Chapter II

REVIEW OF RELATED LITERATURE

During the process of the preparation of the thesis, the research scholar gathered the ideas related to the present study. The investigator has tried his level best to collect and quote the findings on the relevant studies with various psychological and physiological variables related to performance of gymnasts.

The research scholar attempted to review the literature available in the various library related to physical education, sports and education from different parts of India. Some of the most important studies which were found by the researcher from the libraries like: Dr. Babasaheb Ambedkaer Marathwada University, Auragabad; India Gandhi Institute of Physical Education & Sport Sciences-University of Delhi; Laxmibai National Institute of Physical Education-Gwalior (M. P.); and N.I.S. Patiala (Punjab) etc.

The researcher has tried to collect the available literature from the National and International Journals and reviews, Books, Encyclopedia, unpublished thesis and dissertations which were directly or indirectly related with the present study. Attempt has been done to present a summary review of literature, which may be helpful in understanding and bring out meaningful outcomes from this study.
Gould and Horn\(^1\) conducted an investigation was designed to assess perceived sources of stress in Jr. Elite-wrestlers Wrestlers (\(N = 158\)) participating in the United States wrestling federation junior national championship rated the frequency with which they typically experienced 33 sources of stress before competitions. Descriptive statistics revealed that performing up to one's ability, improving on one's cost performance, participating in championship meets, not wrestling was and losing were identified as major sources of stress. Factor analytic results showed that the 33 sources of stress loaded on three factors; including fear or failure-feelings of inadequacy external control guilt and social evaluation. Multiple regression analyses revealed that both wrestler trait, anxiety and years of wrestling experience were significant predictors of the fear of failure-feeling of inadequacy factor, while trait anxiety also was found to be a significant predictor of the social evaluation factor. Although both the most and least frequently experienced sources of stress were identified in this investigation, it was concluded that large individual differences existed in perceive sources of stress. In addition, the need for replicating and extending these findings with other samples was emphasized.

Holland\(^2\) conducted a study in which the heart rates of five high school basketball officials were assessed in one regular season and one post season contest. Holland found that officiating high school state tournament game produce high heart rate response than did officiating

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regular season games. Percentages of maximal heart rate ranged from 75% to 86% for the regular season games and 80% to 89% for the state tournament games. It was also found that "loud boooing of an officials call or calling a technical foul were not associated with heart rate increases. However, coaching confrontation were." Holland concludes that rate "high school officials should condition themselves to withstand the high heart rate associated with officiating games; and state tournaments officials should be especially encouraged to maintain a regular exercise programs due to added heart rate increases associated with officiating tournament games."

Stratton ³ conducted a study and the purpose of this study was to examine the sources of stress reported by members of high school state champion teams. The subjects for this study were 84 (50 football, 34 wrestling) members of state championship team. They completed a questionnaire, which asked for demographic information and then asked them to rate 20 possible sources of stress, which they may have experienced. Results revealed that concern about making a mistake" and "winning or losing" (M = 3.8) were the highest ranked sources of stress. Factor analysis, employing vantage rotation, generated a five-factor matrix. The primary factor, accounting for 38.05% of the variance is characterized as an expectation of others factor, including variables regarding the coach, parents, teammates, and spectators when the data are broken down by the sport, very similar response patterns are noted. For example, the top four ranked sources of stress are the same for the two teams, albeit not in the same order, despite the fact that one is a team

sport and other on individual sport. It is interesting to note the high ranking of winning/losing when compared to previous studies which examined the general youth sport population and typically found that winning was a relatively low ranked source of stress.

Brown\textsuperscript{4} made a stressful situations in Basketball Questionnaire SSBQ was defined to measure perceived stress in competitive Basketball situation. The SSBQ and the ways of coping with sport (WOCs), a sport related checklist adapted from Falk man and Lazarus's players engaged in regular organized competitive grade basketball. Commutative stress scores on the SSBQ were obtained for each competitor such that low mid and high stress groups of basketball players could be established. Pattern of coping related to low, mid and high levels of perceived stress were identified results showed that subjects reporting high levels of competitive stress use increased effort and resolve/ problem-focused coping, social support-seeking and wishful thinking coping strategies more frequently than subjects reporting low competitive stress.

