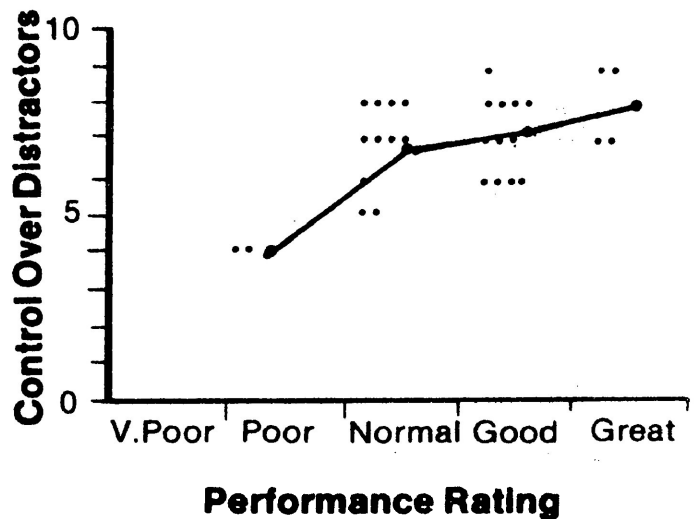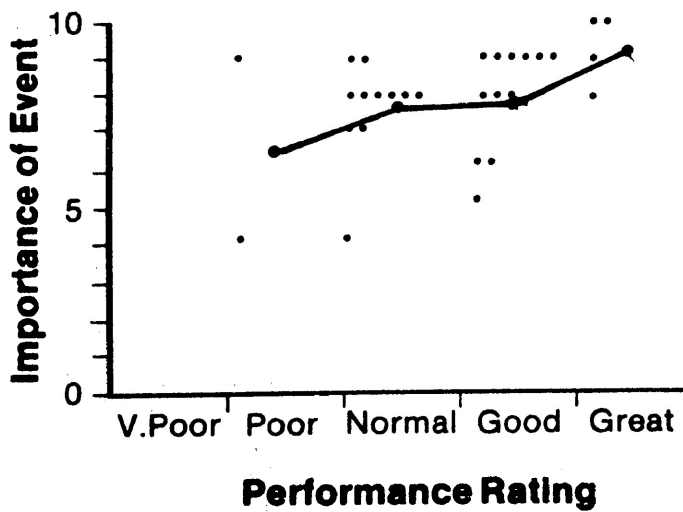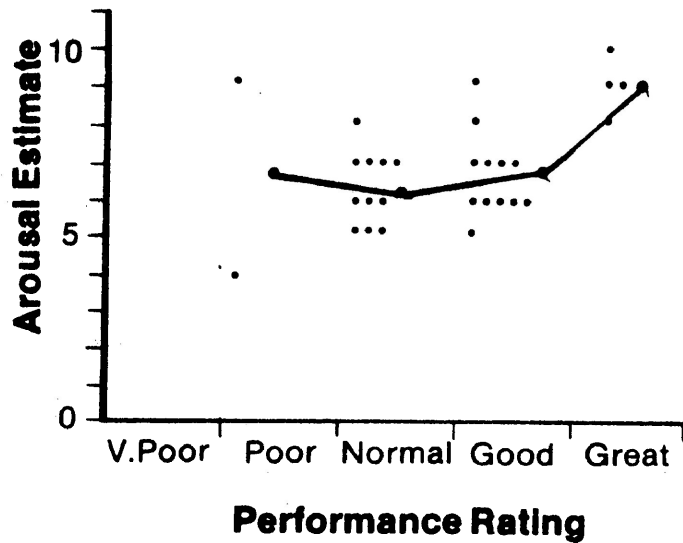
Arousal estimate and importance of event. Summary graphs were constructed for each subject with arousal level along the vertical axis and importance of event along the horizontal axis. Points were plotted for each race using the importance of event scale and arousal scale data from the PCPC. The mean arousal estimate for each importance of event level was calculated from this summary.

Arousal estimate and control over distractors. Summary graphs were constructed for each subject with arousal level along the vertical axis and control over distractors along the horizontal axis. Points

were plotted for each race using the control over distractors scale and arousal scale data from PCPC. The mean arousal estimate for control over distractors level was calculated from this summary. Figures 3 and 4 illustrate these graphs using data points for Subject 1.

Summary

A checklist summary was compiled for each subject in an attempt to determine patterns of arousal symptoms specific to a category of performance. Summary graphs were constructed to examine the nature of the relationships of arousal and performance, estimation of winning and performance, importance of event and performance, control over distractors and performance, arousal and estimation of winning, arousal and importance of event, and arousal and control over distractors.
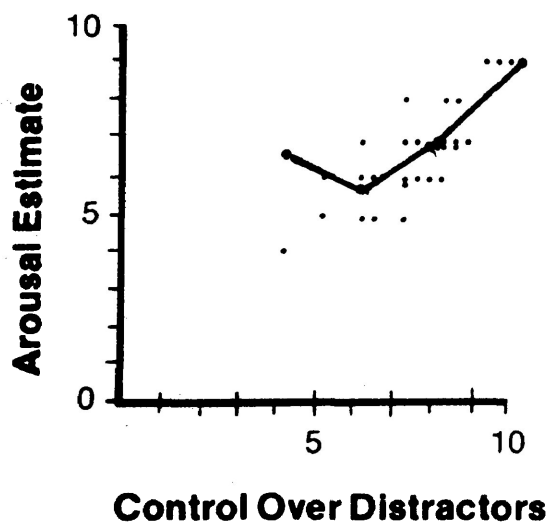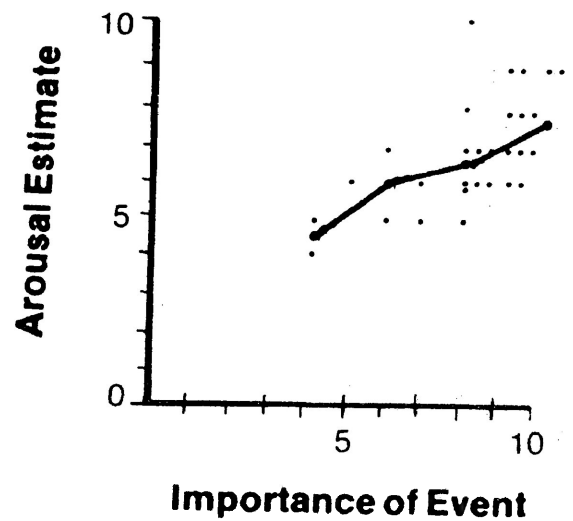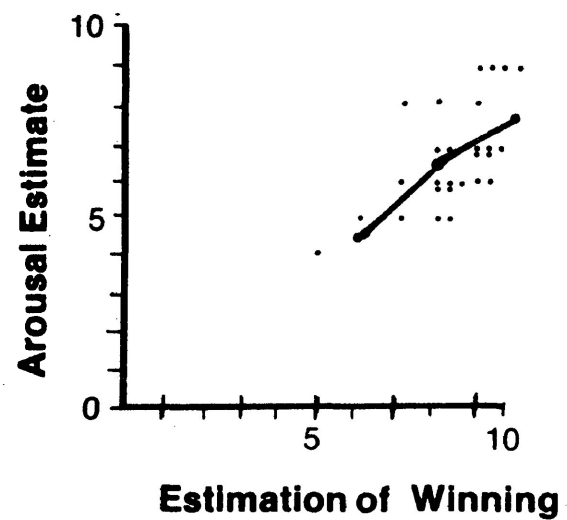
Figure 3. Summary graphs for arousal, estimation of winning, importance of event and control over distractors as they relate to performance for Subject 1.

Figure 4. Summary graphs for estimation of winning, importance of event, and control over distractors as they relate to arousal for Subject 1.

Chapter 4

RESULTS

Psychological Checklist Summaries

PCPC summary tables for all subjects are included in Appendix B.
All subjects displayed at least one arousal pattern indicator (PI).
These patterns ranged across the performance categories Great through
Poor. No PI's were evidenced in the Very Poor category. Ten of the
twelve subjects showed at least one distinct performance discriminator
(PD) for specific performance categories. Due to the individual nature
of the arousal patterns, the results of each subject will be discussed
separately. Table 1 lists a comparison of the arousal patterns exhibited
by each subject and calibre of that subject's rowing.

Subject 1 (S1). Of 29 performances by this national calibre rower,
27 fell within the Normal to Great range. PI's were shown in the Normal,
Good and Great performance categories while none were evidenced in the
Poor category. This subject checked 17 of 23 symptoms across the
performance ratings Poor through Great at one time or another. No
Very Poor performances were checked. The arousal diagnostic "very
confident" was a PI for the Great, Good, and Normal performance categories.
It was the only PI for the Normal category. The diagnostics "aggressive
feelings towards others" and "nervous" were PD's for Great performances.

Subject 2 (S2). This national calibre rower rated 12 of 14
performances in the Normal or better categories. The diagnostic "very
confident" was a PI in three categories, Good, Normal, and Poor. The
diagnostics "nervous" and "shaking and trembling" were PD's for the
normal category while "frequent bowel movements" and "impatient feelings"

Table 1

AROUSAL PATTERN INDICATORS AND DISCRIMINATORS FOR EACH SUBJECT

Subject	Calibre	Number of Diagnostics Checked	Performance Category				
			Great	Good	Normal	Poor	VP.
1	National	17	6 7 16 21	6 21	21	--	--
2	National	11	--	6 15 21	9 16 21	21	--
3	National	14	21	21	21	--	--
4	National	12	21	21	21 9	21	--
5	National	17	14 21	7 21	5 11 21	4 6 7 14	--
6	Provincial	9	--	--	--	14 15	--
7	Provincial	7	--	16 17 21	16 17	--	--
8	Provincial	18	14 16 17 21	16 17 21	14 16 17	--	--
9	Provincial	14	--	6 7 21	21	6 7 9 21	--
10	Provincial	11	6 14 21	16	16	--	--
11	Novice	12	--	--	6 16 18 20 23	5 16 18 20 23	--
12	Novice	11	--	6 16 21	--	16 20	--

Pattern Discriminators — underlined
Pattern Indicators - not underlined

were PD's for the Good category. Eleven of twenty-three symptoms were checked at one time or another by this subject.

Subject 3 (S3). The only PI evidenced by this national calibre subject was "very confident". It was present in the Normal, Good, and Great performance categories. Twenty-three of twenty-seven performances fell within the Normal or better categories. At one time or another, 14 of 23 diagnostics were checked by this rower. No performances were rated as Very Poor.

Subject 4 (S4). The PI "very confident" was common to all four performance categories (Poor through Great) for this national calibre rower. No performances were rated Very Poor. The only PD was indicated in the Normal category by the diagnostic "shaking and trembling". Twenty-two of twenty-nine performances were rated Normal or better. Only 12 of the possible 23 diagnostics were indicated at one time or another.

Subject 5 (S5). Eighteen of nineteen performance levels were rated in the Poor through Great categories by this national calibre subject. All of these categories displayed at least two PI's. The diagnostic "aggressive feelings" were common to both Poor and Good categories while diagnostic "frequent urination" was common to both Great and Poor categories. There were two PD's in the Poor category, "impatient" and "feeling of weakness" and two PD's in the normal category, "inadequate attention to preparation" and "trouble seeing and remembering". The PI "very confident" was present in the Normal through Great categories. A wide range of diagnostics (17 of 23) were checked across all performance ratings.

Subject 6 (S6). The diagnostics "frequent urination" and "frequent

bowel movements" served as PI's and PD's in the Poor category for this provincial rower. Only 9 of 23 symptoms were checked at one time or another across four categories ranging from Very Poor to Good. No Great performance appraisals were noted for this subject. Frequently, no arousal symptoms were checked.

Subject 7 (S7). This provincial rower rated 13 of 14 performances in the Good or Normal categories. Only one race was rated Great and none were rated Poor or Very Poor. The PI's "nervous" and "butterflies" were common to the Good and Normal categories. The only PD was "very confident" for the Good category. Only 7 of 23 diagnostics were checked across 3 performance categories.

Subject 8 (S8). For this provincial calibre rower, four performance categories were checked with 21 of 22 self-perceived performances rated Normal or better. "Nervous" and "butterflies" were common PI's in the Normal, Good, and Great categories. The diagnostic "frequent urination" was common to Normal and Great categories while "very confident" was common to Good and Great categories. Of 23 diagnostics, 18 were checked by this subject across four performance categories.

Subject 9 (S9). This provincial subject appraised 15 or 16 performances in the Poor through Good categories. The diagnostic "very confident" was common to all three categories. "Impatient" and "aggressive feelings" occurred in Good and Poor categories. "Shaking and trembling" was the only PD. It was present in the Poor classification of performance. No performances were rated Very Poor. Fourteen of twenty-three diagnostics were checked across the remaining categories of performance.

Subject 10 (S10). This subject, a provincial calibre rower, checked for categories ranging from Poor through Great with 12 of 14 performances

classified as Normal or better. Three diagnostics, "frequent urination", "very confident" and "impatient" were both PI's and PD's in the Great performance category. The diagnostic "nervous" was the only PI for both Good and Normal categories. Eleven of twenty-three diagnostics were checked at one time or another.

Subject 11 (S11). A novice calibre rower, this subject checked four performance categories ranging from Poor to Great. Across these categories 12 of 23 diagnostics were checked at one time or another. The diagnostics "nervous", "lack of confidence", "thinks will not perform well", and "frightened" were all PI's for both Poor and Normal categories. "Inadequate attention to preparation" was a PD in the Poor classification while "impatient" was a PD for the Normal category.

Subject 12 (S12). All of this novice subject's ratings were in the Good, Normal, or Poor performance categories. PI's were displayed only in the Good and Poor categories with the diagnostic "nervous" being common to both. The diagnostics "impatient" and "very confident" were PD's in the Good category while "thinks will not perform well" was a PD in the Poor category. Eleven of twenty-three symptoms were checked across the three performance categories.

The most common indicator was #21, "very confident". For national calibre rowers this PI was present in 16 of 17 instances where arousal pattern indicators were displayed. Using the binomial test, the probability of this result occurring by chance was $P = .0000$ (for $Pe = .0704$). The PI "very confident" was present in 7 of 12 instances where arousal pattern indicators were displayed for the provincial calibre subjects ($P = .0001$ for $Pe = .0892$) and in only one of four instances in the novice group ($P = .2501$ for $Pe = .0869$). The indicator #20

"feels will not perform well" was exclusive to the novice calibre subjects. The indicator was present in three of four instances where arousal pattern indicators were evidenced ($P = .0001$ for $Pe = .869$).

Distinctive arousal patterns were related to the highest mean level of arousal in 6 of the 10 national and provincial subjects. The probability of chance occurrence of this result was $P = .0891$ (for $Pe = .344$). In those subjects who displayed distinctive arousal patterns, six of eight were associated with their highest mean level of arousal ($P = .0220$ for $Pe = .3636$).

Arousal and Performance

Table 2 presents a summary of the average arousal estimates of each performance category for each subject. Arousal-performance graphs for each subject are located in Appendix C.

S1. The mean arousal levels increased significantly in each ascending category from Normal to Great. There was a noticeable decrease in mean arousal from the Poor to Normal categories. The total increase in mean arousal across all performance categories was 2.5.

S2. This subject showed the same mean arousal level for both Good and Poor categories. There was a noteworthy increase in mean arousal level of Normal to Good and a significant decrease from Normal to Poor. Not enough data points were available to calculate mean arousal for the Great performance category.

S3. This rower showed no marked changes in mean arousal level across four performance categories, Poor through Great.

S4. The mean arousal level increased noticeably in each ascending category from Normal to Great. There was a marked decrease in mean arousal from the Poor to Normal performance category. There was a

Table 2

MEAN AROUSAL LEVELS OF PERFORMANCE CATEGORIES FOR EACH SUBJECT

Subject	Great	Good	Normal	Poor	Summary Change
1 Na	9.0 ↑	6.7 ↑	6.2	6.5	2.5
2 Na	--	7.5 ↑	5.66↓	7.5	0
3 Na	6.75	7.0	7.18	6.75	0
4 Na	8.0 ↑	6.93↑	6.2 ↓	7.14	1.14
5 Na	5.5 ↓	6.64↑	6.0 ↓	7.0	1.5 ↓
6 P	--	5.58	5.83	6.0	.15
7 P	--	6.75↑	6.0	--	.75
8 P	8.25	8.28↑	7.0	--	1.25
9 P	--	6.8	6.57	6.66	.14
10 P	8.33↑	6.66↑	5.66↑	5.0	3.33
11 No		7.5 ↓	8.25↑	6.0	1.5
12 No	8.	8.33↓	-- ↑	7.5	.83

↑   significant increase
↓   significant decrease

Table 3

MEAN AROUSAL LEVELS AND PERFORMANCE CATEGORIES FOR EACH GROUP

Group	Great	Good	Normal	Poor	Summary Change
All Subjects	7.63	7.08	6.41	6.6	1.03
National	7.31	6.95	6.26	6.98	.33
Provincial	7.48	6.86	6.24	5.83	1.65
Novice	--	7.91	--	6.75	1.16

total increase of 1.4 across all performance categories.

S5. The total change in mean arousal, across the Great through Poor performance categories, showed a decrease of 1.5. The highest mean arousal level was associated with the Poor category while the lowest mean arousal was associated with the Great category. Significant decreases in mean arousal level were noted from the Poor to Normal and to Great categories. There was a notable increase from Normal to Good.

S6. There was no noteworthy difference in mean arousal level for any of the three performances categories checked by this rower. The highest mean was associated with the Poor performance category although it was not significantly different from the Normal or Good categories.

S7. Data points were such that the mean levels could be calculated for only two of the three categories checked. The mean arousal level for the Normal category was 6.0 while mean for the Good category was 6.75. This was an overall notable increase of .75.

S8. This subject showed an overall significant increase in mean arousal of 1.25 across the performance categories, Normal through Great. There was a marked increase from Normal to Good while there was a non-significant decrease from Good to Great.

S9. No significant changes in mean arousal level were illustrated by this subject across three performance categories, Poor through Good.

S10. The mean arousal level for this rower increased markedly in each ascending category from Poor through Great. The total change in mean arousal level across all categories was 3.33.

S11. The highest mean arousal for this subject was associated with the Normal category of performance. There was a significant decrease in arousal from the Normal to Good category and a notable increase from the Poor to Normal category.

S12. This subject showed an overall increase in mean arousal of .83 from the Poor to Good categories. Sufficient data points were not available in the Normal and Great categories to calculate means.

Table 3 presents a summary of the mean arousal levels of each category of performance for each group of subjects. Over all subjects, there was an increase in each ascending performance category from Normal to Great. A total noteworthy increase in mean arousal levels across four performance categories of 1.03 was noted. The national and provincial groups each showed significant increases from the Normal through Great categories. From the Poor to Normal category, the provincial rowers showed no marked increase and the national calibre rowers showed a notable decrease. The novice subjects showed a significant increase from the Poor to Good performance categories. Insufficient data were available for calculation of means for the Normal and Great categories.

Average arousal levels for the provincial and national subjects were categorized into high, medium, and low level performances (Appendix D). When four performance categories existed, the middle two categories were averaged to create a middle performance category. Novice subjects were not included in this analysis since they had not yet gained a year of experience in competition and the observations for this group were few in number. In 6 of the 10 subjects the highest mean arousal was associated with the highest performance category. The probability of this result occurring by chance was $P = .0735$ (for $Pe = .33$). The lowest arousal means were associated with the lowest performance level in only 3 of 10 subjects ($P = .8259$ for $Pe = .33$).

Summary. S1, S4, S7, S8, S10, S11, and S12 showed significant increases in mean arousal as performance levels improved. S3, S6, and

S9 showed no significant changes across performance categories. S5 showed a significant decrease in mean arousal as performance levels improved. S2 displayed a decrease to the Normal category then a significant increase to the Good category. When all subjects were considered there was an overall significant increase in mean arousal as performance levels improved.

Estimation of Winning and Performance

Table 4 presents a summary of the estimates of winning of each performance category and the total change in these average estimates from the lowest to the highest performance categories. The estimation of winning-performance graphs for each subject are located in Appendix C.

S1. A notable increase in the mean estimation of winning was evident from the Normal to Good category. A marked decrease in the mean estimate of winning was observed from Good to Great. There was an overall increase of .5.

S2. This rower showed an overall decrease of .75 in the mean estimation of winning across three performance categories. There was a noteworthy decrease from the Poor to Normal category while there was a significant increase from the Normal to Good category.

S3. The highest mean estimation of winning was associated with the Great category while the lowest mean estimate was related to the Good category. A marked decrease was noted from the Normal to Good category. The total increase across four performance categories was 1.5.

S4. This subject showed a notable decrease in mean estimation of winning from the Normal to Good category and then displayed a marked increase from Good to Great. The total change in mean estimation of winning from the Poor to Great performance categories was 1.43.

Table 4

MEAN ESTIMATES OF WINNING OF EACH
PERFORMANCE CATEGORY FOR EACH SUBJECT

Subject	Great	Good	Normal	Poor	Summary Change
1	8.0 ↓	8.5 ↑	7.9	7.5	.5
2	--	7.75↑	7.0 ↓	8.5	-.75
3	9.0 ↑	5.62↓	7.36	7.5	1.5
4	9.0 ↑	7.0 ↓	7.6	7.57	1.43
5	8.0 ↓	8.75	9.0	9.0	-1.0
6	--	9.57↑	8.66	8.66	.91
7	--	7.5 ↑	6.8	--	.7
8	9.0	9.14↑	7.5	--	1.5
9	--	7.0 ↑	4.57	6.6	.4
10	8.66↑	7.5 ↑	6.33↓	7.5	1.16
11	--	8.5 ↑	3.5 ↓	5.0	3.5
12	--	7.16↑	--	5.5	1.66

↑ significant increase
↓ significant decrease

Table 5

MEAN ESTIMATES OF WINNING FOR EACH
GROUP IN EACH PERFORMANCE CATEGORY

Group	Great	Good	Normal	Poor	Summary Change
All Subjects	8.61	7.83	6.92	7.06	1.55
National	8.5	7.51	7.72	8.0	.5
Provincial	8.83	8.14	6.77	6.72	2.11
Novice	--	7.83	--	5.25	2.58

S5. An overall decrease in mean estimation of winning of 1.0 was evidenced by this national calibre rower. The mean estimates descended across the categories Great through Poor with the decrease from Great to Good being significant. The highest mean estimation of winning was associated with the Poor performance category.

