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to Various Levels of Injury Severity

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# Physical Self-Efficacy, Injury History, and Locus of Control as Predictors of Athletes' Expected Recovery Actions in Response to Various Levels of Injury Severity

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Running head: PHYSICAL SELF-EFFICACY AND LOCUS OF CONTROL AS PREDICTORS

Abstract

Athletes and coaches from a university athletic program at the highest level of competition in the National Collegiate Athletic Association and a college athletic program at the lowest level of competition participated in this project designed to study athletes expected recovery actions when presented with various levels of injury. Physical self-efficacy, locus of control and injury history were considered as mediators in the expected recovery processes including expected recovery time, the number of recovery strategies, and reaction to permission for competition after injury. The Physical Self-Efficacy Scale (Ryckman, Robbins, Thorton, & Cantrell, 1982) and the Nowicki-Strickland Locus of Control Scale for Children (Nowicki & Strickland, 1973, adapted for use with college students and adults), were determined to be related to an athlete's predicted recovery actions from specific mild, moderate, and severe injury.

Coaches were determined to have the ability to accurately categorize athletes regarding physical self-efficacy and locus of control. Athletes with an internal locus of control were found to predict different recovery actions from athletes with an external locus of control. Likewise, athletes with high physical self-efficacy were found to predict different recovery actions from athletes with a low physical self-efficacy. When athletes, who were classified as having both an internal locus of control and a high physical self-efficacy were compared to athletes classified as having both external locus of control and low self-efficacy, additional differences were observed. The athletes differed on ratings of their own ability, predictions of recovery times, and on level of awareness of the injury site after approval for competition. Repeated injuries were determined to increase externality of locus of

control of athletes. Previous experience with injury, the athlete's perceived level of ability in sport, and the coach's perceptions of the athlete's response to injury were also considered for their predictive ability for injury recovery.

# Physical Self-Efficacy, Injury History and Locus of Control as Predictors of Athletes' Expected Recovery Actions in Response to Various Levels of Injury Severity

For an athlete, any injury which prevents maximum performance is a potential stress. The athlete's response to the injury often determines the speed and quality of recovery. Locus of control, physical self-efficacy, past experience with injury, and the coach's perceptions of the athlete's talent and injury responses, possibly affect perceptions of the athletes injury and recovery potential. These variables possibly affect the athlete's response to injury situations of varying severity and to influence the goal of a maximally efficient recovery -- that is, the resumption of competition by the healthiest and fastest methods -- while maintaining physical health. Discovery of the links between these predictors and recovery attitudes and behaviors may enable coaches and athletes to maximize recovery.

Eldridge (1983) and Weiss and Troxel (1986) state that the athlete and health professional need to work together to maximize the potential psychological, physiological, and social well-being of the athlete during the recovery process. Consideration of the athlete's personality may aid in achieving maximal efficiency during the injury recovery process.

The assessment and maintenance of psychological and physical wellness that is linked to changing conditions of every day life is becoming increasingly popular. Lanyon (1984) reviewing trends in the area of psychological research found self-concept to be a significant area of current research and study. Specifically, sport psychology is now examining the changing interactions and

mediating variables in physical and mental well-being, namely the athletes' perceptions and cognitions (Brown, 1984). With the continuing interest in athletics, an examination of an athlete's self-concept and some of the factors affecting the athlete's self-concept is helpful for the athletes themselves and their coaches. Believed self-concept plays a role in the injury recovery process while the athlete is attempting to regain lost physical ability (Brown, 1984).

McCready (1985) found that individuals with a positive attitude toward participating in a physical activity program to reduce stress tend to have a higher percent attendance and activity level in that chosen athletic activity. These athletes to a greater extent benefit from the stress reducing potential of athletics.

When a valued or familiar activity (ie. athletics) is lost or taken away, stress results. When an outcome (i.e. an injury) differs from an expectation (i.e. injury-free athletics), stress results. The importance of this situation is directly related to the development of feelings of stress (Scanlan & Passer, 1981). To an athlete, physical ability is crucial. Stress occurs when an athlete is injured and athletic ability is decreased or temporarily taken away. Depending on the severity of the injury, familiar athletic practice and competition, as well as everyday activities, may be postponed or cancelled in order for the injury to heal properly.

Athletic injury that changes the daily routine of the athlete potentially affects the self-image of the athlete. When this happens, coping mechanisms are called into play. A serious test of an athlete's coping quality behavior in a injury situation. The athlete's behavior at this time is the result of contributing factors from within the individual as well as from the individual's environment (Martens, 1977). The athlete's cognitive appraisal of the stressor, the injury, and the strength of coping

mechanisms are a reflection in part of the locus of control and physical self-efficacy.

Locus of control is the degree to which an individual believes reinforcement is contingent upon internal behavior. The extent to which reinforcement is perceived from internal personal and relatively permanent characteristics, or from external forces determine the degree of internality or externality (Rotter, 1966). An internally controlled individual believes that reinforcement is contingent on behavior, personal capacities, and attributes. An externally controlled individual believes that reinforcement depends on powerful others, luck, chance, or fate. Past reinforcement experiences determine attitudes toward either an internal or external locus as the source of reinforcement (Joe, 1971).

In a summary of the research, Joe (1971) found that externals described themselves as "anxious, less able to show constructive responses in overcoming frustration, and more concerned with fear of failure than achievement" and internals described themselves as "more concerned with achievement, more constructive in overcoming frustration, and less anxious" (pp 625-626). Internals may, therefore, be predisposed to more productive coping strategies than others, influencing perceptions of injury and the recovery process. This is supported by DuCette and Wolk (1973) who found that the moderating power of locus of control is a function of both cognitive and maturational qualities of the individual.

If an athlete has sustained an injury, followed by what is perceived as a successful recovery, successful recovery is more likely to be predicted for future injuries. Conversely, an athlete who has or is currently experiencing a difficult or frustrating injury recovery is likely to assume the same for future injury. Weiss and

Troxel (1986) found that athletes with a low self-esteem and a low expectancy of success for the rehabilitative process are likely to experience a greater amount of stress than those athletes with higher self-esteem and expectancy; they concluded that the externally oriented athlete may require more external guidance and encouragement during the recovery process.