Johnson\textsuperscript{5} concludes in a study of six experienced power boat racer that elevated heart rates in these athletes are primary caused by psychological stress. Heart rate measures were continuously mentioned prior to and during a series of five miles power boat races which on the average lasted less than four minutes. The results revealed


that the drivers hearts rates averaged between 170 and 200 beat per minute. It was concluded that "since little physical strength is involved in driving the boat and the air temperature was 60° to 65°F, the rates in these subjects were affected only by psychological stress". Further support was obtained for the psychological stress interpretation from blood pressure readings taken immediately before and after the races, averaging these points higher than normal. Drivers reported having dry months, butterflies, poly-urea and the classic fight or flight response as early as 6 hours before race.

**Muller & Krieger**⁶ conducted a study in which male and female tennis players (N = 76) of middle class background completed a questionnaire on which 46 stress factors in Tennis has to be judged according to one's own competitive performance. The items "incomplete long-term preparation for a contents" and "discontent with one's own performance" were rated at the top of the personal stress factors. The environmental factors such as "long waiting time during a match" and "bad tennis count conditions". Trouble with the coach and with sports friends in profession or with the family were related strongly negative for performance as well as being related to incorrect decision on the part of the reference. "Actions which fail in an important phase of the game" represented phase of the game" represented the greatest factor to hinder performance also the 'gradual relaxation of one's concentration was stated as a factor that influences performance a great deal. A positive influence of most players is noticing that "the condition and concentration of the apparent are weakening" the more contests a

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player has had, the less he or she is influenced by the facts preceding the training and the contest. Finally, for tennis player who generally attack, the monetary situation is most important.

Cryan, and Alles ⁷ conducted a study on collegiate football players (N-151) from three institutions were administered the 48 item social and athletic readjustment pating search (SARRS) 1 week prior to the season in order to determine the degree of psychological stress they had experienced over the last 12 months. The SARRS is used to determine the amount of change that the athlete has experienced in his or her life, and high levels of this change are believe to be stressful. Examples of such stressful events include death of a family member, argument with a coach, financial problems and so forth. Prior research had shown sue stress to be related to the occurrence of physical illness. The authors examined whether high levels of psychogenic stress would lead to a greater number of injuries for college football players and to more severe injuries. To this question, the players were divided into two groups at the end of the season those who had experienced an injury and those who had experienced Injury records were determined from data accumulated by a national injury reporting service to which each of three schools subscribed. Injured players did evidence higher life change scores on the SARRS than their non-injured counterparts. Additionally the football players showing high stress incurred a greater frequency of minor and moderate injuries. However, stressed players did not suffer more severe injuries. The authors note that the origins of the injuries in

competitive football are multi-dimensional but that the degree of "off the field" stress experienced by the player may be a contributing factor.

Selye\textsuperscript{8} has conducted Extensive research relative to the effect of excursive constant stress or distress, on health. Selye developed a theory of stress based on three phases the alarm phase, the adaptation phase, and the Exhaustion phase. The alarm phase is the stress response discussed.

Lazarus\textsuperscript{9} Summarized the definition in human stress term: "Stress refers to a very broad class of problems differentiated from other problems area because it deals with any demand with tax the system, whether It is physiological system, a social system or a psychological system and the response of that system.

Girdano & Everly\textsuperscript{10} developed the four part test The first three parts are designed to measure your vulnerability to certain type of stress and to increase your awareness of stress and how it effects you. The fourth part gives you some idea of how well you cope with stressful situation. In first three parts of test consist 10 question in each and fourth test consist 14 question.


Singh\textsuperscript{11} Stated in their research paper fitness has adverse relationship with psychological stress or emotional disorders as the farmer is badly affected by anxiety, tension, fear nervousness and other strains and stresses of daily life. In modern times, society seems to be more conscious of health of people than ever before physical educators are acutely conscious of the deterioration of health through the loss of physical fitness in a mechanized society. Most people agree that sports and physical activities can help the individuals to be saved from the situation of and physical fitness in this society. Even one of the educational values of sports is to contribute to physical fitness through the intensive training programs provided in the school and colleges, various components of physical fitness such as strength, speed, endurance, agility and coordination can develop in the youth of today.

Singh\textsuperscript{12} Stated in his paper the coach should prepare his team for situational anxieties connected with competition. During training the practice session should include such situations that may create social and psychological stresses for the players that they may later face in the competition.