S6. This rower displayed a noteworthy increase in mean estimation of winning from the Normal to Good category while the means for the Normal and Poor categories were the same. The total change in mean estimation of winning across the three categories of performance as .91.

S7. Only two categories of performance contained enough data points to calculate means. There was a notable increase in mean estimation of winning of .7 from the Normal to Good category.

S8. An overall marked increase of 1.5 was illustrated by this subject across the three performance categories from Normal to Great. The only significant increase was shown between the Normal and Good categories.

S9. A notable increase in mean estimation of winning was noted across the performance category from Good to Great. No significant changes across the performance categories Poor through Good were evidenced.

S10. This subject showed noteworthy increases ascending across the performance categories from Normal through Great. There was however, a marked decrease from the Poor to Normal category.

S11. The highest mean estimation of winning for this rower was associated with the Good performance category while the lowest mean was associated with the Normal category. There was a noteworthy increase of 5.0 from the Normal to Good category and a marked decrease of 1.5

from the Poor to Normal performance category. Total change in mean estimates across three categories was 3.5.

S12. A noteworthy increase from the Poor to Good categories was illustrated by this rower. No mean estimation of winning was calculated in the Normal or Great performance categories.

Table 5 represents the average estimates of winning in each performance category for all groups. Over all subjects, there was a notable increase in the mean estimation of winning from the Normal through Great performance categories. The national calibre group displayed only one marked increase from Good to Great while the three other performance categories were not markedly different. The provincial group reflected the same pattern as the overall group, significant increases from Normal through Great. The novice group showed a total noteworthy increase in mean estimation of winning of 2.58 from the Poor to Good category.

Average estimates of winning for the provincial and national subjects were categorized into high, medium, and low performances (Appendix D). When means for four performance categories existed, the middle two categories were averaged to create a middle category. The novice subjects were not included in this analysis since they had not yet gained a year of experience in competition and observations for this group were few in number. In 6 of the 10 subjects, the highest mean estimates of winning were associated with the highest performance level. The probability of chance occurrence of this result was P = .0735 (for Pe = .33). The lowest mean estimates of winning were related to the lowest level of performance in 5 of the 10 subjects (P = .2627 for Pe = .33). Of the provincial group, four of five subjects illustrated highest estimates of winning in the highest performance level (P = .0251

for Pe = .33) while only two of five of the national group had their

highest estimates of winning in the highest performance level (P = .7339).

Summary. No consistent relationship between the estimation of

winning and performance level was evidenced. S2, S3, S4, S10, and S11,

displayed a decrease in mean estimation of winning then an increase as

performance improved. S1 and S8 showed an increase, then a slight

decrease in mean estimation of winning. S5 illustrated a gradual

decrease in mean estimate of winning as performance categories improved

while S6, S7, S9 and S12 showed an increase in mean estimates.

Importance of Event and Performance

Table 6 presents a summary of the average estimates of importance

of event of each performance category for each subject. Summary graphs

of the importance of event-performance relationship are located in

Appendix C.

S1. The mean importance of event for this rower increased in each

ascending category from Poor through Great. The increases from Poor

to Normal and Good to Great were significant. The total change in mean

importance across all performance categories was 2.75.

S2. A noteworthy decrease in mean importance from Poor to Normal

was evidenced by this rower. However, there was a marked increase in

mean importance from Normal to Good performance categories.

S3. This rower exhibited an oscillating pattern in mean importance

of event across four performance categories. There was an overall

noteworthy increase in mean importance of 2.25.

S4. A total increase in mean importance of 2.0 was illustrated

by this subject. Significant increases were noted from the Good to

Great and Poor to Normal performance categories. A marked decrease was

Table 6

AVERAGE IMPORTANCE OF EVENT OF EACH
PERFORMANCE CATEGORY FOR EACH SUBJECT

Subject	Great	Good	Normal	Poor	Summary Change
1	9.25↑	7.91	7.63↑	6.5	2.75
2	--	7.87↑	6.0 ↓	8.0	.13
3	9.25↑	7.0 ↑	8.18↑	7.5	2.25
4	9.0 ↑	6.56↓	8.0 ↑	7.0	2.0
5	7.0 ↓	8.54↑	7.33↓	10	-3.0
6	--	7.14	7.0	7.0	.14
7	--	7.37↑	6.4	--	.97
8	9.0 ↑	9.14↑	7.6	--	1.4
9	--	7.8 ↑	6.57	6.66	1.14
10	9.0	7.83↑	6.0	7.0	2.0
11	--	10	9.75	10	--
12	--	8.33↓	--	8	.33

↑ significant increase
↓ significant decrease

Table 7

AVERAGE IMPORTANCE OF EVENT OF EACH
PERFORMANCE CATEGORY FOR ALL GROUPS

Group	Great	Good	Normal	Poor	Summary Change
All Subjects	8.75	7.95	7.31	7.76	.99
National	8.63	7.58	7.43	7.8	.83
Provincial	9.0	7.85	6.71	6.88	2.12
Novice	--	9.16	--	9.0	.16

shown for the Normal to Good category.

S5. The mean importance estimates showed a total decrease of 3.0 across four performance categories. The highest estimate of importance was associated with the Poor category while the lowest importance of event was associated with the Great category.

S6. No notable changes across the performance categories Poor through Good were evidenced by this rower.

S7. Only two categories contained enough data points to calculate means. There was a significant increase in mean importance estimates from the Normal to Good category.

S8. A notable increase in mean importance was noted from Normal to Good and a non-significant decrease was shown from Good to Great. Total change across the three categories was 1.4.

S9. This rower illustrated a marked increase from the Normal to Good performance category. There was a total noteworthy increase in mean importance of 1.14 from the Poor through Good categories.

S10. The mean importance of event increased significantly in each ascending performance category from Normal through Great. There was a significant decrease from Poor to Normal and a total increase across all performance of 2.0.

S11. No notable changes in mean importance of event were illustrated by this novice subject.

S12. No noteworthy changes in mean importance of event were illustrated by this novice subject.

Table 7 presents a summary of the mean importance of event of each performance category for all groups. All subjects considered, there was a marked increase in mean importance estimates from the Normal through Great performance levels. The only significant increase for

the national calibre group was exhibited from the Good to Great performance ratings. The provincial subjects showed noteworthy increases from Normal to Good and Good to Great categories. The novice subjects showed no significant changes from the Poor to Good categories.

When mean estimates of importance of event were categorized into high, medium, and low performance categories for the national and provincial groups, 7 of 10 subjects had their highest mean estimate of importance related to the highest performance level (Appendix D). The probability of this result occurring by chance was P = .0139 (for Pe = .33). When means for four performance categories existed, the middle categories were averaged to create a middle performance category. Novice subjects were excluded from this analysis due to lack of competition, experience and data points. Six of ten subjects had their lowest mean importance ratings associated with the lowest performance level, (P =.0735 for Pe = .33). Five of ten subjects had both their highest importance estimates in highest performance levels and lowest mean importance ratings in the lowest performance level. the probability of this result occurring by chance was P = .0001 (for Pe = .111). This indicated that the relationship between event importance and performance is linear.

Summary. S1, S3, S4, S7, S8, S9, and S10 all showed significant increases in mean importance of event as performances improved. Only one subject, S5, showed a significant decrease in mean importance estimates as performance ratings improved. S2, S6, S11 and S12 showed no significant change in mean importance of event across the various performance categories. All groups displayed the highest mean importance estimate in the highest performance category.

Control Over Distractors and Performance

Table 8 presents a summary of the mean control over distractors of each performance category for each subject. Graphs for the control over distractors-performance relationship are located in Appendix C.

S1. The mean control over distractors of this rower, increased in each ascending performance category. The increases from Poor to Normal and Good to Great were significant. A total increase in mean control was 4.0 across four performance categories.

S2. This subject displayed the same mean control over distractors for the Poor and Good categories of performance. There was a marked increase from Poor to Normal and a noteworthy decrease from Normal to Good.

S3. A total change in mean control over distractors of 1.75 was observed in the performances of this rower. There was an oscillating pattern across the four performance categories with notable increases from the Poor to Normal and Good to Great categories. There was a marked decrease in mean control from Normal to Good.

S4. The mean control over distractors for this subject increased in each ascending performance category although none of the increases were distinctive. A total change of .73 in mean control was illustrated across all four performance levels.

S5. As performance improved, an overall decrease of 1.5 in mean control over distractors was displayed by this rower. The highest mean control was related to the poor performance category.

S6. No distinct changes across three performance categories were shown by this rower.

Table 8

MEAN CONTROL OVER DISTRACTORS OF EACH
PERFORMANCE CATEGORY FOR EACH SUBJECT

Subject	Great	Good	Normal	Poor	Summary Change
1	8.0↑	7.16	6.9 ↑	4.0	4.0
2	--	8.5 ↑	7.33↓	8.5	--
3	9.0↑	7.25↓	8.0 ↑	7.25	1.75
4	8.3	8.06	7.8	7.57	.73
5	7.5	7.9 ↑	5.66↓	9.0	-1.5
6	--	6.85	6.6	6.6	.15
7	--	7.37	6.8	--	.57
8	7.5	7.71↑	6.9	--	.6
9	--	8.2 ↑	5.43↓	6.0	2.2
10	8.0↑	7.0	6.66	6.5	1.5
11	--	7.0 ↓	8.5 ↑	7.0	--
12	--	7.33	--	7.0	.33

↑ significant increase
↓ significant decrease

Table 9

MEAN CONTROL OVER DISTRACTORS OF EACH
PERFORMANCE CATEGORY FOR ALL GROUPS

Group	Great	Good	Normal	Poor	Summary Change
All Subjects	8.05	7.53	6.96	6.94	1.11
National	8.2	7.77	7.13	7.264	0.94
Provincial	7.75	7.42	6.48	6.36	1.39
Novice	--	7.16	--	7.0	.16

S7. A notable increase in mean control was observed across the two performance categories checked by this subject. The total change from Normal to Good was .57.

S8. A distinct increase from the Normal to Good performance levels was the only notable change in mean control demonstrated by this provincial calibre rower. There was a total increase in mean control of .6 across three performance categories.

S9. This rower illustrated a significant change in mean control across three performance levels of 2.2. There was a marked decrease from Poor to Normal and a noteworthy increase from Normal to Good.

S10. The mean control over distractors increased in each ascending performance category for this subject. The only major increase was between the Good and Great levels of performance although the total increase across all categories of 1.5 was noteworthy.

S11. A notable increase is mean control from Poor to Normal followed by a marked decrease from Normal to Good was displayed by this novice rower.

S12. Only two performance categories contained enough data points to calculate means for control over distractors. There was no distinct change from the Poor to Good category for this subject.

Table 9 presents a summary of the mean control over distractors in each performance category for all groups. Over all subjects, there was an increase in each ascending performance level. The increases from Normal to Good and Good to Great were significant. The national group also showed notable increases in mean control from the Normal to Good and Good to Great categories. The mean control over distractors of the provincial calibre group increased in each ascending performance category although the only significant increase was from the Normal to

Good category. The novice group showed no distinct change from the Poor to Good levels of performance.

The mean control over distractors for each provincial and national subject was categorized into high, medium, and low performance levels (Appendix D). When means for four performance categories existed, the middle categories were averaged to create a middle level of performance. The novice subjects were excluded from this analysis due to lack of observations and competitive experience. In 8 of the 10 subjects, the highest control over distractors was related to the highest performance level. The probability of this result occurring by chance was $P = .0017$ (for Pe = .33). Seven of ten subjects had their lowest mean control over distractors associated with their lowest performance level ($P = .0139$ for Pe .33). Both highest mean control in highest performance level and lowest mean control in the lowest performance level occurred in five of 10 subjects ($P = .0001$ for Pe = .111). This indicated that a linear relationship existed between control of distractors and quality of performance.

Summary. All groups displayed the highest mean control over distractors in the highest performance category. S2, S6, S11, and S12 showed no significant changes across the various performance categories while S1, S4, S3, S7, S8, S9, and S10 showed significant increases across all performance categories. S5 showed a significant decrease as the performance levels improved.

Arousal and Estimation of Winning Relationship

Summary graphs for all subjects are located in Appendix C. S1, S4, S5, S8, and S10 showed significant increases in both arousal estimates and estimates of winning. S2, S3, S9 and S12 showed similar arousal

levels across all estimates of winning. S6, S7, and S11 did not display sufficient data to graph a relationship. The estimates of winning for each national and provincial subject were categorized into high, medium and low estimates of winning. The average arousal level for each of these categories was determined (Appendix D). The highest arousal levels for 6 of the 8 subjects were in the highest estimation of winning level (p = .014 for Pe = .33). The lowest mean arousal levels were associated with the lowest estimation of winning level in 6 of the 10 subjects (p = .0735 for Pe = .33). Both highest mean arousal in the highest estimation of winning level and lowest mean arousal in the lowest estimation of winning level were observed in 6 of the 10 subjects (P = .0001 for Pe = .111). This indicated that arousal and estimation of winning are linearly related.

Arousal and Importance of Event Relationship

Summary graphs of the arousal-importance of event relationships are located in Appendix C. S3 illustrated similar arousal levels across all levels of importance. Data points for S11 were such that no relationship could be graphed. All other subjects showed significant increases in both arousal and importance of event ratings.

The importance of event ratings were categorized into high, medium and low levels of importance. The mean arousal level for each level of importance was calculated for each of the national and provincial subjects (Appendix D). The highest mean arousal level occurred in the highest level of importance in all subjects. Nine of ten subjects displayed both their lowest and highest mean arousal level in the lowest and highest levels of importance (P = .0001 for Pe = .111). Arousal and event importance were found to be linearly related.

Arousal and Control Over Distraction Relationship

Summary graphs for the arousal-control over distractors relationship are located in Appendix C. S3, S6, and S9 showed similar arousal levels of control over distractors. Data points for S12 were such that no relationship could be graphed. All other subjects (S1, S2, S4, S5, S7, S8, S10, S11) showed significant increases in both arousal estimates and control over distractor ratings.

The control over distractor ratings were categorized into high, medium, and low levels of control. The mean arousal level for each of the provincial and national subjects was calculated for each of the levels of control (Appendix D). In 9 of the 10 subjects the highest mean arousal was related to the highest control over distractors level. The probability of this result occurring by chance was P = .0001 (for Pe = .33). Seven of the ten subjects had their lowest mean arousal associated with the lowest level of control (P = .0139 for Pe = .33). The same seven subjects all had their highest mean arousal in the highest level of control. The probability of chance occurrence of having both high and low mean arousal levels in their respective levels of control was P = .0001 (for Pe = .111). A linear relationship between arousal and distractor control was supported.

Subjective Race Assessment and Crew Race Assessment

S1, S2, and S4 reported no differences in subjective assessments and crew assessment. S3 differed two times with both crew assessments being one category better than the subjective appraisal. S5 reported differences 4 times with crew assessment being one category higher in three of these cases. S6 differed only once with the crew rating being one category higher. S7 rated crew performance better than personal

performance one time and personal rating better than crew performance twice. S8, S9, and S12 all reported different ratings for crew and personal assessment two times. S9 and S12 rated crew performance better than personal performance in both instances while S8 rated crew performance better one time and personal performance better one time. S10 differed on four occassions with crew ratings being better than personal ratings twice. S11 rated crew performance better than personal performance one time.

In 8 of the 12 subjects, crew assessment of performance differed at least twice from personal assessment. In some subjects such as S10 differences occurred in 35% of the assessments.

The findings of this study indicate that arousal pattern indicators observed from the PCPC are idiosyncratic with the most common indicator being "very confident". Over all subjects, mean arousal levels increased across the performance categories, Normal through Great. No consistent relationship was observed between estimation of winning and performance. Linear relationships were indicated for the following relationships: importance of event and performance, control over distractors and performance, estimation of winning and arousal, arousal and importance of event, and arousal and control over distractors. Subjective assessments differed from crew assessments of quality of performance in 9 of the 12 subjects.

Chapter 5

DISCUSSION

Arousal Patterns

Notable individual variation in pre-competition arousal symptoms justified the use of an intra-subject design in this study. The arousal patterns displayed by each subject were highly specific to each subject. The number of Arousal Pattern Indicators (PI) for each subject varied from one to six. For example, S6 revealed PI's in only the Poor performance category while S5 displayed PI's in all four performance categories. S3 evidenced the same single indicator for three performance categories whereas S11 displayed six PI's across two performance standards. There appeared to be no relationship between the calibre of the rower and the number of arousal patterns exhibited in this study.

The type of indicators were also idiosyncratic to each subject. For example, the diagnostic "frequent urination" was a discriminator for a great performance in S10 whereas it was a discriminator for a poor performance in S6. These examples support the individual nature of arousal patterns and symptoms discussed by Barry (1978), Fiorini (1978), and Rushall (1977).

The most obvious diagnostic that discriminated among skill levels was the diagnostic "very confident". This PI occurred in 16 of 17 cases where PI's were evidenced for national calibre rowers, 7 of 12 occurrences in the provincial calibre rowers and only in 1 of 4 instances for the novice subjects. These findings agree with Mahoney and Avener (1977) who reported differences in arousal patterns as a function of skill level. The PI's "thinks he will not perform well" and "lack of

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confidence" were exclusive to the novice calibre rowers. These diagnostics
appear to be symptoms of anxiety rather than arousal. The provincial
and national groups displayed common indicators such as "nervous",
"impatient", and "frequent urination". These symptoms are similar to
common diagnostics reported by Barry (1978) and Rushall (1977) and
therefore appear to have high face validity as indicants of aroused
states. It can be hypothesized that the lower level performers may
be attempting to overcome anxiety symptoms rather than arousal symptoms.
The uncertainty of outcome and the individual's perception of threat
may account for the lack of confidence and more anxious states in the
novice subjects. This is in agreement with Fisher and Zwart (1982)
who stated that these variables have potential to affect arousal. If
coaches could reduce the perception of threat with realistic goal
setting and race simulation, novice subjects may become less anxious
and perform better.

Patterns of high arousal appear to be different than those of low
arousal. Distinct feelings and patterns were associated with highest
arousal level in six of eight national and provincial calibre rowers
who displayed discriminating diagnostics. This supports the hypothesis
that when an athlete is highly aroused, a different set of symptoms
appears than when the athlete is at a lower level of arousal. Rushall
(1977) and Barry (1978) reported that more distinctive patterns of
arousal were evidenced at an elite level. In this study, distinctive
patterns were displayed across all levels of performance, however the
distinctive patterns were associated with level of arousal rather than
level of performer.

The diagnostics and patterns were considered to be indicative of

pre-competition arousal. The wide variety of responses from each subject supported Duffy's (1947) theory that arousal is a multidimensional concept. Aroused states are complex and unique to each subject. Pre-competitive arousal produced a certain set of symptoms for one person but an entirely different set for another. To use the term "arousal" based on the varied indicators displayed, may lead to some over simplification of the concept. Other factors that appear to be closely related to arousal are the importance of the event and the control over distractors. The positive and linear relationship between arousal and importance of event and arousal and control over distractors suggests that those variables have the potential to influence performance as much as does the arousal level. Therefore, development of optimal control over distractors and optimal importance ratings are worth considering for attaining maximum performance. It is also possible that those two variables are part of the multidimensional makeup of the arousal concept. Further study of those variables is warranted.

Since arousal manifests itself in such a specific and complex manner in each athlete, the self-report technique advocated by Thayer (1976), Bird (1982), and Rushall (1977) appears to be the most valid method of assessing it. The reliability of the PCPC was acceptable and it imposed a minimal intrusion on a preoccupied athlete. It appeared to be a feasible and valid measure of arousal.

Arousal and Performance Relationship

When all subjects were considered, an increase in performance standard was related to an increase in self-perceived arousal. Obvious positive linear trends existed in 7 of the 12 subjects. These results partially supported the Drive theory and are consistent with the findings

of Barry (1978) and Rushall (1977). The arousal-performance graphs, for the subjects displaying linearity, were generally linear from the Normal through Great performance categories. At the lower end of the performance scale there appeared to be other variables that affected performance standard. Only 3 of 10 national and provincial subjects displayed lowest arousal in the lowest performance category. This suggests that poor performances are dependent upon more than the arousal concept. These results are in conflict with Martens (1974) who stated that the inverted-U hypothesis best explained the arousal-performance relationship. Over-arousal was not found in 11 of the 12 subjects. It is difficult to establish whether the subjects had learned to control their arousal levels so that over-arousal did not occur or that they perhaps displayed only the left half of the inverted-U curve. Consistent patterns of arousal reported prior to a specific grade of performance suggested that some form of arousal control was occurring.

There were no significant differences in level of excitedness between the various skill levels which differed to what was reported by Barry (1978) and Fiorini (1978). Although the arousal-performance relationship appeared linear, the novice subjects displayed a wide dispersion of arousal estimates across performance categories indicating a lack of arousal control. This lack of control was probably due to lack of training and competition experience. The observations for this group were few in number therefore, it was difficult to develop conclusions from these results.

Seven subjects displayed increases in arousal as performance standards improved, three subjects showed no notable changes in arousal level, one subject illustrated a significant decrease in arousal as performance improved, and one subject showed a decrease then an increase

in arousal as performance ratings improved. The varied results of the arousal-performance relationship question the assertion of a generalized theory of the relationship. The sporting environment does not allow for the complete control that is exerted in laboratory research. Over all subjects, the drive theory is supported; however more complex variables seem to be involved at the lower end of the performance scale.