Another personality factor potentially related to perceptions and predictions of injury recovery is self-efficacy. Self-efficacy refers to a belief in one's own ability to produce a desired outcome. Expectations for personal self-efficacy are derived from performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal (Bandura, 1977).

Perceived self-efficacy influences the choice of behavioral setting, choice of activity, and the amount and the duration of effort expended during stressful situations, provided the appropriate skills and incentives. The strength of this efficacy expectation in turn affects both the initiation and the persistence of coping behaviors when an individual is faced with obstacles or adverse situations (Bandura, 1977).

McAuley and Gill (1983) reported a low but significant correlation between locus of control and physical self-efficacy accounting for approximately 11% of the variance. However, while 11% of the variance between locus of control and physical self-efficacy can be accounted for by the correlation, almost 90% cannot be. Therefore, while the constructs of self-efficacy and locus of control are related, they also tap separate domains.

An injured athlete is expected to respond to the injury and the rehabilitative process dependent upon physical self-efficacy, sense of injury self-efficacy, the

ability to recover from injury possibly irrespective of injury history. The weight given to a new experience depends on the nature and strength of the pre-existing self-efficacy into which these new experiences must be integrated (Bandura, 1986). Self-efficacy also has even been found to be a better predictor of performance than previous performance (Bandura, Adams, Hardy, & Howells, 1980).

Wurtle (1986), reviewing self-efficacy and athletic performance, determined that, although self-efficacy expectations have been shown to adequately predict athletic performance, further research is needed to compare self-efficacy expectations with other predictors of behavior.

An injury self-efficacy measure is expected to allow for individual injury recovery predictions and strategies. How an individual responds, predicting faster or slower recovery times is an indication of injury self-efficacy. A generalized measure allows prediction in a wide variety of situations.

Ryckman, Robbins, Thorton, & Cantrell (1982) found individuals with an internal locus of control orientation to have stronger perceptions of their own physical self-efficacy. Rotter (1966) states that individual locus of control can vary in degree, over time, and across situations. Also an athlete's perception of the causes of an event may influence subsequent motivation (Carron, 1984). This suggests that an injury, an externally caused event, may create feelings of lower self-efficacy and a more external locus of control orientation. Lee, Ho, Tsang, Cheng, & Lieh-Mak (1985) state that after injuries, patients may become more external and feel more vulnerable. They conclude that an internal locus of control, a positive social integration and an ability to enjoy day-to-day activities are important

for positive adaptation to stress. Locus of control is considered to be a coping resource which can moderate a stressful injury situation.

The athlete with a more internal locus of control orientation is expected to have more constructive responses to injury than the more externally oriented athlete. What is happening to the athlete psychologically is as important, or possibly more important, than what is occurring physically during the injury recovery process. Injury recovery strategies such as weight training to strengthen the affected area, practice at a lower intensity, or another approved recovery activity may help the athlete cope with injury as well as speed recovery. This is supported by Bandura (1977) who states that during an injury recovery period, a self-efficacy level may be maintained by alternative activities if these serve to replace the temporarily or permanently lost means of reinforcement. Research is needed which examines the athlete's perceptions of self-efficacy, locus of control, and the perceptions of the athlete's coach on perceptions of injury and injury recovery.

The typical athlete is expected to view fitness related ability as relatively unstable. As a result, athletes may readily assign the cause of a poor performance to themselves. Feather (1968) found individuals who had experienced prior success tended to obtain higher subsequent success in that area than individuals who had failed initially in that same area. When injured, the externally controlled athlete may be expected to be especially susceptible to the opinions of others. Ritchie & Phares (1969) found that externals changed more in response to a communication from a high-prestige source than to a low prestige source. Externals also showed more attitude change than internals when both received a communication from a high-prestige source. The externally oriented athlete may

tend to put less credence in actual physical ability and believe more strongly in what is being relayed from high prestige sources (ie. doctors, trainers, and coaches).

Actual and perceived status on the team (top 25%, mid 26-50%, 51-75%, or bottom 76-100%) and previous experience with injury affecting athletic ability would be expected to affect injury specific self-efficacy and predictions of response to injury. An athlete who is an important member of the team and plays frequently is expected to get back into the game quickly and is expected to predict faster recovery times, and become an active participant in recovery.

An athlete who has never been injured or one who has recently successfully recovered from an injury would be expected to predict shorter recovery times as well as be more likely to carefully follow or accelerate rehabilitative procedures than an athlete who has experienced a slow and frustrating injury recovery in the past.

An efficient injury recovery is an important goal for an injured athlete. According to Locke, Frederick, Bobko & Lee (1984) ability, self-efficacy and goal level are significant predictors of performance. An athlete's own perceptions of ability, defined here as the power to perform in sport, and that athlete's perceptions of the coach's views of ability, should be important in predicting injury recovery because of the effect on physical self-efficacy and locus of control. Actual ability ratings by the coach and the coach's predictions of the athlete's self-rating for ability in sport may be conveyed to the athlete, also potentially affecting physical self-efficacy and locus of control which in turn affect perceptions of injury and recovery.

The perceptions of athletic ability and control over wellness and injury that the athlete brings with him at the time of injury should affect predictions of recovery

and response to injury. An internal locus of control and a high degree of physical self-efficacy is expected to predispose an athlete toward a constructive reaction to stress with effective coping mechanisms coming into play. This is expected to result in individual predictions of faster recovery times to competition, as well as an active involvement in the recovery process when compared to athletes with an external orientation and lower self-efficacy. The perceptions of injury recovery are hypothesized to be mediated by location on the team, estimates of ability, the coach's perceptions of that athlete, and previous injury experience within the past two years.

## Method

### Subjects

Male athletes and coaches from an eastern Division III (National Collegiate Athletic Association (NCAA) level indicating minimal financial support for competing in athletics) college and an eastern Division I (NCAA top level indicating commitment fo finances for support at the top level of competition) university participating in varsity team sports were approached individually or in groups and asked to participate in the study. They were treated according to the "Ethical Principles of Psychologists" (APA, 1981). A total of 108 athletes participated, 62 from a university athletic program at the highest level of competition in the National Collegiate Athletic Association, and 46 from a college athletic program at the lowest level of competition. The final results are made available to all participating athletes and coaches.

