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THE EMOTIONAL EFFECTS OF INJURY
ON FEMALE COLLEGIATE GYMNASTS

by

Nancy J. Albert

A thesis submitted in partial
fulfillment of the requirements for the degree

of

MASTER OF SCIENCE

in

Psychology

Approved:

UTAH STATE UNIVERSITY

Logan, Utah

1988

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I dedicate this work to my best friend, Frederick Albert, and to my daughter, Anastasia, both of whom were "with me" all the way. I owe you one.

Nancy J. Albert

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ABSTRACT

The Emotional Effects of Injury
on Female Collegiate Gymnasts

by

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Utah State University, 1988

Major Professor: Dr. Damian McShane

Department: Psychology

The purpose of this study was to examine affective changes which result from injury in female collegiate gymnasts, using the Profile of Mood States (POMS) instrument (McNair, Lorr, & Droppleman, 1971).

Twelve female gymnasts, comprising the Utah State University gymnastics team, completed the POMS twice per month for four months during their 1986-87 competitive season. A comparison group of 12 non-athlete female college students, matched with the gymnasts by age, year in school, and major, completed the POMS on the same schedule as the gymnasts. Injury was defined as orthopedic damage to the gymnast's body as a result of participation in gymnastics, another sport-related activity, or a non-sport-related accident, which forced the gymnast to miss one week of gymnastics practice or one competitive event.

Pre- and post-injury POMS profiles were analyzed by visual inspection. Of the four gymnasts who sustained injuries during the season, two exhibited significant POMS profile changes. One gymnast who did not participate during the 1986-87

season, due to an injury sustained the previous year, produced POMS profiles which fluctuated in anticipation of, and in response to, her visits to physicians treating her injury.

Comparisons using t tests of POMS factor scores of the non-injured gymnasts with those of the non-athlete college students indicated no significant differences between the two groups. Visual comparisons were conducted to ascertain if non-injured gymnasts' POMS profiles were similar to the "iceberg" profile found by Morgan (1979) in his study of elite athletes. Thirty-six percent of the gymnasts' POMS profiles had the iceberg configuration, as compared to 20 percent of the non-athletes' profiles.

Since three of the five (60 percent) of the injured gymnasts in this study had significant changes in POMS factor scores, the hypothesis that injury can produce substantial affective changes in female collegiate gymnasts was supported. Additional research should be conducted to replicate and extend these results and to explore options for optimal treatment of injured athletes. Further comparisons between POMS profiles of both injured and healthy elite, professional, and collegiate athletes is recommended.

CHAPTER I

PROBLEM STATEMENT

An athlete is a person whose physical condition and ability to perform strongly influence his or her sense of well-being (Faris, 1985). Primary ways in which an athlete measures conditioning and ability to perform are success in competitions, subjective self-assessments of improvement in strength, coordination and control, amount of time spent working toward goals, goals attained, and feedback from coaches, peers, and others. For many athletes, optimal physical condition and athletic ability are major criteria for considering themselves worthwhile human beings. Therefore, regular and consistent participation in their activity helps each athlete to maintain a sense of emotional equilibrium and a stable sense of self (Faris, 1985; Lanning, 1982; May & Sieb, 1987).

When athletes become injured and can no longer participate in practice and performance of their sport, the familiar and important avenues available to maintain stable positive self-perceptions and a sense of physical self-control are temporarily inaccessible (Eldridge, 1983; Faris, 1985; May & Sieb, 1987; Steadman, 1980). Whether athletes are injured temporarily or permanently disabled, they are suddenly without a major source of self-definition. If an athlete previously defined herself as a "successful athlete", once she's injured that definition must change, sometimes so drastically that "athlete" is no longer a part of that definition. A person whose identity is primarily that of "world class athlete", due to her own self-perceptions and evaluations by her peers, parents, coach, and the media, will experience an even greater discrepancy/disruption because of the all-encompassing nature of maintaining world-class levels of performance (Lanning, 1982). When injured, much of what an athlete has worked to attain is lost for the length of time required for rehabilitation (Faris, 1985).

The effects of injury do not solely involve the individual athlete. The team to which the athlete belongs plays a part in the athlete's response to an injury. The injured athlete may feel that she doesn't matter to the coach or team, or that if the coach or team cannot depend on the athlete anymore, she will cease to matter and will not be missed. This sense of unimportance may be coupled with depression, anger, and/or guilt (Massimo, 1985; Weiss & Troxel, 1986).

Determining the effects of injury upon the identity, self-concept, and emotional state of the athlete logically leads to the question of how to respond to these effects. Mental attitude has been shown to be an essential variable in the success or failure of physical rehabilitation (Faris, 1985; Suinn, 1967; Weiss & Troxel, 1986). Therefore, it is conceivable that an anxious, emotionally unstable individual may not adhere to the rigors of physical rehabilitation and may in fact manifest an increase in muscular tension at the injury site, resulting in delayed recovery and/or possible further injury. How do concerned professionals treat the injured athlete as he/she experiences an influx of new emotions and self-perceptions? Is there a need for specialized care and treatment for these individuals? Intuitively, it seems there is a need for support, understanding, and help for injured athletes.

An unreasonable or misunderstood emotional response to injury may have an effect on an athlete's subsequent perceptions of the possibility of injury. If the recently rehabilitated athlete returns to practice, she may be so frightened of future injuries that her tension and preoccupation will make her more susceptible to injury (Nideffer, 1981). In contrast, the athlete who is able to cope with the inevitable upset of injury, either because of her own insight and emotional strength, or because she had support and help to understand her emotional response, may not perceive the possibility of being injured in the future as such a devastating

situation. She may feel confident that she will be able to handle or will receive help in dealing with the emotions connected with injury (Suinn, 1967; Weiss & Troxel, 1986).

Therefore, it does seem important to understand the effects of injury in athletes so that they may be helped to cope with the changes that occur both physically and psychologically. Appropriate treatment for specific emotional problems that result from injury could help to alleviate complications in rehabilitation and/or reduce adverse effects on future athletic performance (Faris, 1985; Nideffer, 1981; Suinn, 1967; Weiss & Troxel, 1986). Knowledge of specific affective states that are likely to result from an athletic injury will allow for an increased likelihood of appropriate, targeted, and prompt treatment of injured athletes.

Although there is a fair amount of clinical observation of the effects of injury, a search of the literature indicated a dearth of research on the subject. Perhaps this is because the impact of injury is so apparent -- presumably athletes become depressed and experience a decrease in body image and self-esteem when injured (May & Sieb, 1987). There may be little motivation to study emotional reactions to injury when those reactions are viewed as insignificant and temporary. May and Sieb (1987) also point out that an injured athlete may not be inclined to participate in research which would dwell on the negative experience of injury. In spite of these possibilities, systematic empirical research on issues of self-worth, identity, body image, motivation, goals, and affect in relation to injury would be worthwhile. This research project was designed to concentrate particularly on the effects of injury on the emotional state of the athlete.

CHAPTER II

REVIEW OF LITERATURE

Frequency of Injury

According to Garrick and Requa (1980), the overall injury rate in women's gymnastics is among the highest in women's sports and slightly higher than injury rates in any men's sports with the exception of football and wrestling. In spite of this, nothing in their study suggested that severe or permanently disabling injury occurred frequently enough to warrant gymnastics being considered an inordinately hazardous sport. In a 5-year study of injuries in women's gymnastics, Snook (1979) found that out of 70 female gymnastics participants, 66 major injuries (those brought to the attention of a physician and which produced disability) were sustained (94% of the athletes). In athletes of national caliber who are constantly trying to improve their performance by engaging in intensive practice of difficult maneuvers, injury rates increase. Snook (1979) stated that because of their findings, gymnastics at the elite level should be considered a hazardous sport where risk factors should be constantly evaluated by the athlete, the coach, and the team physician. Whether one considers gymnastics to be especially hazardous or not, the fact remains that injury rates are high, especially in highly skilled and competitive athletes.

Clinical Reports of Psychological Effects

It seems that little has been written in the psychology literature about the injured athlete (Heyman, 1985). Most of what has been written has been in the fields of sports medicine and physical education. However, some research has been conducted or proposed on self-concept and injuries (Cohen & Young, 1981), injury-proneness (Taerk, 1977), prevention and treatment of injury (Nideffer, 1981), injury

prediction (Jackson, Jarrett, Bailey, Kausek, Swanson, & Powell, 1978), and lifestress as a predictor of injury (May, Veach, Southard, & Herring, 1985; Passer & Seese, 1983). No reports of research on the emotional effects of injury were found. There have been several papers, written from a clinical observation point of view, which suggest a need for injured athletes to receive appropriate emotional support to aid recovery, both physically and mentally, from injury (Danish, 1986; Eldridge, 1983; Feigley, 1984; Feltz, 1986; Massimo, 1985; May & Sieb, 1987; Pargman, 1987; Rotella, 1982; Steadman, 1980; Suinn, 1967; Yaffe, 1983).

Literature based on clinical observation of athletic injuries in general shows that a variety of negative psychological effects result from injury, affecting self-concept, motivation, goals, and emotional stability. As Stark and Toulouse (1984) stated,

A particularly troublesome situation arises in high performance females who suffer an injury that does not allow them to compete at their pre-injury level again. Suddenly, they are without their major source of self-satisfaction, definition of worth, and major goal...others relate to them differently...they have no alternative goals (p. 917).

Rotella (1982) described the athlete's response to injury as similar to the psychological process gone through by persons facing death. Disbelief, denial, isolation, anger, bargaining, depression and hopeful resignation comprise the common emotional response to injury, according to Rotella. Irrational and emotional thinking may interfere with the athlete's recovery and future performance. For instance, self-defeating thought patterns may make physical rehabilitation seem futile and not worth the work and pain. An athlete who is injured once may decide

that he or she is "injury prone". Consequently, the heightened anxiety may cause greater muscle tension generally and at the injury site, precluding healing and making other injuries more likely (Faris, 1985; Rotella, 1982; Weiss & Troxel, 1986). In fact, Ryde (1977) claimed that physical symptoms may be exacerbated by psychological concomitants of injury.

May and Sieb (1987) compiled a list of physical, emotional, and behavioral reactions to physical injury which have been observed clinically. Emotional reactions include distractibility, guilt, stagnation, nightmares, hyperexcitation, distrust, and reductions in body image and self-esteem. Braverman (1977) listed hyperirritability, increased sensitivity to loud noise, problems in concentration and recall, absentmindedness, social withdrawal, anxiety, depression, sexual inhibition or inadequacy, and repetitive nightmares of the injury.

Suinn (1967) classified psychological reactions to injury as follows: injury-linked reactions, common emotional reactions to disablement, and idiosyncratic reactions. Injury-linked reactions are those which are part of the clinical picture of the organic injury itself, such as orientation and memory dysfunction in some injuries to the brain. Common emotional reactions to disability are those which are expected to occur, such as shock, denial, depression and anxiety, partial adaptation, and finally, full adaptation to being disabled. Idiosyncratic reactions are those unique to the injured individual.

Suinn (1967) stressed the importance of attention to the psychological components of physical injury. He listed three factors which color the way in which an individual responds to disability. The person's pre-injury personality, the nature of the disability itself, and the meaning of the disability to the individual can affect her response to injury or illness. According to Suinn (1967), treating a physical disability without attending to the psychological effects of the injury is incomplete,

inefficient, and can hinder physical recovery. Steadman (1980) stressed the importance of immediate treatment for the psychological components of physical injury. In an article on rehabilitation of athletes after knee surgery, Steadman pointed out that in the immediate post-operative stage, the athlete-patient believes she is no longer in control of her environment. The best approach, according to Steadman, is to guide the athlete into immediate exercise "in order to channel the desires for recovery into appropriate and realistic goal patterns" (p. 294), thereby increasing the athlete's sense of control over her hospitalization and post-injury course. In a later article, Steadman (1981) again emphasized the importance of maintaining an injured athlete's psychological conditioning during rehabilitation.

May and Sieb (1987) proposed that the athlete's means of communication in sport is through bodily expression. Injury causes a loss of control of the athlete's body, resulting in a loss of the physical means of communication and decrease in self-esteem. Johnson (1962) suggested that this body-control/self-image relationship is most crucial in young children. May and Sieb (1987) stated that this reduction in body-image and self-esteem is a major component in negative psychological reactions to injury and illness. Eldridge (1983) claimed that injury is a direct assault on the athlete's body-image. Inactivity due to injury is an extreme change in the athlete's life-style, which is even more disturbing to the athlete when physical fitness is a major element of her emotional stability and security.

Feigley (1984), in an article on burnout in elite athletes, reported demotivation as being one effect of injury. Experienced athletes are aware of the time needed for rehabilitation, the loss of progress due to time out of practice, the pain of the injury, and the anxiety that is felt when performing skills associated with previous injury. Feigley maintained that proper counseling at the time of injury and

throughout rehabilitation may help an athlete avoid extreme reactions, thus reducing the role played by injury in future burnout.

Danish (1986) and Weiss and Troxel (1986) described athletic injury as a stressor which demands that the athlete be able to adapt both physically and mentally. Danish stated that the stress of injury, treatment, and rehabilitation is especially great to someone whose body and physical ability are the individual's main source of self-esteem.

Weiss and Troxel (1986) stated that the time of the season the injury occurs (whether close to or far from time of competition), and external pressures to contribute to the team by the coach or teammates place additional stress on the injured athlete. Weiss and Troxel listed the emotions that are often mentioned by athletes upon realizing that they are injured as disbelief, fear, rage, depression, low confidence, guilt, inadequacy, loss of control, inability to cope with restrictions on activity, and feelings of being overwhelmed by the long-term goal of complete recovery. Faris (1985) listed fear, anger, and depression as elements of the normal cyclical response to traumatic injury. This cycle recurs throughout the rehabilitation process and explains why some injury victims appear "up" at times but "down" at others.

Effects of Emotional Response on Rehabilitation

The residual effects of an athlete's emotional response to injury can be seen in rehabilitation, future performance, and even the occurrence of future injury. As mentioned previously, muscle tension due to anxiety can result in ineffective healing of the injury or a predisposition to ineffective muscle use and future injury (Faris, 1985; Rotella, 1982; Ryde, 1977; Weiss & Troxel, 1986).

Psychological attitude, emotional state, and beliefs of the athlete can affect recovery from injury. Not only is the reduction of muscular tension resulting from

anxiety an important determinant of success, but motivation and a positive attitude about the demands of physical therapy can aid in speeding recovery. According to Faris (1985), a positive state of mind promotes better attendance and adherence to physical therapy, yielding more successful results. Feltz (1986) and Rotella (1982) supported the view that until an athlete rationally accepts and learns to cope with an injury, he or she will probably not understand or cooperate with rehabilitation. There is a need for reduction of physiologic tension to allow the athlete to concentrate on rehabilitation in effective, stress-reducing and performance-enhancing ways (Nideffer, 1983).

The psychological intent of the injury is another factor which may affect rehabilitation (Moore, 1960). Moore suggested that injury may achieve for the athlete some purpose not attainable by other means. Athletes who experience conflicts over aggressivity versus passivity and who may attempt to "solve" this conflict through counter-phobia (i.e. dare-devilish, risk-taking behavior) are prone to injury.

Treatment of Injured Athletes

A report on the current treatment of injured athletes reveals that coaches often overreact to injury or behave as though the injured athlete has "vanished from the planet" (Massimo, 1985, p. 43), not allowing her access to the gym because she can no longer contribute to the team as a competitor. This type of treatment of an already emotionally upset, physically injured athlete is as unacceptable and unprofessional as it is common (Massimo, 1985). Massimo (1985) stated that although the physical impact of injury is obvious, the psychological impact is not. May and Sieb (1987) disagree, however, and state that observant team personnel are aware of an athlete's negative emotional reaction when an injury occurs. This awareness is

part of the problem, they claim, because the expected emotional reaction is taken for granted and not given appropriate attention by health professionals.

Any person who presented at a hospital emergency room with a serious injury forcing him or her to miss work or other important activities would experience many of the same emotions as the injured athlete (Gruen, 1975). However, the hospitalized non-athlete very often receives psychological counseling to some degree, whether from nursing staff, counselors, social workers, psychiatrists, or the clergy. Considering the importance to the athlete of participation in his or her sport, it seems evident that counseling of some kind is indicated for the injured athlete. Based on clinical work with athletes, Danish (1986) wrote, "athletes judge their total worth as a person by their athletic performance" (p. 345) and Faris (1985) wrote, "for athletes, physical condition and athletic ability are the major components of self-worth. In their world, many of the criteria for being a worthwhile human being become suddenly unattainable (after injury)" (p. 545). However unrealistic or unhealthy these personal criteria for the athlete's self-worth may be, they nevertheless exist in the minds of many highly committed athletes. As Feltz (1986) proposed, it is not so much the injury itself that upsets the athlete as it is the interruption of participation in their sport. When an athlete is sidelined for more than one week, the injury is even more of a devastating blow. The sport may be a career for which the athlete has trained for many years. Even at a young age, elite level athletes must put a considerable amount of time, energy, and emotional commitment into their sport at the exclusion of much else (Stark & Toulouse, 1984). Some young elites even move away from their families to work with a particularly expert coach. The sport may be the athlete's means of making a living. Thus, "being injured threatens not only an athlete's physical well-being, but acts as a threat to the athlete's self-concept, belief system, social and occupational function-

ing, values, commitments, and emotional equilibrium" (Danish, 1986, p. 346). According to May and Sieb (1987), "the pain, suffering, economic cost, and the loss of enjoyment of those participating in sports still overshadow our inability to prevent and alleviate the discomfort for those injured" (p. 158). The authors concluded that there is a great need for understanding the specific psychological components of injury and rehabilitation. In spite of this need, psychological rehabilitative techniques are not as prevalent in the sport world as they should be, partially due to limited access to athletes by trained professionals (Pargman, 1987).

Nideffer (1983) stated that the physician who treats the injured athlete needs to be sensitive to characteristics of the athlete which determine how much support he or she needs and to be able to empathize with the pressure that the injury and restricted activity will place on the athlete. According to Rotella (1982), the athlete should be helped to understand that an injury is unfortunate and that feeling irritated, frustrated, and sad is reasonable and appropriate, but that feeling hopeless is not. Feltz (1986) stated, "if sports medicine professionals paid as much attention to the psychological aspects of sports injuries as to the physical aspects, injury occurrence might be reduced and recovery might be faster" (p. 342). Faris (1985) recommended that physicians and sports medicine professionals address injured athletes' emotional reactions to their injuries and treatments.

May and Sieb (1987) presented guidelines for reducing the perception of decreased self-control in injured athletes, based on the work of Nideffer (1983), Yaffe (1983), and Eldridge (1983), and on their own personal experience working with athletes. These guidelines include: 1) early detection of physical, emotional, and behavioral changes; 2) involvement of the athlete in psychological counseling as soon as those changes are detected; 3) establishment of a positive relationship with the athlete; 4) provision of continuous care considering the sequence of

reactions of the athlete to injury; 5) avoidance of overloading the athlete with information; and 6) provision of support throughout rehabilitation.

CHAPTER III

PURPOSE AND OBJECTIVES

The general purpose of this study was to examine affective changes as a result of injury in female collegiate gymnasts. A specific objective was to demonstrate significant changes (changes of more than one standard deviation above or below typical scores) in factor scores and Total Mood Disturbance scores on the Profile of Mood States (POMS) (McNair, Lorr, & Droppleman, 1971) from pre-injury scores to post-injury scores. The null hypothesis tested in correspondence with this objective was as follows:

H₀₁: There will be no significant changes in levels of Tension, Depression, Anger, Vigor, Fatigue, Confusion, and Total Mood Disturbance as measured by the Profile of Mood States in female collegiate gymnasts before and after injury.

A second objective of this study was to compare each non-injured gymnast's profiles with the profiles of the non-athlete matched with that gymnast, reflecting basic differences in the mood states of gymnasts as compared to the non-athlete, or a basic similarity among subjects regardless of their involvement or non-involvement in collegiate athletics. The null hypothesis corresponding with this objective was as follows:

H₀₂: There will be no difference between POMS mood factor and Total Mood Disturbance scores of non-injured female collegiate gymnasts and those of non-athlete female college students matched with each gymnast.

A third and final objective was to compare non-injured healthy female collegiate gymnasts' profiles with the "iceberg profile" on the POMS as has been demonstrated in studies of elite wrestlers, oarsmen, and runners (Morgan, 1979). On the iceberg profile, Vigor scores are above the T-score mean of 50 while all other factor scores are below the mean. The college student norms for males and females show a flatter profile, higher on Tension, Depression, Fatigue, Anger, and Confusion and lower on Vigor than do elite athletes. The final null hypothesis was as follows:

H₀₃: The POMS profiles of the non-injured, female collegiate gymnasts will not approximate the iceberg profile, in which vigor scores are above the T-score mean of 50 and other factor scores are below the mean.

CHAPTER IV

METHOD

Population and Sample

The target population consisted of all female collegiate athletes. The accessible population was composed of the female collegiate gymnasts at Utah State University ($n=12$). These gymnasts ranged in age from 18 to 22.