The relatively high levels of arousal reported support Oxendine's (1970) theory that events requiring speed, strength, and endurance are facilitated by increased arousal.

Estimation of Winning and Performance

This relationship does not illustrate any consistent pattern. Five subjects displayed a decrease in estimation of winning, then an increase, as performance ratings improved. Two subjects exhibited the opposite trend while one subject illustrated a gradual decrease in estimation of winning as performances improved. Four subjects showed an increase in estimation of winning as performance ratings increased.

There were some notable differences between the national and provincial calibre subjects. Four of the five provincial subjects estimated their best chance of winning in the best performance category while this was the case in only two of the five national calibre subjects. A possible explanation for these results is that most of the provincial subjects rowed in larger crew boats where the chances of winning are better than in single, double, or pair events. The national subjects may have been focusing on goals other than event outcome. It is also true that a race can be rated in the top performance category although "no chance of winning" is a realistic assessment. An example of this occurs when lightweight crews race in open competition for extra race

experience. Realistically, the lightweight may have no chance of winning even though the race is rated as an exceptional one.

The estimation of winning and arousal relationship was linear in the positive direction for five of nine subjects displaying sufficient data. For some subjects, prior knowledge of the opponents and the probability of success seem to be related to arousal level. These findings are in agreement with Gerson and Deshaies (1978), Sanderson and Ashton (1981), and Fisher and Zwart (1982).

Importance of Event

Seven subjects displayed increases in mean importance ratings as the performances improved. Only one subject illustrated data that suggested the "most important" assessment was related to poor performances. This was the same subject who displayed patterns of over-arousal. The importance of event appeared to be related to performance in a positive and linear manner. The linearity of the relationship was more pronounced than the arousal-performance relationship. This relationship may allow a more generalized interpretation than the generalization that is attributed to arousal and performance.

Importance of event was also closely related to arousal level. These results support the findings of Harmon and Johnson (1958) and Sanderson and Ashton (1981) and contradict Klavora (1975) who found no differences in anxiety as importance of event increased. The importance of an event may be a component of pre-competition arousal or it may be a variable acting independently. Regardless of the reason, the results of this study suggest that, in rowers, more important events are generally associated with better performances and higher arousal levels.

Control Over Distractors

The relationship between control over distractors and performance was linear in 7 of 12 subjects. All subjects displayed the highest control in their best performance category. With better control, less distractions that had a potential to detract from performance, interfered with pre-competition preparation.

Control over distractors was also related to arousal. Eight of twelve subjects displayed distinct increases in arousal as control over distractors ratings increased. These results support the attentional narrowing theory postulated by Easterbrook (1959) that stated as arousal increases, the focus of attention narrows. In rowing, the task relevent cues are few in number and a high level of arousal may produce the appropriate narrowing of attention necessary for a maximum performance. Although the higher levels of arousal in the Good and Great performance categories support the Drive theory, the higher levels of arousal may be afforded due to the increased control over distractors. Further consideration must be given to control over distractors and attentional narrowing in the competitive environment as advocated by Landers (1980) and Rushall (1981).

Further Considerations

S3 and S4 illustrated very similar patterns in the following relationships: estimation of winning and performance, importance of event and performance, and control over distractors and performance. The arousal pattern indicators of these two subjects were the most similar of any of the subjects involved in the study. These similarities may be explained by the fact that they have been rowing together as a successful double-scull crew for five years. It is not known if the

combination was successful because of similar patterns or if similar patterns have developed as a result of training and competing together. It might be that selection of compatible crew members may be an important variable for rowing development.

Crew performance ratings differed from subjective assessments at least once in nine of twelve subjects. Individuals often rated their own performance within a crew as better or worse than the crew as a whole. This result suggests that individual as well as crew "debriefing" after a race may be an effective coaching strategy. This would serve to possibly equalize disparities between crew members' performance assessments. The group dynamics in a team/individual sport such as rowing may have an effect on the way in which a rower assesses his or her performance.

Implications for Theory and Practice

The use of a self-reporting technique appeared to be a manageable and reliable method of investigating arousal in the pre-race environment. With consistent and conscientious use of the PCPC, the athlete may develop an increased self-awareness resulting in a more self-controlled athlete. This study provided information on trends and patterns of good and poor performances in rowers. If athletes learn to recognize and understand cues that precede a good performance, attempts can be made to attain these symptoms and feelings. The result may be more consistent and better performances.

The PCPC could aid a coach to understand and determine an optimal arousal level that is specific for each athlete rather than employing a a generalized theory. The coach could learn along with the athlete, to recognize each athlete's response to varying levels of arousal and could

effectively promote that state prior to competition.

The literature indicated that factors such as importance of event (Harmon & Johnson, 1968; Genov, 1976), attentional focus (Landers, 1980), type of task (Oxendine, 1970), probability of success (Fisher & Zwart, 1982), and skill level (Barry, 1978; Fiorini, 1978) had a significant effect upon the arousal level of an individual. This study supported all these findings except varied arousal levels in relation to skill level. More research is required in the areas of control over distractors and importance of event.

In summary, the results of this study indicate that arousal is not a simple concept. It is only best understood when it is considered to be multidimensional and related to other significant variables such as importance of event, estimation of winning, and control over distractors. It may not be appropriate to talk of the singular arousal-performance relationship in sport because of the varied factors which mediate the relationship. Arousal response patterns and symptoms are unique to each individual. In future, it may be adviseable to use a different label for real world use because the term arousal has come to elicit a concept of a single entity. This simple picture may be misleading. It may be more appropriate to consider control over distractors and importance of event in order to optimize pre-competition preparation.

Chapter 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

This study employed the technique of self reporting to examine the relationship of pre-competition arousal and self-perceived performance in rowers. The research design selected for this thesis was a number of replications of a single subject study.

The dependent variables were observed in 12 members of the Thunder Bay Rowing Club during the 1982 competitive season. A modified version of Rushall's (1977) Pre-Competition Psychological Checklist was completed by the subjects immediately before launching for each race. The pre-competition portion included checking pre-competition arousal symptoms, pre-competition excitedness, estimation of winning, importance of event, and control over distractors. The post-race portion of the checklist was completed within 20 minutes of the completion of the race. This included an individual performance assessment as well as a crew assessment.

The data were analysed to determine: 1) the existence of arousal patterns specific to a grade of performance on a five category scale, 2) a relationship between pre-competition arousal assessment and performance, 3) the relationship between estimation of winning and performance, 4) the importance of event and performance relationship, and 5) the relationship between control over distractors and performance. The data were further examined to determine the presence of relationship between arousal and estimation of winning, arousal and importance of event, and arousal and control over distractors.

Conclusions

1) All subjects in this study illustrated arousal patterns that were performance grade specific. The number and type of symptoms are idiosyncratic and were related to the calibre of rower.

2) The arousal estimate and performance relationship was positive and linear when all rowers were considered. However, individual variations among the subjects questions the practice of using a general theory as a strategy for interpreting arousal factors for all athletes.

3) Linear relationships were evidenced between 1) arousal and estimation of winning, 2) arousal and importance of event, and 3) arousal and control over distractors. These findings indicated that pre-competition arousal is not a simple concept. It is best understood in a multidimensional mosaic of variables.

4) The importance of event and control over distractors were related to performance in a more significant manner than was arousal.

5) The technique of self-report is advocated for an investigation in a sporting environment.

Recommendations

1) The variables importance of event and control over distractors need to be further investigated since they were displayed in this study to be highly related to performance.

2) Differences in self and crew ratings indicate that some disagreements exist when rowers related personal performances to crew performances. The impact of this phenomenon on performance needs to be determined.

3) Changes in excitedness may occur after a subject has completed the checklist. An instrument might be developed allowing pre-competition

assessments to be made closer to race time.

4) Pre-competition arousal symptoms of successful and unsuccessful combinations are worthy of further consideration.

5) Since this study was one of a series (cg. Barry, 1978; Fiorini, 1978) and its findings were partly discordant with the previous studies, further investigations of this nature need to be completed to clarify the topic of arousal and athletic performance relationships.

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APPENDICES

APPENDIX A

ABOUT THE PRE-COMPETITION PSYCHOLOGICAL CHECKLIST

APPENDIX A

About the Pre-Competition Psychological Checklist

These checklists require you to assess how you feel prior to competition. They should be completed <u>just prior</u> to an event or game.

The information that is provided should be the most <u>truthful</u> and accurate that you can provide. Some of the descriptions are very personal but remember your answers will remain private, being only known to you and the coach. The reason that this information needs to be obtained is that depending on how you answer, the coach will be able to make very important last-minute coaching decisions. These decisions should help you to perform even better than you normally would expect.

WHAT TO DO

1. Fill in your name, the date, and the event or game that you are about to contest.

2. Check "yes" for the descriptions or feelings that are applicable. If you have other feelings that are not listed write them briefly in the "24. Other (describe)" section.

3. On the numbered excitedness scale indicate where you feel you are in terms of your arousal (excitedness). Note that the 0 end is complete inactivity and lack of excitedness whereas the 10 end is an extremely aroused feeling, something like how you would feel if you were about to make your first parachute jump or you had just been involved in a fight. The 5 entry is what would be normal for you. Mark where you think you would be considering

how you now feel by putting an "X" on the scale line.

4. On the numbered estimation of winning scale, indicate your level
   of confidence in terms of how you think you will do in the
   competition.

5. On the importance of event scale, indicate how important the
   competition is to you or your team.

6. On the control over distractors scale, indicate the level of
   control you feel you have over distractors in and around the
   competitive environment.

7. After the competition indicate how you feel about your performance
   in the "Rate how you performed" section and rate the crew
   performance if applicable.

Definitions for the Pre-competition Psychological Checklist

These definitions should be read to, discussed and clarified with
the users of the checklist.

1. Can't be bothered attitude. The athlete cannot get excited
or interested in the competition. He feels it is not important. If
the competition was missed, the athlete would not care one way or the
other.

2. Drowsy, sleepy feeling. The athlete feels sleepy. His
eyelids are heavy. He would prefer to sit down and doze or take a nap.

3. Feeling of being alone. The athlete would like to have someone
to keep him company. He feels unsure of what is expected of him or of
what to do. He would like to have some other person to talk to.

4. Feeling of weakness. The athlete feels weak all over. His
arms feel heavy. His knees are hard to keep straight. The athlete

feels that he could just crumple up on the floor. The feeling of being strong does not exist.

5. <u>Inadequate attention to preparation</u>. The athlete has not had time nor been able to prepare himself physically and mentally for the event. This produces a feeling of "something missing" in the event preparation procedures and consequently the athlete has some doubts about his readiness to compete.

6. <u>Impatient feeling</u>. The athlete wishes the event would occur sooner than it is scheduled. The time to be spent waiting is frustrating. The athlete feels that he is ready to compete at the time of completing the checklist.

7. <u>Aggressive feeling towards others</u>. The athlete dislikes the other competitors. In the event that is to come it will be this athlete that dictates what will happen. There is no feeling of friendship with or like for the other competitors.

8. <u>I have cried a little</u>. The athlete has shed some tears while preparing for the competition. The amount of crying is not important just the fact that some crying has occurred.

9. <u>Some shaking and trembling</u>. The athlete has noticed his hands, legs, or some part of the body shaking or trembling. He has been able to see the shaking occurring.

10. <u>Poor movement coordination</u>. The athlete feels awkward and different. The activities followed in warm-up have not felt normal. The athlete is concerned about this unusual and distracting occurrence.

11. <u>Trouble seeing and remembering</u>. The athlete has occassional bursts of blurred vision. He cannot focus on anything for a long time. His mind is in a turmoil. It is difficult to concentrate on any one

thing for any appreciable length of time.

12. <u>I have vomited.</u> This has occurred at least once.

13. <u>I have diarrhea.</u> The athlete has been to the toilet frequently and his bowl movements are like liquid.

14. <u>I have urinated several times.</u> The frequency of urination is more noticeable than usual.

15. <u>I have had frequent bowel movements.</u> The athlete has been to the toilet frequently but the bowel movements are not like diarrhea.

16. <u>Nervous.</u> The athlete feels nervous all over. Tingling, jittery feelings occur everywhere and are noticeable. It is hard to locate where the exact feelings occur.

17. <u>Butterflies in the stomach.</u> The athlete's stomach feels like it is moving or churning inside. The nervous feeling is decidedly more evident in the stomach than in any other part of the body.

18. <u>Lack of confidence.</u> The athlete feels that he is not prepared or does not have the ability to perform to expectations in the forthcoming event.

19. <u>Do not feel well.</u> The athlete feels ill or slightly ill. He could become sick if the feeling got worse.

20. <u>I do not think that I will be able to perform well.</u> The athlete believes that he will do a poor performance in the forthcoming event.

21. <u>Very confident.</u> The athlete is sure that he will be able to perform at least to expectations. He also feels that there is a good chance of performing even better than is expected.

22. <u>Can't take the competition seriously.</u> The athlete is not able to concentrate on the forthcoming event. It is hard to get ready

or even be serious about preparing for it. The game will be played but the athlete does not care about the result.

23. .Frightened. The athlete is afraid of the experiences that will occur in the forthcoming event. He has some hesitancy about competing. It would be nice to be able to withdraw from the event at the stage of completing the checklist.

24. Other (describe). Indicate any other feelings or sensations which exist but have not been described above.

APPENDIX B

PSYCHOLOGICAL CHECKLIST SUMMARY SHEETS

PRE-COMPETITION PSYCHOLOGICAL CHECKLIST SUMMARY

Athlete: _____S1_____(29)_____

Diagnostic	Performance Rating				
	Great 4	Good 12	Normal 11	Poor 2	Very Poor
1. Can't be bothered				1	
2. Drowsy, sleepy			1		
3. Feels alone			4	1	
4. Feels weak	1			1	
5. Inadequate preparation		1	1	1	
6. Impatient	3 (75)	9 (75)	4	1	
7. Aggressive feelings	3 (75)	1	1	1	
8. Cried	1			1	
9. Shaking, trembling	1	1			
10. Poor coordination					
11. Trouble seeing, remembering	1		1		
12. Vomited					
13. Diarrhea					
14. Urinated frequently		1			
15. Frequent bowel movements		1	3		
16. Nervous	3 (75)	3	4		
17. Butterflies	1	7	6		
18. Lack of confidence					
19. Did not feel well					
20. Thinks will not perform well					
21. Very confident	4 (100)	11 (92)	7 (64)	1	
22. Can't be serious					
23. Frightened					
24. Other					
EXCITEDNESS ESTIMATE	9.0	6.7	6.27	6.5	

PRE-COMPETITION PSYCHOLOGICAL CHECKLIST SUMMARY

Athlete: ____S2_____(14)_____

Diagnostic	Performance Rating				
	Great 1	Good 8	Normal 3	Poor 2	Very Poor
1. Can't be bothered					
2. Drowsy, sleepy					
3. Feels alone		1			
4. Feels weak		1		1	
5. Inadequate preparation					
6. Impatient	1	8 (100)	1	1	
7. Aggressive feelings		2		1	
8. Cried					
9. Shaking, trembling	1	4	3 (100)		
10. Poor coordination					
11. Trouble seeing, remembering					
12. Vomited					
13. Diarrhea					
14. Urinated frequently	1	4			
15. Frequent bowel movements	1	7(87.5)			
16. Nervous	1	8(100)	2 (66)		
17. Butterflies		1		1	
18. Lack of confidence					
19. Did not feel well					
20. Thinks will not perform well					
21. Very confident	1	6 (75)	2 (66)	2 (100)	
22. Can't be serious					
23. Frightened		2			
24. Other					
EXCITEDNESS ESTIMATE	8	7.5	5.66	7.5	

PRE-COMPETITION PSYCHOLOGICAL CHECKLIST SUMMARY

Athlete: _____S3_____ (27)

Diagnostic	Performance Rating				
	Great 4	Good 8	Normal 11	Poor 4	Very Poor
1. Can't be bothered					
2. Drowsy, sleepy					
3. Feels alone					
4. Feels weak			1	1	
5. Inadequate preparation		1	1	1	
6. Impatient					
7. Aggressive feelings				1	
8. Cried					
9. Shaking, trembling				1	
10. Poor coordination				1	
11. Trouble seeing, remembering				1	
12. Vomited					
13. Diarrhea			1		
14. Urinated frequently	1				
15. Frequent bowel movements	1	1	1		
16. Nervous	1	2	2	1	
17. Butterflies					
18. Lack of confidence			1		
19. Did not feel well				1	
20. Thinks will not perform well			1	1	
21. Very confident	4 (100)	8 (100)	10 (91)	2	
22. Can't be serious					
23. Frightened					
24. Other					
EXCITEDNESS ESTIMATE	6.75	7.0	7.18	6.75	

LAKEHEAD UNIVERSITY

PRE-COMPETITION PSYCHOLOGICAL CHECKLIST SUMMARY

Athlete: ___S4_____(29)_____

Diagnostic	Performance Rating				
	Great 3	Good 16	Normal 5	Poor 7	Very Poor
1. Can't be bothered					
2. Drowsy, sleepy					
3. Feels alone					
4. Feels weak			2	1	
5. Inadequate preparation					
6. Impatient				1	
7. Aggressive feelings				2	
8. Cried					
9. Shaking, trembling	1	1	3 (60)		
10. Poor coordination				1	
11. Trouble seeing, remembering					
12. Vomited					
13. Diarrhea		1		2	
14. Urinated frequently		1			
15. Frequent bowel movements		3			
16. Nervous		1			
17. Butterflies	1	1	1	2	
18. Lack of confidence					
19. Did not feel well		1	2		
20. Thinks will not perform well					
21. Very confident	3 (100)	16 (100)	5 (100)	7 (100)	
22. Can't be serious					
23. Frightened					
24. Other					
EXCITEDNESS ESTIMATE	8.0	6.93	6.2	7.14	

PRE-COMPETITION PSYCHOLOGICAL CHECKLIST SUMMARY

Athlete: __S5_____ (19)_____

Diagnostic	Performance Rating				
	Great 2	Good 11	Normal 3	Poor 2	Very Poor 1
1. Can't be bothered					
2. Drowsy, sleepy	1	4			
3. Feels alone	1	5		2 (100)	1
4. Feels weak		3			
5. Inadequate preparation	1	4	2 (66)	1	
6. Impatient	1	6	1	2 (100)	
7. Aggressive feelings		7 (64)	1	2 (100)	
8. Cried					
9. Shaking, trembling		1	1		
10. Poor coordination			2 (66)		
11. Trouble seeing, remembering					
12. Vomited					
13. Diarrhea		5	1		1
14. Urinated frequently	2 (100)	5	1	2	1
15. Frequent bowel movements	1	3			1
16. Nervous		5	1	1	1
17. Butterflies					
18. Lack of confidence		1			
19. Did not feel well					
20. Thinks will not perform well			1		
21. Very confident	2 (100)	8 (82)	2 (66)	1	
22. Can't be serious					
23. Frightened		1			
24. Other					
EXCITEDNESS ESTIMATE	5.5	6.6	6.0	7.0	

PRE-COMPETITION PSYCHOLOGICAL CHECKLIST SUMMARY

Athlete: ___S6_____(24)___

Diagnostic	Performance Rating				
	Great	Good 14	Normal 6	Poor 3	Very Poor 1
1. Can't be bothered					
2. Drowsy, sleepy					
3. Feels alone					
4. Feels weak					
5. Inadequate preparation				1	1
6. Impatient			1		
7. Aggressive feelings		1	1		
8. Cried					
9. Shaking, trembling			1	1	
10. Poor coordination				1	
11. Trouble seeing, remembering					
12. Vomited					
13. Diarrhea					
14. Urinated frequently		2	2	3 (100)	
15. Frequent bowel movements		1	2	2 (66)	
16. Nervous				1	
17. Butterflies					
18. Lack of confidence					
19. Did not feel well					
20. Thinks will not perform well			1		
21. Very confident		5			
22. Can't be serious					
23. Frightened					
24. Other					
EXCITEDNESS ESTIMATE		5.85	5.83	6.0	4

LAKEHEAD UNIVERSITY

PRE-COMPETITION PSYCHOLOGICAL CHECKLIST SUMMARY

Athlete: ___S7_____ (14)___

Diagnostic	Performance Rating				
	Great 1	Good 8	Normal 5	Poor	Very Poor
1. Can't be bothered					
2. Drowsy, sleepy					
3. Feels alone					
4. Feels weak					
5. Inadequate preparation					
6. Impatient		1			
7. Aggressive feelings					
8. Cried					
9. Shaking, trembling					
10. Poor coordination					
11. Trouble seeing, remembering					
12. Vomited					
13. Diarrhea			1		
14. Urinated frequently	1	4			
15. Frequent bowel movements	1	2	2		
16. Nervous	1	8 (100)	4 (80)		
17. Butterflies	1	5 (62.5)	3 (60)		
18. Lack of confidence					
19. Did not feel well					
20. Thinks will not perform well					
21. Very confident	1	5 (62.5)	2		
22. Can't be serious					
23. Frightened					
24. Other					
EXCITEDNESS ESTIMATE	7	6.75	6.0		

PRE-COMPETITION PSYCHOLOGICAL CHECKLIST SUMMARY

Athlete: _____S6_____(22)_____

Diagnostic	Performance Rating				
	Great 4	Good 7	Normal 10	Poor 1	Very Poor
1. Can't be bothered.					
2. Drowsy, sleepy		4	1		
3. Feels alone	2	4		1	
4. Feels weak			2		
5. Inadequate preparation		1	5		
6. Impatient	2	4	5	1	
7. Aggressive feelings		1	1		
8. Cried					
9. Shaking, trembling			1		
10. Poor coordination			1		
11. Trouble seeing, remembering					
12. Vomited					
13. Diarrhea		1	1		
14. Urinated frequently	3 (75)	4	8 (80)	1	
15. Frequent bowel movements	1	1	2	1	
16. Nervous	3 (75)	7 (100)	9 (90)	1	
17. Butterflies	3 (75)	6 (86)	8 (80)	1	
18. Lack of confidence			2		
19. Did not feel well			2		
20. Thinks will not perform well			1		
21. Very confident	4 (100)	7 (100)	4	1	
22. Can't be serious					
23. Frightened	1	4	1		
24. Other					
EXCITEDNESS ESTIMATE	8.25	8.28	7.0	8	