Materials

The Physical Self-Efficacy Scale (Ryckman, Robbins, Thorton, & Cantrell, 1982) was administered. The Physical Self-Efficacy Scale (PSE), (Ryckman, Robbins, Thorton, & Cantrell, 1982), was designed as an individual differences measure of physical self-efficacy and feelings of confidence. They found satisfactory reliability and validity generally, as well as for the two subscales of Perceived Physical Ability (PPA) and Perceived Self-Presentation Confidence (PSPC). Ryckman et.al. (1982) also found good predictive validity for future tasks requiring physical skills.

McAuley and Gill (1983) found the PSE to be a reliable and valid measure of general physical self-efficacy in a competitive sport setting; however, a task specific measure of self-efficacy was a better predictor of specific performance than the more general Physical Self Efficacy Scale.

Using undergraduate psychology students, Ryckman et.al. (1982) found test-retest reliabilities of .85 for the PPA subscale, .69 for the PSPC subscale, and .80 for the PSE (see Appendix A). The coefficient reliabilities for internal consistency are .85 for the PPA, .75 for the PSPC, and .82 for the PSE. Ryckman et.al. (1982) demonstrated good convergent validity, ($r=.58$, $p<.001$) with the Tennessee Self Concept Scale (TSCS), (Fitts, 1965). The TSCS is designed to measure five aspects of self: personal; social; family; moral-ethical; and physical. Ryckman et.al. (1982) found satisfactory concurrent validity for the PSE and the two subscales as well as satisfactory discriminant validity between the two subscales.

The Nowicki-Strickland Locus of Control Scale for Children (Nowicki & Strickland, 1973) was used to measure the degree of internality of each athlete at the time of testing (see Appendix B). This scale has been revised and adapted for use with college and adult subjects by changing the word "kids" to "people" and deleting items about parents (Nowicki and Strickland, 1973). Nowicki and Duke (1974), studying A Locus of Control Scale for Non-college as Well as College Adults (ANS-IE), found split-half reliabilities from .74 to .86 and test-retest reliability of .83 over six weeks. Correlations between the ANS-IE and Rotter's Locus of Control Scale for non-college as well as college adults, range from $r=.44$, $p<.05$ to $r=.68$, $p<.01$ and suggest adequate construct validity.

An individual injury response questionnaire generated for this study was given to each athlete to assess perceived level of talent for his sport, injury history during the past 24 months, and prediction of recovery rate and rehabilitative activities for specific injury of mild, moderate and severe degree. Each question was considered for terminology, athletic familiarity, and accuracy. The full range for injury recovery and response is believed to be considered to account for the potential response continuum (see Appendix C).

Descriptions of specific, common athletic injuries at varying degrees of severity, were presented in counterbalanced fashion to allow for standardization of injury. Each athlete predicted recovery times and behaviors. Examples of questions include:

**During competition, while running, I suddenly step in a hole. The ankle is turned hard as I fall. 3 of the supporting ligaments are completely torn, the ankle is unstable. It is iced for 72 hours and casted for 3 weeks.**

1. I expect to return to COMPETITION:
   a) at the end of the 3 weeks
   b) in 1 to 3 months after injury
   c) in 4 to 6 months after injury
   d) in 7 to 9 months after injury
   e) in 10 to 12 months after injury

2. I will be back to my prior level of performance:
   a) 1 month after injury
   b) in 2 to 4 months after injury
   c) in 5 to 7 months after injury
   d) in 8 to 11 months after injury
   e) in 12 to 14 months after injury
   f) after 15 months

3. To insure the best recovery for a severely sprained ankle I will:
   (please check all that apply)
   _____ rely on total rest
   _____ participation in practice discontinued
   _____ weight training to strengthen the ankle support muscles
   _____ practice at decreased intensity
   _____ practice as usual
   _____ other _____

The coach also filled out a brief questionnaire (see Appendix D) concerning each athlete. The questionnaire examined the coach's perceptions of each athlete's talent level, the coach's perception of each athlete's view of his level of talent for sport, and the coach's rating of the athlete's response to injury, both past and predicted future. Examples of questions include:

1. What is your estimate of this individual's ability (i.e. power to perform) in his sport?
    a) very little ability for sport
    b) less ability than most of his team members
    c) on a par with most of his team members
    d) better than most of his team members
    e) just below a professional level
    f) on a level with most professionals
    g) better than most professionals

2. How do you feel the athlete will estimate his ability in his sport?
    a) very little ability for sport
    b) less ability than most of his team members
    c) on a par with most of his team members
    d) better than most of his team members
    e) just below a professional level
    f) on a level with most professionals
    g) better than most professionals

Each athlete and coach were given an informed consent form (see Appendix E).

Procedure

Coaches of football, soccer , baseball, basketball, and lacrosse teams in eastern colleges and universities were contacted for possible interest in the study through personal contact, letter, phone, or a combination of these means. Once interest was established, the coach received the athlete and coach consent forms including brief explanations of the procedure, the questionnaire packet for each athlete, and the coach's questionnaire on each athlete. Each coach was asked to fill out the coach's questionnaire pertaining to each athlete as well as a general consent form. Completion time was 1-2 minutes per questionnaire.

Athletes were each given a consent form including a brief explanation of the procedure, and the questionnaire packet containing the Physical Self-Efficacy Scale, the Nowicki-Strickland Locus of Control Scale adapted for use with adults and the

Individual Injury Response Questionnaire (IIRQ). Each athlete was allowed to complete the questionnaire at a self-determined pace. Completion time was approximately 20-30 minutes.

All questionnaires and consent forms were returned by mail or picked up by the experimenter as distance permitted. Responses on the PSE, the ANS-IE, the IIRQ, and the coach's responses were examined for predictive ability for predicted recovery actions from the three injury severity levels. At the completion of the analysis all interested coaches and athletes receive a summary of the findings.