Malhotra, Ghosh and Khanna\textsuperscript{13} conducted study on physical and physiological stresses of playing hockey on grassy and Astroturf fields. The samples were twelve hockey trainees admitted to N.I.S for regular diploma course in coaching. They concluded in his research that Stress on the heart is more during the game played on the astroturf than on the grassy field. Stress on the heart and pulse rate after running of various distances on astroturf and grassy fields no significant difference was observed in pulse rates after running on astroturf and grassy fields, with or the without ball for any of the distance. The Astroturf also offers a great stress on the cardiovascular system during shuttle run.

Dembach\textsuperscript{14} Deals with Indices of oxidant stress in the blood and muscle of rowers during four weeks of high intensity twice daily rowing training. The exercise has been shown to results in an observable degree of oxidant stress in blood and muscle of unstrained subjects. Trained muscle is resistant to oxidant stress/muscle damage unless-exercise is accompanied by glycogen depletion.

Henderson\textsuperscript{15} A major professor of the Florida State University: studied the effect of progressive relaxation training on stress perception,
dispositional optimism and frequency and severity of running related enquiries. The purpose of this study was to determine the effect of a program of progressive relaxation. Training on stress perception, dispositional optimism and the frequency and the severity of running related injuries.

**Tieman** 16 examined changes in state anxiety (SA), acoustic star Eyeblink response amplitude and latency following exercise at 40% and 75% of VO2 peak in physically active (N = 14) and in active (N = 13) men. The results indicates that quiet rest is equally as effective as exercise for reducing anxiety in a non-clinical population. The reduction in S.A. was modest, but the effect size (0.25) is consistent with past literature.

**Delashmit Sherrijo** 17 Studied the effect of game stress situation on the heart rates of selected high school football coaches. The purpose of this study was to determine the effect of game stress situation on the heart rates of selected high school football coaches and to determine if those coaches are accurate in recognizing those stress situation. Within the limitations of this study, the following results were obtained:

1. Significant differences (P 7.05) were found in the mean resting heart rates and the mean game heart rate of the coaches and the

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maximum heart rate and perceived peak stress situation heart rate of the coaches.

(2) No differences were found in the mean game heart rates of the head coaches and assistant coaches.

(3) It was concluded that coaches are indeed stress while coaching but not accurate in determining what is stressful to their hearts.

Singh $^{18}$ concluded in this paper stress whether psychological or social is one of the factors which inhibits the players to achieve the goal. Our players may be given the best type of scientific training for learning new techniques or strategies of the skill, they may be given the best nutritive food or they may be given the sophisticated and modern equipment but unless they are prepared mentally of psychologically for the contest they would not be able to perform well or produce the desired results. The psychological training has to be provided by the coaches .along with the physical training and under psychological training, it is imperative that players are trained how to face stressful situations occurring during the competition.

Horn, Claytor, and Brown$^{19}$ conducted recent research shows that there is considerable variability between children in the degree of reactivity that they exhibit when exposed to stressful environmental conditions. The purpose of present study was to fast whether a

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combination of physical (e.g. cardiovascular fitness) and psychological (e.g. trait, anxiety trait anger, anger expression) factors could explain a significant amount of this inter individual variability. 49 male adolescents ranging in age from 13 to 16 reactivity was measured using a verity of cardiovascular indices (e.g. heart red blood pressure, spoke volume) which were continuously assessed throughout the proto self report insertions were used to obtained psychological profiles of each subject multivariate analysis of variables did explain a significant amount of the variability between subject in their reactivity responses. In particular cardiovascular finite trait anxiety trait anger, self-esteem and mode of anger expression were the variables that were most predictive of the degree of reactivity exhibited by subjects in response to laboratory stress.

Kamlesh\textsuperscript{20} conducted study on 191 track and field athletes who took part in 41\textsuperscript{st} All India Inter-university Athletic Meet at Gwalior. The IPAT Anxiety Scale is a brief non-stressful clinically valid questionnaire was used to collect the data. He concluded in his research that top class athletes are in fact less anxious than less competent athletes is not sustained.

The individual sports are consistently subjected to higher internal as well as external pressures of competition whereas in team games, these pressures are distributed amongst the members of playing team in a given situation.