PRE-COMPETITION PSYCHOLOGICAL CHECKLIST SUMMARY

Athlete: ___S9_____ (16) ___

Diagnostic	Performance Rating				
	Great 1	Good 5	Normal 7	Poor 3	Very Poor
1. Can't be bothered					
2. Drowsy, sleepy		1	1		
3. Feels alone					
4. Feels weak		1	1		
5. Inadequate preparation			1		
6. Impatient		3 (60)	4	2 (66)	
7. Aggressive feelings	1	4 (80)	3	3 (100)	
8. Cried					
9. Shaking, trembling			2	2 (66)	
10. Poor coordination		1		1	
11. Trouble seeing, remembering					
12. Vomited					
13. Diarrhea					
14. Urinated frequently		1	1		
15. Frequent bowel movements					
16. Nervous		2	1	1	
17. Butterflies		2	1		
18. Lack of confidence		1			
19. Did not feel well					
20. Thinks will not perform well		1	1	1	
21. Very confident	1	3 (60)	5 (71)	2 (66)	
22. Can't be serious		1	1	1	
23. Frightened					
24. Other					
EXCITEDNESS ESTIMATE	8	6.8	6.57	6.66	

PRE-COMPETITION PSYCHOLOGICAL CHECKLIST SUMMARY

Athlete: ____S10_____ (14)

Diagnostic	Performance Rating				
	Great 3	Good 6	Normal 3	Poor 2	Very Poor
1. Can't be bothered					
2. Drowsy, sleepy					
3. Feels alone					
4. Feels weak					
5. Inadequate preparation			2		
6. Impatient	2 (66)	1			
7. Aggressive feelings					
8. Cried					
9. Shaking, trembling		1			
10. Poor coordination					
11. Trouble seeing, remembering					
12. Vomited					
13. Diarrhea		1			
14. Urinated frequently	3 (100)	3	1		
15. Frequent bowel movements		1	1		
16. Nervous		6 (100)	3 (100)	1	
17. Butterflies	1	3	1	1	
18. Lack of confidence					
19. Did not feel well			1		
20. Thinks will not perform well			1		
21. Very confident	2 (66)	1			
22. Can't be serious					
23. Frightened					
24. Other					
EXCITEDNESS ESTIMATE	8.33	6.66	5.66	5.0	

PRE-COMPETITION PSYCHOLOGICAL CHECKLIST SUMMARY

Athlete: ___S11_____(10)___

Diagnostic	Performance Rating				
	Great 1	Good 2	Normal 4	Poor 3	Very Poor
1. Can't be bothered					
2. Drowsy, sleepy			1		
3. Feels alone	1				
4. Feels weak		1		1	
5. Inadequate preparation			1	3 (100)	
6. Impatient	1	2	3 (75)		
7. Aggressive feelings	1	1	1		
8. Cried					
9. Shaking, trembling		1		1	
10. Poor coordination				1	
11. Trouble seeing, remembering					
12. Vomited					
13. Diarrhea					
14. Urinated frequently					
15. Frequent bowel movements					
16. Nervous	1	2	4 (100)	2 (66)	
17. Butterflies					
18. Lack of confidence					
19. Did not feel well					
20. Thinks will not perform well					
21. Very confident					
22. Can't be serious					
23. Frightened	1	2	4 (100)	2 (66)	
24. Other					
EXCITEDNESS ESTIMATE	10	7.5	8.25	6	

PRE-COMPETITION PSYCHOLOGICAL CHECKLIST SUMMARY

Athlete: _____S12_____(10)_____

Diagnostic	Performance Rating				
	Great	Good 6	Normal 2	Poor 2	Very Poor
1. Can't be bothered					
2. Drowsy, sleepy		1			
3. Feels alone					
4. Feels weak		1			
5. Inadequate preparation				1	
6. Impatient		6 (100)	2	1	
7. Aggressive feelings		1	1	1	
8. Cried					
9. Shaking, trembling		1	1	1	
10. Poor coordination					
11. Trouble seeing, remembering					
12. Vomited					
13. Diarrhea					
14. Urinated frequently		3	2	1	
15. Frequent bowel movements					
16. Nervous		6 (100)		2 (100)	
17. Butterflies		1	2	1	
18. Lack of confidence					
19. Did not feel well					
20. Thinks will not perform well					
21. Very confident		4 (66)	2	1	
22. Can't be serious					
23. Frightened		3	1	1	
24. Other					
EXCITEDNESS ESTIMATE		8.33	9	7.5	

APPENDIX C

SUMMARY GRAPHS
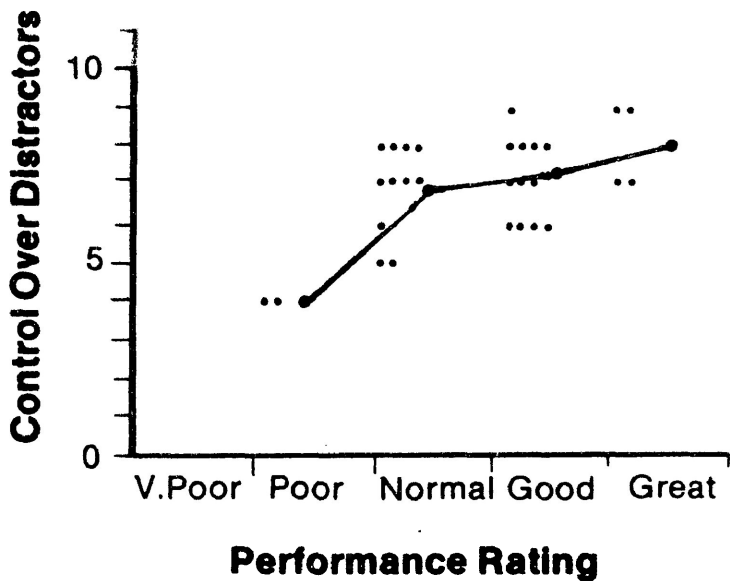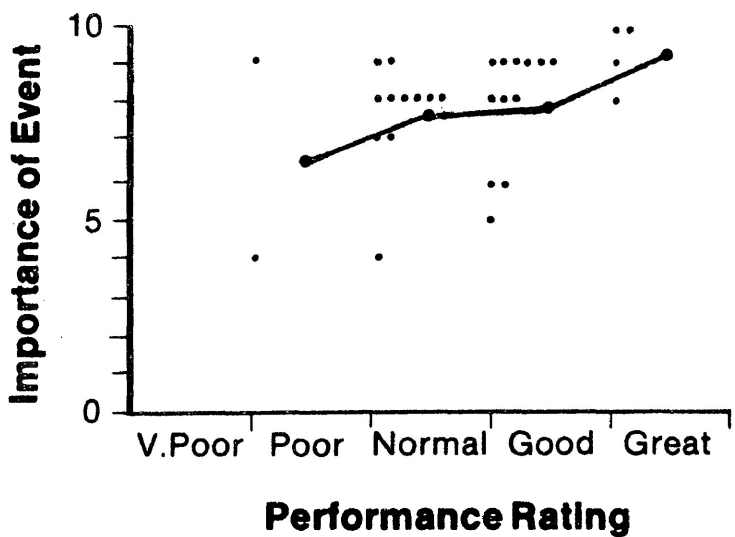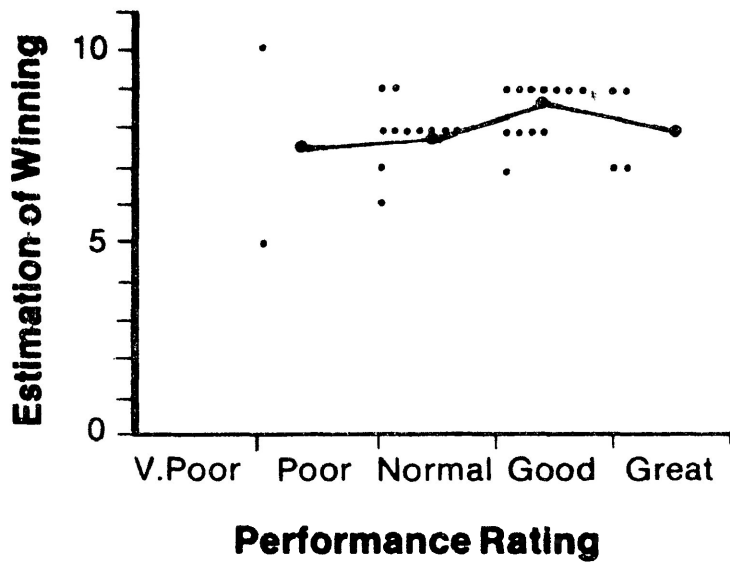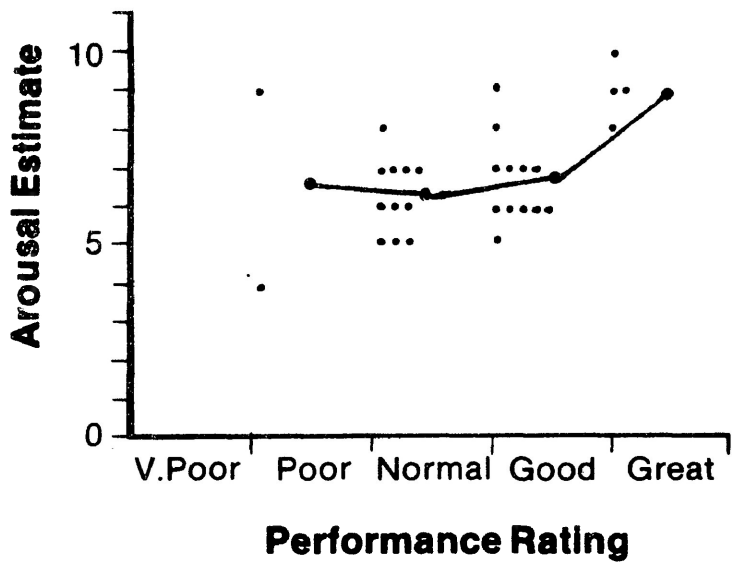
SUBJECT 1

Data Points   **Mean** **Line Graph**

...   •

SUBJECT 1

Estimation of Winning

Importance of Event

Control Over Distractors
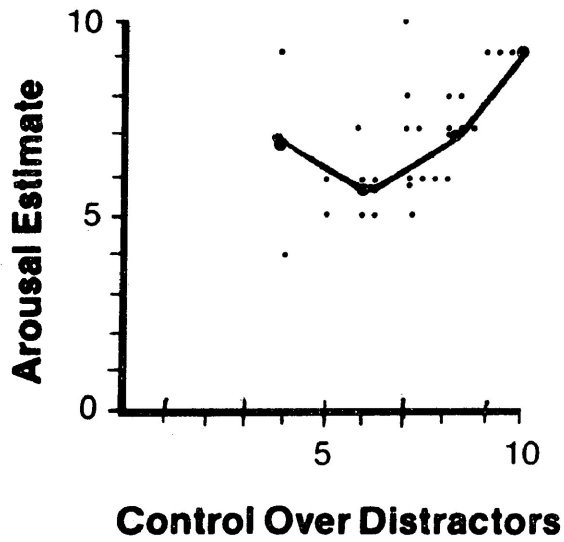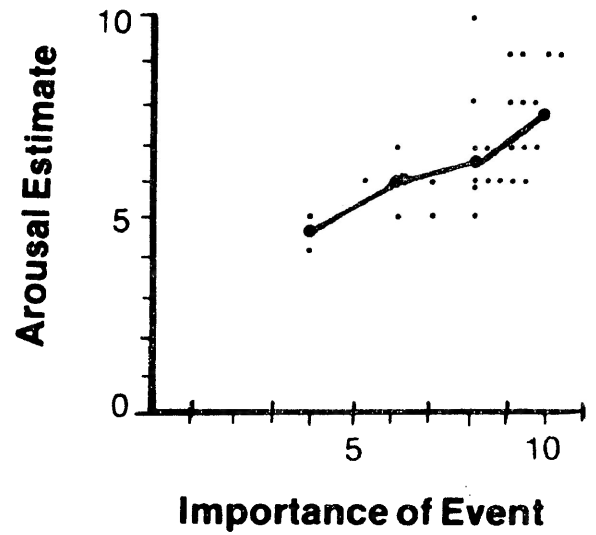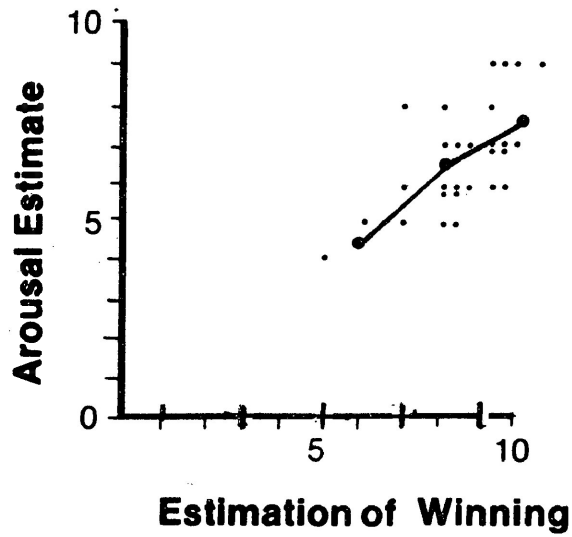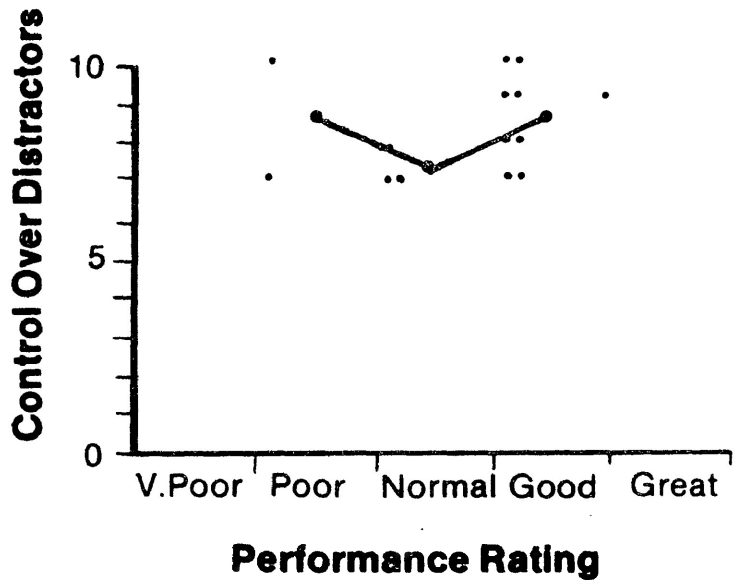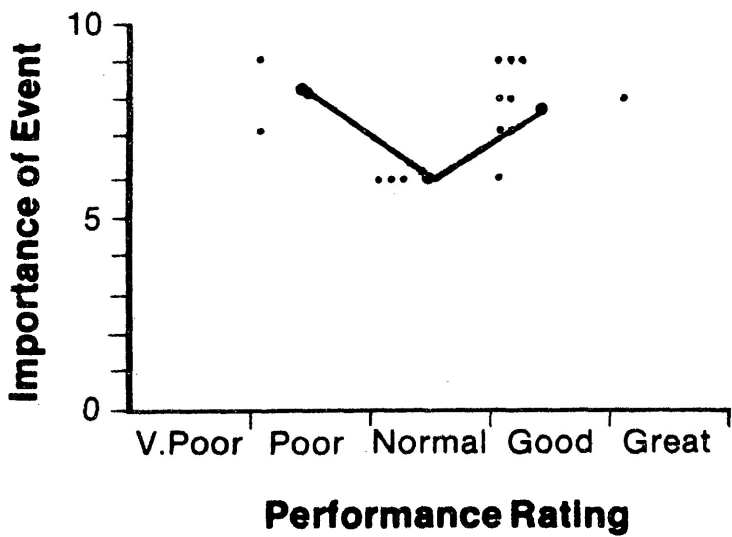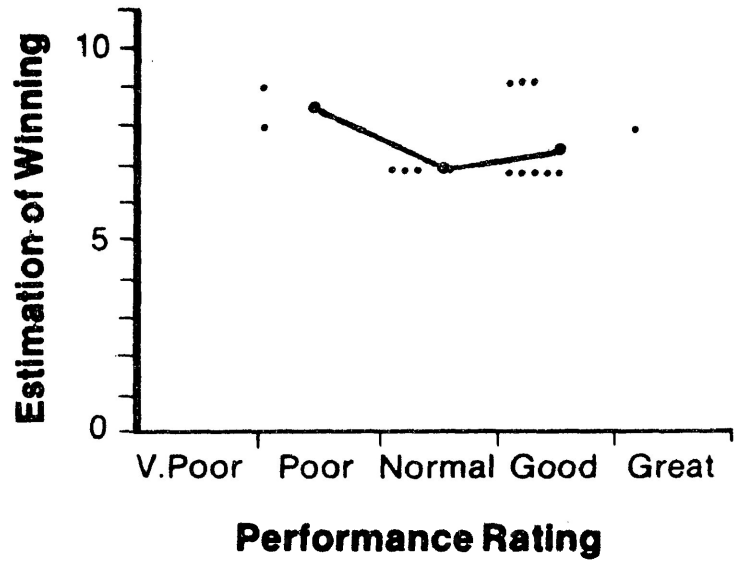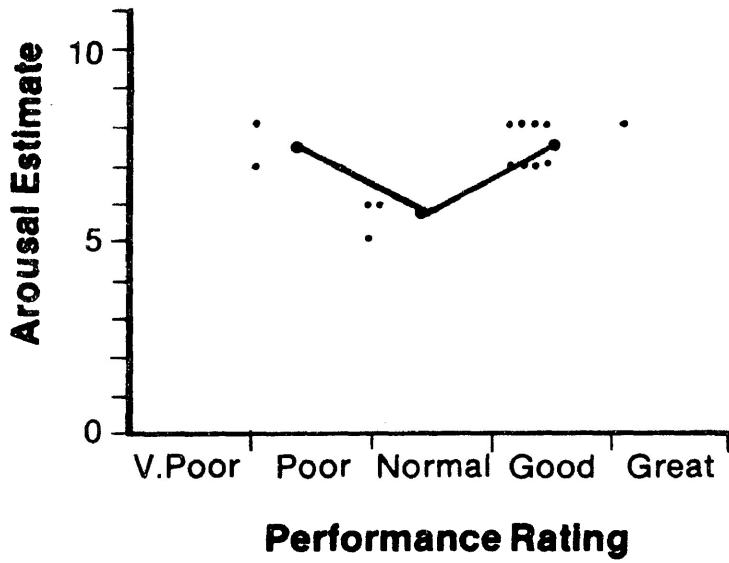
Data Points	Mean	Line Graph
...	●	——