## Results

Locus of control was scored for internal responses with a maximum possible of 37. In general the sample tended to be internally oriented, the mean measure of internal locus of control was 28.5 with a standard deviation of 4.1. Scores ranged from 14 to 36. The mean score for the athletes at the highest level of competition in the National Collegiate Athletic Association was 28.0, the mean score for the athletes at the lowest level of competition was 29.3. This difference was non-significant, $t(1,106)=-1.655$, $p>.10$.

Physical self-efficacy was scored according to the Ryckman, Robbins, Thorton, & Cantrell (1982) directions with a maximum possible of 22. The mean was 16.3, the standard deviation 3.04. Scores ranged from 8 to 22.

Physical self-efficacy was the only measure in which the two groups of athletes differed significantly, $t(1,106)=-2.495$, $p<.05$. The athletes at the top level of NCAA competition scored significantly higher on the Physical Self-Efficacy Scale (Ryckman, Robbins, Thorton, & Cantrell, 1982), with a mean score of

16.919, than the athletes at the lowest level of NCAA competition, with a mean score of 15.497.

Injury history was coded for mild, moderate, and severe history and frequency. Individuals ranged from no injury experience to four severe injuries in the twenty-four month period, with the average individual experiencing at least two injuries during that time. All responses to the mild injury situation, the moderate injury situation and the severe injury situation respectively, were examined by first response to injury, the number of recovery strategies, by return to competition behavior and by each situation overall.

The number of recovery strategies over the three injury situations was calculated. There was a mean of 5 with a standard deviation of 2.3. The number of recovery strategies ranged from 3 to 12.

The coach's rating of the athlete's ability, the power to perform, offered seven categories ranging from having less ability than most team members to being better than most team members. The middle category was on a par with most of the team members. No athlete was judged at the extremes for very little ability for sport or for the ability to be playing at a professional level.

The coach's rating of the athlete's belief in his own ability were on the average slightly above the coaches rating of the athletes. Ratings ranged from having less ability than most of his team members to performing just below a professional level.

Ratings of past and predicted injury responses ranged from participation in practice discontinued to continuing to practice believing the athlete is invulnerable.

No athlete relied on total rest. The coach rating of past and predicted injury response were identical and were considered as one unit in the analysis.

Factor analysis of the athlete's and coach's responses using varimax rotation, the oblique solution, determined a five factor solution. The factors include: return to competition, talent counterbalanced by injury history, response to injury, physical self-efficacy and locus of control mediated by recovery time after severe injury, and recovery time for lesser injuries (see table 1).

A MANOVA (multivariate analysis of variance) found the interaction of physical self-efficacy with reactions to injury on the IIRQ, as well as the interaction of injury history, physical self-efficacy and responses to injury on the IIRQ were significant, $f(8,800) = 35.92$, $p<.05$, and $f(8,800) = 72.34$, $p<.05$, respectively. The interaction of injury history, physical self-efficacy and locus of control with responses to injury on the IIRQ approached significance, $f(8,800) = 1.77$, $p = .078$. In light of the exploratory nature of this research, specific post hoc tests were performed to examine any consistencies among the variables of physical self-efficacy, locus of control, injury history, and the coach's perceptions for the athlete.

T-tests were performed to examine comparisons of specific variables of interest. These include injury history, the coach's predictions, locus of control, physical self-efficacy, and the locus of control-physical self-efficacy interaction.

Coaches, through their own observations, were determined to have the ability to accurately categorize athletes regarding physical self-efficacy and locus of control. Athletes with a low physical self-efficacy were rated by their coach as believing to have less ability for sport than individuals with a high physical self-

believing to have less ability for sport than individuals with a high physical self-efficacy score, who, were rated as believing they have higher ability, $t(1,44) = -.499$, $p<.01$. The coach's rating of the athlete's talent and rating of the athlete's rating of his own talent correlate with physical self-efficacy , $r=.35$ and $r=.47$, respectively, both are significant, $p<.05$.

Athletes rated by their coach as responding to injury by discontinuing practice or practicing at low intensity had more injury response strategies than athletes who continued to practice and compete when injured $t(1,44) = 1.959$, $p<.05$. These same athletes also reported consciously and unconsciously protecting the injured area when approved for competition, whereas, the athletes who continued to practice and compete reported being unaware of the injury site or playing through the injury during competition $t(1,44) = -3.583$, $p<.01$.

Athletes with a more internal locus of control orientation were rated by their coaches as believing to have a greater power to perform, (i.e. better than most team members), athletes with an external locus of control were rated by their coaches as believing to have less power to perform in sport, (i.e.less ability, or on a par with most team members); $t(1,44) = -2.875$, $p<.01$.

Athletes with low physical self-efficacy are more likely to report consciously and unconsciously protecting an injury site after being approved for competition than athletes with a high physical self-efficacy who tend to report being unaware of the injury site and competing through the injury, $t(1,106) = -2.489$, $p<.05$.

The number of injury recovery strategies are best predicted from the coach's rating of the athlete's power to perform combined with the athlete's rating of his

being approved for competition increased the strength of R, but decreased the value and power of F, $R = .536$, $F(1,62) = 5.642$, $p<.05$.

Athletes with an internal locus of control were found to predict significantly different recovery actions from athletes with an external locus of control. The internally controlled athletes predicted significantly shorter recovery times in the severe injury condition than the more externally controlled athletes, $t(106) = 2.321$, $p<.05$.

Athletes with high self-efficacy were found to predict significantly different recovery actions from athletes with a low physical self-efficacy. The correlation between physical self-efficacy and overall response to injury is $r = .194$, $F(1,108) = 4.124$, $p<.05$, suggesting physical self-efficacy plays a role in the level of injury response. Individuals who are high in physical self-efficacy are more likely to take an active role in the injury recovery process with more injury recovery strategies than individuals who are low in physical self-efficacy.

The analysis of physical self-efficacy found a predictor solution includes the athlete's behavioral response to severe injury, the coach's rating of the athlete's own rating of the power to perform and locus of control , $R=.789$, $F=23.122$, $p<.05$. Singly the athlete's recovery strategies for severe injury predict with an $R=.298$, $F(1,62) = 10.323$, $p<.05$.

