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PSYCHOSOCIAL STRESS AND ATHLETIC INJURIES

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

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THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graudate Studies and Research, for acceptance, a thesis entitled PSYCHOSOCIAL STRESS AND ATHLETIC INJURIES submitted by Erin E. Inglis in partial fulfilment of the requirements for the degree of Master of Science.

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ABSTRACT

It has been suggested that there is a dynamic relationship between psychosocial stress and athletic injuries and that injury prediction is possible by measuring the amount of psychosocial stress of the athlete within a specific time period.

The main purpose of this study was to investigate the relationship of stress levels of university athletes within a certain time period and the number of injuries they sustained within or subsequent to that time period. The test population consisted of 122 university athletes, 63 male and 59 female, who participated in the non-contact sports of basketball, volleyball, gymnastics, and swimming and the contact sport, hockey, at the University of Alberta. The test population was asked to place numerical scores on 54 stress items and then asked to indicate in which time period, 0-6 months ago, 6 months-1 year ago, 1-2 years ago or 2-3 years ago, any of these events occurred. For each stress event that occurred to the athlete, the mean score for that item, as determined by all 122 subjects was assigned. The sum of these scores, for each time period, was then correlated with the number of athletic injuries each subject sustained as recorded by the athlete and as recorded by the Athletic Injuries Clinic at the University of Alberta. Only three correlations demonstrated significance between the sum of stress scores for any of the time periods and the number of athletic injuries recorded. These three correlations indicate little relationship between these life stress items and athletic injuries.

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Gerry, who lights up my life.

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CHAPTER I

STATEMENT OF THE PROBLEM

Introduction

Stress is undoubtedly an important personal problem for everyone. Selye (38) feels that life is largely a process of adaptation to the circumstances in which we exist and that doctors are just beginning to see many common diseases, that are due to errors in our adaptative response to stress, rather than due to germs, poisons and other external agents. Even the word disease originally meant a lack of ease, not illness. "The discovery that germs cause illness failed to unravel one important riddle--the mystery of illness onset." (20:71). Holmes and Masuda (20) found that ordinary life--marriage, a vacation, a new job etc. can trigger illness, because the effort required to cope with these events weakens resistance. In concurrence, Selye (38:262) describes a mechanism for surrender which encourages the body not to defend itself and not put up barricades in the path of the invading stressor. Selye feels we can eliminate the stressor by recognizing its nature and maintain a balance by making a proportionate adjustment.

The Problem

Athletics is an area in which injuries occur frequently, resulting in a loss of time and disability which can adversely affect physical conditioning and physical strength. Selyes' description of stress has been widely accepted and consequently raises the question; can researchers

minimize athletic injuries which may occur as a result of clustering of stress events, simply by recognizing their existance? This project will investigate the relationship between the athletes' perception of stress in their lives and incidence of athletic injuries. The history of previous injury will be used to distinguish those who have had the injury before and those with a new injury attributable to increased stress levels.

The Need For The Study

To the writer's knowledge there has been no research done on womens athletic teams in relation to increased stress levels and increased athletic injuries. This study will utilize the university athletic teams, in which both men and women participate, of hockey, basketball, volleyball, gymnastics and swimming. This study will compare the correlation between stress levels and injuries of athletes in high injury sports (mens hockey) to those of athletes in low injury sports (swimming). As well, an investigation will be made of the past history of injury of each athlete. Possibly, present injuries are related to past injuries rather than increased stress levels.

Limitations

In proceeding with this study a number of restrictions had to be placed on the sample and the study.

1. The questionnaire was handed to each athlete who was allowed one 24 hour period to respond. This method provided less control over possible biasing of answers by groups of students

than that of a controlled supervised session.

2. Because the questionnaire was subjective, there is always the possibility of variations in interpretation of stress items. Explanations of each item have been included where possible.

3. The self-recorded history of the athletes past injury was compared to the history of the present injury as recorded in the Athletics Injuries Clinic at the University of Alberta. If the athlete's present injury is influenced by past injury, then stress levels in this time period were considered not to be the predisposing factor in the occurrence of the present injury.