In addition to the group of gymnasts, a group ($n=12$) of non-athlete female students at USU was composed to be comparable to each gymnast according to age, major, and year in school. The criterion for being considered a non-athlete was non-participation in any organized sports or athletics. Some of the non-athletes participated in recreational skiing, softball, or aerobic dance classes on a casual basis. The purpose of the comparison subjects was to provide non-athlete college student profiles against which to compare each gymnast's profiles, assuming that environmental events which may have affected all students might have similar effects on control subjects' profiles as well as on gymnasts' profiles, but which would not be misinterpreted as an effect of being a gymnast. School events, or events typical of the gymnast's age or sex, would thereby be reflected in all subjects' profiles. Effects of injury or illness in gymnasts were expected to be reflected over and above effects of events common to both groups.

Data and Instrumentation

The dependent variables measured in this study were Tension-Anxiety, Depression-Dejection, Anger-Hostility, Vigor-Activity, Fatigue-Inertia, and Confusion-Bewilderment, as well as a Total Mood Disturbance score as measured by the Profile of Mood States (McNair, Lorr, & Droppleman, 1971) (see Appendix A). Values of these scores were expected to depend on the presence or absence of injury.

The Profile of Mood States (POMS) measures transient, fluctuating affective states. It is a 65-item 5-point adjective rating scale which represents the refinement of 100 different adjective scales by means of repeated factor analyses (McNair, Lorr, & Droppleman, 1971). The six factors measured by the POMS are Tension-Anxiety, Depression-Dejection, Anger-Hostility, Vigor-Activity, Fatigue-Inertia, and Confusion-Bewilderment. Individual scores are obtained for each factor and a Total Mood Disturbance (TMD) score can also be obtained by summing all individual factor scores with Vigor-Activity weighted negatively. The POMS raw scores are converted to T-scores with a mean of 50 and standard deviation of 10. Internal consistency reliability (K-R20) of scores obtained on the POMS is .90 or above, as measured by two studies of male and female psychiatric outpatients (McNair, Lorr, & Droppleman, 1971). Stability coefficients for the six POMS factors scores as measured by studies of male and female psychiatric outpatients range from .65 for Vigor-Activity to .74 for Depression-Dejection. Although these stability coefficients are relatively low, they are consistent with the test's purpose of measuring fluctuating mood states which would not be expected to be highly stable over time (McNair, Lorr, & Droppleman, 1971).

Examination of individual items comprising each mood scale supports the content validity of the factor scores. Additionally, the predictive and construct validity has been demonstrated in research on brief psychotherapy (Lorr, McNair, Weinstein, Michaux, & Raskin, 1961), controlled outpatient drug trials (Lorr, McNair, & Weinstein, 1964), studies of response to emotion-inducing conditions (Pillard & Fisher, 1967), and studies of concurrent validity coefficients and POMS correlates (McNair, Lorr, & Droppleman, 1971). The results of these studies as presented in the POMS manual lend support to use of POMS in research.

Reliability and validity of the POMS are not reported in the manual for the college student normative sample. Through a search of the literature the investigator did not find any reports of reliability and/or validity studies for college students or athletes. Due to this apparent lack, an internal consistency reliability coefficient (Coefficient Alpha) was calculated for the female non-athlete students and for the non-injured female collegiate gymnasts, as was a test-retest reliability coefficient. These values are reported in the Results and Discussion section (Chapter V).

Norms are available for male and female psychiatric outpatients ($n=1000$) and for male and female college students ($n=856$). The justification for selecting the POMS for this study when the norms are limited to psychiatric outpatients and college students is because research by Morgan (1979) on elite wrestlers, oarsmen, and runners indicated that these successful elite athletes consistently show an iceberg profile on the POMS, scoring below the T-score mean of 50 on Tension-Anxiety, Depression-Dejection, Anger-Hostility, Fatigue-Inertia, and Confusion-Bewilderment and above the mean of 50 on Vigor-Activity. This is a more positive profile than that of the college student normative sample and of unsuccessful athletes. Significant differences were found between athletes and college students in Morgan's study for all factors with the exception of Anger-Hostility. In the present study, the non-injured collegiate gymnasts' POMS profiles were compared to Morgan's iceberg profile for elite athletes.

The Information Questionnaire for Gymnasts (see Appendix B) is a 15-item survey constructed by the researcher to determine the presence or absence of injury or illness and to allow the researcher to be aware of possible confounding variables such as personal experiences, school events, or an impending competition which might affect POMS scores independently of injury. The Information Questionnaire

for Non-Athletes (see Appendix C) is a 13-item survey constructed by the researcher to determine the presence or absence of injury or illness in the nonathlete student subjects. It provided information on events which may have affected the non-athlete subjects' emotional state and thereby POMS scores as well. It also asked the non-athletes for their subjective feelings and thoughts about injury or illness, if any, which prevented them from attending school, work, or other important activities.

Definition of Injury

Clarke and Buckley (1980) defined "significant injury" as an injury which "caused the athlete to miss at least one week of participation", which they stated is "generally the priority index for evaluating noncatastrophic sports injuries" (pp. 188-189). Garrick and Requa (1980) defined injury as "a sport-related incident that resulted in an athlete missing any portion of a workout or competitive event" (p.262). Taerk (1977) mentioned three possible definitions of injury: a) all injuries reported to the medical facility treating the team; b) injuries causing loss of practice time; and c) injuries forcing loss of game time.

For the purpose of this study, injury was defined as sport-related orthopedic damage to the gymnast's body as a result of participation in gymnastics or an activity other than gymnastics (such as injuries resulting from a car accident or participation in another sport), reported to the team coach, which forced the gymnast to miss one week of gymnastics practice or one competitive event.

Presence or absence and severity of injury was indicated by responses to questions number 1 through number 6 on the Information Questionnaire.

Design

The design employed to analyze the results of this exploratory study was an adapted form of an ABA, replicated single-subject design with matched controls.

Eight of the gymnasts started their season in the A or un-injured phase. As the season progressed, injuries occurred which forced some of the gymnasts to miss practice and/or competitions. When a gymnast experienced such an injury, the B-phase began for that gymnast. Since not all gymnasts became injured, and those who did were injured at different times throughout the season, the B-phase did not begin at the same time nor was it the same length for all gymnasts. The seven gymnasts who did not become injured at all throughout the study, and one gymnast who had an injury at the outset of the study and was rehabilitating during the entire four months of data collection, were included for the purpose of comparison. Their POMS scores and injury status were monitored on their Profile Graphing Sheets (see Appendix D) as were the other gymnasts'. The non-athlete matched control subjects stayed in the A-phase for the entire four months of data collection.

At a group meeting of the gymnasts, the researcher presented the study to the gymnasts, gave them Information Letters and Informed Consent Forms (see Appendix E) to read, sign, and return at the end of the meeting. The final gymnast sample consisted of those gymnasts from whom the researcher received signed Informed Consent Forms. All teammembers agreed to participate in the study, and their names were listed on the Subject Roster (see Appendix F).

The issue of confidentiality was also discussed at this meeting. The researcher informed the gymnasts that all of their responses on the POMS and in interviews would be kept strictly confidential and would be used only for the purpose of this study. The gymnasts were apprised of exceptions to this policy concerning evidence of severe emotional disturbance as detected by POMS scores. (See Appendix G for a complete explanation of how this situation would have been handled.)

The twice monthly meetings to complete the POMS were held after gymnastics practice at a date and time agreed to by the team coach and the researcher. The researcher administered the POMS to the gymnasts, collected the completed forms, and scored them. Profiles were then plotted on the Profile Graphing Sheets for each gymnast and her matched non-athlete counterpart. Any absent gymnasts were contacted by the researcher and arrangements were made to complete the POMS at some time during the week of the scheduled group meeting. This procedure was repeated twice monthly for four months. One gymnast was out of the country at the time of assessment period number 5 and was unable to complete the POMS for that session. Otherwise, the POMS was completed by every gymnast at each assessment period or shortly thereafter.

The non-athlete female college students were contacted by the researcher with the aid of the Undergraduate Advisor for the USU Psychology Department. A roster of the gymnasts with their ages, years in school, and majors was the guide for defining the desired characteristics of the non-athletes, as well as the criteria of non-participation in organized athletics and exercising three or fewer times per week. When initial telephone contact was made with each non-athlete, the researcher briefly explained the study and the criteria for choosing each individual. Approximately 95 potential control subjects were contacted by telephone before obtaining a group of 12 non-athletes who fit the appropriate specifications to be matched with the gymnasts and who were willing to participate. These twelve non-athletes were asked to attend an introductory meeting, which was for the purpose of explaining the study, distributing Information Letters and Informed Consent Forms (see Appendix H), for emphasizing the importance of attendance by each subject at every assessment session, and for completing the first POMS. A schedule of twice monthly meetings was given to each subject. Any subject who anticipated

difficulty in attending any of the meetings was asked to contact the researcher to schedule an alternate appointment time as close to the originally scheduled meeting time as possible. Additionally, subjects were informed of the confidentiality of their responses on the POMS and Information Questionnaire, as well as of the limits of confidentiality, in the same fashion as were the gymnasts. The final non-athlete sample consisted of those students from whom signed Informed Consent Forms were received. Their names were listed on the Subject Roster (see Appendix F).

Several days prior to each scheduled assessment date, the researcher phoned each non-athlete subject to remind her of the upcoming meeting. If any subject had a conflict with the scheduled meeting time, arrangements were made for alternate meeting times or for the subject to pick up the POMS form and complete it in the Psychology Department office. One subject informed the researcher midway through the study that she was moving out of the country and would not be available to complete the final four assessments. All other subjects completed the POMS within one week of the scheduled meeting date.

The researcher administered the POMS to the subjects, collected and scored them, and plotted profiles of each non-athlete subject with her gymnast counterpart on the Profile Graphing Sheets. This procedure was repeated twice monthly for four months.

At the end of the four month period, the researcher had 12 complete Profile Graphing Sheets, one for each matched pair, with eight profiles for a gymnast plotted next to eight profiles for her matched non-athlete counterpart on one sheet. This allowed for visual inspection of the profiles over the four month period, as well as documentation of the gymnasts' health/injury status for each assessment period.

If a gymnast indicated on the Information Questionnaire for Gymnasts attached to each POMS form (see Appendix B) that she had an injury which kept her out of one week of gymnastics practice or one competition in the previous two weeks, she was contacted for a brief telephone interview (see Appendix I for questions asked during this interview). The purpose of the interviews was to gain insight into whether it was the injury itself which was having an effect on the gymnast's sense of well-being and mood state, or if other factors, such as attitudes of the coach, peers, and/or family toward the injured gymnast were having a greater effect. Additionally, the interview itself was anticipated to be helpful to the gymnasts by allowing them an opportunity to express their feelings about their injury. Since the interview took place after the POMS was completed for that assessment period, the interview did not confound the gymnasts' responses on the POMS.

Data Analysis

Due to the nature of the POMS and design of this study, responses on the POMS from one assessment to another were not entirely independent, and ABA phases of non-injury/injury/non-injury were not uniform across subjects. While some gymnasts were never injured, another was injured for the first two weeks of data collection, and yet another was injured throughout the entire study. Therefore, typical statistical analysis, even analysis modified for use with single-subject designs, was not appropriate for use to test Hypothesis #1 (Kazdin, 1976). Visual inspection was the means of analyzing differences in pre- and post-injury profiles within each subject on the Profile Graphing Sheets. Changes of more than one standard deviation ($SD=10$) in either direction in individual factor and TMD scores from a gymnast's non-injured to injured status on her POMS profiles were considered significant. Similarly, injured gymnasts' and non-athletes' scores throughout

rehabilitation were compared, with the criteria for significant differences again being changes of one standard deviation.

Hypothesis #2, comparing non-injured gymnasts with non-athletes, was tested by means of t tests. POMS factor and TMD scores of individual matched pairs for each of the eight assessment periods were compared. Comparisons were also made of the matched pairs by compiling POMS factor and Total Mood Disturbance scores over the entire study. In a similar fashion, POMS factor and TMD scores of the group of non-injured gymnasts were compared to scores of the group of non-athletes by compiling scores over the entire study.

Hypothesis #3, comparison of non-injured gymnasts (both as individuals and as a group) with the iceberg profile, were tested by visual inspection to determine if Tension, Depression, Fatigue, Anger, and Confusion scores fell anywhere below the mean and Vigor scores fell at least one standard deviation above the T-score mean of 50.

Calculation of the internal consistency reliability of POMS scores for the female collegiate gymnast and female non-athlete subjects was done by means of the Coefficient Alpha formula. Coefficient Alpha was used rather than KR-20 (which was used by the POMS authors as reported in the POMS Manual) because Coefficient Alpha is more appropriate for multiple-scored items as the POMS (Anastasi, 1982). Test-retest reliability was calculated by computing Pearson product-moment correlation coefficients for non-injured gymnasts' and non-gymnast subjects' responses on two consecutive POMS assessments which were two weeks apart.

CHAPTER V

RESULTS AND DISCUSSION

A complete listing of T-scores, means, and standard deviations of scores for all gymnasts and non-athletes are presented in Appendices J and K. POMS profiles of pairs of non-injured gymnasts and non-athletes are presented in Appendix L.

Four gymnasts sustained injuries during the 1986-87 competitive season. One additional gymnast was redshirted for the season due to an injury from the preceding year, and at the end of the 1986-87 season she retired from gymnastics upon her doctor's advisement. Below is a description of each injured gymnast's pre- and post-injury POMS profile changes.

Gymnast number 1 was injured for the first month of data collection (assessment periods 1 and 2), so pre-injury data is not available for her. Her profile changes during rehabilitation (see Figure 1) show a somewhat improved profile after recovery, with Vigor increasing and Fatigue decreasing significantly (by more than one standard deviation), and a decrease of 32 points in Total Mood Disturbance.

Gymnast number 2 was injured for assessment periods 2 and 3. Profile changes from pre-injury to injury were non-significant (see Figure 2), although it is interesting that her Fatigue score decreased by almost one standard deviation after injury. This may indicate that fatigue was a factor in her becoming injured, and being forced to rest while injured resulted in less fatigue. Her injury to non-injury scores changed minimally, with no definite pattern of change and only a one point change in Total Mood Disturbance.

Gymnast number 3 was injured at the beginning of data collection, so preinjury data is not available for her. Her profile changes during rehabilitation are significant (see Figure 3): Tension and Fatigue decreased by one and two standard

Figure 1

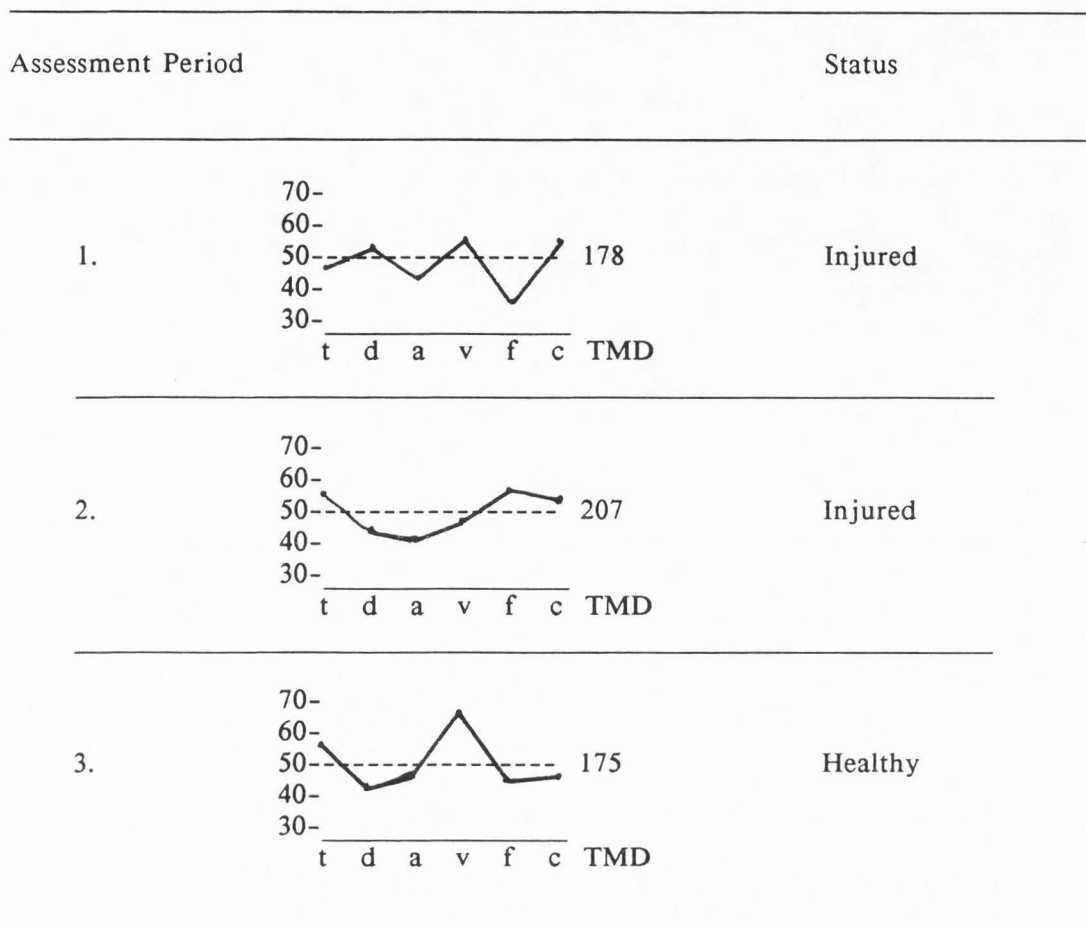
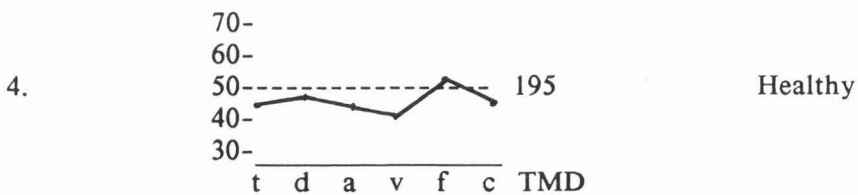
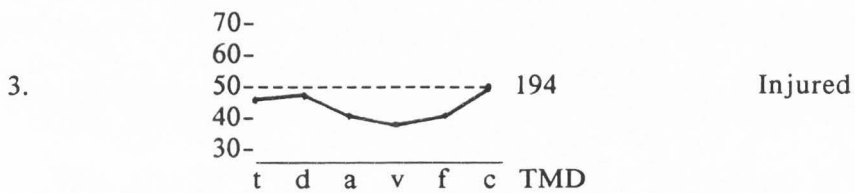
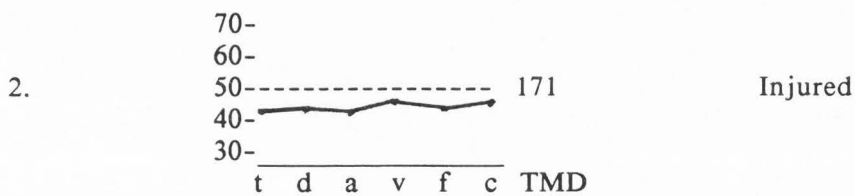
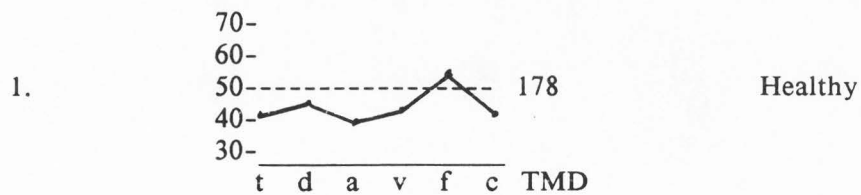
Profile Changes After Injury in Gymnast Number 1

Figure 2

Profile Changes Before and After Injury in Gymnast Number 2

Assessment Period

Status



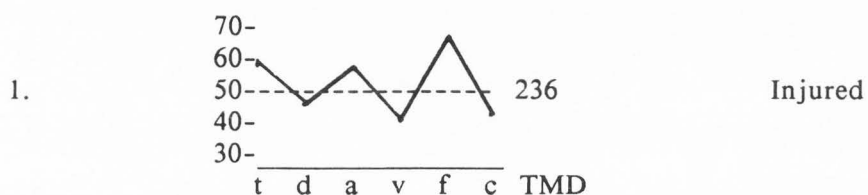
deviations respectively, Anger and Depression decreased by slightly less than one standard deviation, and Vigor increased by almost two standard deviations. Her Total Mood Disturbance score decreased by 71 points during recovery.