The correlation between physical self-efficacy and locus of control is $r=.221$, $F(1,108) = 5.452$, $p<.05$. There is a small correlation between low physical self-efficacy and externality, and high physical self-efficacy and internality. When athletes who were classified as having both an internal locus of control and a high physical self-efficacy were compared to athletes classified as

having both external locus of control and low self-efficacy, additional differences were observed. External, low physical self-efficacy athletes were rated by their coaches as having less ability in sport than the internal high physical self-efficacy athletes, $t(1,31) = 3.891$, $p<.01$. External, low physical self-efficacy athletes also predict longer recovery times in the severe injury condition than the internal, high physical self-efficacy athletes, $t(1,54) = -2.574$, $p<.01$.

Athletes with an external locus of control and a low physical self-efficacy, after being approved for competition, describe themselves as concerned about re-injury and consciously and unconsciously protecting the injured area $t(1,54) = 2.111$, $p<.05$. The internally oriented, high physical self-efficacy athlete rated himself as playing well through any injury soreness, or being unaware of the injury site during competition in the severe injury condition, $t(1,54) = 2.059$, $p<.05$.

To summarize, athletes with an external locus of control combined with low physical self-efficacy predicted the longest recovery times, appear to have a lower view of their ability, and tend to be more concerned with reinjury and protective of the injury site after approval for competition. Internal locus of control, high physical self-efficacy athletes predicted significantly shorter recovery times after injury and a faster return to playing back to 100% in the severe injury condition.

Repeated injuries were determined to increase externality of locus of control of athletes. Athletes with a high incidence of injury during the two year history had a more external locus of control orientation. Individuals with fewer reported injuries during the same two year period had a more internal orientation. Individuals with high incidence of injury tend to be more external, whereas those

with lower incidence of injury had a more internal locus of control orientation $t(1,106) = 2.771$, $p<.01$.

The correlation between the number of response strategies between mild and moderate injury, $r=.60$, $p<.05$, and moderate and severe injury, $r=.51$, $p<.05$ is greater than the correlation between response strategies to mild and severe injury, $r=.46$, $p<.05$. The differences in magnitude depict differences in injury response by level of injury. Responses to more similar injuries (mild and moderate, and moderate and severe) in terms of severity are more similar to each other than the most disparate case of mild compared to severe injury. This pattern suggests differential responding by the athletes as a result of injury severity.

This pattern is similar to the correlation for the number of overall response strategies to injury. Between mild and moderate response $r=.56$, $p<.05$, between moderate and severe, $r=.38$, $p<.05$, and $r=.31$, $p<.05$ between mild and severe response strategies. Again, the responses suggest differential response strategies by level of injury.

Stepwise regression analyses were developed using the following as predictors of the athlete's response to various levels of injury severity: responses to mild, moderate, and severe injury; recovery strategies; and physical self-efficacy. The stepwise regression analysis summarizes the data and the predictive relationships by adding and removing variables to achieve the best predictor solution.

The analysis of the mild injury situation found the athlete's response to being approved for competition overall as the best predictor of response, $R=.677$, $F(1,107) = 84.917$, $p<.05$. Similarly, the analysis of the moderate injury situation

found the athlete's response to being approved for competition after severe injury as the best predictor of response, R=.456, $F(1,107) = 27.856$, $p<.05$. The coach's rating of the athlete's response to injury predicted with an R=.37, $F(1,62) = 7.001$, $p<.05$.

The analysis of the severe injury situation found injury history as the best single predictor with an R=.328, $F(1,107) = 5.309$, $p<.05$. Singly the coach's rating of the athlete's rating of his own power to perform produced an R=.301, $F(1,62) = 4.372$, $p<.05$. The best predictor solution includes the coach's rating of the athlete's response to injury, the athlete's overall recovery strategies, and the athlete's response to being approved for competition, R=.722, $F(1,62) = 15.24$, $p<.05$.

## Discussion

The primary goal of this study was to examine expected recovery actions at various levels of injury severity and how these responses relate to previous injury experience, locus of control, physical self-efficacy, and estimates of ability. The scores on the locus of control and physical self-efficacy instruments and the results of the injury response questionnaire were expected to confirm the research hypothesis that there are differences in physical self-efficacy, locus of control, and individual injury responses.

Predictions of recovery from injury were significantly related to physical self-efficacy, the interaction of injury history and physical self-efficacy, and the coach's perceptions of the athletes response to injury. However, the athlete's estimates of ability and team level were expected to, but did not exert a significant effect.

The coach was found to be an accurate judge of the athlete's physical self-efficacy and locus of control. Using what the coach knows about each athlete and his response to injury offers the potential of a maximally efficient recovery when the coach becomes involved with the athlete and the injury recovery process. The coach appears to be forming an impression of the athlete' physical self-efficacy which is independently confirmed by the athlete's own physical self-efficacy score.

The findings concerning athletes and their response to injury, as well as the interactions of locus of control, physical self-efficacy, and injury history, confirm and extend many theories to include athletes and athletic injury (Bandura[1977], Ryckman, Robbins, Thorton, and Cantrell [1982], and McAuley and Gill [1983]). These correlations support the theory of the physical self-efficacy construct. Specifically, locus of control and physical self-efficacy were found to be moderately correlated ($r = .221$, $p<.05$). However this correlation accounts for only 5% of the variance between the two constructs. Therefore while there is a significant relationship, 95% of the variance between physical self-efficacy and locus of control cannot be accounted for by the correlation. These are appear to represent different areas of the athlete's self-concept.

Locus of control was shown to be related to the athlete's injury history, differences in recovery times and actions, as well as that athlete receiving differential talent ratings by the coach. An athlete's injury history, the frequency and severity of injuries, is significantly related to the degree of internality or externality an athlete experiences. An athlete who experiences frequent of severe injuries is more likely to be or to become more externally oriented than the athlete with few or milder injuries who is more likely to be internally oriented. The

internally oriented athlete was also more likely to predict shorter recovery times, more recovery actions, and was more likely to be perceived by the coach as having greater power to perform. These findings support and extend the theories of Rotter (1966), Joe (1971), and Nowicki and Strickland (1973) as they relate to athletes and responses to injury.