Delimitations

1. The study was delimited to 122 university students (63 male and 59 female) who were members of the university athletic teams of hockey, basketball, volleyball, gymnastics and swimming.

2. The study was delimited to 21 variables which might influence the number of injuries occurring to the athletes.

Definition of Terms

Past Injury: any injury recorded by the athlete which has not been recorded by the Athletic Injuries Clinic staff.

Present Injury: any injury which has been reported to the

University of Alberta Athletic Injuries Clinic and which has been recorded by the Athletic Injuries staff as a statistic for the athletic seasons of 1976-77 and 1977-78.

Type A Injury: any injury which received treatment for less than three days by the Athletic Injuries Clinic staff.

Type B Injury: any injury which received treatment of more than three days by the Athletic Injuries Clinic staff.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

Introduction

At the turn of the century, Adolf Meyers (28) postulated that physiological and sociological phenomena contributed a unique role in formation of an individual's life events. Meyers formulated a 'life chart' which emphasized fundamentally important environmental influences such as births, deaths, school entrance, graduation, failures and habitats. With the work of Harrold G. Wolff, (44,45) stress was defined as a "dynamic state within an organism in response to a demand for adaptations " (44:4). Wolff also stated that life itself entails constant adaptation and subsequently sought to examine the nature of the adaptative response, especially the timing or time of life in which they occurred. Wolffs' conviction was that adaptative reaction patterns due to stress would display themselves as headaches, hyperventilation, infections, gastric disorders, coronary occlusions and many other body disfunctions. One of Wolff's associates, Hinkle (4,16,17,18), formulated that onset of illness is significantly associated with an increase in the number of social events which require some adaptative or coping behavior on the part of the involved individual and in which they could make no satisfactory adaptation to the situation.

In 1949, another life chart which evolved from the past research was devised by Holmes et al. (21). In 1964, Rahe et al. (31) summarized

a series of studies which contributed to the present form of the life-event chart. It was established that life event items were significantly associated with the time of illness onset. Graham and Stevenson (9,39) found alteration in social status preceeding recognized symptoms of leukemia and lymphoma. Fischer and Weiss (6,7) describe changes in social situations prior to coronary occlusion and both Kissen (25,26), Hawkins et al. (15) and Holmes (22) found social stress preceeded the onset of tuberculosis. Also a significant association has been found between life event items and the onset of hives (8), pregnancy (43), cardiac disease and inguinal hernia (31). Each of these researchers' methods included the interview of questionnaire technique and the data gathered in the above cases were significantly associated with the time of illness onset.

The Social Readjustment Rating Scale (S.R.R.S.)

In 1967, Holmes and Rahe (23) devised a social readjustment scale which provided an estimate of the magnitude of these life events and a quantitative basis for the study in the area. The rank order of these life events is presented on Table I.

Since the development of the social readjustment rating scale many correlations between ethnic groups have been investigated. Masuda and Holmes (29) "compared a Japanese sample and American sample which indicated essential similarities in their attitudes toward life events, but with some interesting differences which reflect cultural variation " (29:236). Harmon, Masuda and Holmes (13) compared French, Belgian and Swiss samples with a corresponding American sample and found a high correlation of relative rank of adjustment by life events. Again the numerical responses of the S.R.R.S. reflected differences in cultures and living