Figure 3

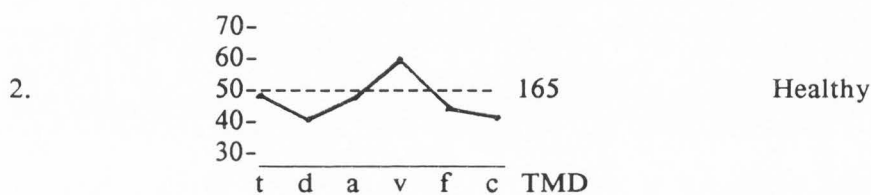
Profile Changes After Injury in Gymnast Number 3

Assessment Period

Status



Injured



Healthy

Gymnast number 4 was injured for the first month of data collection, was healthy for the next month, and was injured again for the remainder of the competitive season. After being injured for the second time, she decided to retire from gymnastics and participate in a different sport. No pre-injury data is available, and injury to non-injury data shows no significant changes (see Figure 4).

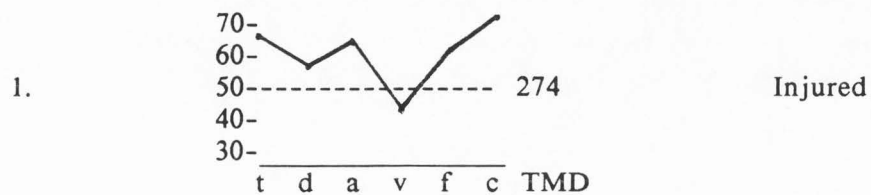
It is interesting to note, however, that during the first month of data collection while she was injured, all of her scores decreased by at least one standard deviation except for Vigor, which increased on one-half of a standard deviation. This could perhaps be attributed to an increased sense of well-being and

Figure 4

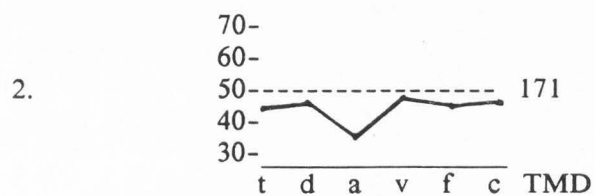
Profile Changes During Rehabilitation and Subsequent Injury in Gymnast Number 4

Assessment Period

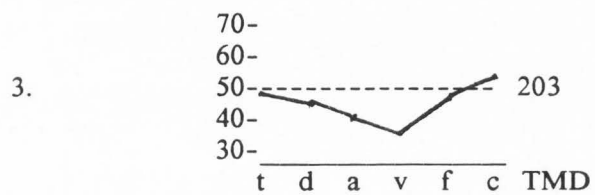
Status



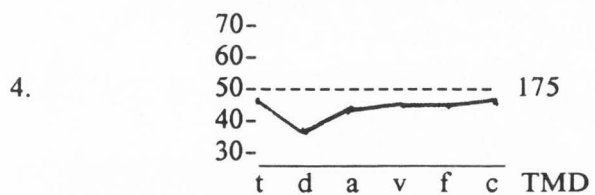
Injured



Injured

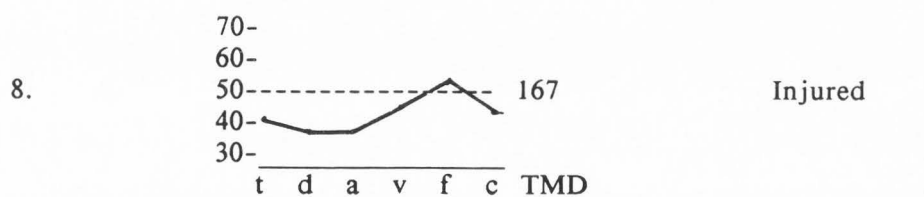
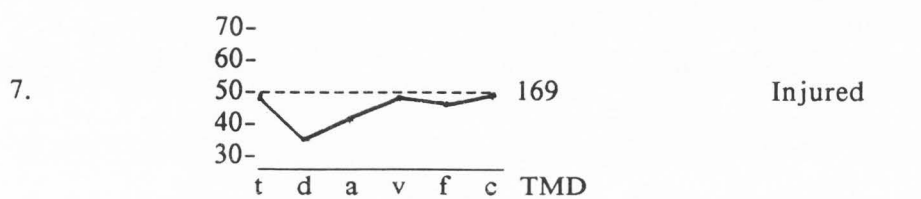
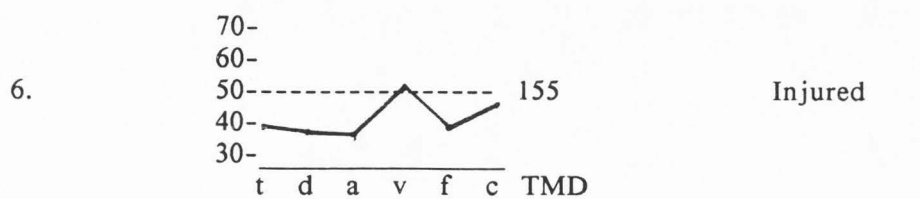
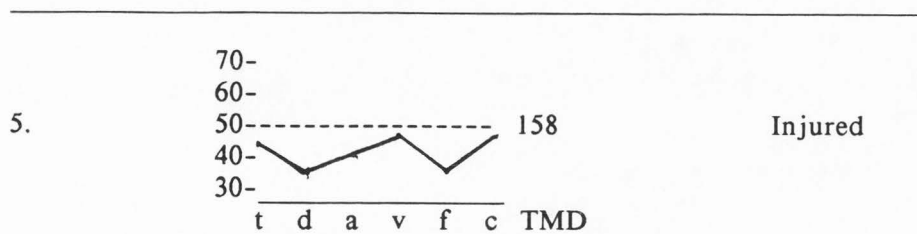


Healthy



Healthy

Figure 4 (Continued)



fitness brought on by rehabilitation. At the time of her second injury, this gymnast's profiles showed no significant changes, as was the case throughout the remainder of data collection.

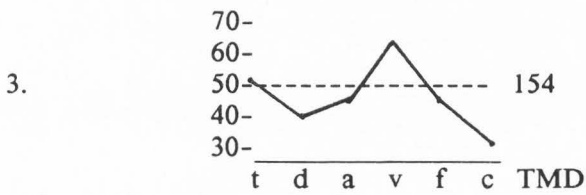
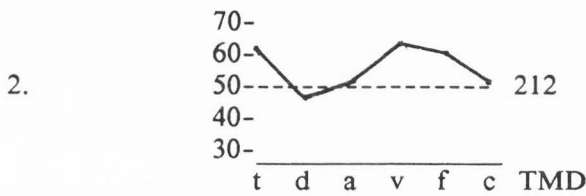
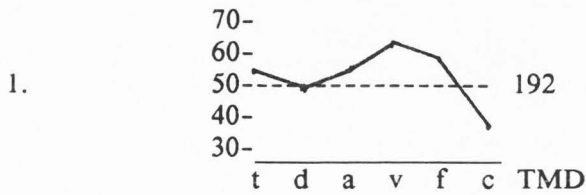
Gymnast number 5 was injured initially nine months prior to the beginning of data collection and was redshirting (not participating) during the 1986-87 season. No pre-injury or post-injury data is available on this gymnast. Her injured-status profiles exhibit some interesting changes coinciding with events in her life concerning her injury and future in gymnastics (see Figure 5). For the first two assessment periods, her profiles were generally the same, moderately high on Tension, Vigor, and Fatigue. During this time she reported no special events or unusual circumstances. At assessment period 3, she reported that she had an upcoming appointment with the physician treating her injury. Her profile changed to nearly an iceberg profile with the exception of Tension at a T-score of 51. This change may be explained as being in anticipation of good news from her physician coupled with anxiety over the situation. A drastic change in her profile was seen at assessment period 4, after she had been to her physician and was told she would need surgery. She also reported feeling upset about several personal relationships. These circumstances were reflected in her profile by increases of two standard deviations in Depression and Confusion, three standard deviations in Anger, and a decrease in vigor of two standard deviations. Her Total Mood Disturbance score increased by 115 points. Her next profile at assessment period 5 showed a decrease in Anger of almost two standard deviations with no other significant changes. She reported feeling less angry and frustrated after taking a trip home to see her family. At assessment period 6, the gymnast reported that she was going to see a specialist about her injury. Her profile at the time was the only iceberg profile this gymnast had over the entire data collection period. Again, this may be

Figure 5

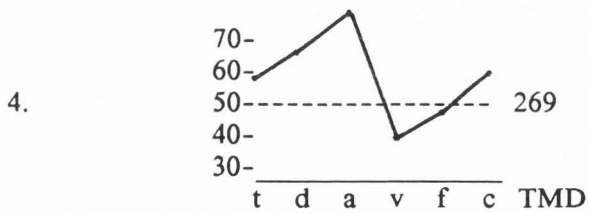
POMS Profiles and Coincidental Life Events of Gymnast Injured for Entire Season

Assessment Period

Coincidental Events

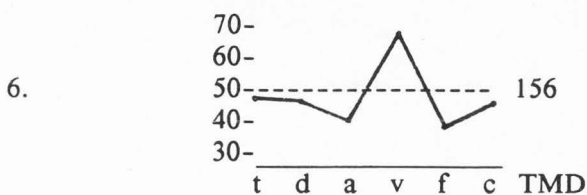
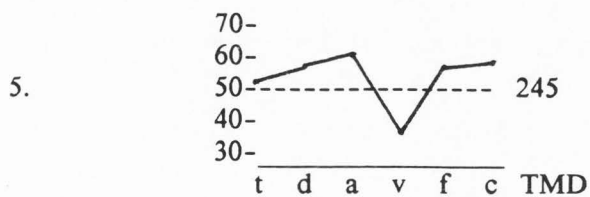


Anticipating
visit to
her physician.

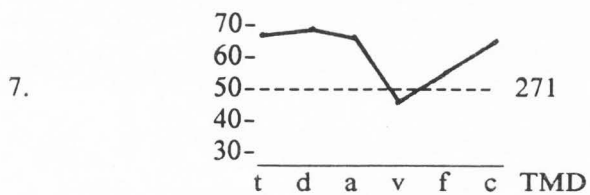


After 2 visits
to physician.
Told she
needed surgery.
Personal conflicts.
Final exams.

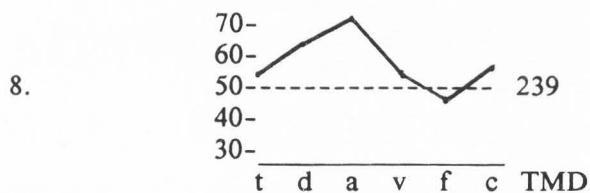
Figure 5 (Continued)



Anticipating
visit to
specialist.



Results of visit
to specialist.
Must have
additional surgery
and retire from
gymnastics.



interpreted as anticipation of a positive outcome upon her visit to the physician. The significant changes in her profiles from assessment period 5 to 6 were decreases in Anger, Fatigue, and Confusion, and an increase in Vigor of three standard deviations.

It is possible to look at this gymnast's profiles throughout data collection and plot her emotional status according to the circumstances of the treatment of her injury and how her disability would affect her future as a gymnast.

Comparing the five gymnasts who were injured prior to or during the course of the 1986-87 season with the non-athletes matched with each gymnast, it can be seen that the non-athletes' POMS profiles were consistent (did not change significantly) at the time when each gymnast was injured and/or was recovering from injury (see Figure 6). Thus, the changes in the gymnasts' profiles at the time of injury and rehabilitation are likely to be due to the effects of injury rather than to school-, age-, or sex-related events which would have been seen in the nonathlete's profiles as well.

Because of a lack of consistency in POMS profile changes in injured athletes, it is difficult to make any conclusions based on the observations made in this study regarding the direction or degree of change of POMS scores as a result of injury. However, the hypothesis (H_{01}) of no significant change in POMS factor and Total Mood Disturbance scores as a result of injury is not supported. Significant changes were detected as a result of injury. Furthermore, significant changes were evident in POMS scores of the gymnast who redshirted for the season and eventually retired from the sport. Observation of this gymnast's profiles gives further evidence of significant emotional change as measured by the POMS, not only as a result of injury, but also in response to concomitant treatment of the injury and eventual outcome of that treatment.

Figure 6

POMS Profiles of Matched Pairs of Injured Gymnasts and Non-Athletes

Assessment Period

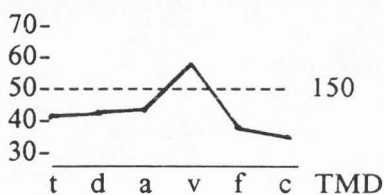
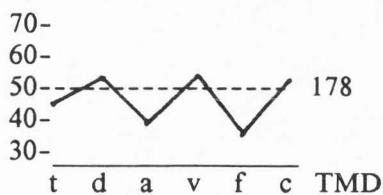
Injured Gymnast and Non-Athlete Pairs

Pair Number 1

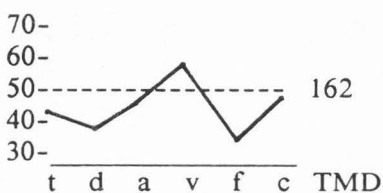
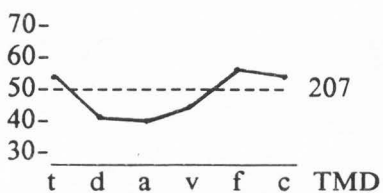
Gymnast

Non-Athlete

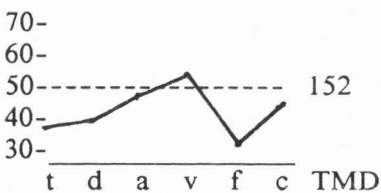
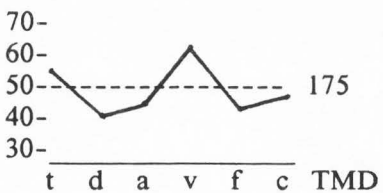
1.^a



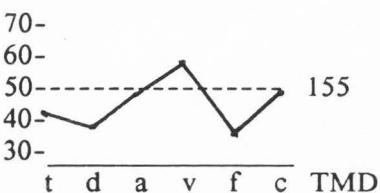
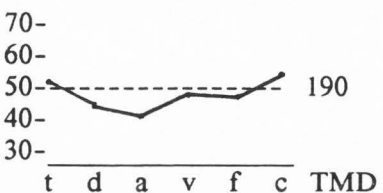
2.^a



3.



4.



^aGymnast injured at this time.

Figure 6 (Continued)

Pair Number 1

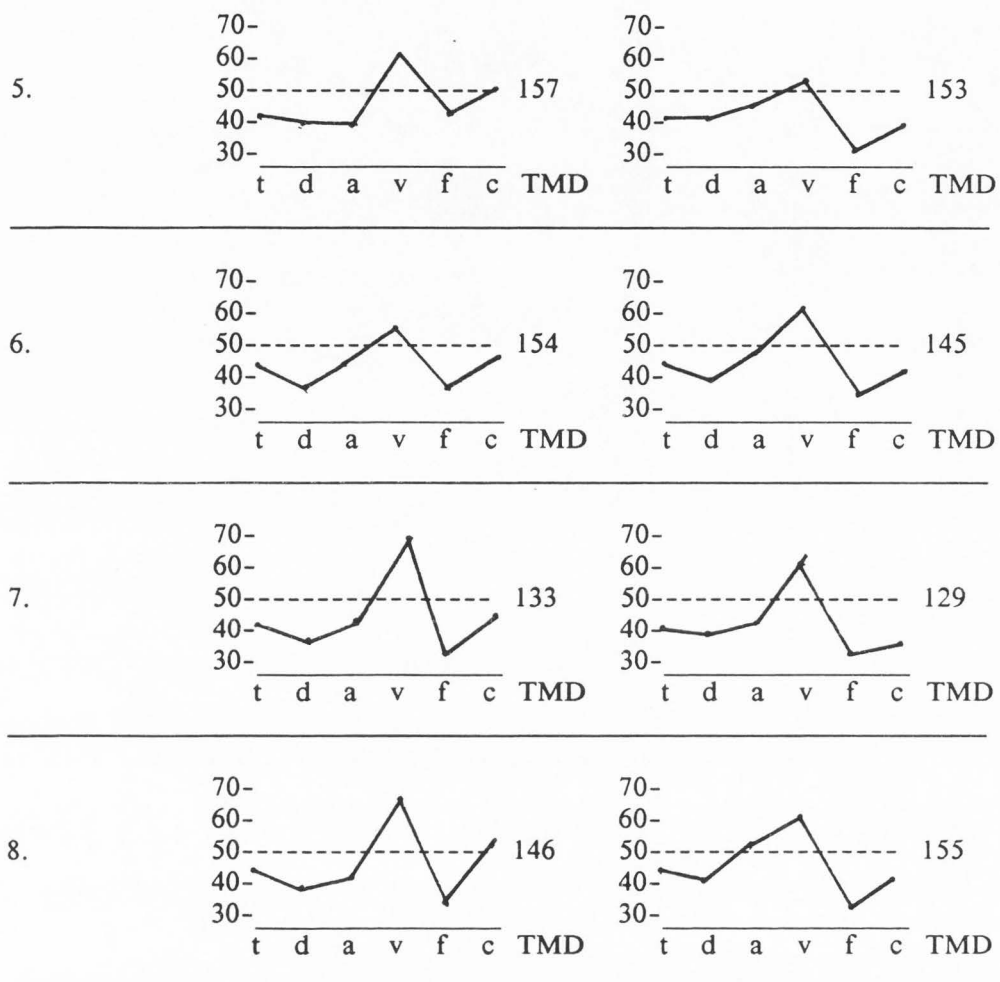
^aGymnast injured at this time.

Figure 6 (Continued)

Assessment Period

Injured Gymnast and Non-Athlete Pairs

Pair Number 2

Gymnast

Non-Athlete

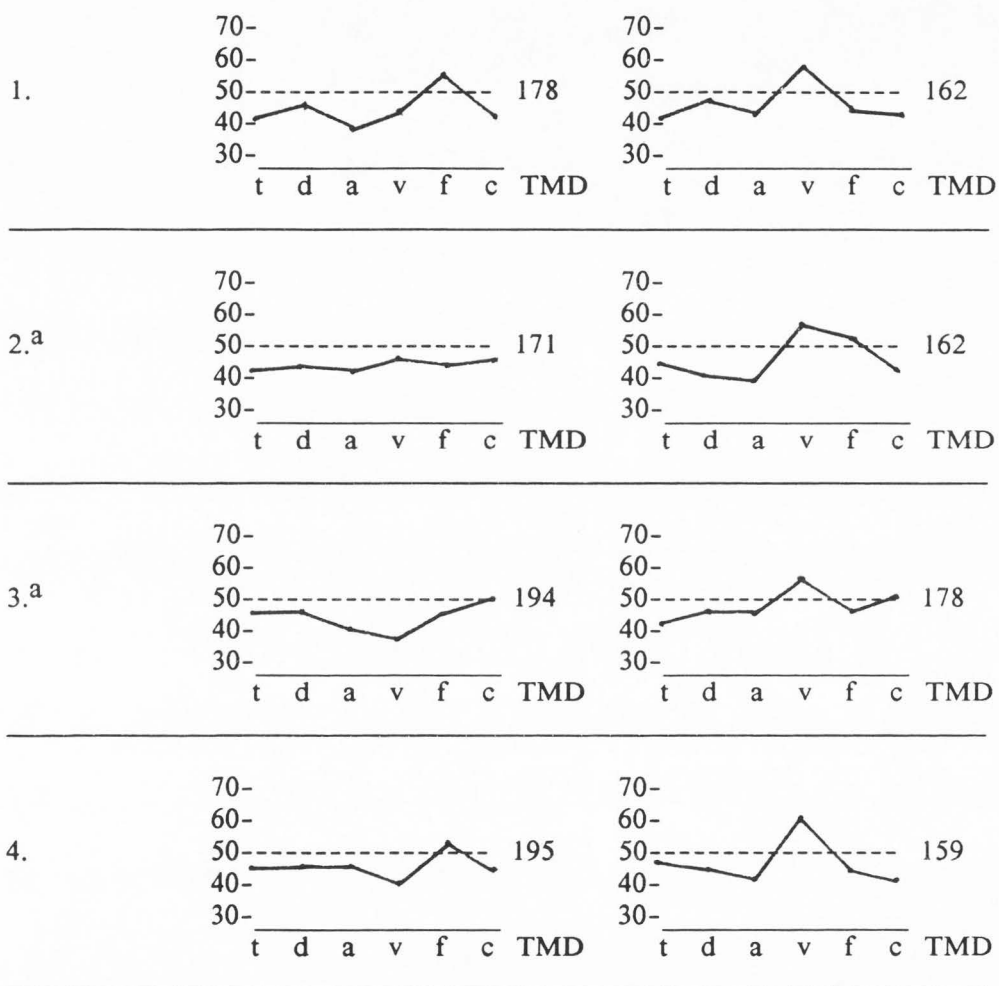
^aGymnast injured at this time.