Athletes with an internal locus of control and high physical self-efficacy appear to have better coping strategies, to predict shorter recovery times, appear to have a higher view of their ability, and tend to feel they are playing well if not back to 100% after approval for competition. These findings concurring with Joe (1971), past reinforcement experiences determine attitudes toward either an internal or external locus as the source of reinforcement.

An athlete who is frequently battling injuries may develop a more external locus of control orientation than his less injured counterpart. It is this same externally oriented athlete, according to Weiss and Troxel (1986), who tends to need more external guidance and support during the rehabilitative process.

Locke, Frederick, Bobko, & Lee's (1984) finding that ability and self-efficacy were significant predictors of performance was confirmed by the athletes sampled. Levels of an athlete's power to perform were significantly related to locus of control and physical self-efficacy. The coach's rating of ability was also positively correlated with physical self-efficacy. The athlete's physical self-efficacy and locus of control are related to both the athlete's and the coach's ratings of the athlete's power to perform. Perceptions of individual talent for sport appear to be a mediating factor in both physical self-efficacy and locus of control, which in turn affect injury recovery strategies.

As the degree of hypothetical injury increased in severity, the differences in response actions became more pronounced. The severe injury situation tended to differentiate more clearly than the mild or moderate injury situations. Differences that were not apparent at the lower levels of injury were evident at the severe injury level. It is in the severe injury condition that injury history is the best single response predictor. Also, the athlete's recovery strategies in the severe injury situation predict physical self-efficacy.

As more individuals participate in sport-related activities, on both a competitive and a fitness-related level, the number of injuries and the time lost from usual practice and competition as a result of these injuries continue to rise. While medical science is making great strides in the treatment of physical stress and injury, it is also necessary to treat and prepare the athlete psychologically. Understanding how factors such as locus of control, physical self-efficacy, injury history, the role of the coach and their interaction may affect the injury recovery process will begin to enable coaches and athletes to train and compete more effectively.

Future research may act to intervene in the pre-injury and recovery cycles. Teaching positive recovery actions and orientations, such as aiding the externally oriented athlete in an approach that is more internally oriented, may alter the athlete's attitude toward injury, possibly offering the athlete a more efficient recovery process. The knowledge and understanding coaches have for their athletes and their athlete's physical self-efficacy and locus of control is an area that may also be utilized in injury recovery as well as in athletic training strategies.

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# Appendix A

## The Physical Self-Efficacy Scale

Ryckman, Robbins, Thorton, and Cantrell, 1982

PLEASE MARK THE BEST RESPONSE: (T:True, F:False)

T F 1. I have excellent reflexes.

T F 2. I am not agile and graceful.

T F 3. I am rarely embarrassed by my voice.

T F 4. My physique is rather strong.

T F 5. Sometimes I don't hold up well under stress.

T F 6. I can't run fast.

T F 7. I have physical defects that sometimes bother me.

T F 8. I don't feel in control when I take tests involving physical dexterity.

T F 9. I am never intimidated by the thought of a sexual encounter.

T F 10. People think negative things about me because of my posture.

T F 11. I am not hesitant about disagreing with people bigger than me.

T F 12. I have poor muscle tone.

T F 13. I take little pride in my ability in sports.

T F 14. Athletic people usually do not receive more attention than me.

T F 15. I am sometimes envious of those better looking than myself.

T F 16. Sometimes my laugh embarrasses me.

T F 17. I am not concerned with the impression my physique makes on others.

T F 18. Sometimes I feel uncomfortable shaking hands because my hands are clammy.

T F 19. My speed has helped me out of some tight spots.

T F 20. I find that I am not accident prone.

T F 21. I have a strong grip.

T F 22. Because of my agility I have been able to do things which many others could not do.

# Appendix B

The Nowicki-Strickland Locus of Control Scale,
revised and adapted for use with college and adult subjects

Nowicki and Strickland, 1973

PLEASE MARK THE CORRECT RESPONSE (Y:Yes, N:No)

Y N 1. Do you believe that most problems will solve themselves if you just don't fool with them?

Y N 2. Do you believe that you can stop yourself from catching a cold?

Y N 3. Are some people just born lucky?

Y N 4. Most of the time do you feel that getting good grades means a great deal to you?

Y N 5. Are you often blamed for things that just aren't your fault?

Y N 6. Do you believe that if somebody studies hard enough he or she can pass any subject?

Y N 7. Do you feel that most of the time it doesn't pay to try hard because things never turn out right anyway?

Y N 8. Do you feel that if things start out well in the morning that it's going to be a good day no matter what you do?

Y N 9. Do you believe that wishing can make good things happen?

Y N 10. When you get punished does it usually seem it is for no good reason at all?

Y N 11. Most of the time do you find it hard to change a friend's (mind) opinion?

Y N 12. Do you think that cheering more than luck helps a team to win?

Y N 13. Do you believe that your parents should allow you to make the most of your own decisions?

Y N 14. Do you feel that when you do something wrong there's very little you can do to make it right?

Y N 15. Do you believe that most people are just born good at sports?

Y N 16. Are most of the other people your age stronger than you are?

Y N 17. Do you feel that one of the best ways to handle most problems is just not to think about them?

Y N 18. Do you feel that you have a lot of choice in deciding who your friends are?

Y N 19. If you find a four leaf clover do you believe that it might bring you good luck?

Y N 20. Do you often feel that whether you do your homework has much to do with what kind of grades you get?

Y N 21. Do you feel that when a person your age decides to hit you, there's little you can do to stop him or her?

Y N 22. Have you ever had a good luck charm?

Y N 23. Do you believe that whether of not people like you depends on how you act?

Y N 24. Have you felt that when people were mean to you it was usually for no reason at all?

Y N 25. Most of the time, do you feel that you can change what might happen tomorrow by what you do today?

Y N 26. Do you believe that when bad things are going to happen they just are going to happen no matter what you try to do to stop them?

Y N 27. Do you think that people can get their own way if they just keep trying?

Y N 28. Most of the time do you find it useless to try to get your own way at home?