TABLE I SOCIAL READJUSTMENT RATING SCALE

RANK	LIFE EVENT	MEAN VALUE
1.	Death of spouse	100
2.	Divorce	73
3.	Marital separation	65
4.	Jail term	63
5.	Death of close family member	63
6.	Personal injury or illness	53
7.	Marriage	50
8.	Fired at work	47
9.	Marital reconciliation	45
10.	Retirement	45
11.	Change in health of family member	44
12.	Pregnancy	40
13.	Sex difficulties	39
14.	Gain of new family member	39
15.	Business readjustment	39
16.	Change in financial state	38
17.	Death of a close friend	37
18.	Change to a different line of work	36
19.	Change in number of arguments with spouse	35
20.	Mortgage over $10,000	31
21.	Foreclosure of mortgage or loan	30
22.	Change in responsibilities at work	29
23.	Son or daughter leaving home	29
24.	Trouble with in-laws	29
25.	Outstanding personal achievement	28
26.	Wife begin or stop work	26
27.	Begin or end school	26
28.	Change in living conditions	25
29.	Revision of personal habits	24
30.	Trouble with boss	23
31.	Change in work hours or conditions	20
32.	Change in residence	20
33.	Change in schools	20
34.	Change in recreation	19
35.	Change in church activities	19
36.	Change in social activities	18
37.	Mortgage or loan less than $10,000	17
38.	Change in sleeping habits	16
39.	Change in number of family get-togethers	15
40.	Change in eating habits	15
41.	Vacation	13
42.	Christmas	12
43.	Minor violations of the law	11

conditions. Holmes and Masuda (24) also report that two different Spanish speaking cultures were investigated by Celdran in 1970 and Seppa in 1972 and found considerable consensus in the rankings of the life event items. Table II demonstrates Rahes' (32) findings with seven different subcultures along with the Spearman coefficient of correlation between rank ordering of life events.

Schedule of Recent Experience

After the Social Readjustment Rating Scale was developed, the Schedule of Recent Experience became part of the questionnaire used by Holmes and Masuda (24). The Schedule of Recent Experience is a questionnaire that allows the respondent to document the occurrence of life event items in a particular time period. It was originally used by Hawkins et al. (15) in 1957 while studying the psychosocial factors in the development of pulmonary tuberculosis.

In 1968, Rahe (36) studied naval officers aboard three ships for six months. He administered the Schedule of Recent Experience before the cruise and found high, moderate and low risk groups. Within the first month the high risk group reported 90 percent more first illness consistently during the six month cruise. Rahe et al. (37) also predicted near future health change from subjects preceeding life changes and demonstrated a linear relationship between mean illness rate and magnitude of life change with shipboard personnel. In further tests of the Schedule of Recent Experience, Thurlow (41) in 1971, divided the items into objective and subjective groups and found that subjective items tend to be better predictors of illness.

TABLE II SPEARMAN COEFFICIENTS OF CORRELATION BETWEEN RANK ORDERING OF THE LIFE EVENTS BY THE VARIOUS CULTURAL AND AMERICAN SUBCULTURE GROUPS

	Caucasian Amer.	Negro Amer.	Mexican Amer.	Japanese	Danish	Swedish	Hawaiian
Caucasian Amer.	1.000	0.829	0.767	0.917	0.899	0.943	0.757
Negro Amer.	0.829	1.000	0.844	0.807	0.714	0.800	0.811
Mexican Amer.	0.767	0.844	1.000	0.696	0.648	0.698	0.766
Japanese	0.917	0.807	0.696	1.000	0.776	0.917	0.773
Danish	0.899	0.714	0.648	0.776	1.000	0.841	0.629
Swedish	0.943	0.800	0.698	0.917	0.841	1.000	0.732
Hawaiian	0.757	0.811	0.766	0.773	0.629	0.732	1.000

Seriousness of Illness

Another important dimension of the Schedule of Recent Experience is the magnitude of each life event and seriousness of illness. Because this study will deal with acute athletic trauma and not illness common to the general population, seriousness of illness will not be used, however, it is an interesting method of validation of the findings of studies in the area. Hinkle et al. (19) in 1960, formulated a seriousness of illness scale which placed illness in five groups. Each group of illness was determined by the degree of probability that the disease, if untreated would lead to death. Rahe et al. (33) also found an association between the amount of life change and the seriousness of one's illness. In this study, Rahe ek al. combined Hinkle's five illness groups into minor and major illness. Rahe's data indicated that major illness preceeded a greater change in one's life. Since the Hinkle's et al. study, a seriousness of illness rating scale was developed by Wyler et al. (46,47). Wyler et al. investigated the relationship between quantity of life change, onset of illness and seriousness of illness. The Wyler et al. research suggests the greater the life change the greater the disruption to bodily function and vulnerability to disease but does not explain specificity of disease.