SUBJECT 2

Data Points Mean Line Graph
...   •

SUBJECT 2

Arousal Estimate vs **Estimation of Winning**

Arousal Estimate vs **Importance of Event**

Arousal Estimate vs **Control Over Distractors**
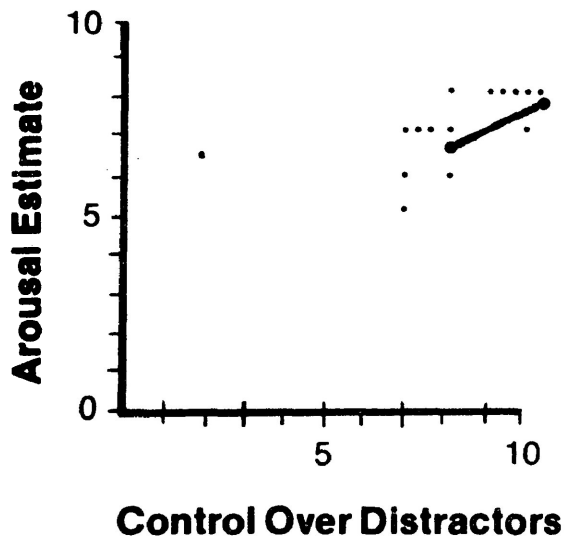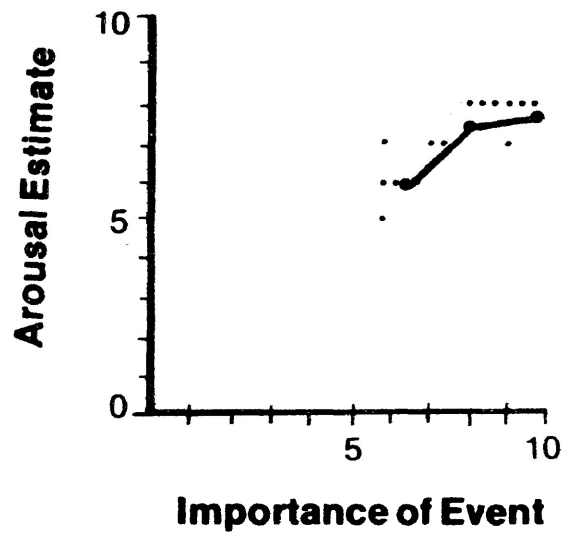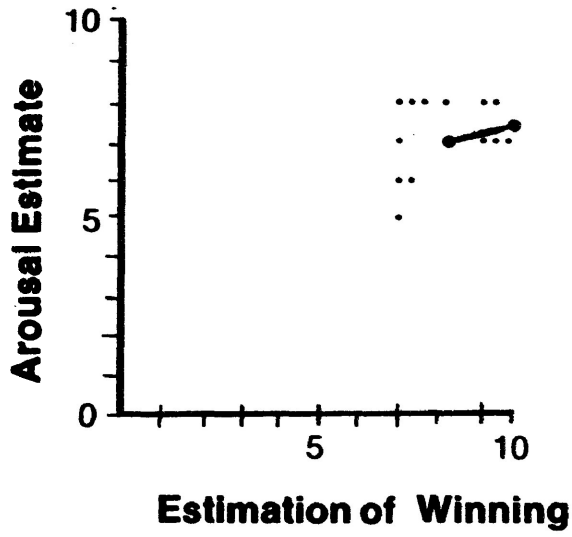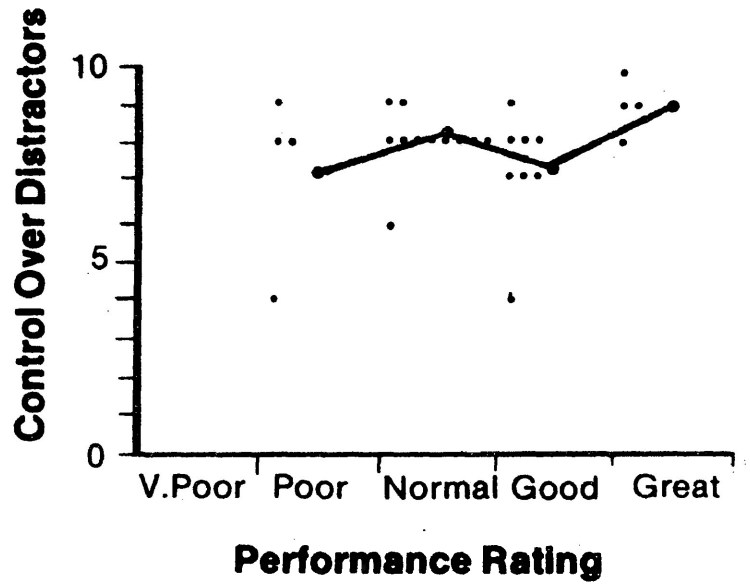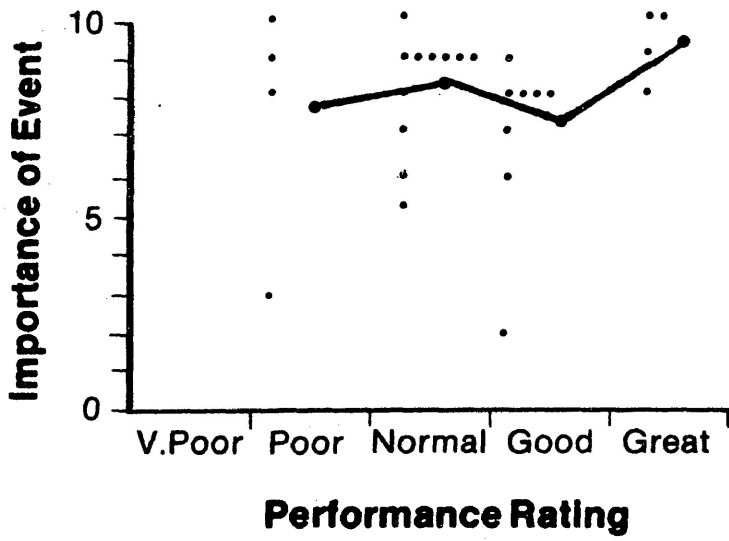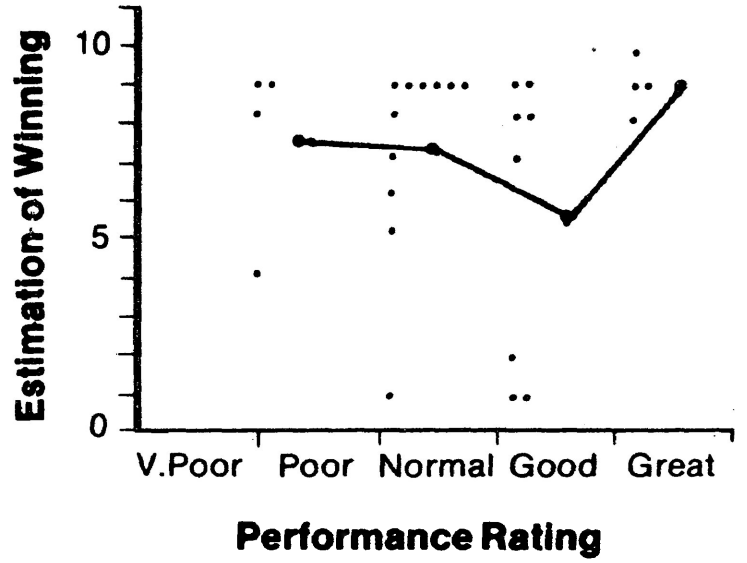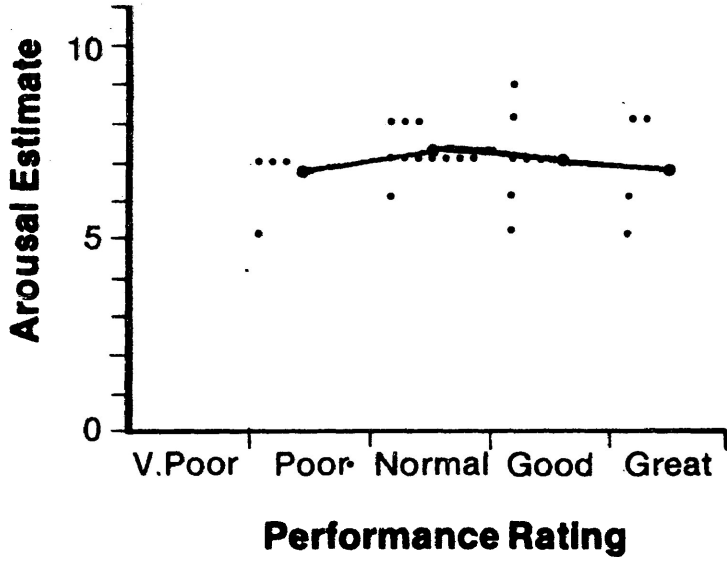
Data Points
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Mean
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Line Graph
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SUBJECT 3

Data Points
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Mean
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Line Graph
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SUBJECT 3

Estimation of Winning

Importance of Event

Control Over Distractors
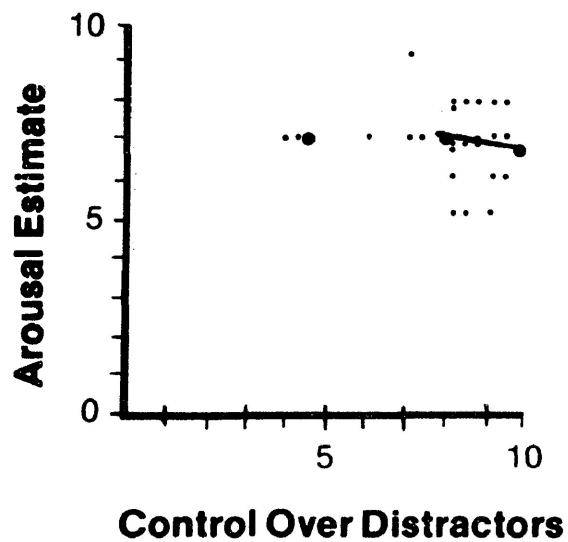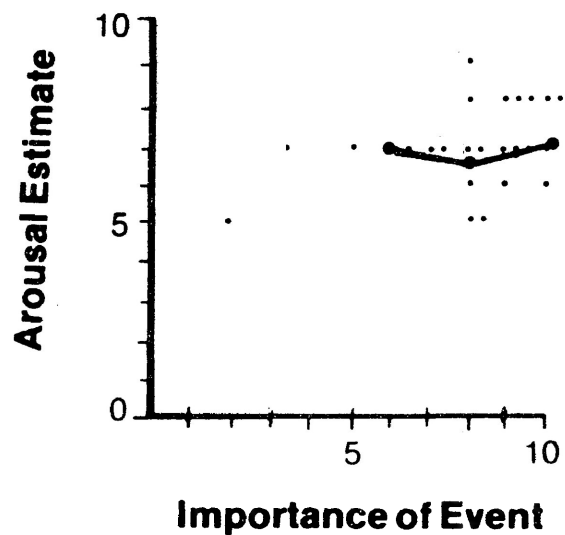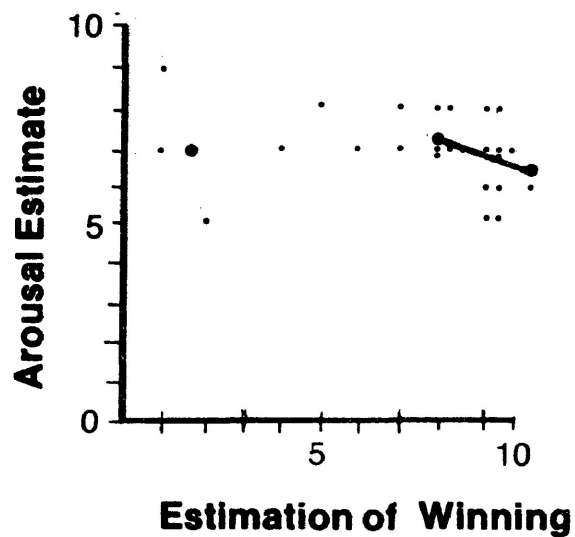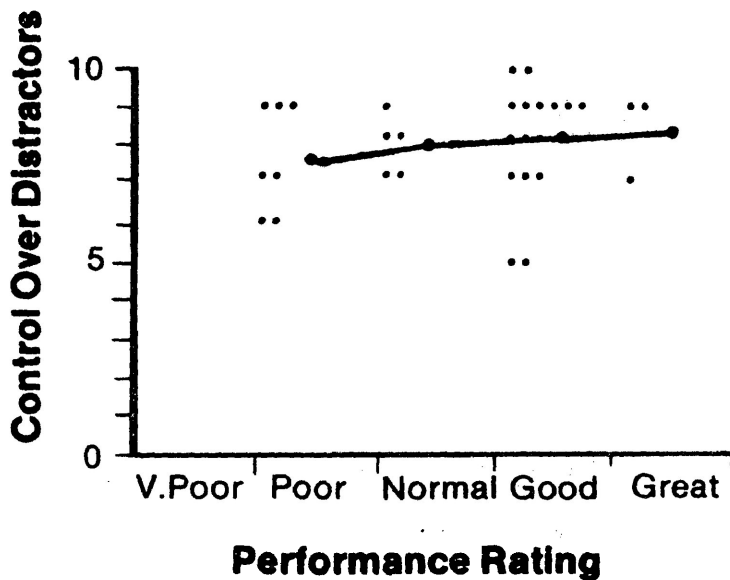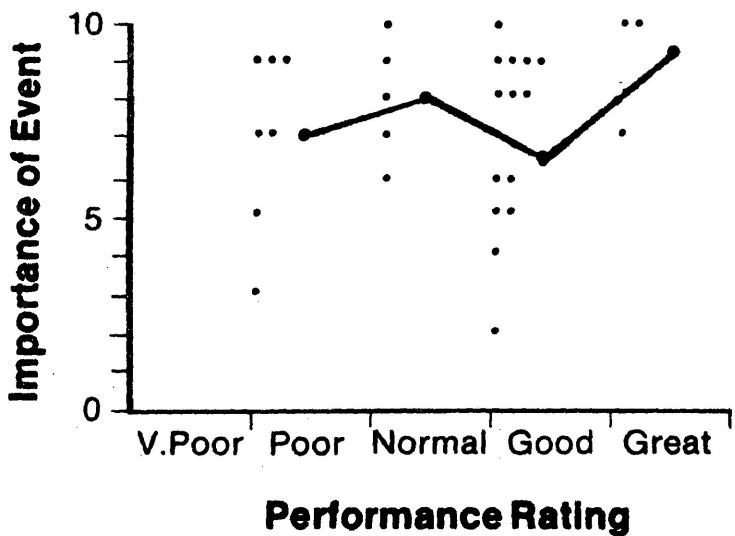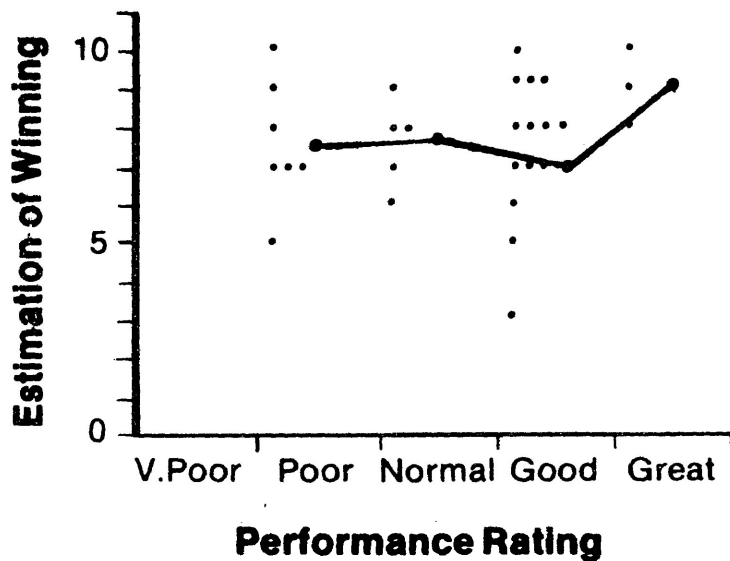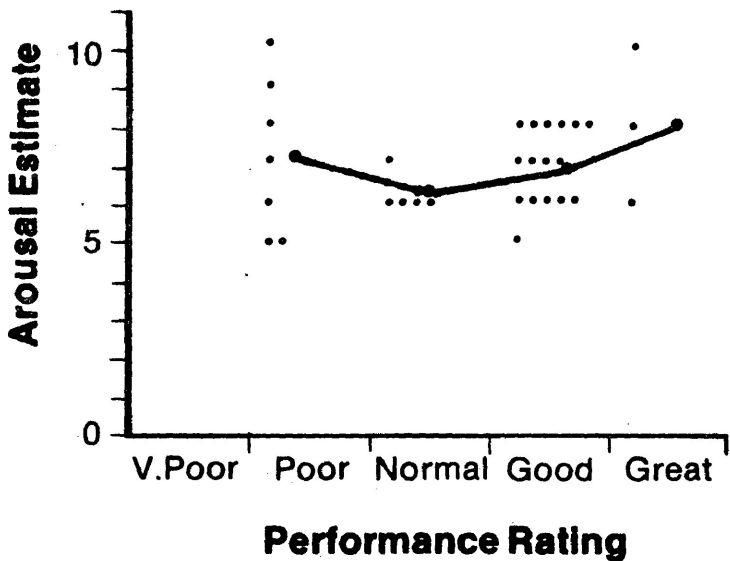
Data Points	Mean	Line Graph
...	●	———

SUBJECT 4

Data Points   Mean   Line Graph

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SUBJECT 4

Arousal Estimate vs **Estimation of Winning**

Arousal Estimate vs **Importance of Event**

Arousal Estimate vs **Control Over Distractors**

Data Points ... Mean ● Line Graph ———

SUBJECT 5

SUBJECT 5

Estimation of Winning

Importance of Event

Control Over Distractors
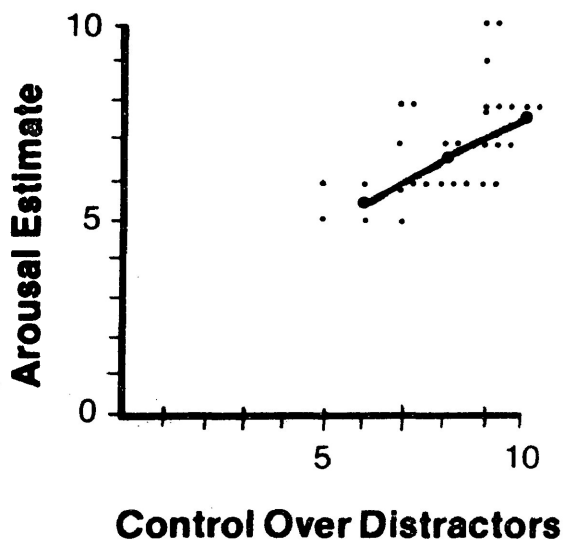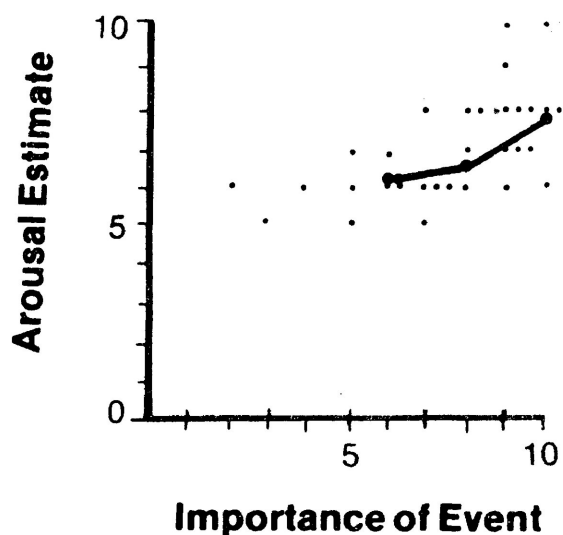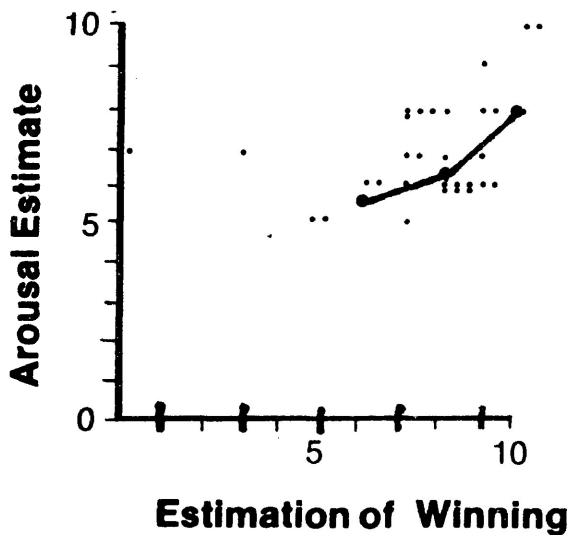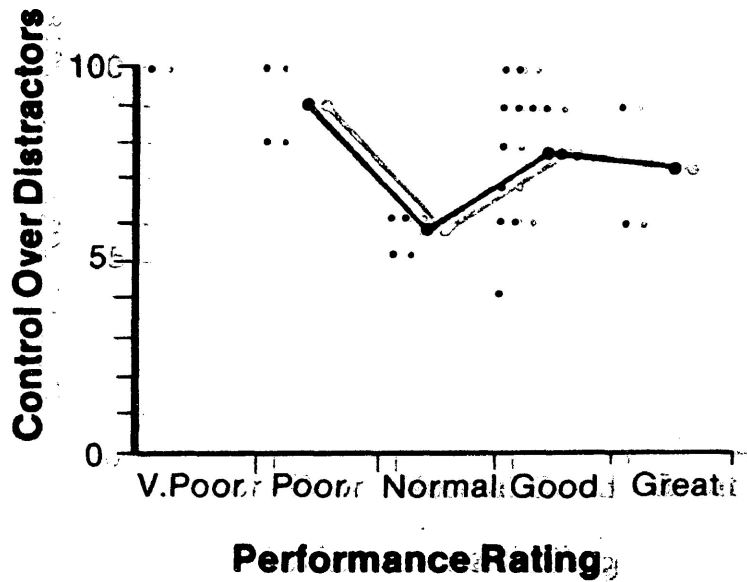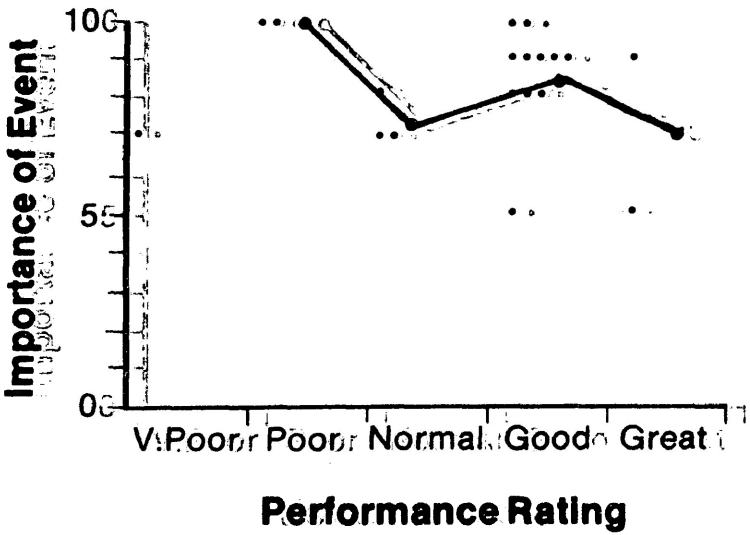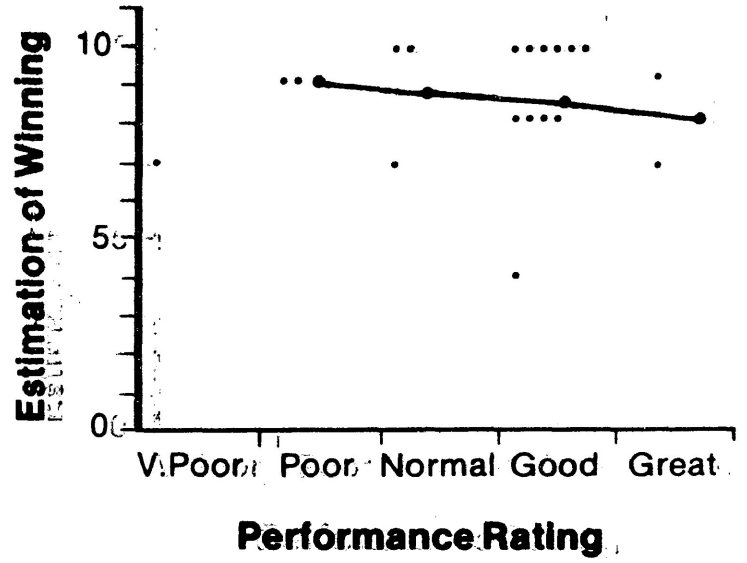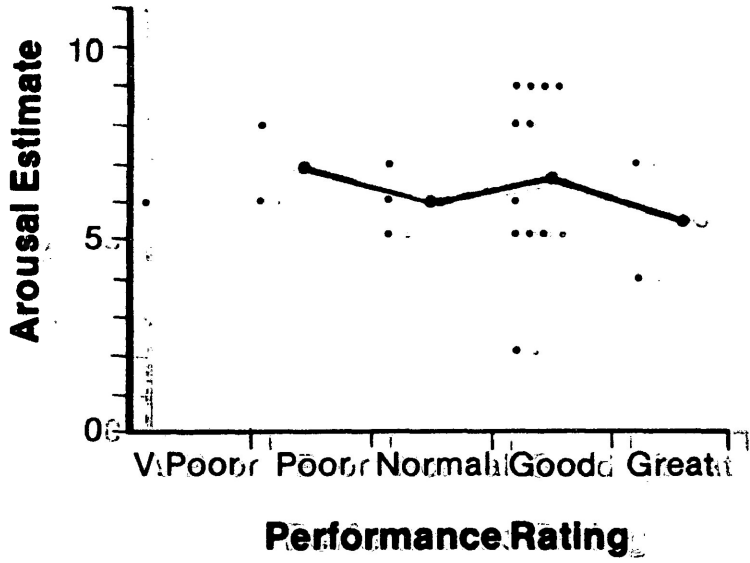
Data Points
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Mean
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Line Graph
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SUBJECT 6