Figure 6 (Continued)

Pair Number 2

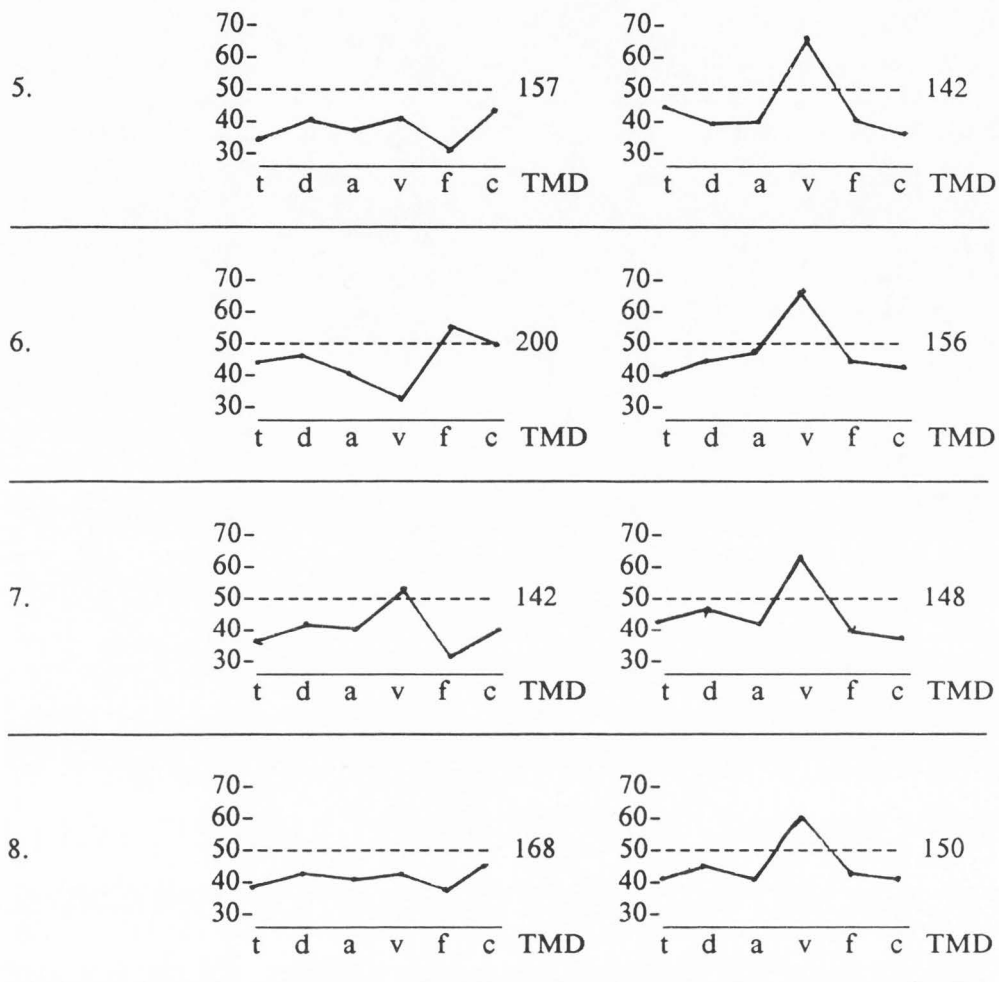
^aGymnast injured at this time.

Figure 6

Assessment Period

Injured Gymnast and Non-Athlete Pairs

Pair Number 3

Gymnast

Non-Athlete

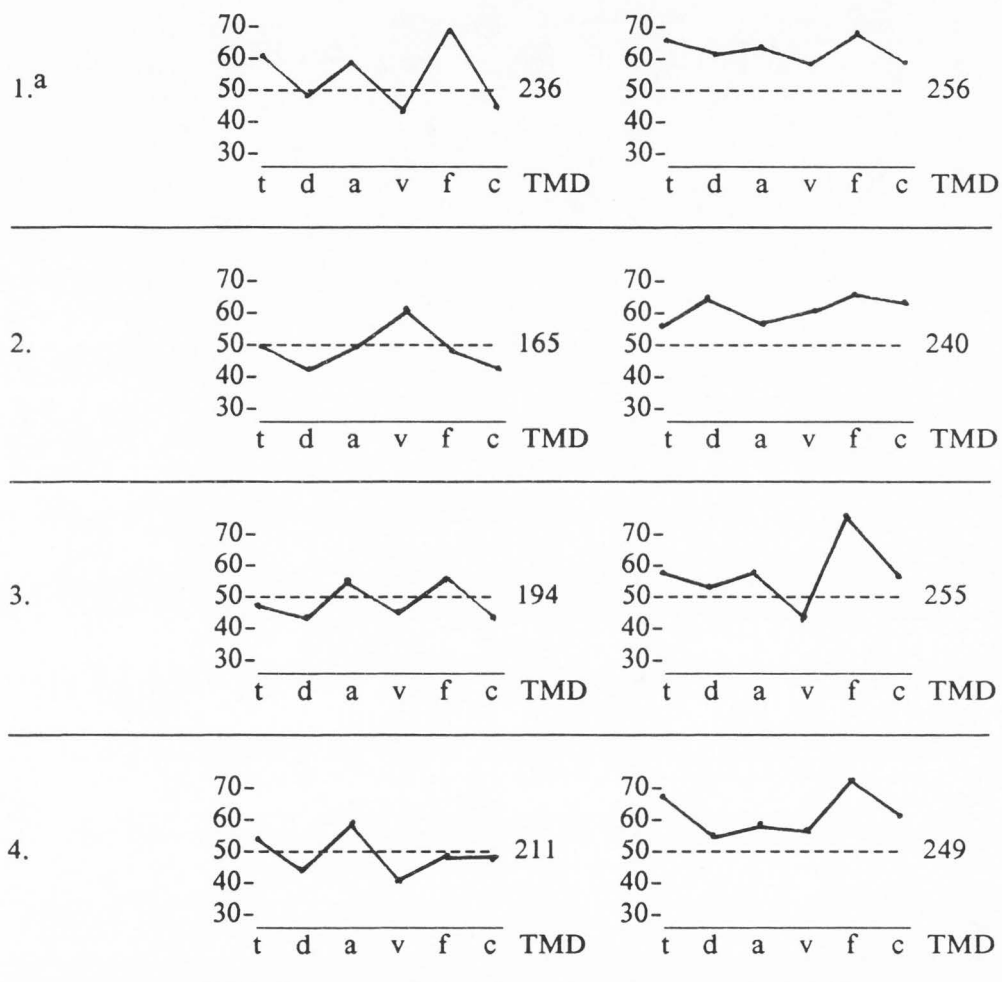
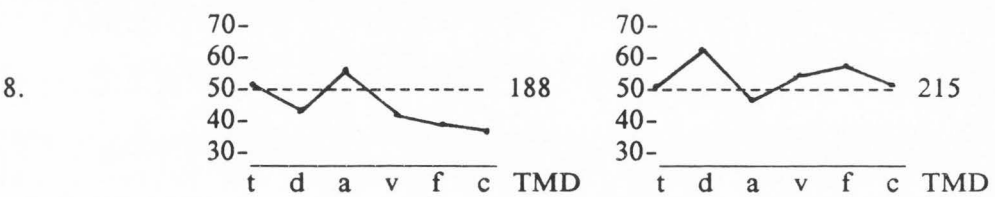
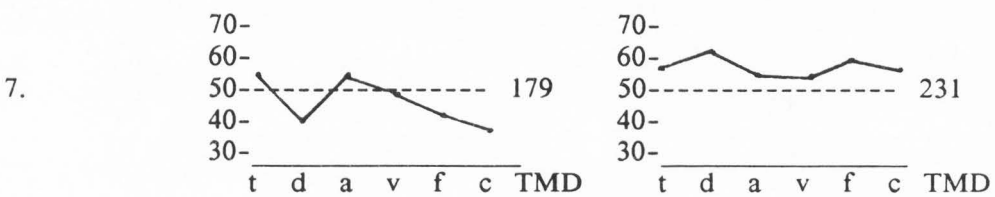
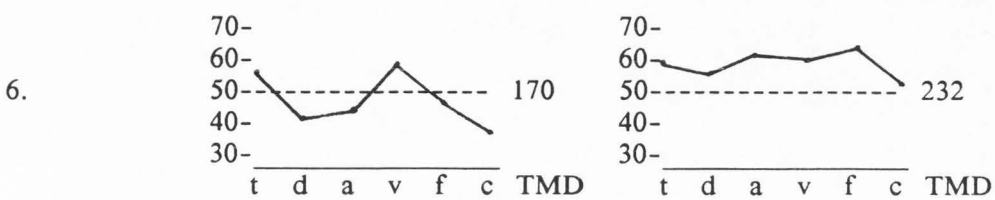
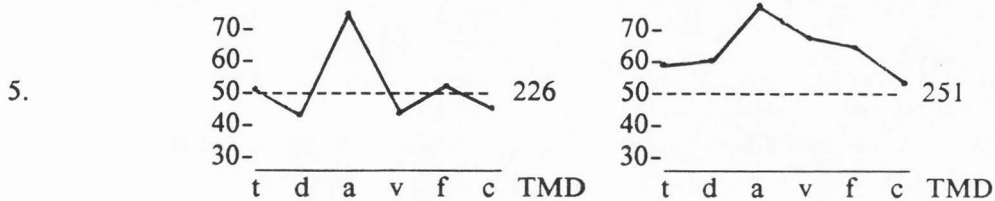
^aGymnast injured at this time.

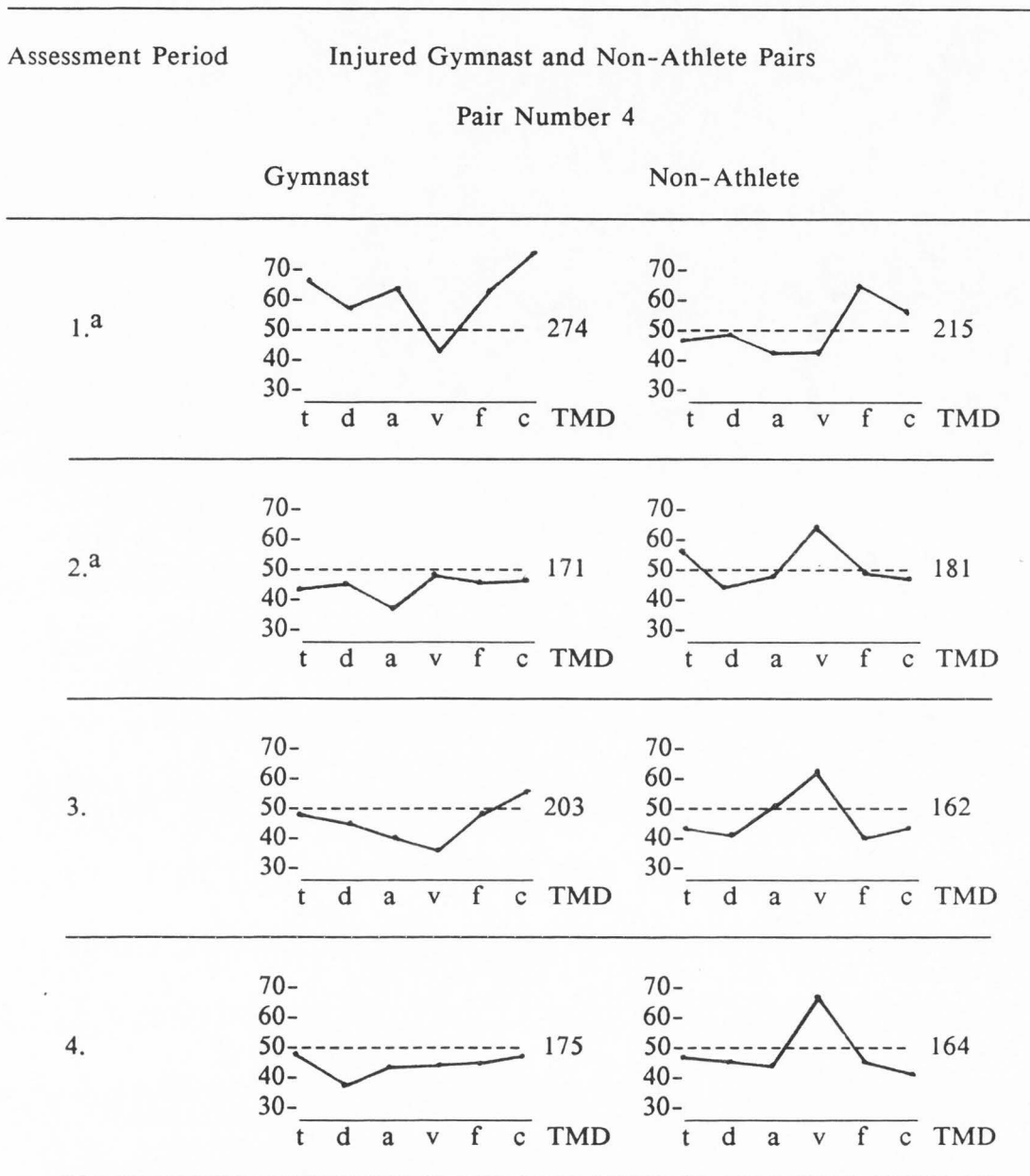
Figure 6 (Continued)

Pair Number 3



^aGymnast injured at this time.

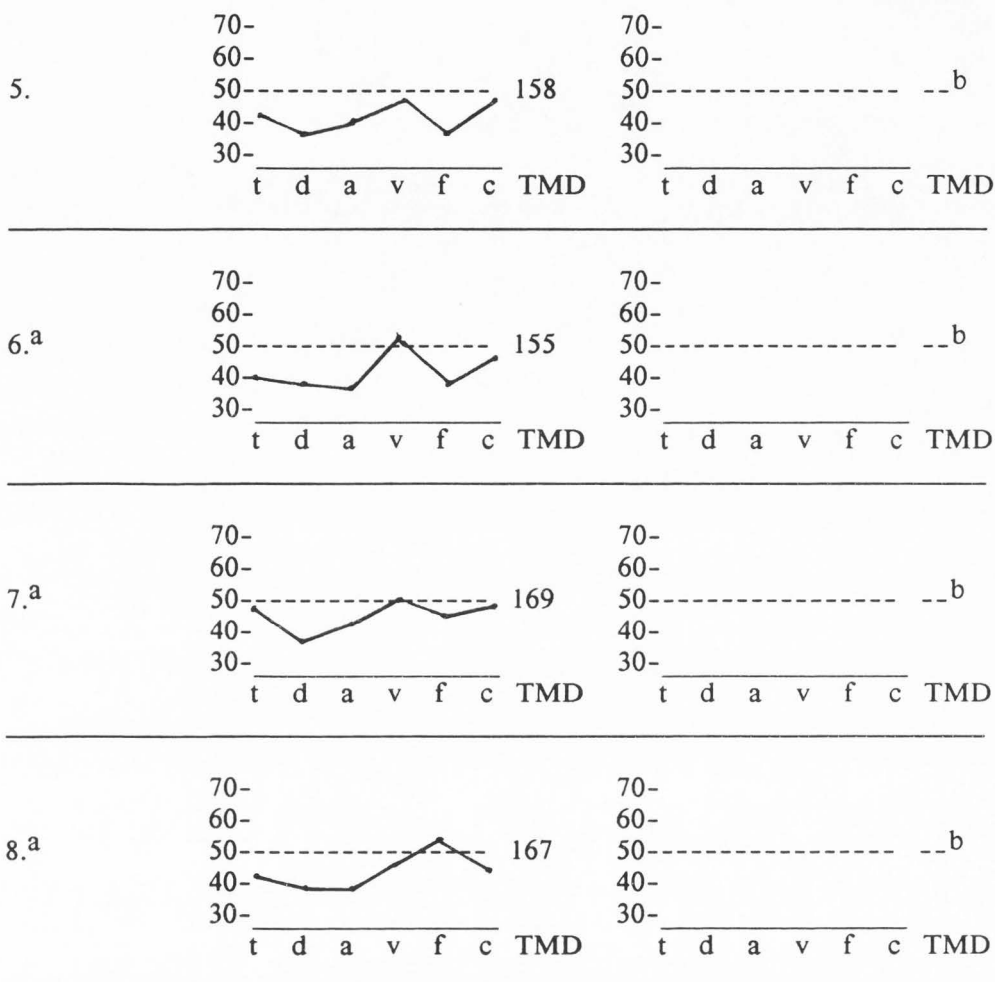
Figure 6



^aGymnast injured at this time.

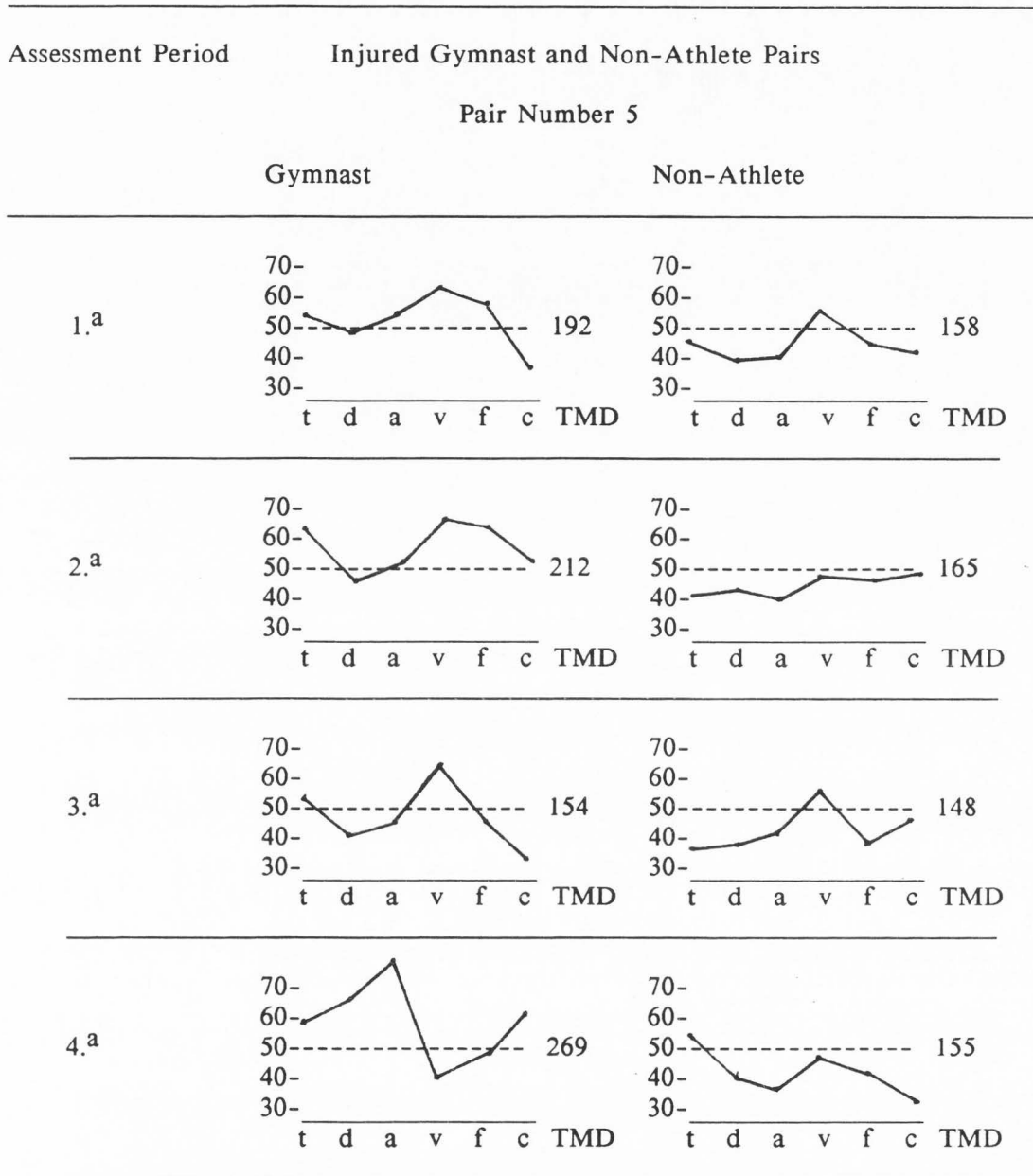
Figure 6 (Continued)

Pair Number 4



^aGymnast injured at this time. ^bNon-athlete moved out of the country and was unavailable for this assessment.