Y N 29. Do you feel that when good things happen they happen because of hard work?

Y N 30. Do you feel that when somebody your age wants to be your enemy there's little you can do to change matters?

Y N 31. Do you feel that it's easy to get friends to do what you want them to?

Y N 32. Do you usually feel that you have little to say about what you get to eat at home?

Y N 33. Do you feel that when someone doesn't like you there's little you can do about it?

Y N 34. Do you usually feel that it's almost useless to try in school because most others are just plain smarter than you are?

Y N 35. Are you the kind of person who believes that planning ahead makes things turn out better?

Y N 36. Most of the time, do you feel that you have little to say about what your family decides to do?

Y N 37. Do you think it's better to be smart than to be lucky?

Appendix C

# The Individual Injury Response Questionnaire

Kristen R. Goldbach, in collaboration with
William E. Walker, Ph.D., professor and tennis coach, & Laurie Wright, trainer,
of The University of Richmond, 1985

Location on team:

____ top 25%
____ 26-50%
____ 51-75%
____ 76-100%

1. What is your estimate of your own ability (ie. power to perform) in your sport?
   a)very little ability
   b) less ability than most of my team members
   c) on a par with most of my team members
   d) better than most of my team members
   e) just below a professional level
   f) on a level with most professionals
   g) better than most professionals

2. How will your coach rate you?
   a) very little ability for sport
   b) less ability than most of my team members
   c) on a par with most of my team members
   d) better than most of my team members
   e) just below a professional level
   f) on a level with most professionals
   g) better than most professionals

3. Please describe any injury(ies) you have experienced within the past 24 months, indicating type (mild, moderate, or severe), location, and days lost:
   mild: a 1-4 day recovery before ready to play
   moderate: a 5-14 day recovery before ready to play
   severe: longer than 15 days before ready to play

a) from March, 1985 to August, 1985 yes no
   mild, moderate, or severe
   location and diagnosis:_____
   number of days lost:_____

b) from September, 1985 to February, 1986 yes no
   mild, moderate, or severe
   location and diagnosis:_____
   number of days lost:_____

c) from March, 1986 to August, 1986 yes no
   mild, moderate, or severe
   location and diagnosis:_____
   number of days lost:_____

d) from September, 1986 to March, 1987 yes no
mild, moderate, or severe
location and diagnosis:_____
number of days lost:_____

e) I have not been injured in the past 24 months.

Directions: Please read the following scenarios and answer the following questions as if you, yourself, received the injury, answering according to your own experience and knowledge of your body's responses to injury.

**During competition I step down on a teammate's foot, turning my left ankle inward. The ligaments have been stretched but there is no tissue damage. It is iced for 24 hours.**

1. I expect to return to COMPETITION:
   a) the next day
   b) in 2-3 days
   c) 4+ days
   d) I will continue to play on the ankle

2. I will be back to my prior level of performance in:
   a) the next day
   b) in 2-3 days
   c) 4-6 days
   d) 7-10 days

3. To insure the best recovery for an ankle injury of this type I will: (please check all that apply)
   ____ rely on total rest
   ____ participation in practice discontinued
   ____ weight training to strengthen the ankle support muscles
   ____ practice at decreased intensity
   ____ practice as usual
   ____ other _____

4. The trainer recommends that practice be discontinued for the first day with practice at decreased intensity beginning on day 2 with approval for competition on day 4, I will:
   a) rely on total rest
   b) workout less strenuously than trainer suggests
   c) follow trainer's orders precisely
   d) accelerate trainer's suggestions time-wise
   e) practice as usual

5. During PRACTICE, I:
   a) consciously protect the area
   b) unconsciously find myself protecting
   c) am unaware of the injury site
   d) am aware of injury location and play through it

6. After being approved for COMPETITION, I:
   a) am concerned about re-injury and prefer to take more recovery time
   b) have residual pain and play through it
   c) am playing well but not up to 100%
   d) am back to 100%

7. During COMPETITION, I:
    a) consciously protect the area
    b) unconsciously find myself protecting
    c) am aware of injury location and play through it
    d) am unaware of the injury site

**During competition I stop quickly, turning on my right knee, stretching the ligament on the outer side of that knee and tearing about a third of the fibers of that ligament. The knee is iced for the next 72 hours.**

1. I expect to return to COMPETITION:
   a) I will continue to play on the knee
   b) in 1-4 days
   c) in 5-8 days
   d) in 9-12 days
   e) in 13-16 days
   f) after 17 days

2. I will be back to my prior level of performance:
   a) the next day
   b) in 2-6 days
   c) in 7-11 days
   d) in 12-16 day
   e) after 17 days

3. To insure the best recovery for a sprained knee I will: (please check all that apply)
   ____ rely on total rest
   ____ participation in practice discontinued
   ____ weight training to strengthen the knee support muscles
   ____ practice at decreased intensity
   ____ practice as usual
   ____ other _____

4. The trainer recommends that practice be discontinued for the first four days with light physical workouts beginning on day 5, with approval for competition by day 14. I will:
   a) rely on total rest
   b) workout less strenuously than trainer suggests
   c) follow trainer's orders precisely
   d) accelerate trainer'
   e) practice as usual

5. During PRACTICE, I:
   a) consciously protect my knee
   b) unconsciously find myself protecting
   c) am unaware of the injury site
   d) am aware of injury location and play through it

6. After being approved for COMPETITION, I:
    a) am concerned about re-injury and prefer to take more recovery time
    b) have residual pain and play through it
    c) am playing well but not up to 100%
    d) am back to 100%

7. During COMPETITION, I:
    a) consciously protect my knee
    b) unconsciously find myself protecting my knee
    c) am unaware of the injury site
    d) am aware of injury location and play through it

**During competition, while running, I suddenly step in a hole. The ankle is turned hard as I fall. 3 of the supporting ligaments are completely torn, the ankle is unstable. It is iced for 72 hours and casted for 3 weeks.**

1. I expect to return to COMPETITION:
   a) at the end of the 3 weeks
   b) in 1 to 3 months after injury
   c) in 4 to 6 months after injury
   d) in 7 to 9 months after injury
   e) in 10 to 12 months after injury