SUBJECT 6

Estimation of Winning

Importance of Event

Control Over Distractors
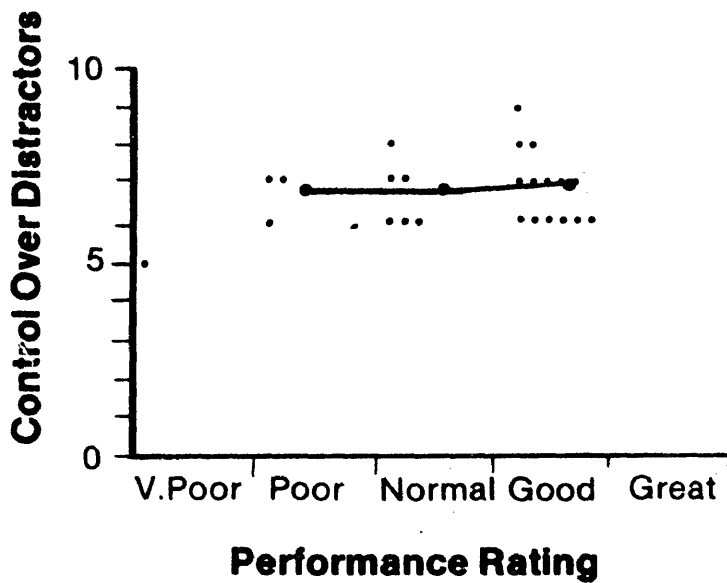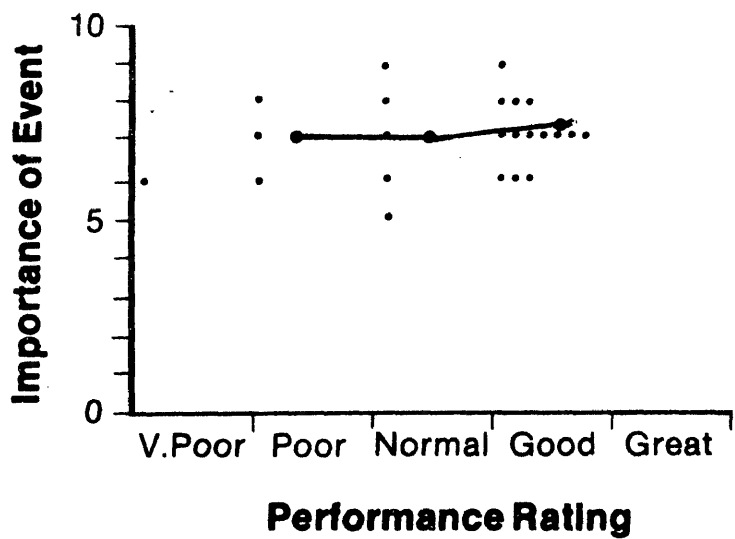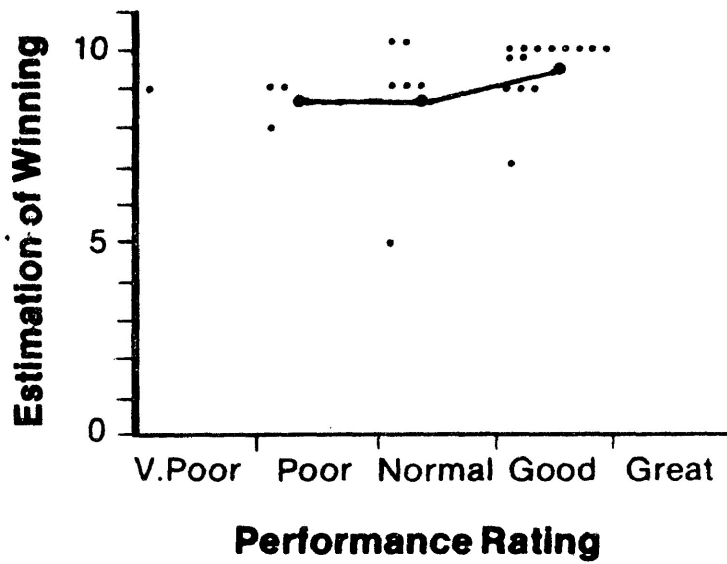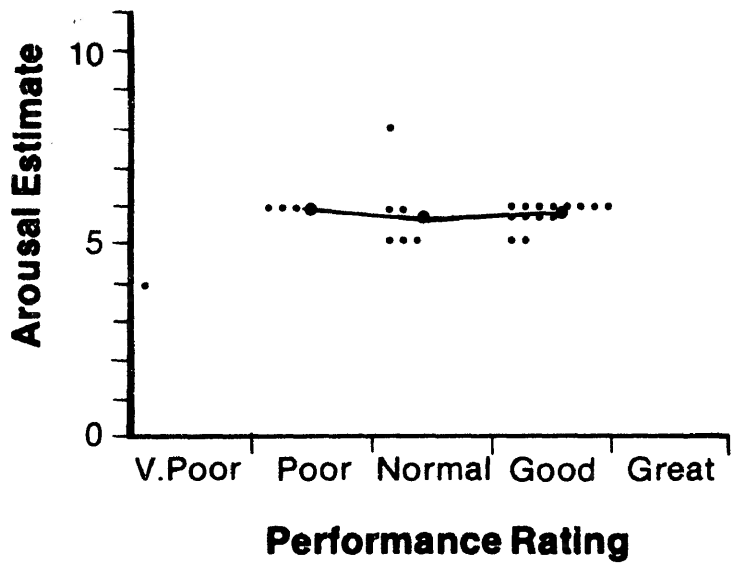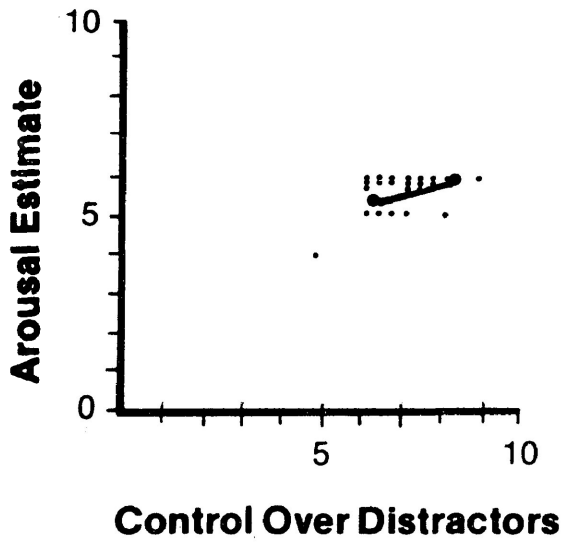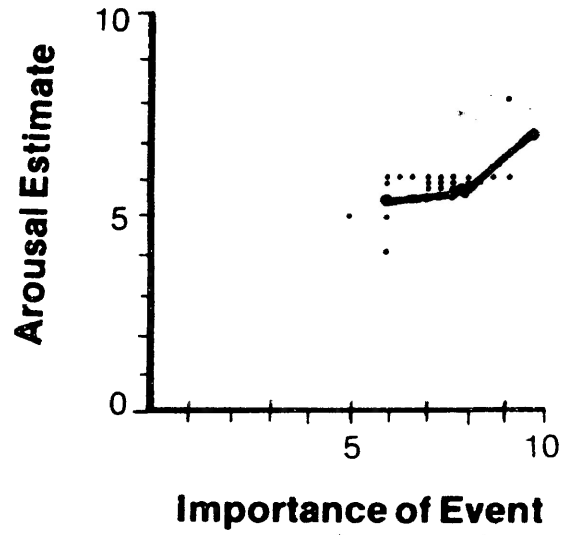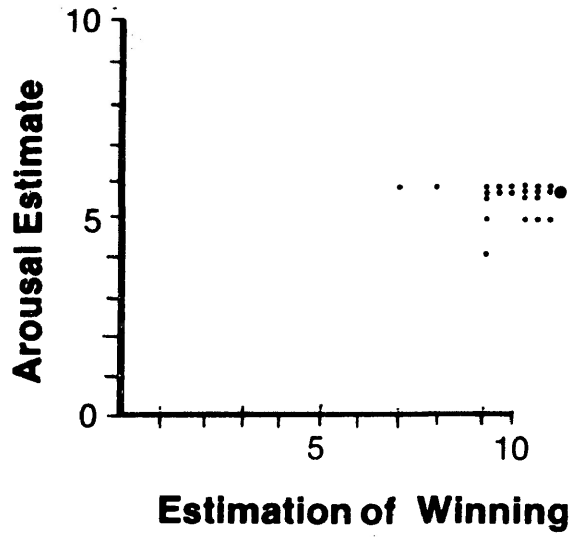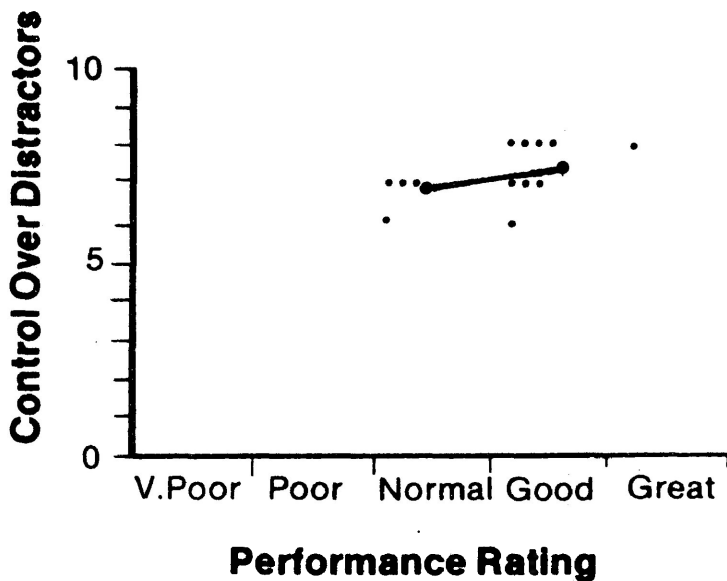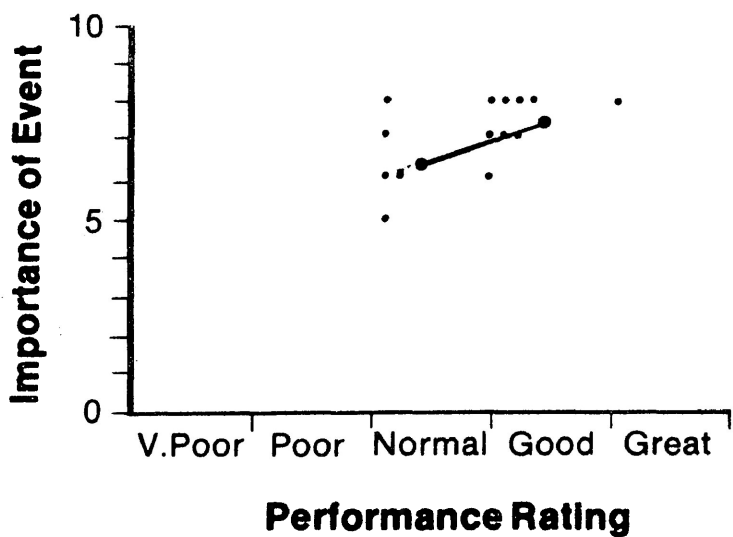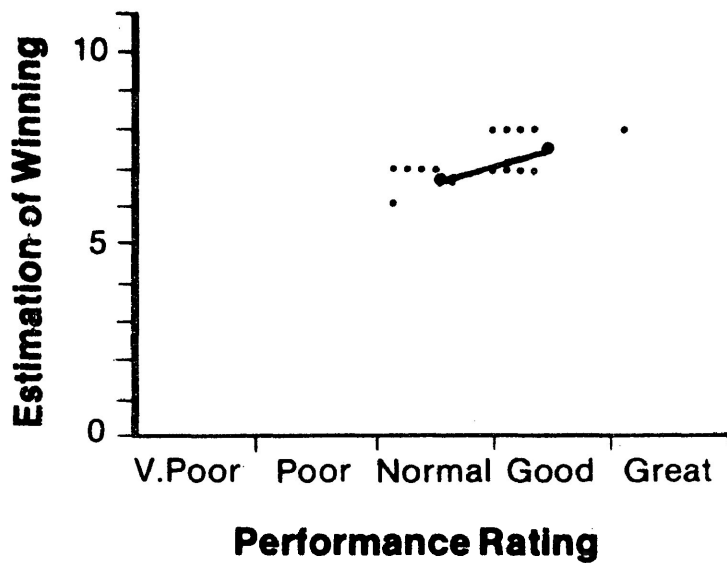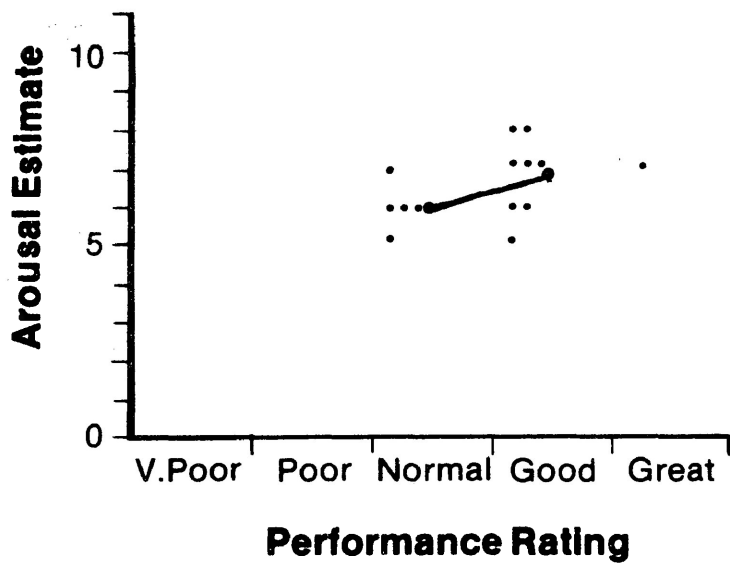
Data Points	Mean	Line Graph
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SUBJECT 7

Data Points   **Mean**   **Line Graph**
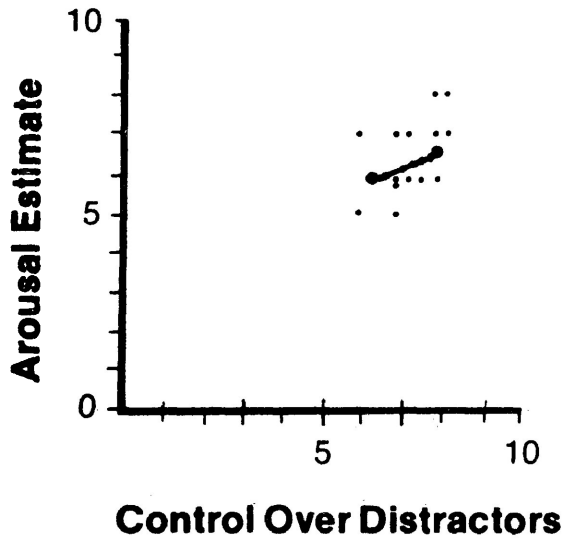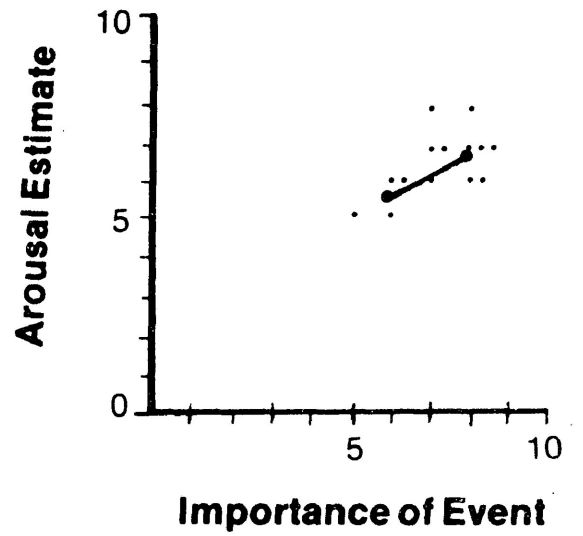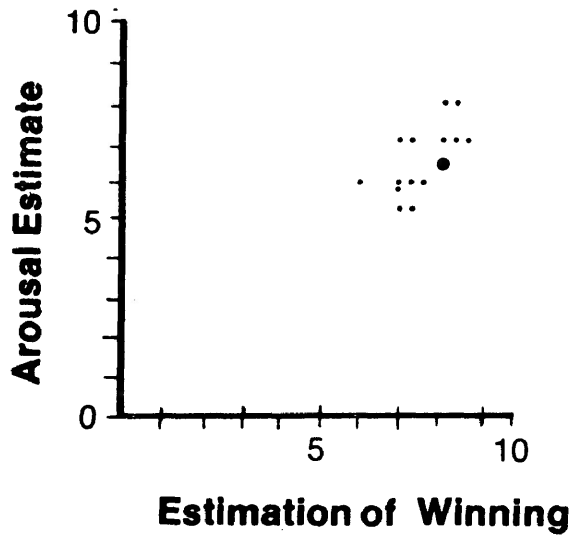
SUBJECT 7