Duffy\textsuperscript{21} stated that the learning of complex tasks may be handicapped by a degree of anxiety, while the learning of simple tasks may facilitated. Thus, it is inferred that stress and anxiety are the essential component for better performance of sports activity to some extent but on the other hand, their high degree and increased intensity hinder performance in sports.

Sharma\textsuperscript{22} compared the stress of female and male volley-ball players, the sample of 80 players were taken from both the sexes of different colleges affiliated to the G.G.D. University. "Stress and You " Girdano and Everly (1985) was administered as a tool on them and it was found that all the players felt a higher potentiality of stress than normal view and results indicated.. The male players felt more stress on the work overload aspects, its mean 29.73 is higher than the mean of female players 27.63 and significant in .05 level of confidence. It is also indicated in this study that stress coping ability is higher in female players than male players because the mean scores of them 91.96 is higher than mean of male players 73.56 and this is also significant in .01 level of confidence. The results are discussed in the situation of sports competition and sexual difference.


Sharma and Mishra\textsuperscript{23} conducted study on institutional stress among male volley-ball players (N—55) in Universities of Madhya Pradesh during the M. P. State Universities volley ball tournament held at Govt. College, Seepat, Bilaspur during the session 1997-98. The samples for this research were taken into consideration from seven divisional university volley-ball team players. To measure the effect of institutional stress, one scale of institutional stress (BBS5-1987) was administered. The ANOVA and correlation coefficient of this test have been described that some time, motivational factors to sports person creates stress and its effects provide best performance of their life. The results revealed that playing under pressure is harmful for the player during competition because an. Institutional stress have been found significantly differ from team to team. The results are also described in the special reference of first, second and third place holder teams player responses The finding shows the more need of psychological preparation of teams because all the guest team which has given sincere response and performance in higher stress, but those teams whom has not given higher performance and higher stress score, it shows the less orientation to the sports,

Sharma\textsuperscript{24} conducted study on one hundred forty four male and female gymnasts (99 males and 45 females) those were taking part in


All India Inter-University Gymnastics Championships 2002-2003 held at Amritsar(Punjab). The Stress Scale developed by Dr. Daniel Girdano and George Everly (1985) and Anxiety Scale developed by Melvin H. William (1990) were administered upon all participating Gymnastic-teams in All India Inter-university championships for the purpose of data collection. To draw the statistical inference from data Means and SD were calculated on both variables separately and t-test was applied. (ANOVA) was applied to find out the significance of differences among male and female gymnasts for each factor. To draw the statistical inference from the data, Means and SD were also calculated on first three winner team of both gender and t-ratio was computed. The significant was set at 0.05 level The analysis of data enumerated the following conclusions: 1. Mostly the male and female gymnasts expressed medium potentiality of stress. Very few gymnasts of both sex were found under high stress during competition. 2. Female gymnasts were found under high stress and low anxiety in comparison of male counter parts. 3. Male and female gymnasts were found significantly differ in their stress and anxiety during competition.4. The significant differences were not found among male and female gymnasts in their stress levels.5. The male gymnasts had no significant difference in their anxiety, but significant difference was observed in case of female gymnasts in their anxiety.6 Runner and third winner gymnastic-teams expressed more stress than male counter parts. But winner of male gymnastic-teams showed more stress than female counter parts. 7. Winner and runner male gymnastic-teams indicated more anxiety than female teams. But third winner female team expressed more anxiety in comparison of third winner male team.
Prasad\textsuperscript{25} compared the sports stress of professional and non-professional male handball players who had represented their Chhattisgarh state in different National competitions organized by National federation. Eighty male handball players (40 professional and 40 non-professional) were selected to serve as subjects of the study. The age range of the subjects was between 19 years to 27 years. Sports Stress Index developed and prepared by Dr. A. K. Srivastava and Dr. A. P. Singh was used to assess the sports stress of professional and non-professional handball players. To find out the significant differences between professional and non-professional handball players, Critical ratios were computed. Analysis of Variance (F-ratio) was also computed to find out the significant difference among professional and non-professional handball players separately. To test the significance of difference between ordered paired means, the Scheffe's Test of Post-hoc Comparison was applied. The level of Significance was set at .05 level.