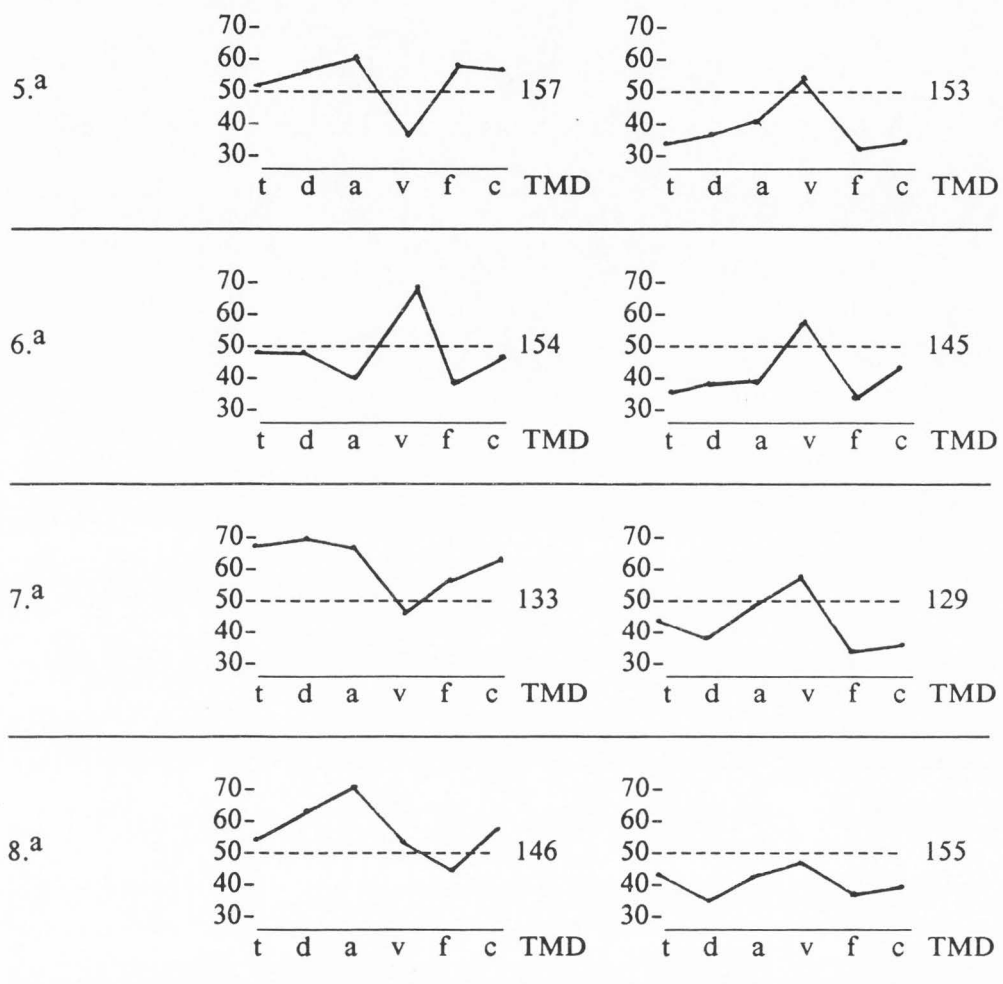
Figure 6



^aGymnast injured at this time.

Figure 6 (Continued)

Pair Number 5

^aGymnast injured at this time.

Total Mood Disturbance scores of 11 matched pairs of non-injured gymnasts and non-athletes for each assessment period were compared by t tests for individual differences (see Table 1). Three of the pairs were found to differ significantly on TMD at various assessment periods, although no definite pattern was seen. Of the 76 t values presented in Table 1, only eight were significant (approximately 11 percent of the figures). In addition, Total Mood Disturbance scores over all eight assessment periods were studied comprehensively to compare each non-injured gymnast with her non-athlete counterpart (see Table 2). Out of 11 pairs, only two differed significantly (18 percent of the pairs). As a result, further t -tests of the separate factor scores (of which the Total Mood Disturbance score is a composite) was deemed unnecessary. These low percentages of significant differences lend support to the null hypothesis (H_{02}) of no difference between POMS factor and TMD scores of non-injured female collegiate gymnasts and non-athlete female college students.

The group of non-injured gymnasts was compared with the group of nonathlete control subjects by means of t tests of the POMS factor and Total Mood Disturbance scores from all eight assessment periods (see Table 3). Again, no significant differences were found between these two groups. These results give additional support to the hypothesis (H_{02}) of no difference between the gymnasts and non-athletes in this study.

The small number of subjects in each group in this analysis places a limitation on these results. Therefore, the question of how different the groups are cannot unambiguously be answered. Gymnasts and non-athletes truly may not differ substantially in mood state, but further research is needed before making any conclusions. Female collegiate gymnasts may bear a great similarity to non-athlete

Table 1

Individual Pairs Comparisons by t tests of Total Mood Disturbance Scores for Each Assessment Period

Pair	Assessment Period							
	1	2	3	4	5	6	7	8
1	4.26**	-1.24	-.95	.06	-	-.28	-1.50	-.64
2	1.36	1.41	2.14	1.78	1.37	1.45	2.10	1.71
3	-.07	-2.03	-.36	-1.97	-1.90	-.61	-1.82	-1.19
4	2.90*	4.63**	5.14**	2.03	.86	1.88	2.99**	4.97**
5	1.65	1.11	.89	1.64	-2.11	-.50	.00	.32
6	.97	1.40	.91	1.92	1.49	2.88*	.10	3.38*
7	-1.30	-.91	.38	-.92	-.54	-1.76	-.25	-1.59
8	-	-	-	.21	-1.44	-	-	-
9	-	-1.53	-3.16	1.08	-4.09	-4.46	-2.98	-2.12
10	-.53	-	-	-.42	-1.44	-.44	-2.63	-.21
11	-	-	2.10	.79	.98	-.32	1.65	.84

Note. Use of a dash in cells indicates assessment periods when gymnast was injured and data was not included for this analysis. Pairs composed of non-injured gymnasts and non-athletes.

* $\alpha = .05$, two-tailed. ** $\alpha = .01$, two-tailed.

Table 2

Individual Pairs Comparisons by t tests of Total Mood Disturbance Scores for Combined Assessment Periods

Pair Number	t	<u>n</u> ^a
1	-1.03	7
2	1.88	8
3	-1.89	8
4	4.81**	8
5	1.24	8
6	-.30	8
7	-4.35	8
8	.08	2
9	-6.75	7
10	2.85*	6
11	1.72	6

Note. Pairs composed of non-injured gymnasts and non-athletes. ^an=number of assessment periods completed by the pair while the gymnast was uninjured.

* $\alpha = .05$, two-tailed. ** $\alpha = .01$, two-tailed.

Table 3

Group Comparisons by t tests of POMS Factor and Total Mood Disturbance (TMD)
Scores for Combined Assessment Periods

Variable	Non-Injured Gymnasts ^a		Non-Athletes ^b		t^b	$r_{pt\ bis}$
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>		
Tension	46.44	7.30	44.42	4.95	-.79	-.17
Depression	44.06	7.41	45.60	6.80	.52	.11
Anger	47.19	8.96	48.84	6.18	.52	.11
Vigor	53.78	8.99	54.00	7.82	.06	.01
Fatigue	46.66	4.55	44.47	7.65	-.82	-.17
Confusion	43.68	7.85	43.87	6.45	.06	.01
TMD	175.12	37.23	172.48	34.22	-.18	-.03

^a $n=11$. ^b $n=12$. ^cCriterion $t(21)=2.086$; $\alpha = .05$, two-tailed.

female college students, a similarity which may not be seen in studies of non-students or subjects from different age groups.

Of the seven gymnasts in this study who never sustained an injury or illness which kept them out of practice and/or competition for one week or more, only one scored in the iceberg profile configuration for the entire four months of data collection (see Appendix K). Of all 55 profiles of these seven healthy gymnasts throughout the entire study, 20 (36.4 percent) were iceberg profiles. These results generally support the null hypothesis (H_{03}) which states that POMS profiles of non-injured, female, collegiate gymnasts will not approximate the iceberg profile. Visual inspection of the non-athletes' 92 possible POMS profiles throughout the study yields a total of 19 (20.7 percent) iceberg profiles. It should be noted that the non-athletes' profiles were more consistent in configuration over the four months of the study than were the gymnasts' profiles. Again, this analysis is limited by the small sample size in each group. A larger sample might indicate more effectively if iceberg profiles are predominant in gymnasts or non-athletes.

Internal consistency and test-retest reliability coefficients were computed for both gymnasts and non-athletes on the POMS. These figures are displayed in Tables 4 and 5.

The internal consistency reliabilities are similar to those reported in the POMS manual (McNair, Lorr, & Droppleman, 1971), with the exception of Confusion which is much lower for the gymnasts than for the POMS normative groups and for the non-athletes in this study.

The stability coefficients for the gymnasts are similar to those reported for the normative groups in the POMS manual, except for the Fatigue factor which had an extremely low reliability of .25. The reliability coefficients for the non-athlete subjects are quite high, all above .80, except for Anger at .68. This reflects the

Table 4

Internal Consistency Reliability Coefficients

Variable	Gymnasts ^a	Non-Athletes ^a
Tension	.93	.86
Depression	.77	.91
Anger	.81	.82
Vigor	.97	.91
Fatigue	.95	.92
Confusion	.47	.88

Note. Based on Coefficient Alpha Correlations of data from assessment period 4.

^an=11

Table 5

Test-Retest Reliability Coefficients

Variable	Gymnasts ^a	Non-Athletes ^b
Tension	.74	.81
Depression	.64	.85
Anger	.70	.68
Vigor	.44	.83
Fatigue	.25	.93
Confusion	.50	.80
TMD	.63	.94

Note. Based on Pearson product-moment correlations of data from assessment periods 3 and 4 which were two weeks apart.

^a \underline{n} =10. ^b \underline{n} =12.

consistency seen in the profiles of the non-athletes whose scores generally varied minimally from week to week. The gymnasts may have experienced wider mood swings than the non-athletes due to the additional stress placed on them by practice, competitions, or injury, resulting in more varied scoring and lower stability coefficients.

CONCLUSIONS AND RECOMMENDATIONS

The need for understanding the psychological effects of injury in athletes for the purpose of providing appropriate treatment is clear. Research is limited on this subject, however, and most current knowledge has come from clinical observation of injured athletes. Although team personnel and sports medicine professionals may be aware of the devastation wrought by serious injury, the emotional response of the athlete is often taken for granted and the athlete receives little or no treatment for the psychological injury he or she experiences (May & Sieb, 1987).

This study attempted to demonstrate a relationship between physical injury and resultant emotional changes as measured by the Profile of Mood States. Significant changes did occur on several POMS factors, specifically Vigor, Fatigue, and Tension, at times which coincided with injury or rehabilitation in injured gymnasts. Furthermore, non-athletes' POMS profiles were largely consistent in contrast to the injured gymnasts', which suggests the changes in the gymnasts' profiles were related to injury, and not to events common to both groups.

It was also demonstrated that the non-injured gymnasts' and non-athletes' profiles are not significantly different from one another. Perhaps the age, sex, and major interest similarities bear more weight when mood states of female college students are compared than does the variable of athletic participation. It is remarkable that the gymnasts and non-athletes did not differ in mood state any more than they did, considering the unique stresses the gymnasts endured. Observation of the USU gymnastics team yielded greater awareness for the researcher of the pressure and restrictions these young women place on themselves. The stress of daily practice, physical aches and pains, fatigue, maintaining proper weight and diet, and of competing is considerable. Yet, in addition there is the stress of "measuring up" to personal performance demands placed on the gymnast by her own ego. There

is the fear of falling short of expectations of family, friends, coach and teammates, of not being able to maintain or increase skill level, and the feeling of disappointment at failure. For the student athlete, there is the added stress of competing scholastically and the time conflicts of practice versus study. Aches and pains can also affect ability to concentrate. Although athletes may be on scholarships, at times they may be faced with financial difficulties, but time reserved for practice is not available for working. Finally, time unavailable for social activities reduces the opportunities for relaxation and enhancement of one's personal network or support system outside of the team. If the team-oriented gymnast who has few outside-of-team social contacts becomes injured severely and must give up her sport, she may not have a support system to provide emotional reinforcement. This may be especially difficult for a gymnast who sees her healthy former teammates as a sad reminder of skill, years, and belongingness lost.

In spite of the pressures they experience, the healthy gymnasts in this study scored very similarly to the non-athletes, although the profiles of the latter group appeared to be more consistent over time. Neither groups' profiles were outstandingly healthy, as defined by the iceberg profile. Instead, their profiles reflected what are perhaps more normal and expectable mood states of young adult females who are undergoing the dynamics of being college students in this day and age.

The relatively low percentage (36.4) of iceberg profiles of the non-injured gymnasts neither supports nor contradicts Morgan's (1979) work, since his subjects were male elite athletes participating in sports other than gymnastics. The lifestyle and mood states of collegiate female gymnasts are very likely to be different from elite male wrestlers, oarsmen, and runners. The present study was able to demonstrate the iceberg configuration, however, and the changes seen in POMS profiles in

the course of medical treatment of Gymnast number 5 demonstrates the ability of the POMS to reflect changes in mood state relative to injury and treatment.

The iceberg profile is perhaps a useful indicator of a sense of improvement, hopefulness, and well-being. Recognition of the iceberg profile and its accompanying improvement in mood state, in conjunction with an effective use of therapy in the course of treatment of injury, could be a means of timing psychological and physical interventions so as to accelerate recovery as much as possible. On the other hand, the iceberg profile could be an indicator of getting one's hopes too high, as may have been the case with the gymnast who had great expectations for her visits to her physician. When reality struck, her profile had farther to "fall", and so did her emotions. In this regard, recognition of the iceberg profile may be useful for enhancing the athlete's sense of realistic expectations about the possibility of rehabilitation. Either way, the profiles generated by the POMS over an extended period of time appear to have utility for increasing awareness of the athlete's emotional state. Appropriate responses to those emotions evidenced by the POMS may be a crucial element in both the psychological and physical treatment of injured athletes (Albert & Gordin, in prep.)

Further research could make use of a greater number of injured subjects so as to make more generalizable conclusions about the effects of injury. Future studies would also be designed so as to collect more pre-injury data than was available in the present research. This would facilitate more precise study of the emotional changes which occur at the time of injury when initial contact and intervention may be the most critical. It may be that appropriate treatment immediately after the injury occurs could set a positive emotional tone for the entire rehabilitation period.

It is also suggested that successful and unsuccessful male, female, professional, elite, and recreational athletes of a variety of ages in different sports could be investigated and compared on their emotional responses to injury. The responses of handicapped athletes to being injured would be complex and certainly interesting to study. Athletes who experience repeated injuries in the course of a season or career would add valuable insight into knowledge of how best to treat injured athletes. Use of instruments supplemental to the POMS to aid in defining emotional responses or to focus on body-image, self-esteem, locus of control, or other factors would be useful.

The purpose of these suggestions is not to inspire further research which would be done for the sake of pure knowledge only. Rather, it is for the purpose of understanding, as health professionals, athletic trainers, coaches, sport psychologists, or any team personnel, how to best respond to the athlete whose body has undergone the physical shock of injury and whose mind must respond to and deal with the reality of disability.

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APPENDICES

Appendix A.
Profile of Mood States

NAME _____

SEX: Male Female

Below is a list of words that describe feelings. Read each word carefully. Then fill in ONE circle under the word that best describes HOW YOU HAVE BEEN FEELING DURING THE PAST WEEK.

The numbers refer to these phrases.

- 0 = Not at all
- 1 = A little
- 2 = Moderately
- 3 = Quite a bit
- 4 = Extremely

Col O P

- | | | |
|--------------------------|-------|--|
| | | NOT AT ALL
A LITTLE
MODERATELY |
| 1. Friendly | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 |
| 2. Tense | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 |
| 3. Angry | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 |
| 4. Worn out | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 |
| 5. Unhappy | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 |
| 6. Clear-headed | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 |
| 7. Lively | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 |
| 8. Confused | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 |
| 9. Sorry for things done | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 |
| 10. Shaky | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 |
| 11. Listless | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 |
| 12. Peeved | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 |
| 13. Considerate | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 |
| 14. Sad | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 |
| 15. Active | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 |
| 16. On edge | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 |
| 17. Grouchy | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 |
| 18. Blue | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 |
| 19. Energetic | | <input type="radio"/> 0 <input checked="" type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 |
| 20. Panicky | | <input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 |

Appendix B.Information Questionnaire for Gymnasts

This questionnaire asks for information about the past two weeks. Please be as honest and accurate as you can. Read carefully and answer all of the items as directed. You may wish to use a calendar to remember some of the dates.

1. Have you had an injury that caused you to miss an entire week of gymnastics practice or competition in the past two weeks?

Yes___ No___

If you answered yes to #1, please answer questions #2-6. If no, please go on to #7.

2. What date did you get injured? Date_____

3. Have you returned to practice? Yes___ No___

4. If yes, what date did you return? Date_____

5. How many days were you unable to fully participate?

Number of days_____

6. How do/did you feel about being injured?_____

7. Have you been unable to practice or compete in the past two weeks because of being sick? Yes___ No___

8. If yes, how many days were you unable to go to practice?

of days_____

9. Have any of the following important events happened to you in the past two weeks? Please check if yes.

___a. My parents are getting divorced

___b. My family members are arguing a lot

___c. I had a big argument with my family, boyfriend, or other friend(s)

___d. I broke up with my boyfriend

___e. I started to date someone new

___f. My boyfriend/best friend is moving out of town

___g. I got a bad grade on an important test

___h. I did very well on an important test

___i. Death or severe illness of family member or friend

___j. Death of a pet

___k. I got my menstrual period

___l. I was in a car accident

___m. I was fired from my job

___n. I just started a new job

___o. OTHER, PLEASE SPECIFY_____

- m. I was fired from my job
- n. I just started a new job
- o. OTHER, PLEASE SPECIFY _____

10. Are any other important events going on in your life? If so, please list

11. Did you have any competitions in the past two weeks?

Yes ___ No ___

12. How do you think you did at that competition?

a. ___ I did well

b. ___ I did not do well

13. Do you have any important tests in the next two weeks?

Yes ___ No ___

14. Are there any other important events coming up in the next two weeks?

Yes ___ No ___

15. If yes, please list and give dates _____

Appendix C.
Information Questionnaire for Non-Athletes

This questionnaire asks for information about the past two weeks. Please be as honest and accurate as you can. Read carefully and answer all of the items as directed. You may wish to use a calendar to remember some of the dates.

1. Have you gotten injured or ill in the past two weeks?
 Yes___ No___
2. What kind of injury or illness did/do you have? _____

3. Has this injury or illness caused you to miss school, work, or any other important event? Yes___ No___

If you answered yes to #3, please answer questions #4-7. If not, go on to #8.

4. What date did you get injured or ill? _____
5. What events/activities have you missed? _____

6. How many days did you miss school, work, and/or other activities? _____
 When did/will you resume these activities? _____
7. How do/did you feel about being injured or ill and unable to go to school, work, or other activities? _____

8. Have any of the following important events happened to you in the past two weeks? Please check:
 - ___a. My parents are getting divorced
 - ___b. My family members are arguing a lot
 - ___c. I had a big argument with my family, boyfriend, or other friend(s)
 - ___d. I broke up with my boyfriend
 - ___e. I started to date someone new
 - ___f. My boyfriend/bestfriend is moving out of town
 - ___g. I got a bad grade on an important test
 - ___h. I did very well on an important test
 - ___i. Death or severe illness of family member or friend
 - ___j. Death of a pet
 - ___k. I got my menstrual period
 - ___l. I was in a car accident
 - ___m. I was fired from my job
 - ___n. I just started a new job
 - ___o. OTHER, PLEASE SPECIFY _____

- m. I was fired from my job
- n. I just started a new job
- o. OTHER, PLEASE SPECIFY _____

9. Are any other important events going on in your life? If so, please list

10. Have you had any important tests in the past two weeks?

Yes___ No___

11. Do you have any important tests in the next two weeks?

Yes___ No___

12. Are there any other important events that are coming up in the next two weeks? Yes___ No___

13. If yes, please list and give dates _____

Appendix D.
Profile Graphing Sheet

Pair Number ____

Assessment Period	Gymnast	Non-Athlete
1. Date ____ Status ____	70- 60- 50----- 40- 30- _____ TMD t d a v f c	70- 60- 50----- 40- 30- _____ TMD t d a v f c
2. Date ____ Status ____	70- 60- 50----- 40- 30- _____ TMD t d a v f c	70- 60- 50----- 40- 30- _____ TMD t d a v f c
3. Date ____ Status ____	70- 60- 50----- 40- 30- _____ TMD t d a v f c	70- 60- 50----- 40- 30- _____ TMD t d a v f c
4. Date ____ Status ____	70- 60- 50----- 40- 30- _____ TMD t d a v f c	70- 60- 50----- 40- 30- _____ TMD t d a v f c

5.	70-	70-
Date _____	60-	60-
Status _____	50-----	50-----
	40-	40-
	30-	30-
	<u> </u>	<u> </u>
	t d a v f c TMD	t d a v f c TMD

6.	70-	70-
Date _____	60-	60-
Status _____	50-----	50-----
	40-	40-
	30-	30-
	<u> </u>	<u> </u>
	t d a v f c TMD	t d a v f c TMD

7.	70-	70-
Date _____	60-	60-
Status _____	50-----	50-----
	40-	40-
	30-	30-
	<u> </u>	<u> </u>
	t d a v f c TMD	t d a v f c TMD

8.	70-	70-
Date _____	60-	60-
Status _____	50-----	50-----
	40-	40-
	30-	30-
	<u> </u>	<u> </u>
	t d a v f c TMD	t d a v f c TMD

Appendix E.
Gymnast's Information Letter and
Informed Consent Form

Dear Gymnast,

This letter is an introduction to research being conducted to help gymnasts who get injured. I am a Master's student in Counseling Psychology at Utah State University. I'm doing a project on the emotional effects of injury in female collegiate gymnasts, and I would like to include you in my study.