Stress and Illness Onset

Since the development of the S.R.R.S. and the Schedule of Recent Experience the association of disease onset and life changes have been studied extensively using both of these techniques. Holmes and Masuda (24) report an unpublished research project which found a 93 percent association of reported health changes with a life crisis. This pilot

study dealt with resident physicians over a ten year period.

Rahe and Lind (34) found a positive relationship between mounting life change and sudden cardiac death. Rahe and Paasikivi (35) found a positive association between increased life change and time of onset of myocardial infarction. Holmes and Masuda (24) reports that an unpublished thesis (5) demonstrates a similar relationship between life change and myocardial infarction. Tollefson (42) found similar findings with fractures, in an unpublished thesis. Harris (14) found grade point average to be inversely proportionate to amount of life change experienced and remained constant regardless of college readiness. Carranza (3) found that increases in life changes among high school teachers was associated with teacher absenteeism due to illness or injury.

According to Holmes and Masuda (24), the magnitude of life changes for the year prior to football was used to evaluate the association with injury in college football players. Players were divided according to life change scores into high, medium and low risk groups. The high risk group reported a 50 percent injury rate, the medium risk group, a 25 percent injury rate and the low group reported a 9 percent injury rate. "Of the ten players who sustained multiple injuries during the season, seven were in the high risk group." (24: 181).

In 1975, Bramwell (2) conducted a study with college football players Bramwell modified the S.R.R.S. to include additions and deletions which purportedly increased the credibility of the S.R.R.S. for college male athletes. Bramwell also modified the Schedule of Recent Experience to include items scaled on the new S.R.R.S. that he used. His data indicated a significant association between increases in life events and injuries.

Bramwell also used his data to predict injury. He divided the players into low, moderate and high risk groups. Over a period of two years he found 30 percent of the players in the low risk group were injured or suffered major time loss due to an injury, 50 percent in the moderate risk group and 73 percent in the high risk group.

CHAPTER III

METHODS AND PROCEDURES

Sample

The sample consisted of 122 university athletes, 63 male and 59 female, who participated in the university level sports of hockey, basketball, volleyball, gymnastics and swimming. These teams were chosen because their university season was in progress at the time of this study. Eight athletes on the above teams were unable to participate in this study due to personal time restrictions and unavailability.

Test Instrument

The test instrument utilized in this study consisted of three separate parts. Part I dealt with the history of injury of the athlete. The respondent was asked to record all previous injury both athletic and non-athletic and was also requested to include the following additional information:

(a) What area was affected;

(b) How the injury occurred;

(c) How long they were affected by the injury;

(d) Whether it affected their present playing ability;

(e) How long ago the injury occurred;

Part II was made up of 54 life events that the respondents were asked to

priorize, according to an established rating scale. Event 1, Marriage, was assigned an arbitrary value of 500. The subject was asked to rate the remaining events by comparing each stress event to marriage. Marriage was chosen as a reference point because response to marriage should be neutral as most of the test population was unmarried. In the case of Bramwell's study (2) there was the possibility of biasing of the stress score responses of the other items since all the athletes were attending college and as a result, they may have a biased response to that particular stress score.

Part III is categorized as a Schedule of Recent Experience and requests the respondent to fill in which time period each of these events occurred, if they occurred at all. The complete questionnaire is contained in Appendix A.

Procedure For Administering The Test

The questionnaire was distributed to each athlete for a 24 hour period. Instructions were given to the respondents both verbally and in writing to decrease the variability of response. The verbal instruction paralleled those in writing on the first page of the questionnaire. The head coach or assistant coach was present in all cases. Any questions the respondent had were answered immediately and the investigator's phone number was given so that if any questions arose later the respondent could contact the investigator. If the respondent could not return the questionnaire within 24 hours due to time restriction, an extension of another 24 hours was granted.