The results of study indicate that Professional male handball players exhibited more stress as a whole in comparison of Non-professional male handball players. The significant difference was not found between professional and non-professional male handball players in their different levels of sports stress. Professional male handball players in all three levels of sports stress did not have any significant difference as obtained F-value (1.15) was much less than F.05 (2,37)=3.23. But non-professional male handball players expressed significant differences in all three levels of sports stress. These differences were also further confirmed by using Scheffe's Test of Post-hoc Comparison.

\textsuperscript{25} Mohan Prasad, “A Comparative Study of Sports Stress of Handball Players” Unpublished Master’s Thesis (Guru Ghasi Das University, Bilaspur), 2005
Singh\textsuperscript{26} compared the sports stress of twenty employed and twenty non-employed Basketball players affiliated to B.H.U. Varansi age ranging from 20-35 and 18-25 years respectfully. To measure the sports stress of professional and non-professional Basketball players, Sports Stress Index developed and standardized by Dr. A. K. Shrivastava and Dr. A. P. Singh was used to collect the data. To compare the collected data of both category, t-test was computed along with computation of means and standard deviations. The following conclusions were drawn from this study:- 1. The professional players have high level of stress than non-professional players. 2. Professional players have more stable stress level than non-professional in low and moderate stress, but professionals stress level fluctuated more than non-professional players for high stress. 3. The significant difference was found between professional and non-professional players in their high stress. 4. There was no significant difference in their stress level between professional and non-professional players.

Jones and Hardy \textsuperscript{27} concluded in research that stress, arousal and anxiety each have distinct meaning. Stress is a process. It occurs when people perceive an imbalance between physical and psychological demands on them and their ability to respond (e.g., events that are important and where event outcome is uncertain). Stress is also influenced by personality dispositions (e.g., trait anxiety and

\footnotesize{\textsuperscript{26}Shailendra Narayan singh, "Comparative Study of Sports Stress of Basketball Players" Unpublished Master’s Thesis (Banaras Hindu University, Vranasi), 2003

Performer with high trait anxiety and low self-esteem experience more state anxiety. Arousal related emotions, such as cognitive and somatic state anxiety, are related to performance. An optimal recipe of emotions is related to peak performance, and when performer are outside this optimal range, poor performance results. This optimal combination of emotions needed for peak performance does not necessarily occur at mid point of the arousal /state anxiety continuum, and the relationship between arousal and performance depends on the level of cognitive state anxiety (worry) a performer exhibits.

**Martens**

Competitive stress is the negative emotional reaction a child feels when his/her self-esteem is threatened. This personal threat occurs when the young athlete perceives an imbalance between the performance demands of competition and his/her own ability to successfully meet those demands, under conditions where the consequences of such a failure are thought to be important. It must be emphasized that threat to self-esteem is based on the child's own appraisal of the competitive situation. It is his/her perceptions of inadequacy in successfully meeting the performance demands, and his/her perceptions of the consequences of failure, that create the threat to self-esteem which triggers the stress reaction.

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Simon and Martens\textsuperscript{29} described that athletes of individual sports exhibit greater pre-competition state anxiety than athletes of team sports. Wrestling, in which an error can result in a sudden pin, was found to be a particularly stressful sport for boys and college males. Gymnastics, in which the individual performance process is closely scrutinized and each action's effect on eventual success or failure is magnified, was also found to be stressful for boys and for girls.

Hanson\textsuperscript{30} demonstrated the impact that highlighting individual performance can have on autonomic arousal levels of Little League players. When at bat, players dramatically to an average of 166 beats per minute (b/pm), 56bpm above their mean resting rate of 110. In fact, no other event during the game caused arousal increases that even closely approximated the levels experienced when batting.

Lowe and McGrath\textsuperscript{31} assessed their pulse and respiration rates of Little League players before batting, under conditions where the consequences of their performance varied importance. Players were tested throughout the entire season. The two important variables


\textsuperscript{30} D.L. Hanson, “Cardiac Response to Participation in Little League Baseball Competition as Determined by Telemetry” Research Quarterly 38 (1967) :384-388.

examined were the criticality of the game and the criticality of the situation. Game critically involved the ranking of the two teams within the league, the difference in their win-loss percentage, and the number of games left in the season. Situation critically included variables such as the inning and number of outs in the inning, the score, and the number and placement of the base runners. The findings indicated higher autonomic arousal levels under conditions of increased importance, with game criticality having an even greater effect than situation critically.