Oftentimes, when a gymnast becomes injured, she may feel different emotions than those she usually feels, especially if she is unable to participate in gymnastics as she normally would. Being able to practice and compete is very important to all athletes, as you probably know. If you've ever been injured, you may have experienced feelings such as depression, nervousness, or anger when you were unable to practice or compete and could only "sit on the sidelines". The purpose of this study is to find out exactly which emotions result from injury so that coaches, athletic trainers, parents, and others can help the injured gymnast to understand her feelings. Dealing with the negative emotions associated with injury can help the gymnast to develop a better attitude about her physical rehabilitation, which may allow her to return to participation sooner.

I will administer a brief questionnaire to you twice per month for four months. The questionnaire will consist of the Profile of Mood States (McNair, Lorr, and Droppleman, 1971) and 15 additional questions on an Information Questionnaire which I have constructed. You'll be asked questions about how you feel emotionally (such as happy, sad, confused, or angry), about important events going on in your life, and whether or not you have been injured or ill recently. If you do become injured or ill, it will be especially important that you continue to complete the survey forms so that we can find out what happens to you emotionally when you get hurt or sick. I would also like to briefly interview you if you get injured. If you are injured or ill so severely that you are in the hospital or confined to home, it would be important that I could get the survey forms to you so you can complete them. We will meet as a group twice per month to complete the forms as part of your previously scheduled meetings with Rich Gordin, and total time needed to complete the forms will be 30 minutes or less.

Although I will need to have your name on the surveys, any information you give me will be kept strictly confidential and will only be used for this research. Your name will never be used in any papers, reports, or presentations that will result from this study.

I hope that as a result of this study we can help gymnasts and other athletes who get injured. Before I can even begin this research, however, I need you to sign the Informed Consent form attached to this letter, giving me your permission to include you in the study. Once you have read and signed it, please return it to me as quickly as possible so the study can begin.

Thank you very much for your help and cooperation.

Sincerely,

Nancy Albert
Master's student, researcher

Damian McShane, PhD
Supervisory Committee Chairman

I, (print name) _____, age _____, hereby agree to participate in the study "The Emotional Effects of Injury in Female Collegiate Gymnasts" being done by Nancy Albert, Master's student, Department of Psychology, Utah State University, Logan, Utah. I understand that I will be administered the Profile of Mood States (POMS) and the Information Questionnaire two times per month for four months.

I understand that any information that may identify me will be kept confidential and available only to Nancy Albert and Ms. Albert's Supervisory Committee Chairman, Damian McShane. All identifying papers will be kept under secure conditions in a locked file.

I understand that any information which may identify me will not be used in any publications or presentations of the results of the study, and that at all times Nancy Albert will make every effort to protect the rights and privacy of any persons consenting to participate in this study. I also understand that Ms. Albert can be contacted by phone at (801)-753-1998 if I have questions regarding what will be expected of me. If at any time I wish to withdraw from this study, I understand that I am free to do so without any negative consequences.

Signature

Date

Appendix G.
Limits of Confidentiality

The gymnasts and non-athletes were informed that if the researcher became aware that any subject in this study was responding in such a way that indicated she was severely depressed, fatigued, confused, or suffering from any other potentially dangerous emotional condition, Damian McShane, PhD, a licensed psychologist, would be consulted for the purpose of determining what action, if any, to take to provide support or therapy for that person. No subject's name would be divulged unless it became necessary to do so for protection of the person's well-being. If it was determined by Dr. McShane and the researcher in this consultation that a gymnast's condition was severe and potentially dangerous, her name would have been given to Dr. McShane, he would have informed the team coach of the concerns about the gymnast, and make a decision as to how to proceed. This scenario was not expected to occur and, in fact, did not. However, it was necessary to be prepared for the possibility and to inform the gymnasts and non-athlete subjects of the limits of confidentiality.

Appendix H.
Non-Athlete's Information Letter and
Informed Consent Form

Dear _____,

This letter is an introduction to research being conducted to help us understand the emotional effects of injury and illness. I am a Master's student in Counseling Psychology at Utah State University. I'm doing a research project involving both athletes and non-athletes, and you have been chosen to be included in this study because of certain special qualifications, such as your age, major, and year in school.

Oftentimes, when a person becomes injured, she may feel different emotions than those she usually feels, especially if she is unable to participate in the important activities of daily life such as work, school, or recreation. If you've ever been injured, you may have experienced feelings such as depression, nervousness, or anger. An athlete may also experience these feelings when she is unable to practice or compete and can only "sit on the sidelines". The purpose of this study is to find out exactly which emotions result from injury so that coaches, athletic trainers, parents, and others can help the injured athlete to understand her feelings. Dealing with the negative emotions associated with injury can help the athlete to develop a better attitude about her physical rehabilitation, which may allow her to return to participation sooner.

Because of your age, sex, major, and year in school I would like to invite you to participate in this study as a member of a comparison group. I will administer a brief questionnaire called the Profile of Mood States (McNair, Lorr, and Droppleman, 1971) and another 13-item questionnaire to you twice per month for four months. Both questionnaires ask questions about how you feel emotionally (such as happy, sad, confused, or angry) and about important events going on in your life and will take less than 30 minutes to complete. We will meet as a group on campus two times per month to complete the questionnaires. Although each meeting will be brief, it will be essential that you attend every meeting (all 8 of them) so that I will have complete data for all of our subjects.

Although I will need to have your name on the questionnaires, any information you give will be kept strictly confidential and will only be used for this research. Your name will never be used in any papers, reports, or presentations that will result from this study.

I hope that as a result of this research it will be possible to understand and more effectively help athletes who become injured. Before I can begin this study, however, I need you to read and sign the Informed Consent form attached to this letter, giving me your permission to include you in the study. If you will agree to participate in this study, please sign the form and return it to me before you leave. I will be glad to answer any questions you have.

Thank you very much for your cooperation.

Sincerely,

Nancy Albert
Master's student, researcher

Damian McShane, PhD
Supervisory Committee Chairman

I, (print name) _____, age _____, hereby agree to participate in the study being done by Nancy Albert, Master's student, Department of Psychology, Utah State University, Logan, Utah. I understand that I will be administered the Profile of Mood States (POMS) and the Information Questionnaire two times per month for four months.

I understand that any information that may identify me will be kept confidential, under secure conditions in a locked file, and will be available only to Nancy Albert and Ms. Albert's Supervisory Committee Chairman, Damian McShane, PhD.

I understand that any information which may identify me will not be used in any publications or presentations of the results of the research, and that at all times Nancy Albert will make every effort to protect the rights and privacy of any persons consenting to participate in this study. I also understand that Ms. Albert can be contacted by phone at (801)753-1998 if I have questions regarding what will be expected of me. If at any time I wish to withdraw from this study, I understand that I am free to do so without any negative consequences.

Signature

Date

Appendix I.
Interview Form

1. What kind of injury do you have? _____
2. How long do you think you'll be unable to practice? How do you feel about that?

3. Will you miss any competitions because of your injury? How do you feel about that?

4. How will this injury affect the rest of the season for you?

5. How will it affect the rest of your collegiate gymnastics career?

6. Do you have a scholarship for gymnastics? Will your injury affect your scholarship award? _____
7. How do you feel about returning to practice and competition eventually?

8. How do you perceive the coach's attitude toward you since you got injured? How do you feel about that?

9. How do you perceive the other gymnasts' attitudes toward you since you got injured? Do you think your relationship with your teammates has changed? How do you feel about that?

10. How do you perceive your parents'/family's attitudes toward you since you got injured? How do you feel about that?

11. Are there any other major events going on in your life, such as family problems, problems with your friends/boyfriend(s), school problems, or others?

Appendix J.
POMS Factor and TMD Scores of Matched
Pairs With Corresponding Means (M)
and Standard Deviations (SD)

Pair Number 1	Assessment Period								<u>M</u>	<u>SD</u>
	1	2	3	4	5	6	7	8		
<hr/>										
Gymnast										
Tension	62	31	43	41	-- ^a	41	38	47	43.3	9.6
Depression	54	37	39	40	--	39	39	44	41.7	5.8
Anger	69	45	66	58	--	41	54	58	55.9	10.2
Vigor	52	76	62	66	--	76	66	65	66.1	8.3
Fatigue	70	35	41	48	--	37	35	39	45.6	11.5
Confusion	48	30	35	37	--	37	35	39	33.0	11.9
TMD	251	102	162	158	--	122	140	168	157.6	47.5
<hr/>										
Non-Athlete									<u>M</u>	<u>SD</u>
Tension	38	47	45	43	38	43	40	40	41.8	3.3
Depression	43	53	45	44	46	44	44	54	46.6	4.3
Anger	48	47	58	51	45	44	51	58	50.3	5.4
Vigor	46	57	63	60	55	59	63	59	57.8	5.5
Fatigue	48	41	43	43	43	41	55	45	44.9	4.7
Confusion	43	57	48	48	52	50	46	55	49.9	4.6
TMD	174	188	176	169	169	163	173	194	175.8	10.3

^aSubject unavailable.

Appendix J.
POMS Factor and TMD Scores of Matched
Pairs With Corresponding Means (M)
and Standard Deviations (SD)

Pair Number 2	Assessment Period								<u>M</u>	<u>SD</u>	
	1	2	3	4	5	6	7	8			
<hr/>											
Gymnast										<u>M</u>	<u>SD</u>
Tension	66	45	43	35	49	37	37	41	44.1	10.0	
Depression	71	43	48	38	42	38	39	37	44.5	11.3	
Anger	58	45	52	37	45	37	37	37	43.5	8.1	
Vigor	30	60	54	65	55	65	65	60	56.8	11.7	
Fatigue	75	51	46	45	46	41	41	45	48.8	11.1	
Confusion	55	43	44	35	44	37	35	37	41.3	6.8	
TMD	295	167	179	125	171	125	124	137	165.4	57.1	
<hr/>											
Non-Athlete									<u>M</u>	<u>SD</u>	
Tension	38	42	33	34	35	37	35	34	36.0	2.9	
Depression	43	44	38	37	41	37	37	37	39.3	3.0	
Anger	48	49	41	39	41	41	39	41	42.4	3.9	
Vigor	65	48	60	62	66	60	55	57	59.1	5.8	
Fatigue	41	46	45	38	34	35	35	34	38.5	4.9	
Confusion	35	39	30	32	32	30	32	33	32.9	2.9	
TMD	140	172	127	118	117	120	123	122	129.9	18.5	
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Appendix J.
POMS Factor and TMD Scores of Matched
Pairs With Corresponding Means (M)
and Standard Deviations (SD)

Pair Number 3	Assessment Period								<u>M</u>	<u>SD</u>	
	1	2	3	4	5	6	7	8			
<hr/>											
Gymnast										<u>M</u>	<u>SD</u>
Tension	43	35	43	38	35	42	34	31	37.6	4.6	
Depression	42	41	44	38	39	42	38	38	40.3	2.3	
Anger	45	37	47	37	37	40	37	37	35.9	12.3	
Vigor	43	52	48	76	71	57	71	76	61.8	13.3	
Fatigue	63	46	45	35	34	46	34	34	42.1	10.2	
Confusion	44	33	46	32	33	41	33	30	36.5	6.2	
TMD	194	140	177	104	107	154	105	94	134.4	37.7	
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Non-Athlete									<u>M</u>	<u>SD</u>	
Tension	42	43	47	47	45	45	47	45	45.1	1.9	
Depression	44	44	45	44	42	46	45	44	44.3	1.2	
Anger	57	51	51	52	45	51	52	52	51.4	3.2	
Vigor	54	57	51	68	65	49	59	54	57.1	6.6	
Fatigue	41	40	37	40	38	41	45	48	41.3	3.6	
Confusion	44	44	46	43	41	48	43	46	44.4	2.2	
TMD	174	165	175	158	146	182	173	181	169.3	12.3	
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Appendix J.
POMS Factor and TMD Scores of Matched
Pairs With Corresponding Means (M)
and Standard Deviations (SD)

Pair Number 4	Assessment Period								<u>M</u>	<u>SD</u>
	1	2	3	4	5	6	7	8		
<hr/>										
Gymnast									<u>M</u>	<u>SD</u>
Tension	67	60	65	79	49	66	74	67	65.9	9.0
Depression	76	68	70	51	49	57	80	76	65.9	12.0
Anger	80	72	61	66	56	49	76	68	67.3	11.2
Vigor	44	44	46	38	44	60	43	41	45.0	6.5
Fatigue	52	58	49	70	70	58	41	69	58.4	10.8
Confusion	72	70	63	50	44	63	63	75	62.5	10.7
TMD	303	284	270	278	224	233	291	324	250.9	72.6
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Non-Athlete									<u>M</u>	<u>SD</u>
Tension	45	47	47	49	48	48	55	55	49.3	3.7
Depression	59	57	52	52	52	61	62	52	55.9	4.4
Anger	53	52	48	48	51	53	56	52	51.6	2.7
Vigor	41	41	38	35	40	37	37	38	38.4	2.1
Fatigue	54	48	46	51	45	45	45	45	47.4	3.4
Confusion	52	52	48	53	52	57	53	55	52.8	2.6
TMD	222	175	203	218	208	227	234	221	213.5	18.4
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Appendix J.
POMS Factor and TMD Scores of Matched
Pairs With Corresponding Means (M)
and Standard Deviations (SD)

Pair Number 5	Assessment Period								<u>M</u>	<u>SD</u>
	1	2	3	4	5	6	7	8		
<hr/>										
Gymnast										
Tension	47	52	42	59	38	47	34	42	45.1	7.9
Depression	42	44	43	44	37	38	37	40	40.6	3.0
Anger	44	39	42	47	37	40	37	39	40.6	3.5
Vigor	43	49	38	41	55	35	59	43	45.4	8.3
Fatigue	52	46	58	58	34	60	34	37	47.4	11.2
Confusion	50	41	50	44	32	44	37	41	42.4	6.1
TMD	192	173	197	211	123	194	120	156	170.8	34.6
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Non-Athlete										
Tension	43	42	38	35	37	34	34	34	37.1	3.6
Depression	42	40	38	38	39	41	37	37	35.3	11.2
Anger	41	39	40	40	40	41	40	39	40.0	0.8
Vigor	57	57	54	54	57	54	60	54	55.9	2.2
Fatigue	43	35	41	40	40	40	34	34	38.4	3.5
Confusion	37	39	37	35	35	37	33	39	36.5	2.1
TMD	149	138	140	134	134	139	118	129	135.1	9.0
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Appendix J.
POMS Factor and TMD Scores of Matched
Pairs With Corresponding Means (M)
and Standard Deviations (SD)

Pair Number 6	Assessment Period								<u>M</u>	<u>SD</u>
	1	2	3	4	5	6	7	8		
<hr/>										
Gymnast									<u>M</u>	<u>SD</u>
Tension	47	49	43	51	49	42	38	54	46.6	5.3
Depression	39	44	38	39	42	47	37	53	42.4	5.4
Anger	47	45	44	45	48	51	42	53	46.9	3.7
Vigor	63	60	70	51	55	52	62	43	57.0	8.5
Fatigue	51	58	45	70	60	52	46	43	53.1	9.1
Confusion	35	43	35	41	37	50	43	59	42.9	8.2
TMD	156	179	135	195	181	190	144	219	174.9	28.1
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Non-Athlete									<u>M</u>	<u>SD</u>
Tension	42	45	45	48	47	45	54	41	45.9	4.0
Depression	44	42	39	41	44	39	44	41	41.8	2.1
Anger	47	49	58	42	51	48	45	47	48.4	4.7
Vigor	37	38	30	32	44	44	44	38	38.4	5.4
Fatigue	46	51	35	37	45	41	37	41	41.6	5.4
Confusion	39	43	43	35	41	41	41	37	40.0	2.8
TMD	181	192	190	171	184	170	177	169	179.3	9.0
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Appendix J.
POMS Factor and TMD Scores of Matched
Pairs With Corresponding Means (M)
and Standard Deviations (SD)

Pair Number 7	Assessment Period								<u>M</u>	<u>SD</u>
	1	2	3	4	5	6	7	8		
<hr/>										
Gymnast										
Tension	40	45	49	45	42	41	45	38	43.1	3.5
Depression	38	42	45	44	40	40	40	38	40.9	2.6
Anger	40	39	45	45	39	37	39	37	40.1	3.2
Vigor	66	60	62	63	65	66	65	68	64.4	2.6
Fatigue	45	48	45	41	40	38	46	45	43.5	3.4
Confusion	33	39	43	43	37	35	37	37	38.0	3.5
TMD	130	153	165	155	133	125	142	127	141.3	14.9
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Non-Athlete									<u>M</u>	<u>SD</u>
Tension	56	49	48	51	42	56	54	48	50.5	4.8
Depression	53	44	44	54	47	61	58	59	52.5	6.8
Anger	52	40	45	49	44	62	57	69	52.3	9.9
Vigor	49	55	52	55	55	43	40	48	49.6	5.8
Fatigue	43	48	41	45	43	57	52	55	48.0	6.0
Confusion	55	46	53	53	48	55	52	52	51.8	3.2
TMD	210	172	179	197	169	248	233	235	205.4	30.9
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Appendix J.
POMS Factor and TMD Scores of Matched
Pairs With Corresponding Means (M)
and Standard Deviations (SD)

Pair Number 8	Assessment Period								<u>M</u>	<u>SD</u>
	1 ^a	2 ^a	3	4	5	6 ^a	7 ^a	8 ^a		
<hr/>										
Gymnast									<u>M</u>	<u>SD</u>
Tension	66	43	49	47	43	40	48	41	47.1	8.3
Depression	58	44	47	38	37	39	36	37	42.0	7.5
Anger	62	37	41	42	40	39	41	37	42.4	8.1
Vigor	44	49	38	43	48	51	49	46	46.0	4.2
Fatigue	60	48	49	45	38	40	47	52	47.4	6.9
Confusion	72	48	55	46	48	48	49	46	51.5	8.8
TMD	274	171	203	175	158	155	169	167	184.0	39.2
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Non-Athlete									<u>M</u>	<u>SD</u>
Tension	49	55	45	48	-- ^b	-- ^b	-- ^b	-- ^b	49.3	4.2
Depression	49	42	44	47	--	--	--	--	45.5	3.1
Anger	42	49	51	47	--	--	--	--	47.3	3.9
Vigor	43	62	62	65	--	--	--	--	58.0	10.1
Fatigue	63	49	40	46	--	--	--	--	49.5	9.7
Confusion	55	48	44	41	--	--	--	--	47.0	6.1
TMD	215	181	162	164	--	--	--	--	180.5	24.5

^aGymnast injured. ^bNon-athlete subject moved out of the country and was unable to complete the study.

Appendix J.
POMS Factor and TMD Scores of Matched
Pairs With Corresponding Means (M)
and Standard Deviations (SD)

Pair Number 9	Assessment Period								<u>M</u>	<u>SD</u>
	1 ^a	2	3	4	5	6	7	8		
Gymnast										
Tension	59	49	47	51	51	55	54	51	52.1	3.8
Depression	49	41	43	45	45	41	40	47	43.9	3.2
Anger	58	49	53	58	77	44	54	56	56.1	9.7
Vigor	41	60	46	40	46	57	49	43	47.8	7.3
Fatigue	67	45	54	49	51	48	43	40	49.6	8.3
Confusion	44	41	43	48	48	39	37	37	42.1	4.4
TMD	236	165	194	211	226	170	179	188	196.1	26.0
Non-Athlete										
Tension	65	55	56	65	60	59	58	51	58.6	4.8
Depression	62	62	53	54	61	57	61	62	59.0	3.8
Anger	62	57	58	56	80	61	54	49	59.6	9.2
Vigor	57	59	46	55	66	60	54	54	56.4	5.8
Fatigue	67	64	77	70	63	63	57	55	64.5	7.0
Confusion	57	61	57	59	53	52	55	52	55.8	3.3
TMD	256	240	255	249	251	232	231	215	241.1	14.1

^aGymnast injured.

Appendix J.
POMS Factor and TMD Scores of Matched
Pairs With Corresponding Means (M)
and Standard Deviations (SD)

Pair Number 10	Assessment Period								<u>M</u>	<u>SD</u>
	1	2 ^a	3 ^a	4	5	6	7	8		
<hr/>										
Gymnast									<u>M</u>	<u>SD</u>
Tension	41	42	47	45	38	45	38	40	42.0	3.4
Depression	45	42	48	47	42	46	41	44	44.4	2.6
Anger	39	42	40	45	40	40	40	42	41.0	1.9
Vigor	44	46	47	40	41	35	52	44	42.4	5.4
Fatigue	54	45	46	52	35	54	34	40	45.0	8.1
Confusion	43	46	50	46	43	50	41	46	45.6	3.2
TMD	178	171	194	195	157	200	142	168	175.6	20.2
<hr/>										
Non-Athlete									<u>M</u>	<u>SD</u>
Tension	42	45	43	47	47	40	43	41	43.5	2.6
Depression	47	40	46	44	42	44	46	43	44.0	2.3
Anger	44	39	47	42	41	49	42	42	43.3	3.3
Vigor	57	57	57	60	68	65	62	60	60.8	4.1
Fatigue	43	52	49	45	41	45	40	43	44.8	4.0
Confusion	43	43	50	41	39	43	39	41	42.4	3.5
TMD	162	162	178	159	142	156	148	150	157.1	11.0

^aGymnast injured.