2. I will be back to my prior level of performance:
   a) 1 month after injury
   b) in 2 to 4 months after injury
   c) in 5 to 7 months after injury
   d) in 8 to 11 months after injury
   e) in 12 to 14 months after injury
   f) after 15 months

3. To insure the best recovery for this sprained ankle I will: (please check all that apply)
   ____ rely on total rest
   ____ participation in practice discontinued
   ____ weight training to strengthen the ankle support muscles
   ____ practice at decreased intensity
   ____ practice as usual
   ____ other _____

4. The trainer recommends that practice be discontinued for 6 weeks and light physical workouts beginning week 7 and approval for competition 3 months from injury. I will:
   a) practice as usual
   b) rely on total rest
   c) follow trainer's orders precisely
   d) workout less strenuously than trainer suggests
   e) accelerate trainer's suggestions time-wise

5. During PRACTICE, I:
   a) consciously protect my ankle
   b) unconsciously find myself protecting my ankle
   c) am unaware of the injury site
   d) am aware of injury location and play through it

6. After approval for COMPETITION at 3 months I:
    a) am concerned about re-injury and prefer to take more recovery time
    b) have residual pain and play through it
    c) am playing well but not up to 100%
    d) am back to 100%

7. During COMPETITION, I:
    a) consciously protect the area
    b) unconsciously find myself protecting
    c) am unaware of the injury site
    d) am aware of injury location and play through it

# Appendix D

## The Coach's Questionnaire on Each Athlete

Coach's Questionnaire:

Athlete's Name:_____

Sport/Specialty:_____

Location on Team:
____ top 25%
____ 26-50%
____ 51-75%
____ 76-100%

1. What is your estimate of this individual's ability (i.e. power to perform) in his sport?
    a) very little ability for sport
    b) less ability than most of his team members
    c) on a par with most of his team members
    d) better than most of his team members
    e) just below a professional level
    f) on a level with most professionals
    g) better than most professionals

2. How do you feel the athlete will estimate his ability in his sport?
    a) very little ability for sport
    b) less ability than most of his team members
    c) on a par with most of his team members
    d) better than most of his team members
    e) just below a professional level
    f) on a level with most professionals
    g) better than most professionals

3. How has this athlete responded to injury in the past?
    a) relies on total rest
    b) participation in practice discontinued
    c) practice at decreased intensity
    d) believes he is invulnerable, continues to practice and compete
    e) other _____

4. How will this athlete respond to injury in the future?
    a) relies on total rest
    b) participation in practice discontinued
    c) practice at decreased intensity
    d) believes he is invulnerable, continues to practice and compete
    e) other _____

# Appendix E

## Participant and Coach Consent Forms

Participant Consent Form

Project: Predicted Injury Recovery Times

This project is a study of the relationship between predicted recovery times from specific injuries, previous injury experience, and how you perceive yourself. The series of questionnaires will take approximately 30 minutes to complete. The information gathered in this study is expected to be used as a basis for future research in athletic injury. The goal is to achieve maximal efficiency during the injury recovery period. Only if you and others participating answer each question honestly can we begin to achieve this goal.

As future research will result from this study, if you have any questions or comments, please feel free to write on the back of this form or call me at (xxx)xxx-xxxx. If you would like to receive the final results of the study, please include your name and address below and I will send them as soon as possible.

_____
_____
_____

Your name is only used to keep track of materials; all names will be coded by number in the analysis. The information will be used in a group context without any reference to you individually.

Thank you for your time.

Sincerely,
Kristen Goldbach, 2nd year graduate student
Department of Psychology
University of Richmond

I, _____ voluntarily agree to participate in this study. I understand that I will be filling out a series of questionnaires that will pose no physical or psychological risk to me. I understand that I may decline participation at any time and that all information will be kept confidential.

Signature _____

Date _____

Coach Consent Form

Project: Predicted Injury Recovery Times

This project is a study of the relationship between predicted recovery times from specific injuries, previous injury experience, and how an athlete perceives himself. Each questionnaire will take approximately 1-2 minutes per athlete. The information gathered in this study is expected to be used as a basis for future research in athletic injury. The goal is to achieve maximal efficiency during the injury recovery period. Only if you and others participating answer each question honestly can we begin to achieve this goal.

As future research will result from this study, if you have any questions or comments, please feel free to write on the back of this form or call me at (xxx)xxx-xxxx. If you would like to receive the final results of the study, please include your name and address below and I will send them as soon as possible.

_____
_____
_____

Your name and each athlete's name are used only to keep track of materials; all names will be coded by number in the analysis. The information will be used in a group context without any reference to you individually. Thank you for your time.

Sincerely,
Kristen Goldbach, 2nd year graduate student
Department of Psychology
University of Richmond

I, _____ voluntarily agree to participate in this study. I understand that I will be filling out a questionnaire on each athlete that will pose no physical or psychological risk to me or the athletes involved. I understand that I may decline participation at any time and that all information will be kept confidential.

Signature _____

Date _____

Table 1

Factor Structure of the Individual Injury Response Questionnaire

| Factor Name | #Items | Item Type | Loading | Alpha |
|---|---|---|---|---|
| 1. Return to Competition | 4 | - competition after mild injury | .772 | .747 |
| | | - competition after mod. injury | .869 | |
| | | - competition after sev. injury | .649 | |
| | | - coach's estimate of athlete's response to injury | .616 | |
| 2. Response to Injury | 3 | - response to mild injury | .866 | .847 |
| | | - response to moderate injury | .868 | |
| | | - response to severe injury | .774 | |
| 3. Talent/ Injury History | 3 | - injury history | -.705 | -.235 |
| | | - coach estimate of athlete talent | .765 | |
| | | - coach est. athlete's talent estmt. | .851 | |
| 4. PSE/ LOC with recovery time of severe injury | 3 | - physical self-efficacy | .869 | .402 |
| | | - locus of control | .827 | |
| | | - recovery time for sev. injury | -.626 | |
| 5. Recovery time for lesser injuries | 2 | - recovery time for mild injury | .840 | .446 |
| | | - recovery time for mod. injury | .691 | |