Scanlun\textsuperscript{32} examined the two potential sources of stress, were the intrapersonal factor of competitive trait anxiety and the situational variable of win-loss. Competitive trait anxiety (CTA) measured by the Sport Competition Anxiety Test (Martens, 1977), were selected to participate in the study. Each contest involved one timed trial through the motor maze. Competitive stress was measured by the Spielberger SA1C (1973). A. baseline measure was taken before the boys entered the van. Then, state anxiety was assessed immediately before and after the competition, as well as after a final debriefing session in which all boys groups received success feedback.

The findings showed that CTA was a significant source of pre-competition stress and that win-loss was the major cause of post-competition stress. Just before competing, the high CTA boys exhibited greater state anxiety than the low CTA boys. After competing, the W20 group showed a significant increase in state anxiety from its pre-

competition level, the W50 group demonstrated no difference, and the W80 group indicated a significant decrease in pre-to-post-competition state anxiety. Comparing the post-competition anxiety means of the three groups, we can see that the W20 group (M = 39.73) evidenced significantly greater state anxiety than the W50 (M = 33.52) and W80 (M = 30.25) groups. The state anxiety differences between W50 and W80 groups were also statistically reliable, A further indication of the importance of successful performance to these boys was shown by the dramatic drop in state anxiety that occurred after the W20 (M = 24.4) and W50 (M = 24.9) groups received success feedback in the debriefing.

Scanlan & Passer tested 11-to-12-year male competitive soccer players participating with the American Youth Soccer Organization. Later they also assessed girls from the same age group and geographic region. Scanlan research procedures were used in both studies, and 16 teams were tested.

They included CTA, self-esteem, and, for control purposes, baseline state anxiety. Self-esteem, like CTA, is a stable personality disposition that reflects a child's overall opinion or evaluation of himself/herself and indicates how capable, successful, and worthy the child feels. Competitive stress, measured by the Spielberger SA1C, was assessed before and immediately after each team's game on a set day. Also assessed before the game were players' expectancies about whether

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they thought their team would win or loss, and how well each player expected to perform individually.

The findings of these two studies were virtually identical, which demonstrated successful replication within the field setting and indicated the generalizability of the finding's to both genders. Additionally, the previous laboratory results indicating CTA and win-loss as respective sources of pre- and post-competition stress were replicated. This demonstrates the generalizability of these findings to the real-world setting of children's team sports.

The new intrapersonal factors found to be related to the pre-competition stress experienced by boys and girls were self-esteem and team performance expectancies and, in the case of boys only, personal performance expectancies. Athletes with low self-esteem and low expectancies experienced greater pre-competition state anxiety than did athletes were high on these attributes. In contrast to these factors which all reflect perceptions of inadequacy, indicants of perhaps a more realistic demand/capability imbalance were not found to be associated with pre-competition stress. These non-stress-related factors included the player's actual soccer ability, the team's overall win-loss record, and the score of the previous game against the same opponent.

**Scanlan & Lewthwaite**[^34] tested 9- to 14-year-old wrestlers from all over the state who competed in the season's final tournament, sponsored

by the California Age Group Wrestling Association. Although several issues were addressed in this study, only two are discussed here. First, we wanted to determine, whether the variables associated with stress in the interactive team sport context would also be predictive of stress in the individual sport setting of competitive wrestling. Second, we wanted to examine the relationship between stress and various sport-related perceptions that wrestlers had about their parents and coaches. State anxiety was assessed in this study by the Martens et al. CSA1-G. In accord with earlier results, CTA and personal performance expectancies were shown to be related to pre-competition stress, win-loss and fun were again found to be reliably associated with post-competition stress.

**Rachman** 35 Studied person to able to resist highly stressful situations. He found the top members of the crews to be physiologically unresponsive to stress. Astronauts have been found to possess the same calmness, now known as the “Right Stuff” as have certain athletes such as Henry Cooper (boxer).

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Ford, Eklund and Gordon\textsuperscript{36} assessed the six psychosocial variables as possible moderators of the relationship between life stress and injury among 121 athletes (65 males, 56 females) competing in a variety of sports at state, national or international level. No significant effects of the sex of the participants were evident. Correlation analyses revealed moderator effects of several variables. Specifically, dispositional optimism and hardiness were related to decreased injury time-loss in athletes when positive life change increased, and global self-esteem was associated with decreased injury time-loss when both negative life change and total life change increased. The results indicate that athletes with more optimism, hardiness or global self-esteem may cope more effectively with life change stress, resulting in reduced injury vulnerability and recovery rates.