Appendix J.
POMS Factor and TMD Scores of Matched
Pairs With Corresponding Means (M)
and Standard Deviations (SD)

Pair Number 11	Assessment Period								<u>M</u>	<u>SD</u>
	1 ^a	2 ^a	3	4	5	6	7	8		
<hr/>										
Gymnast									<u>M</u>	<u>SD</u>
Tension	48	56	56	51	42	42	41	47	47.9	6.1
Depression	52	45	41	44	40	38	38	40	42.3	4.7
Anger	41	42	47	41	40	45	42	41	42.4	2.4
Vigor	54	48	63	48	63	54	68	68	58.3	8.3
Fatigue	38	57	46	49	46	37	34	34	42.6	8.2
Confusion	53	55	48	53	52	46	46	52	50.6	3.5
TMD	178	207	175	190	157	154	133	146	167.5	24.4
<hr/>										
Non-Athlete									<u>M</u>	<u>SD</u>
Tension	42	45	38	41	42	42	40	43	41.6	2.1
Depression	43	40	40	38	42	39	39	42	40.4	1.8
Anger	45	49	49	48	49	48	41	51	47.5	3.1
Vigor	59	60	55	57	55	60	60	60	58.3	2.3
Fatigue	40	38	34	37	34	35	34	34	35.8	2.3
Confusion	39	50	46	48	41	41	35	41	42.6	5.0
TMD	150	162	152	155	153	145	129	155	150.1	9.8

^aGymnast injured.

Appendix J.
POMS Factor and TMD Scores of Matched
Pairs With Corresponding Means (M)
and Standard Deviations (SD)

Pair Number 12	Assessment Period								<u>M</u>	<u>SD</u>
	1	2	3	4	5	6	7	8		
<hr/>										
Gymnast ^a										
Tension	54	62	51	59	51	49	67	55	56.0	6.2
Depression	50	49	41	66	57	48	68	63	55.3	9.7
Anger	54	51	45	77	60	41	66	70	58.0	12.5
Vigor	62	63	62	40	37	68	48	54	54.3	11.5
Fatigue	57	61	46	48	57	40	55	48	51.5	7.1
Confusion	39	52	33	59	57	46	63	57	50.8	10.5
TMD	192	212	154	269	245	156	271	239	217.3	46.6
<hr/>										
Non-Athlete									<u>M</u>	<u>SD</u>
Tension	45	41	37	52	35	37	43	45	41.9	5.6
Depression	39	41	38	39	39	39	37	38	38.8	1.2
Anger	40	40	41	37	42	40	49	45	41.8	3.7
Vigor	54	48	54	46	57	57	57	48	52.6	4.6
Fatigue	45	45	40	40	34	37	35	40	39.5	4.1
Confusion	43	46	46	33	35	43	35	41	40.3	5.2
TMD	158	165	148	155	128	139	142	161	149.5	12.6

^aThis gymnast was injured throughout the entire study.

Appendix K.
Means (M) and Standard Deviations (SD)
of POMS Factor and Total Mood Disturbance (TMD)
Scores for All Gymnasts and Non-Athletes

Gymnasts	<u>M</u>	<u>SD</u>
Tension	47.6	7.5
Depression	45.4	7.6
Anger	47.5	9.5
Vigor	53.8	8.2
Fatigue	47.9	4.8
Confusion	44.8	8.0
TMD	165.2	56.5

Non-Athletes	<u>M</u>	<u>SD</u>
Tension	42.6	12.6
Depression	45.3	7.2
Anger	48.8	5.5
Vigor	53.5	7.7
Fatigue	44.5	7.6
Confusion	44.7	6.9
TMD	173.9	33.1

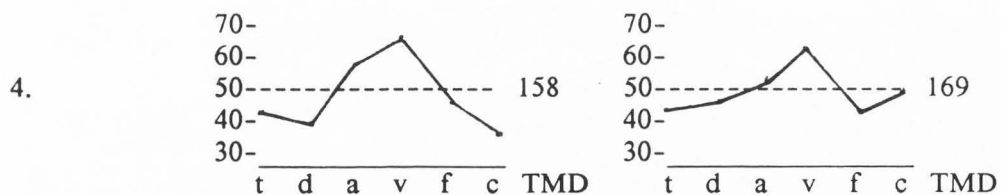
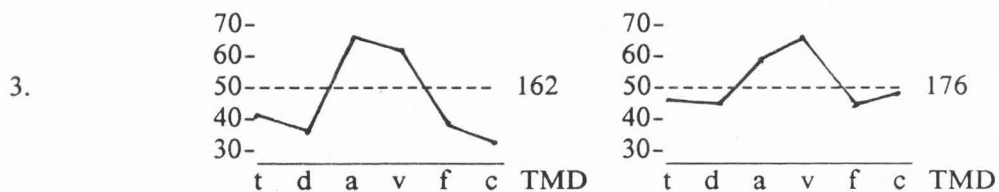
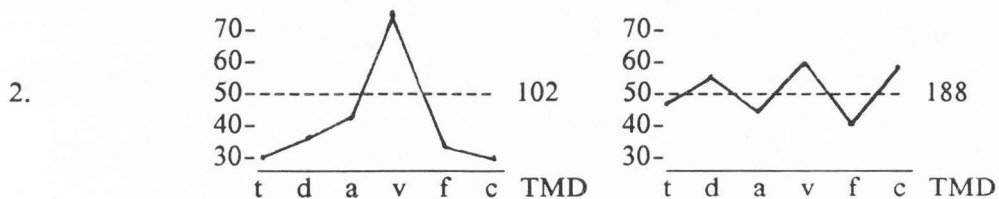
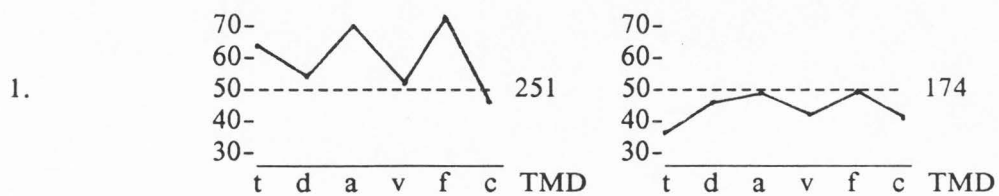
Appendix L.
POMS Profiles of Matched Pairs of
Non-Injured Gymnasts and Non-Athletes

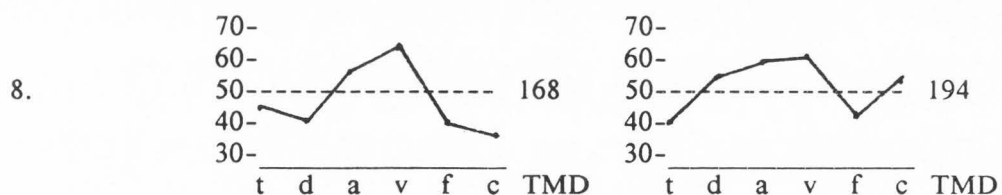
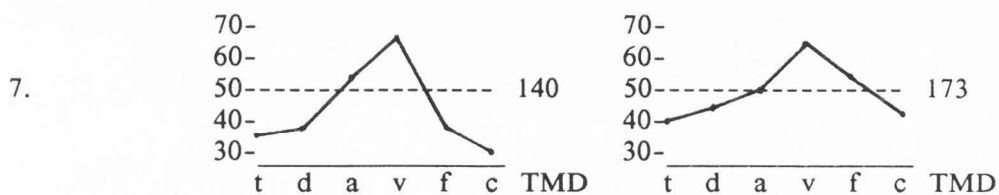
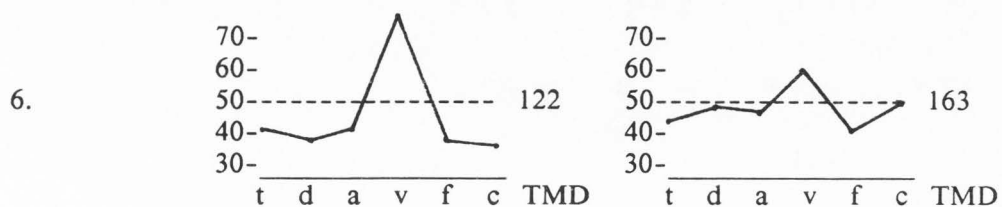
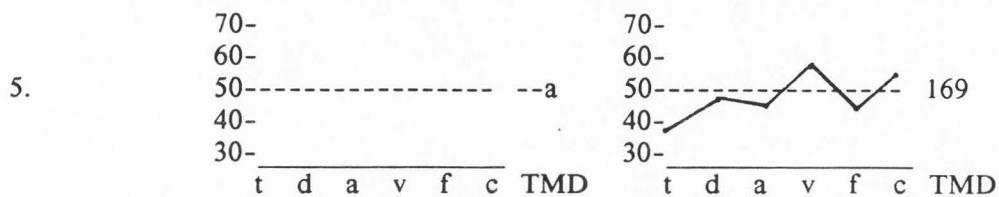
Assessment Period

Pair Number 1

Gymnast

Non-Athlete



Pair Number 1

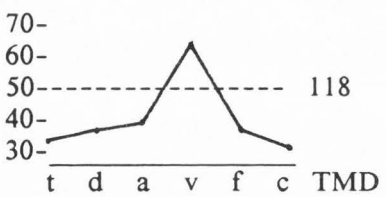
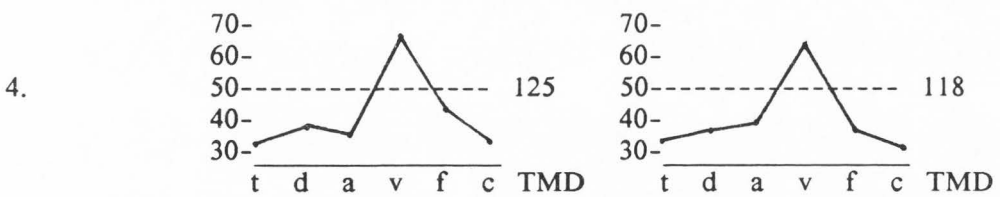
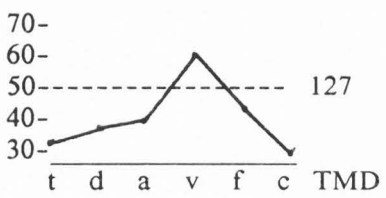
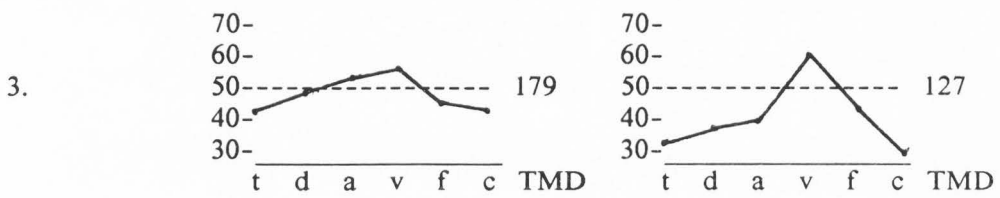
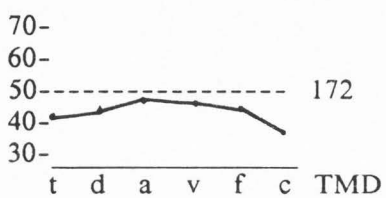
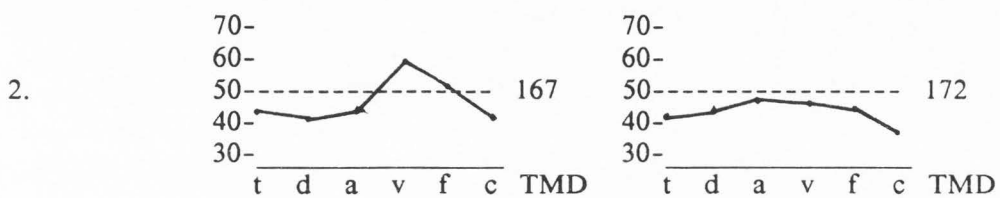
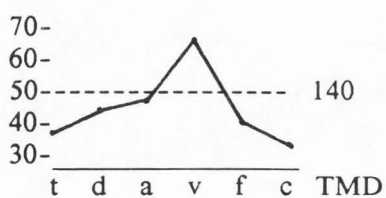
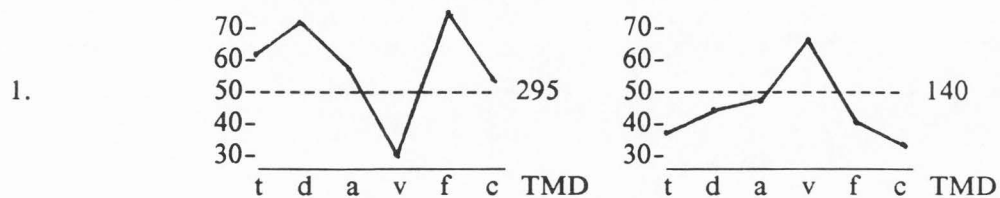
^aGymnast unavailable.

Assessment Period

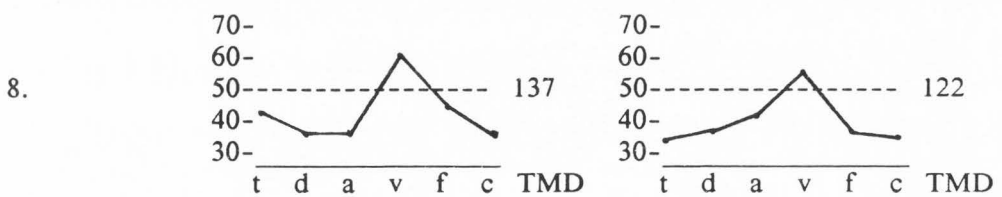
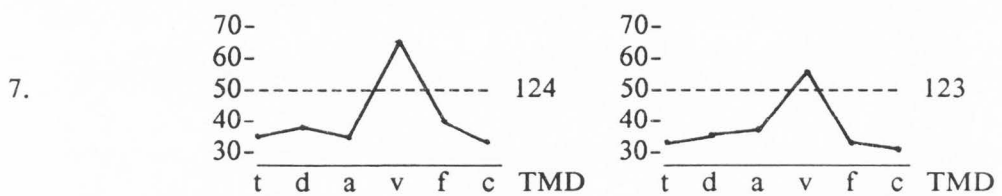
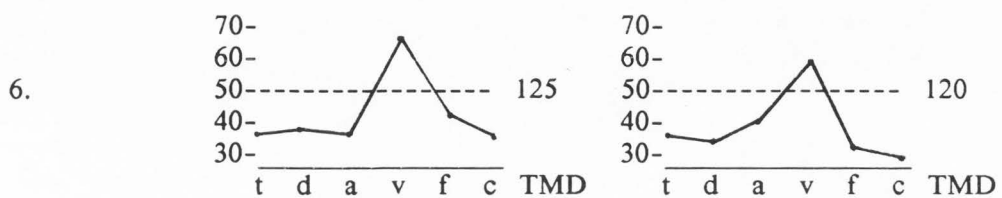
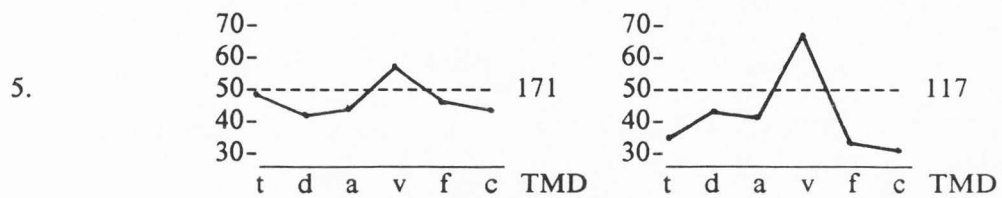
Pair Number 2

Gymnast

Non-Athlete



Pair Number 2

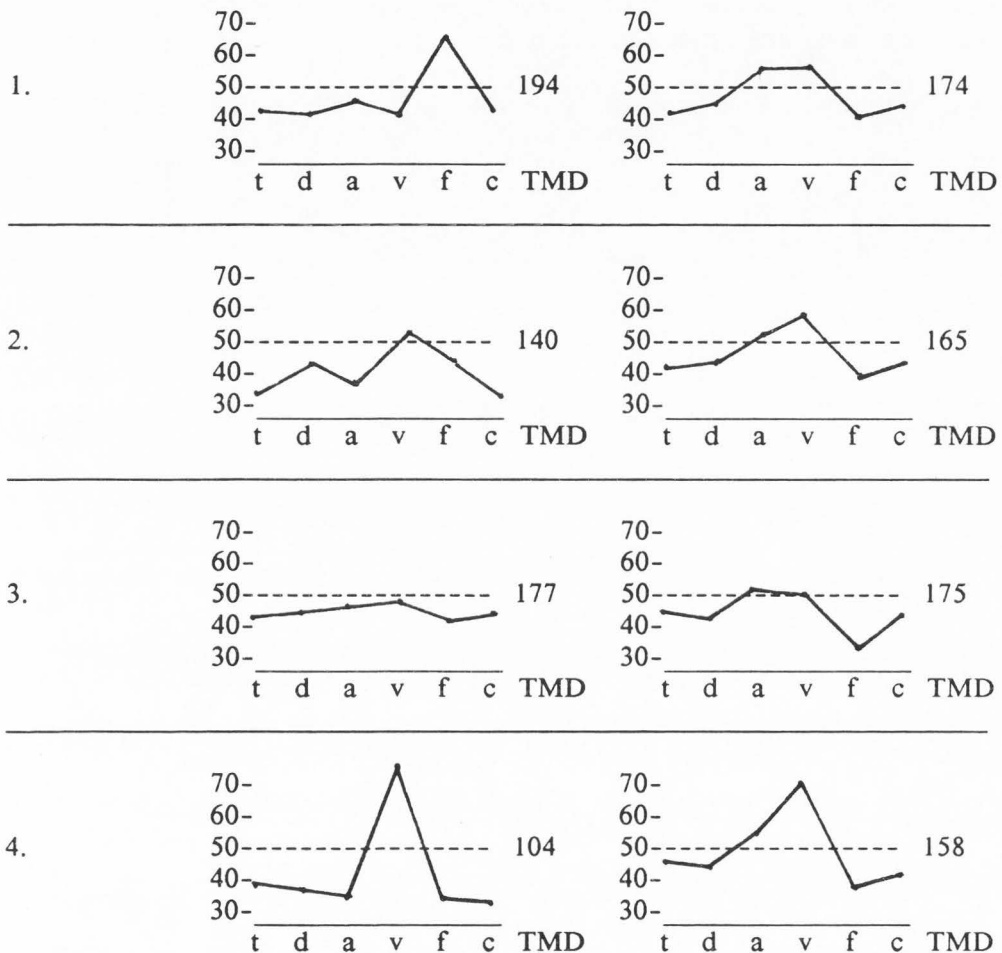


Assessment Period

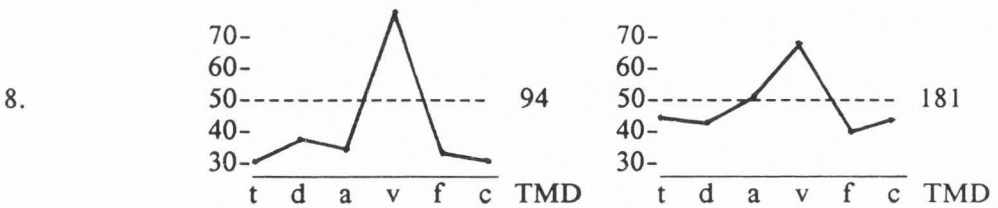
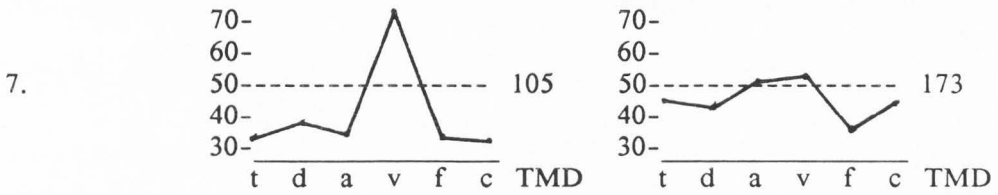
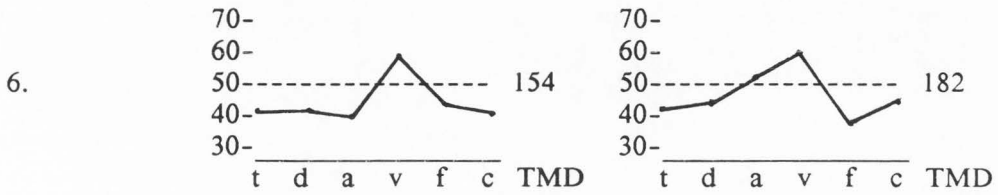
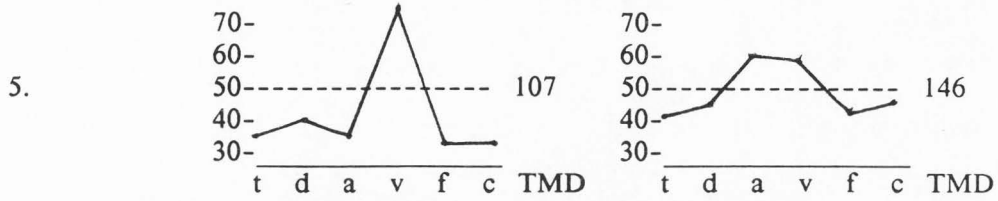
Pair Number 3