SUBJECT 8

SUBJECT 8

Estimation of Winning

Importance of Event

Control Over Distractors
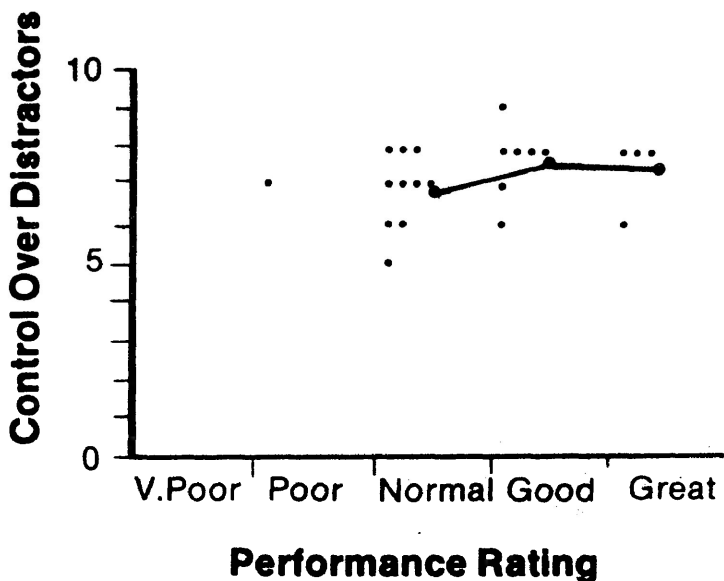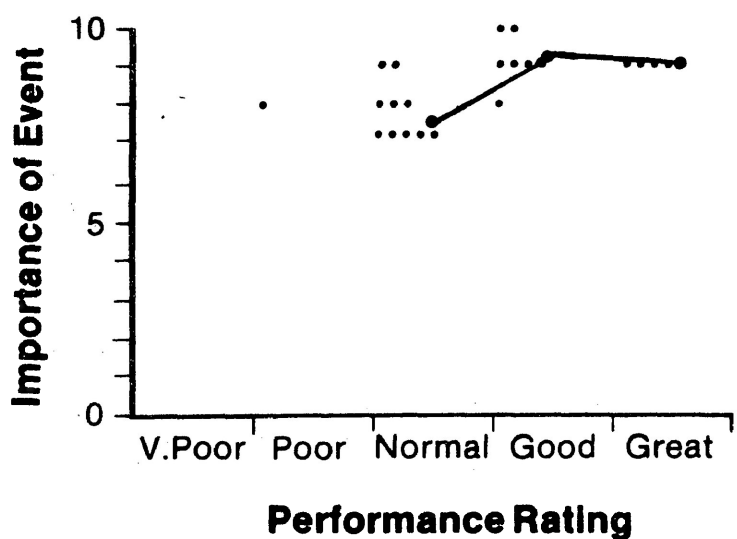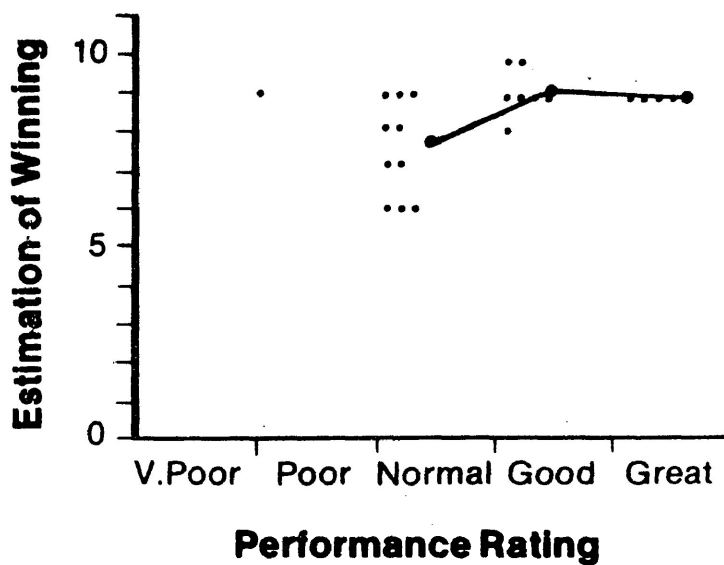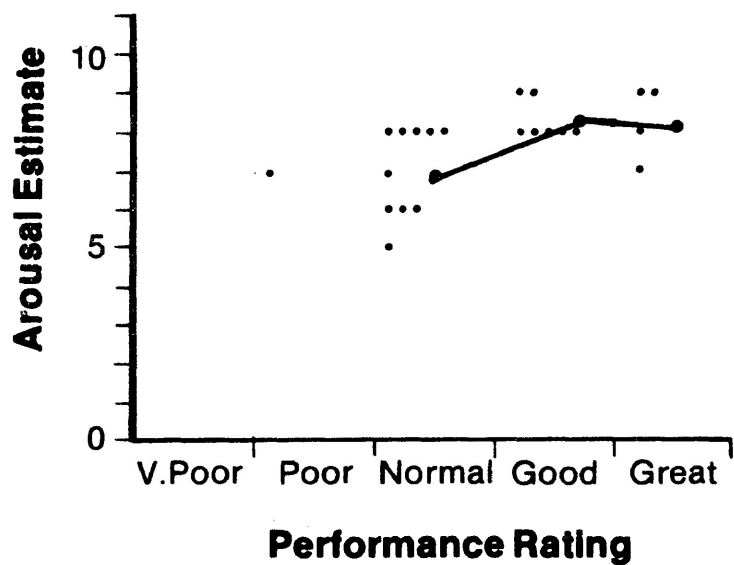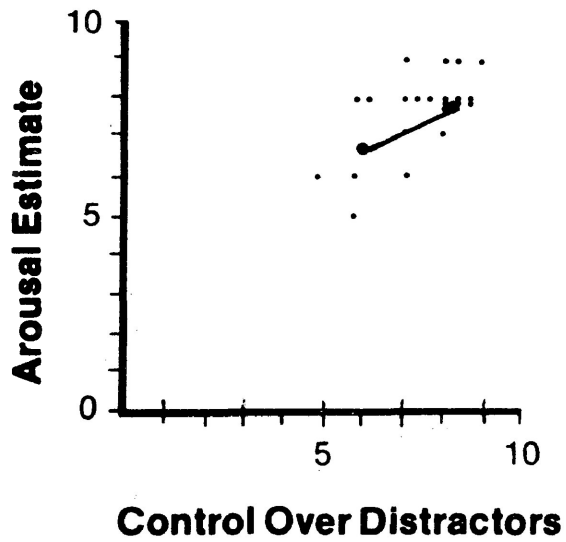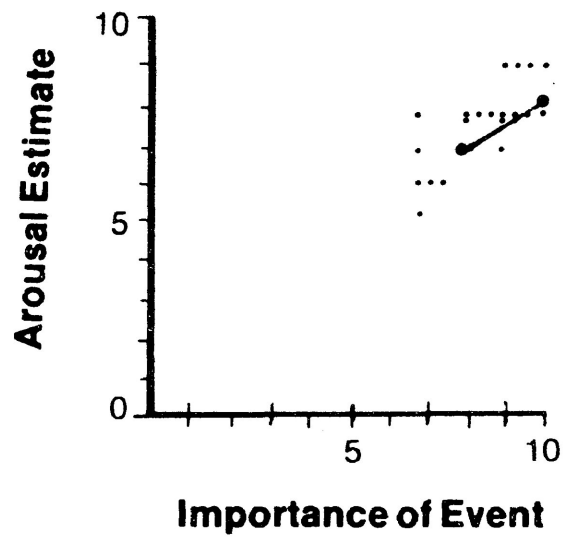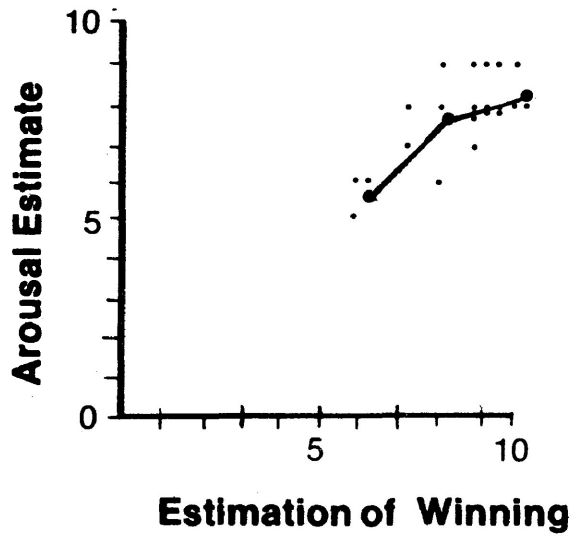
Data Points	Mean	Line Graph
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SUBJECT 9

SUBJECT 9

Estimation of Winning

Importance of Event

Control Over Distractors

Data Points

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Mean

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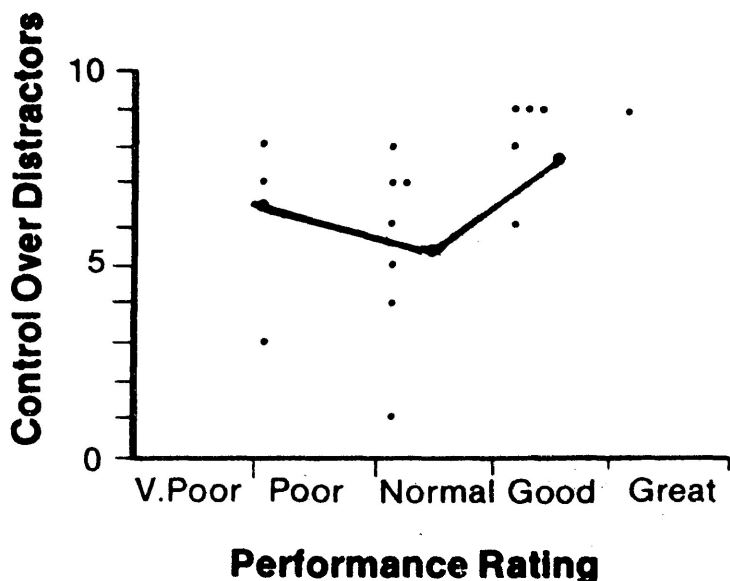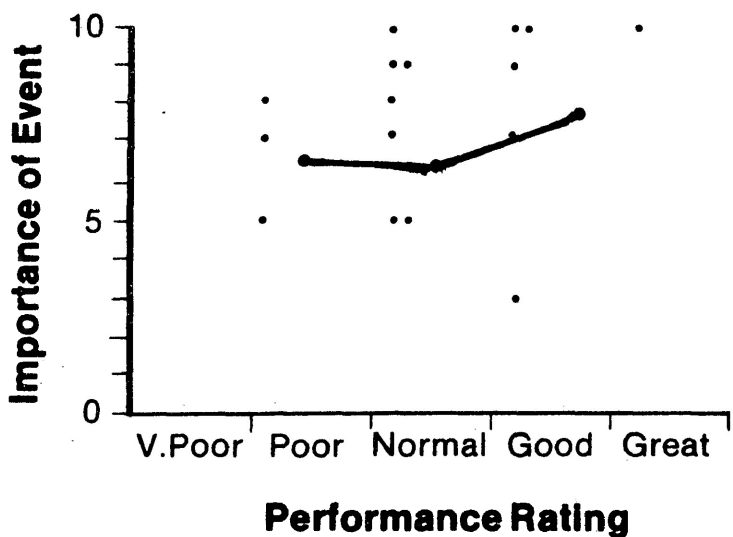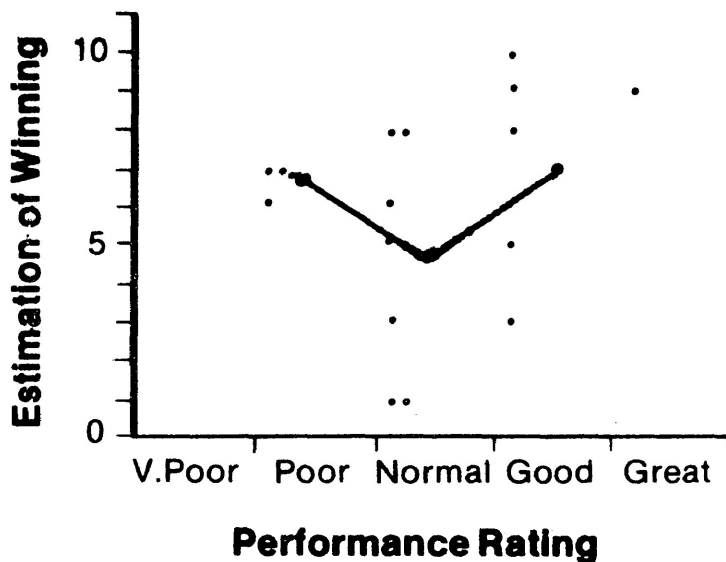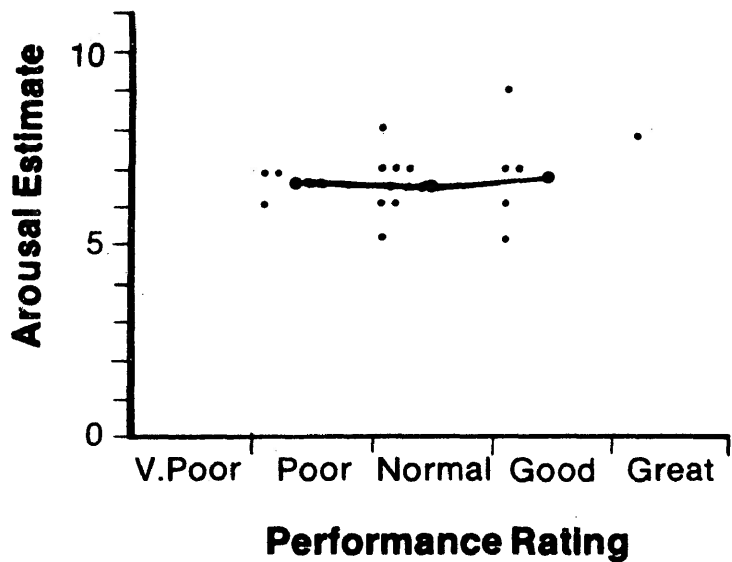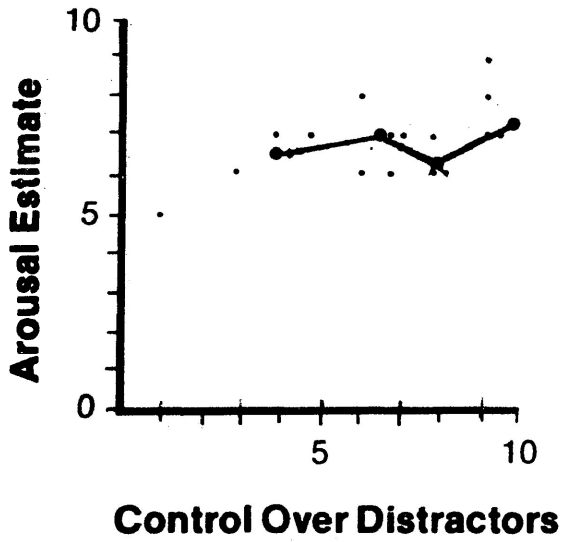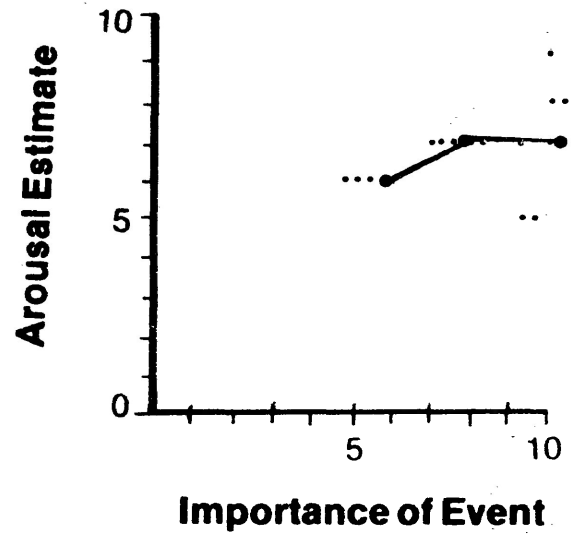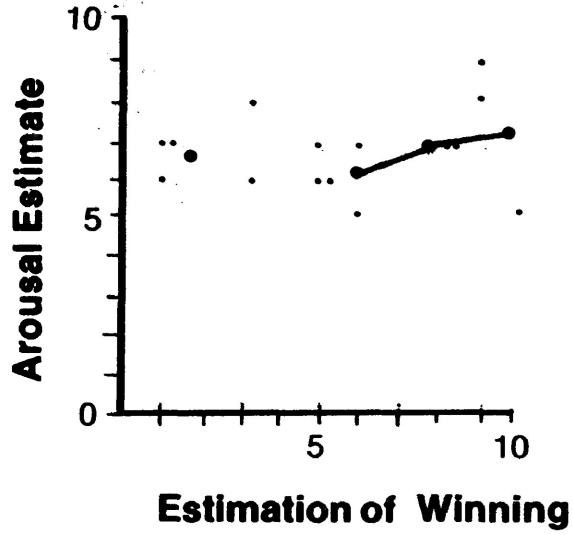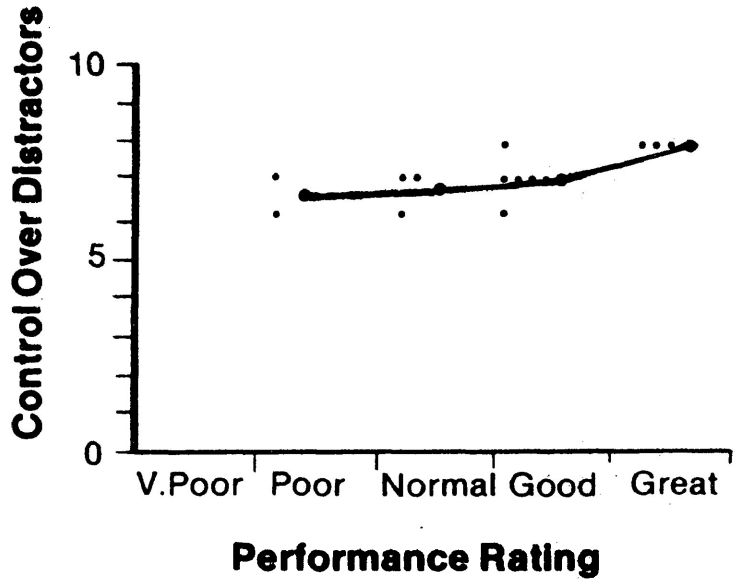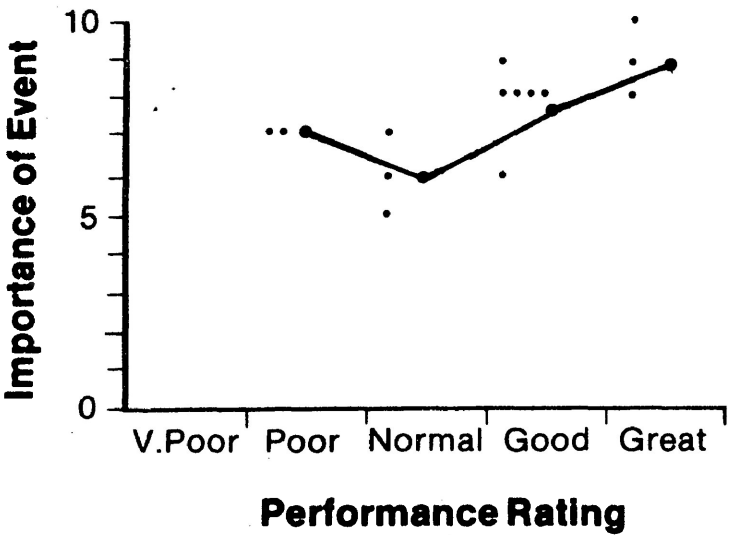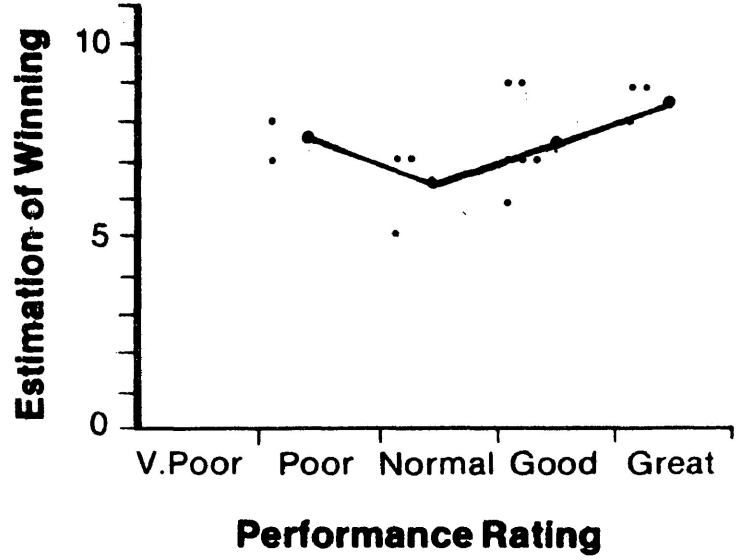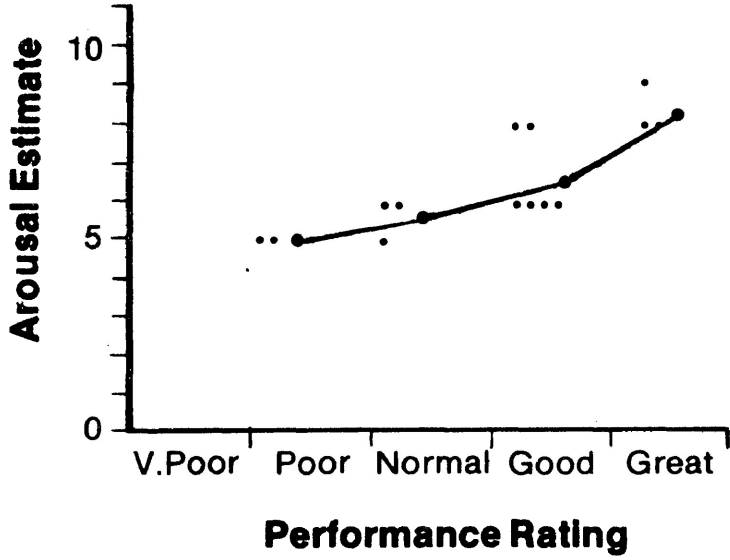
Line Graph

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SUBJECT 10

Data Points
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Mean Line Graph
● ————