Andersen and Williams\textsuperscript{37} measured changes in state anxiety, visual perception and reaction time during stress among 196 collegiate athletes participating in 10 sports. The athletes also completed measures of life events and social support at the beginning of their seasons. Measures of life events stress, social support, perceptual changes and changes in reaction time during stress were used as predictors of the number of injuries. For the entire sample, the only significant predictor of injury was negative life events stress (R= 0.45, P < 0.001). Following the suggestions of Smith et al., simple correlations were performed for


those with least social support (bottom 33%, n=65). Among this group, those individuals with more negative life events and greater peripheral narrowing during stress incurred more injuries than those with the opposite profile. Our findings are in line with the model of Andersen and Williams, in that those individuals who were low in a variable that buffers stress responsively (i.e. social support), their negative life events and peripheral narrowing under stress (large and medium effect sizes, respectively) were substantially related to their number of injuries.

Hardy\textsuperscript{38} reviewed the empirical literature on psychological stress in sport, and the effects that such stress may have upon performance, vulnerability to injury, and rehabilitation from injury. It also examines the strategies that sports performers could use to overcome these effects. The major sources of stress that have been reported by sports performers include fear of failure, concerns about social evaluation by others (particularly the coach), lack of readiness to perform, and loss of internal control over one's environment. Various models and theories of the effects of such stress upon performance and vulnerability to injury are reviewed, including multidimensional anxiety theory and a catastrophe model of anxiety and performance. The cognitive and physiological processes which are thought to underly these effects are also reviewed, together with the intervention strategies that are implied by these processes. Research on the psychological stress that appears to be experienced by performers when they are injured is very limited. However, that which is available suggests that many of the same

psychological skills that are thought to enhance performance can also be used to reduce the risk of injury, and promote a speedy recovery from injury. These include goal-setting, imagery, self-talk, and relaxation skills.

Takayuki & Yasushi The purposes of this study were to verify the validity of the psychological stress model in high school athletes, and to investigate the relationship between each variable of the psychological stress process. The subjects were 449 first and second year high school athletes (245 males and 204 females). They were required to complete a questionnaire that consisted of a stressor scale for his/her performance, a cognitive appraisal scale (2 subscales: influence of stressors, and controllability), a stress-coping scale for high school athletes (5 subscales: problem solving, avoidance, catharsis, distractive recreation, and positive thought), a stress response scale for high school athletes (5 subscales: depressive-anxious feeling, irritated-angry feeling, restlessness, helplessness, and withdrawal), and a motivated participation scale for athletic club activity. First, the validity and reliability of the cognitive appraisal scale and motivated participation scale in athletic club activity were verified through factor analysis. Second, hierarchical multiple regression analyses were conducted assuming the following process "stressor → cognitive appraisal → stress-coping → stress response". The results verified the validity of the psychological stress model in high school athletes, and found that there

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were two patterns of psychological stress process. One was "influence of stressors → emotion-focused coping → increasing of stress response" and the other was "controllability → problem-focused coping → decreasing of stress response". Finally, the psychological stress process, from stressor to motivated participation in athletic club activity, was analyzed as an index of athlete adaptation. As a consequence, it was shown that the relationship between cognitive appraisal and stress-coping had a positive effect on motivation in athletic club activity, and it was clarified that actual athlete adaptation followed an almost linear course through the steps of the psychological stress model.

Rachel determined that competitive stress in athletes and of how this anxiety relates to performance. Research and studies pertaining to factors related to pre-game and post-game competitive stress were investigated as well as the validity and reliability of tests used to measure competitive stress in athletes. The annotations are divided into three categories: (1) factors or sources that determine pre-game and post-game competitive stress in athletes; (2) the effect of stress on an athletic performance; and (3) the validity of tests used to measure competitive anxiety. (JD)