Gymnast

Non-Athlete



Pair Number 3

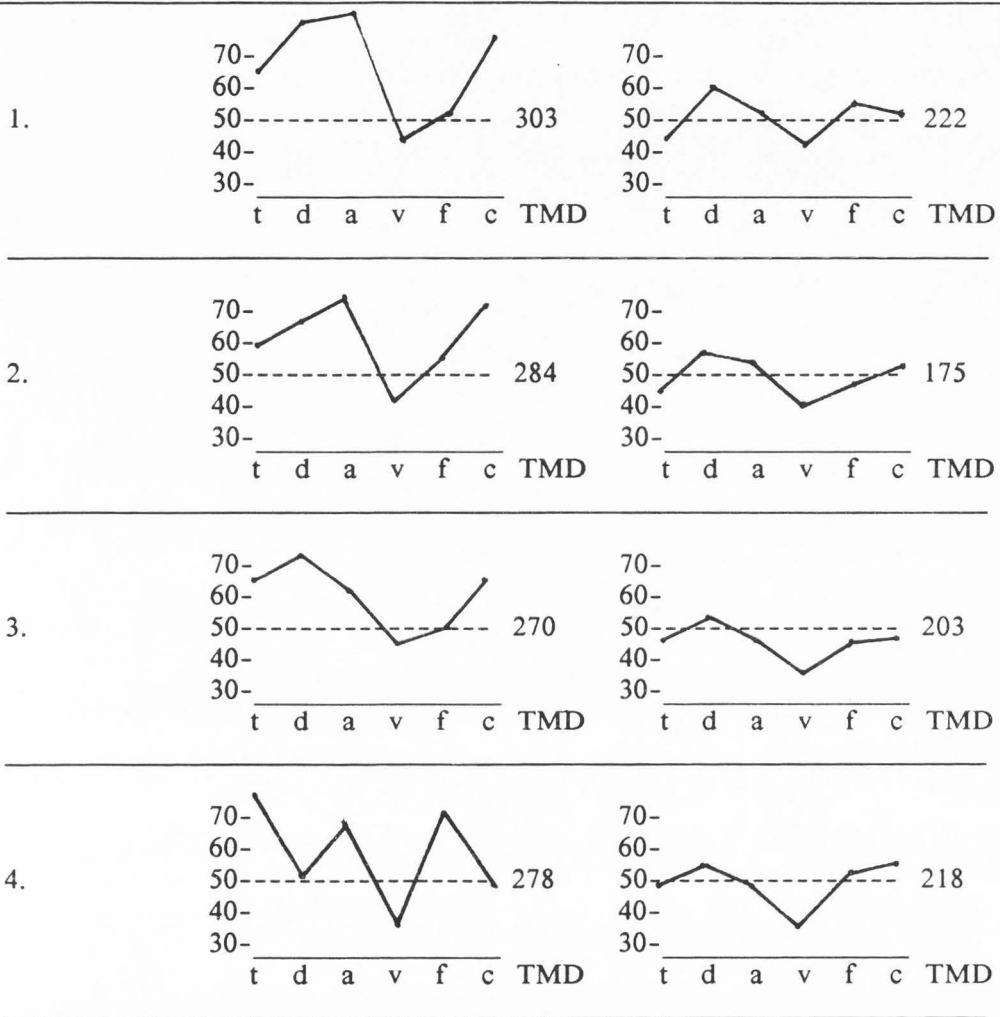


Assessment Period

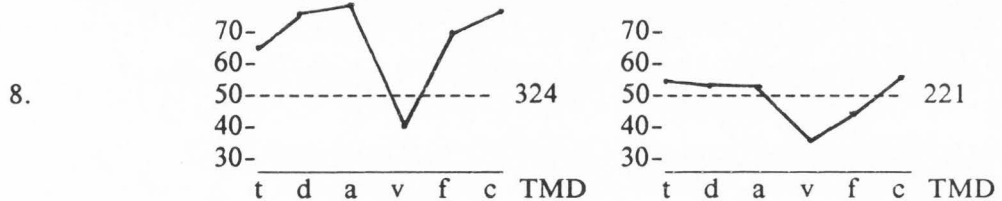
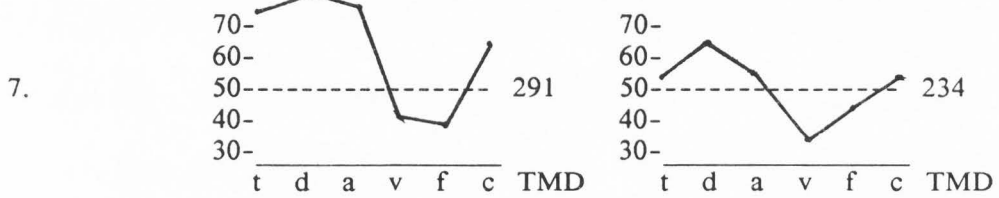
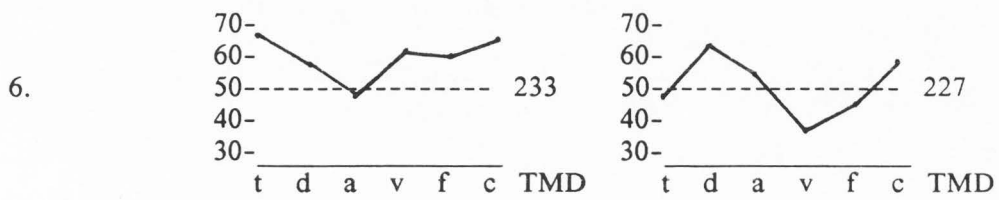
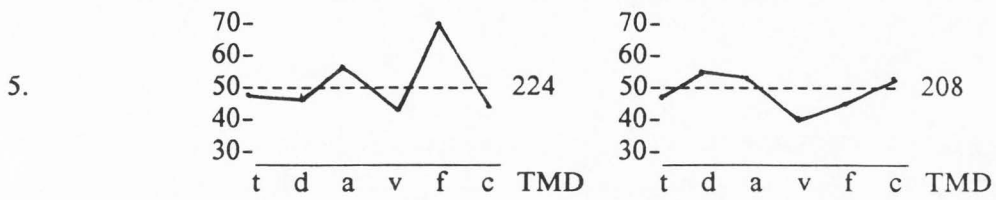
Pair Number 4

Gymnast

Non-Athlete



Pair Number 4

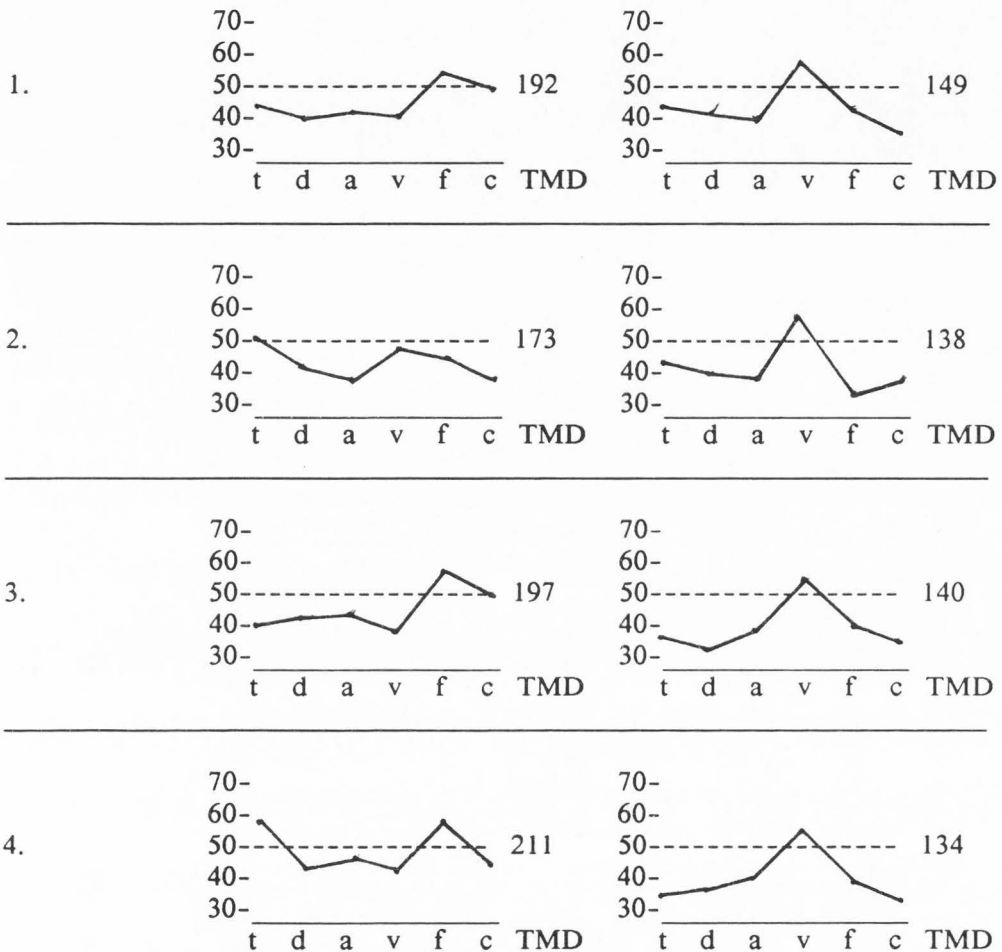


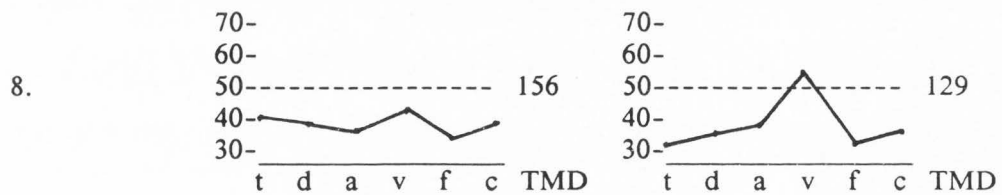
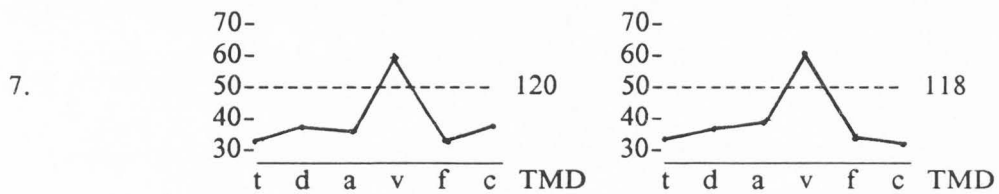
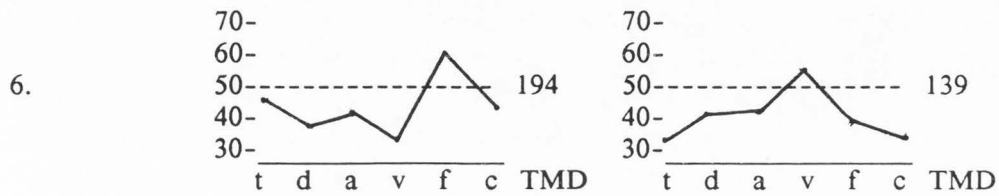
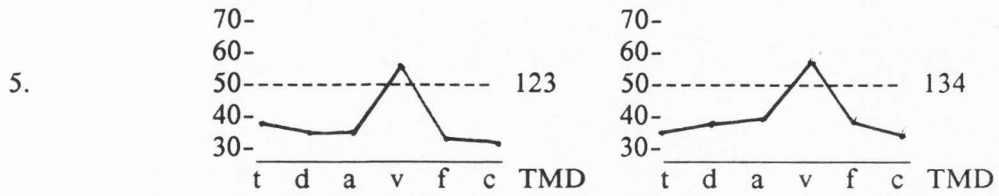
Assessment Period

Pair Number 5

Gymnast

Non-Athlete



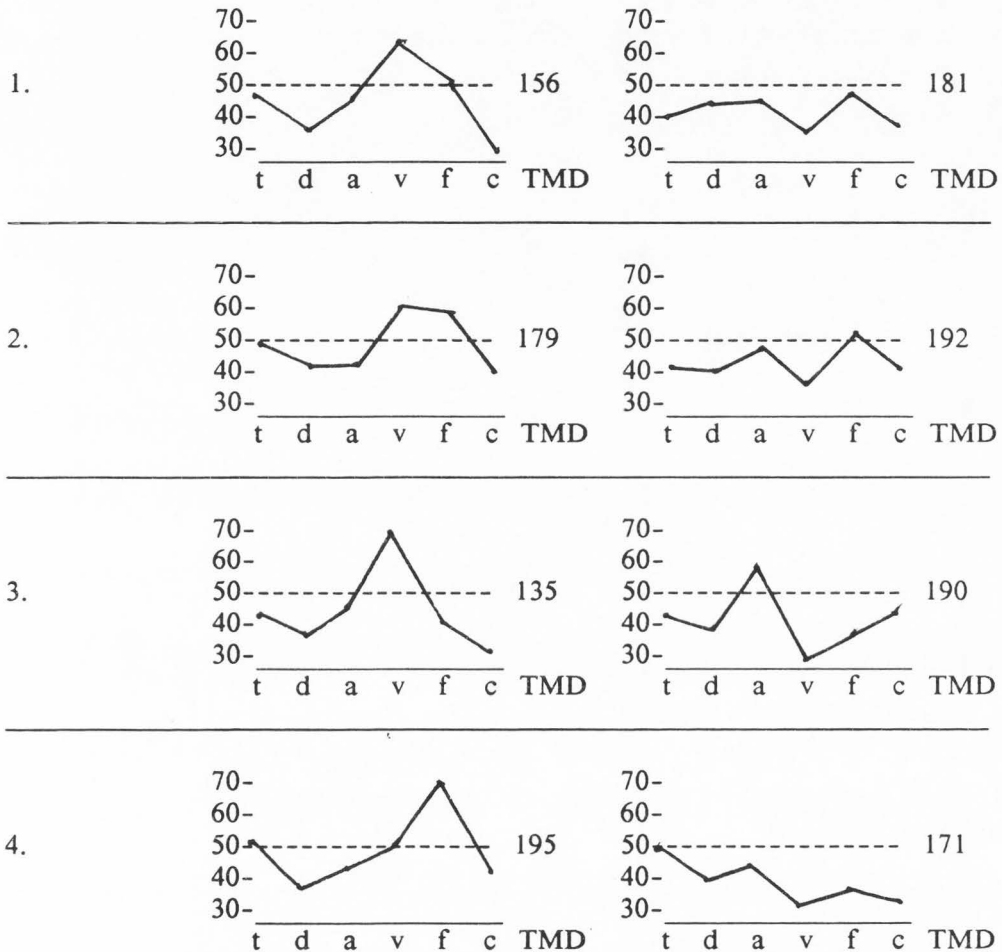
Pair Number 5

Assessment Period

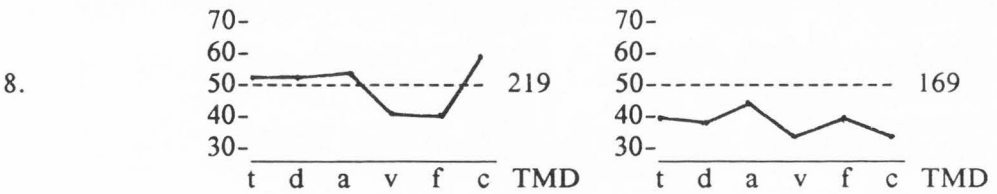
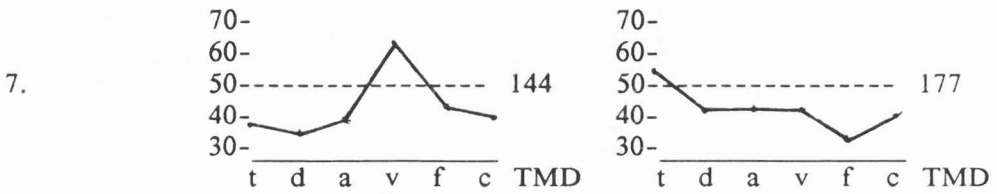
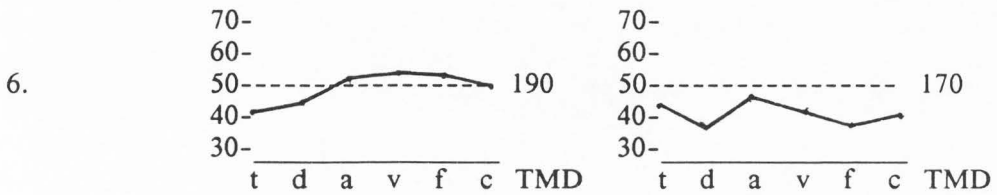
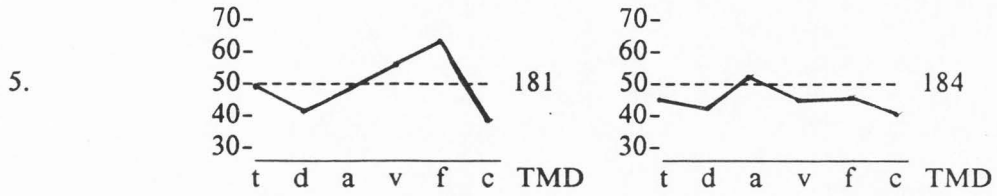
Pair Number 6

Gymnast

Non-Athlete



Pair Number 6

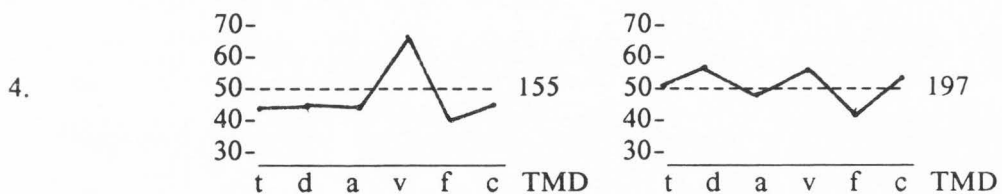
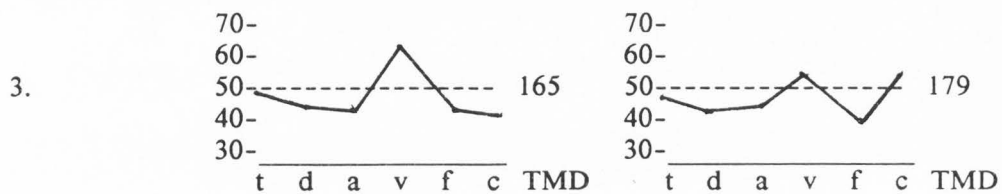
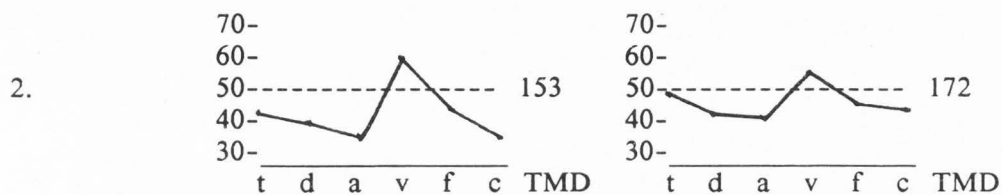
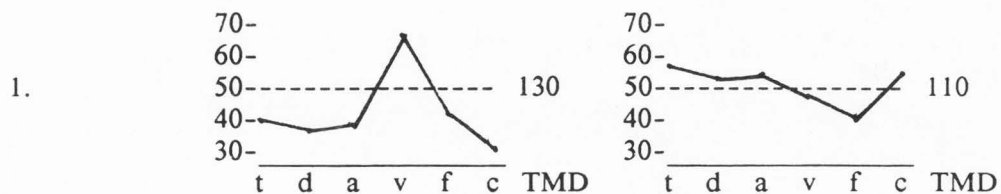


Assessment Period

Pair Number 7

Gymnast

Non-Athlete



Pair Number 7