SUBJECT 10

Estimation of Winning

Importance of Event

Control Over Distractors
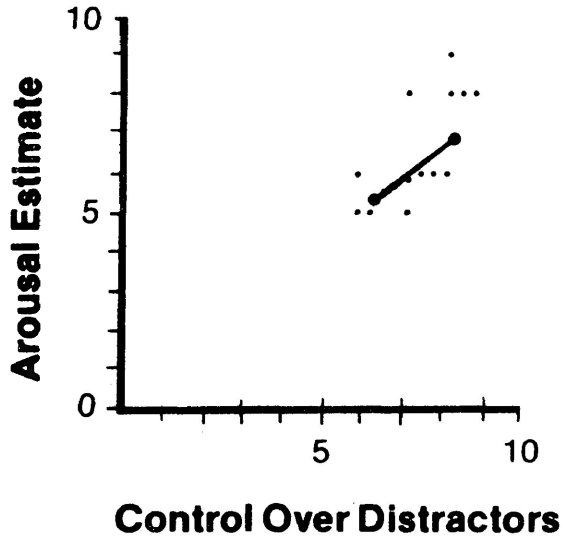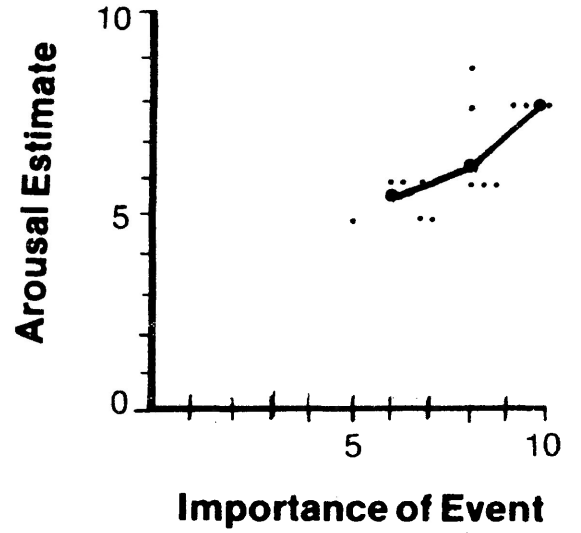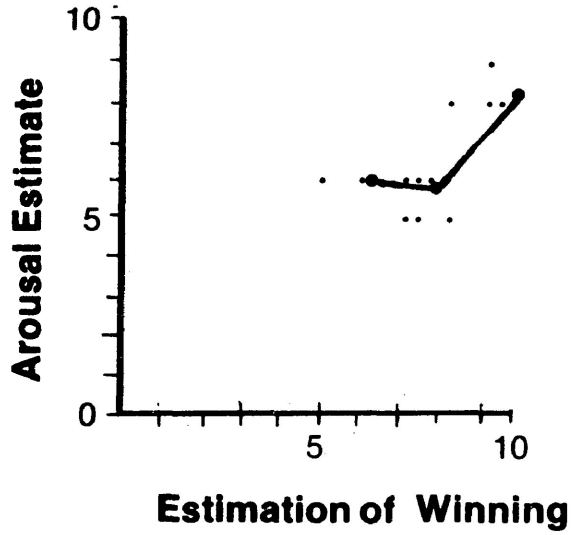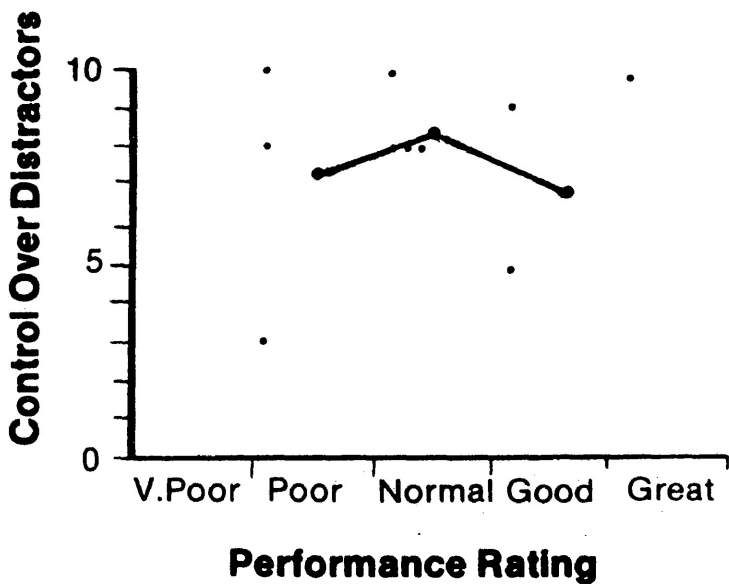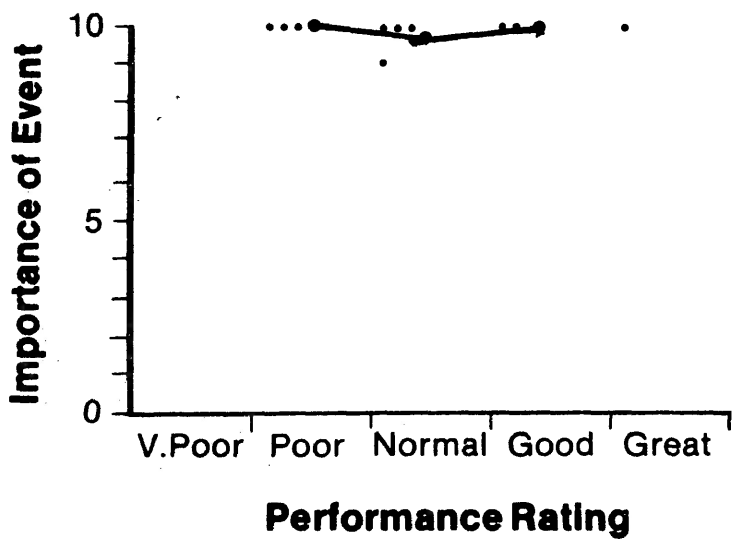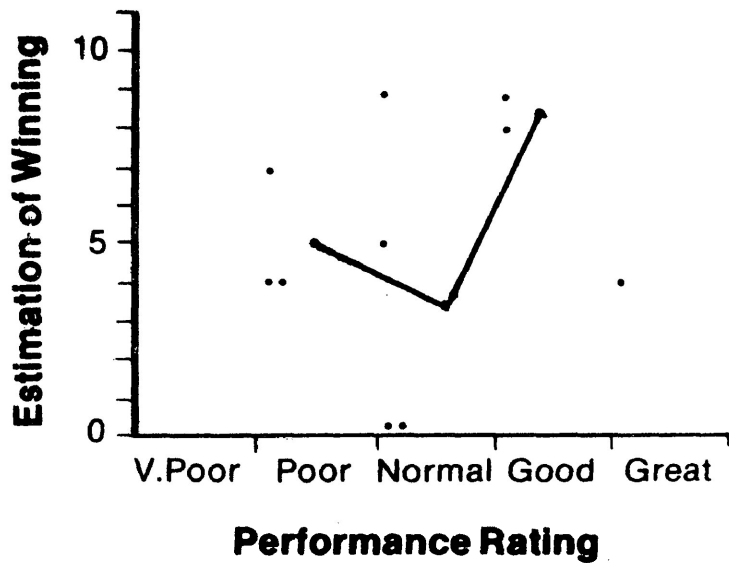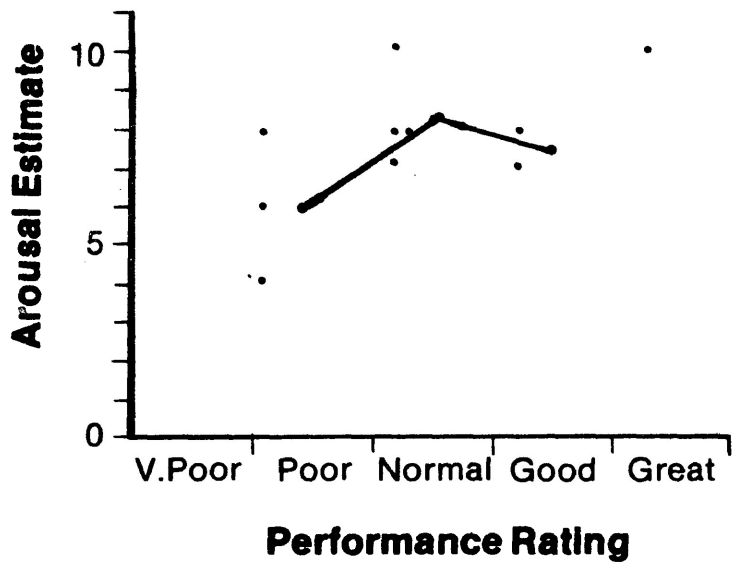
Data Points	Mean	Line Graph
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SUBJECT 11

Data Points
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Mean
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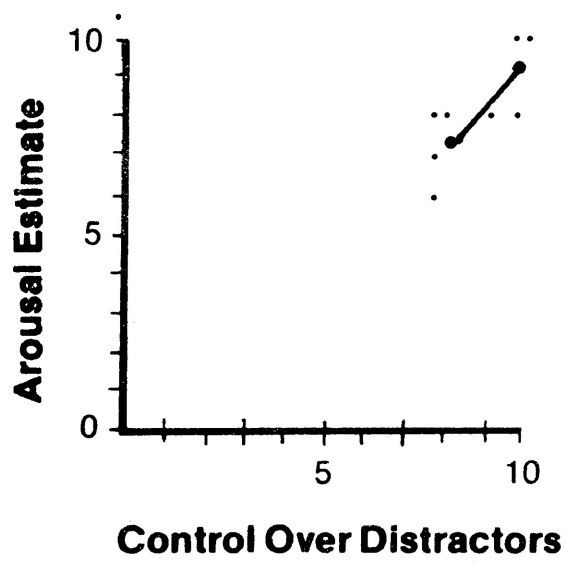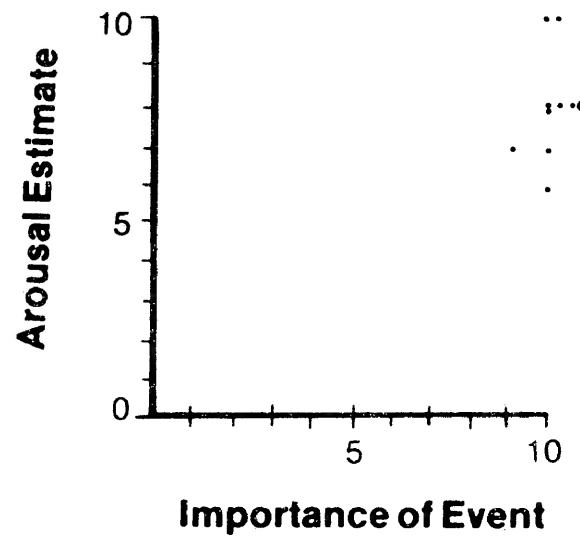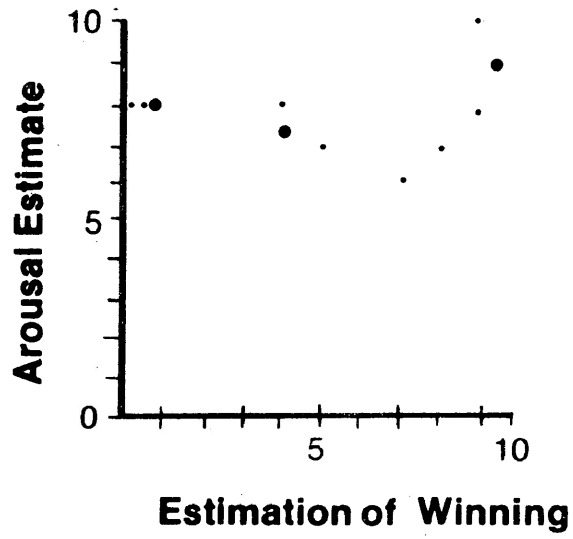
Line Graph
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SUBJECT 11

Arousal Estimate (y-axis) vs **Estimation of Winning** (x-axis)

Arousal Estimate (y-axis) vs **Importance of Event** (x-axis)

Arousal Estimate (y-axis) vs **Control Over Distractors** (x-axis)

Data Points	Mean	Line Graph
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SUBJECT 12

SUBJECT 12

Arousal Estimate vs. Estimation of Winning

Arousal Estimate vs. Importance of Event

Arousal Estimate vs. Control Over Distractors
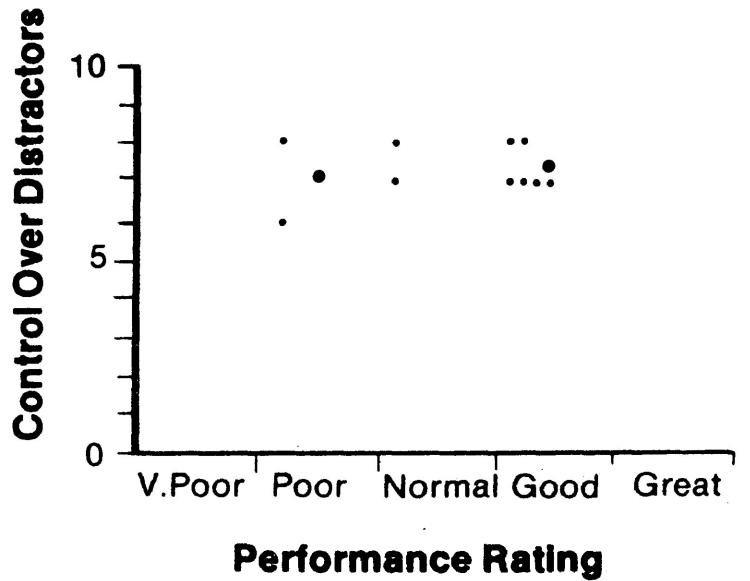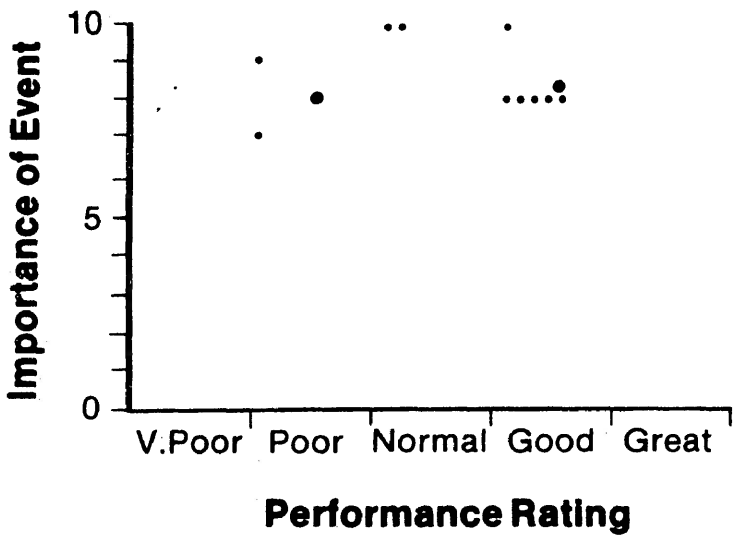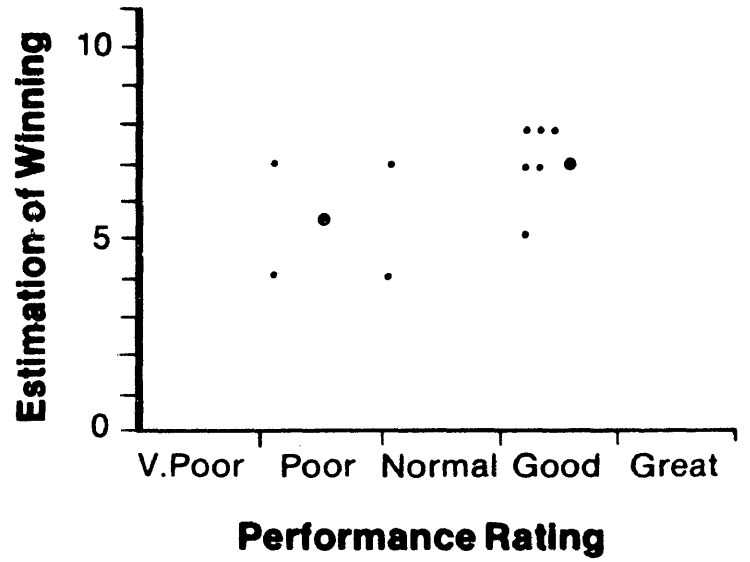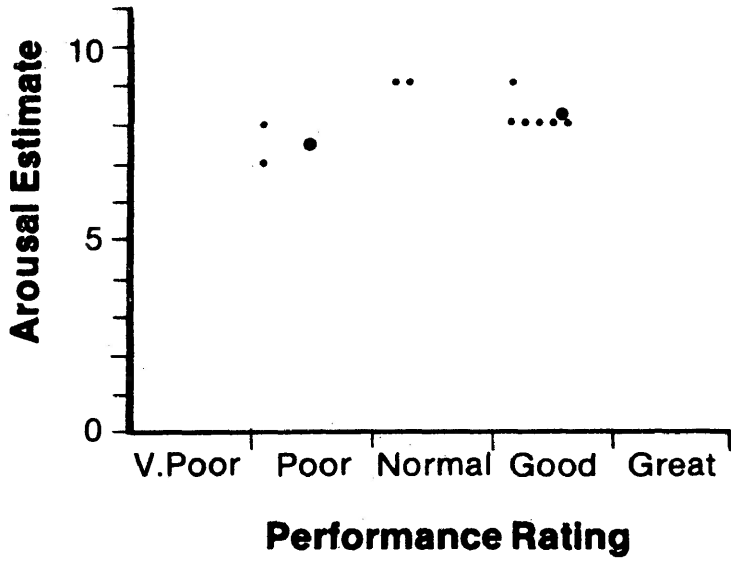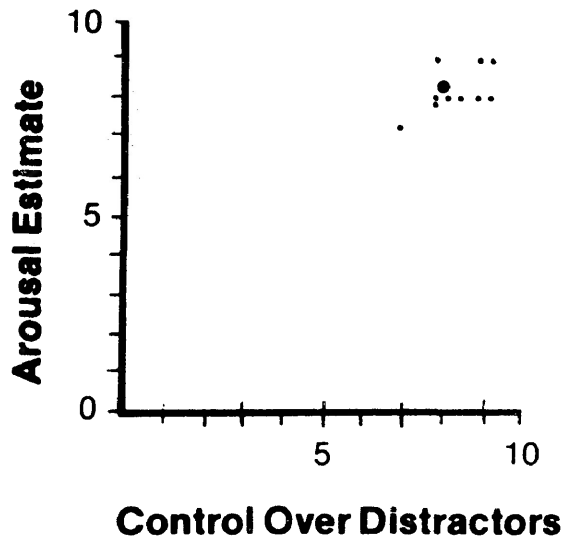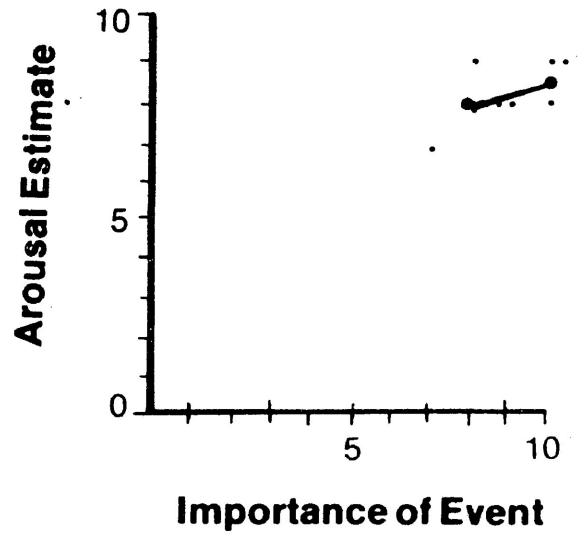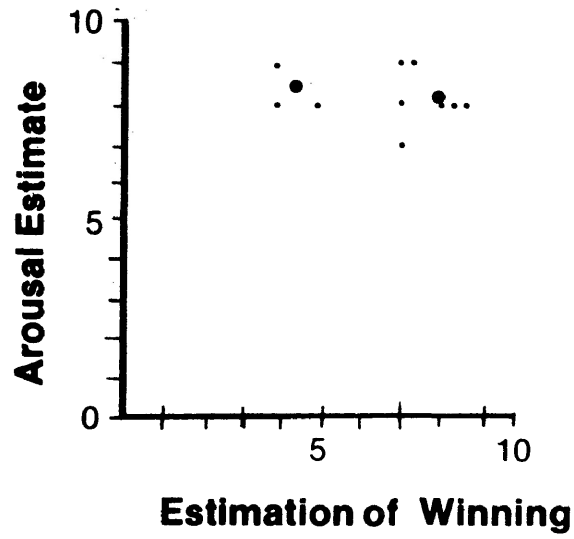
Data Points
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Mean
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Line Graph
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APPENDIX D

RECONVERTED NUMBERS FOR PROBABILITY ASSESSMENT

MEAN AROUSAL FOR THREE PERFORMANCE LEVELS

Subject	High	Medium	Low
S1	9.0	6.48	6.5
S2	7.5	5.6	7.5
S3	6.75	7.09	6.75
S4	8.0	6.56	7.14
S5	5.5	6.32	7.0
S6	5.85	5.83	6.0
S7	6.75	--	6.0
S8	8.25	8.28	7.0
S9	6.8	6.57	6.66
S10	8.3	6.16	5.0

MEAN ESTIMATION OF WINNING FOR THREE PERFORMANCE LEVELS

Subject	High	Medium	Low
S1	8.0	8.2	7.5
S2	7.75	7.0	8.5
S3	9.0	6.5	7.5
S4	9.0	7.3	7.6
S5	8.0	8.9	9.0
S6	9.6	8.7	8.7
S7	7.5	--	6.8
S8	9.0	9.1	7.5
S9	7.0	4.6	5.0
S10	8.7	6.9	5.5

MEAN IMPORTANCE OF EVENT FOR THREE PERFORMANCE LEVELS

Subject	High	Medium	Low
S1	9.25	7.77	6.5
S2	7.9	6.0	8.0
S3	9.25	7.6	7.5
S4	9.0	7.28	7.0
S5	7.0	7.9	10.0
S6	7.14	7.0	7.0
S7	7.37	--	6.4
S8	9.0	9.14	7.6
S9	7.8	6.57	6.66
S10	9.0	6.91	7.0

MEAN CONTROL OVER DISTRACTORS FOR THREE PERFORMANCE LEVELS

Subject	High	Medium	Low
S1	8.0	7.03	4.0
S2	8.5	7.33	8.5
S3	9.0	7.63	7.25
S4	8.3	7.93	7.57
S5	7.5	6.78	9.0
S6	6.85	6.6	6.6
S7	7.37	--	6.8
S8	7.5	7.7	6.9
S9	8.2	5.43	6.0
S10	8.0	6.85	6.5

MEAN AROUSAL LEVELS FOR THREE LEVELS OF ESTIMATES OF WINNING

Subject	High	Medium	Low
S1	7.6	6.5	4.5
S2	7.4	--	7.0
S3	6.5	7.37	7.0
S4	7.86	6.63	5.5
S5	7.0	--	6.0
S6	--	5.8	--
S7	--	6.5	--
S8	8.2	7.8	5.6
S9	7.3	7.0	6.4
S10	8.25	5.9	6.0

MEAN AROUSAL LEVELS FOR THREE LEVELS OF IMPORTANCE OF EVENT

Subject	High	Medium	Low
S1	7.8	6.3	4.5
S2	7.75	7.5	5.0
S3	7.2	6.7	7.0
S4	7.85	6.6	6.2
S5	7.3	6.5	3.0
S6	7.0	5.8	5.4
S7	6.9	--	5.5
S8	8.25	--	7.0
S9	7.0	7.0	6.0
S10	8.0	6.4	5.66

MEAN AROUSAL LEVELS FOR THREE LEVELS OF CONTROL

Subject	High	Medium	Low
S1	9.0	6.35	6.5
S2	7.83	--	6.2
S3	6.71	7.0	7.0
S4	7.86	7.63	5.5
S5	7.9	7.0	5.3
S6	6.0	--	5.5
S7	6.6	--	5.0
S8	7.9	--	6.6
S9	7.25	6.5	7.0
S10	6.9	--	5.33