Hanton, Fletcher, and Coughlan compared the content and quantity of competitive and organizational stressors in elite athletes. Ten


international performers were interviewed about sources of stress. Content analysis of the data involved categorizing the demands associated primarily and directly with competitive performance (#CS = 21) under the post hoc dimension "performance issues", and the demands associated primarily and directly with the sport organization (#OS = 72) under one of the following four post hoc dimensions: "environmental issues", "personal issues", "leadership issues" and "team issues". Frequency analysis revealed that the participants mentioned the competitive stressors (sigma = 95) less than the organizational stressors (sigma = 215). Further analysis within these categories showed that the mean number of participants citing individual competitive stressors (M = 4.52) was greater than the mean number of participants citing individual organizational stressors (M = 2.99). The findings indicate that elite athletes experience and recall more demands associated primarily and directly with the sport organization than with competitive performance. Furthermore, this population appears more likely to mention similar competitive stressors but varied organizational stressors, probably because the former are inherent and endemic to elite sport, whereas the latter are essentially extraneous and widely distributed.

Anshel & Wells\(^{42}\) studied that (a) to identify the sources of acute stress experienced by competitive basketball players occurring during a game, and (b) to assess the intensity of these stressful situations as perceived by basketball players. Inductive content analysis procedures from a structured interview with 20 male basketball players

identified 25 sources of acute stress, placed into five categories: interpersonal conflicts, refereeing decisions, personal performance problems, opposition influences, and team behaviors. A second group of athletes (n = 69) rated the perceived intensity of each of the 25 acute stressors on a 5-point Likert scale ranging from 1 (not at all stressful) to 5 (very stressful). Part 2 of this study examined the players' coping styles with four highly intense stressors which were commonly experienced during competition. A pool of coping strategies was compiled for each of the four stressors and administered to 360 male basketball players. Using the conceptual framework of approach and avoidance coping styles, separate principal-components analyses with varimax rotation revealed that the use of approach and avoidance coping styles were used as a function of the type of stressful event, supporting the transactional coping model. Implications of the results for providing individualized and effective stress management interventions are discussed.

Felsten, & Wilcox\textsuperscript{43} examined relationships between figure skating performance and perceived stress from daily hassles and skating-specific stressors. Results from 13 young, female figure skaters showed that higher levels of daily stress, skating-specific stress, and total stress were related to poorer skating performance. Our study, although very limited, was consistent with theory-based predictions. We also provide a discussion of the different approaches generally taken by sports psychologists and stress researchers in studies relating stress to athletic performance and suggest that these may be combined to more

fully evaluate stress-performance relationships in sport. Although there is no consensus definition of stress, modern researchers often view it as a process in which environmental demands (stressors) are perceived to be out of balance wit...

Mace, Eastman and Carroll\textsuperscript{44} described that a male gymnast who had represented his country in Olympic gymnastics and had developed a maladaptive mental approach to performing on the pommelled horse in competition was given stress inoculation training in order to help him overcome his difficulties. Preliminary interviews revealed that immediately before competing he became very tense, his arms started to shake and he had doubts about being able to complete his routine. In addition, he was unable to use visualization, a technique which he used for mental preparation on the other five pieces of apparatus in Olympic gymnastics competitions. Further interviews also strongly suggested that the subject had developed an unconscious set of negative self-statements. An intervention programme comprising 12 sessions of training in relaxation, visualization and making positive self-statements was implemented. Recorded interviews and comments made by the subject on completion of the training indicated that the programme had been successful. For many years the subject had experienced problems performing on the pommelled horse and he had frequently suffered falls in competition. Towards the end of the stress management training programme his performance began to improve. He also became more confident and he used his stress coping skills in competition. In the National Championships he was able to relax,

visualize his routine and make positive self-statements. Shortly after this competition he successfully completed his routine to a high standard without any falls to win the individual title in the Midlands Regional Championships. In a subsequent international match he again successfully performed his routine to a high standard.

**Heller; Bloom, Neil & Salmela** identified the sources of stress experienced by NCAA Division I women ice hockey players. Individual interviews consisting of open-ended questions were carried out with six elite athletes. The results of the qualitative analysis identified three main categories of stress: (a) hockey pressures, which included the transition to and the advantages of playing Division I hockey, as well as performance stressors and training concerns, (b) relationship issues, which included the athletes’ concerns with relationships in their personal lives, and (c) educational demands, which included academic and time concerns relating to their studies. The results of this study revealed that the primary source of stress emanated from the game itself and adapting to higher expectations, intense scrutiny, and higher caliber of play.

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