Procedure for Analysis

Part I was the self-recorded history of each athlete's injury and was used to investigate the possible influence of past injury on present injury. If a relationship was found, the present injury was discarded and recorded as a past injury only. For example, if an athlete is predisposed to dislocating shoulders due to past trauma, and dislocates his shoulder during this athletic season, the present dislocation cannot be attributed to present stress levels and therefore must be recorded as a past injury only.

Some modifications were made in the S.R.R.S. The rationale for changes is outlined below:

1. A pilot study indicated clarification of several items was necessary. For example, sex difficulties was divided into sexual performance difficulties and sexual role adjustment difficulties, because of the ambiguity of the two terms. Mechanic (30) also noted this ambiguity of terms when he criticised the S.R.R.S.
2. The differences in heirarchical structures in the athletic department at a Canadian college as compared to an American college necessitated changes in wording of several items. For example, the Canadian university teams have a team manager and are governed by an Athletic Director rather than the General Manager or Business Manager as in American colleges.
3. The fact that the questionnaire had not been used on university level female athletes required some modification

for their use. For example, 'pregnancy' was changed to 'pregnancy of wife, girlfriend or self'.

4. Holmes and Rahe's (23) use of marriage as a reference point rather than 'entering college' as utilized by Bramwell, (2).

The arithmetic mean was used to assess the central tendency of each item score and was used in the rank ordering of results. The rank order as determined by the mean scores of stress events was compared to the rank order of like items used by Holmes and Rahe (23) with a general American sample and like items in Bramwell's study (2) using an American College Football sample. These two samples are used for comparison because the Holmes and Rahe study is the basis for all the research done with the S.R.R.S. and Bramwell's study utilizes college athletes as does this study.

Part III was used to calculate the sum of stress scores for four time periods, 0-6 months, 6 months-1 year, 1-2 years and 2-3 years and correlate those sums with the number of injuries which occurred during that time period or subsequent time periods.

Reliability

A random sample of nine items of the S.R.R.S. was readministered one to three weeks after the original test. A reliability check on the S.R.R.S. was warranted to find whether the numerical values placed on the stress items by the athletes would remain constant. Appendix B contains the retest questionnaire.

Relationship of Past and Present Injuries

When recording the present injury for each athlete it became apparent that three of these injuries had a distinct relationship to three injuries recorded by three separate athletes as a past injury. Because of this overlap these three injuries were discarded as present injuries and was recorded as a past injury only. This eliminated the possibility of recording the same injury twice and also eliminated the possibility of relating the present injury to stress rather than to its reoccurrance as a past injury.

CHAPTER IV

RESULTS AND DISCUSSION

Results

The mean scores and item rank order as determined by 122 University of Alberta athletes were computed for all 54 stress items. Table III lists this rank comparison and the mean value for each item. Also included in Table III is the mean score for each item as determined by the male and female participants of basketball, volleyball, gymnastics, hockey, and swimming at the University of Alberta. A Spearmans rho of .98 ($p<.01$) was found for the rank order of means between all the male and female athletes.

The rank order as determined by the mean score of the 28 like items in the S.R.R.S. used in this study is compared with the S.R.R.S. as scored by the general American sample (23). Table IV lists this rank comparison. A Spearmans rho of .92 ($p<.01$) was found. The two samples coincided on nine items to be ranked in the first 10. 'Marital reconciliation' was ranked at 11 by the Canadian University athletes. The two samples coincided on eight items to be ranked in the second 10. 'Trouble with in-laws' was rated lower and 'death of a close friend' was rated higher by the Canadian University athletic sample. The ranking of the last eight items by the Canadian Univessity athletic sample was consistent with the general American sample ranking with the exception that 'change in living conditions' was ranked lower by the University athletes.

TABLE III RANK COMPARISON AND MEAN SCORE VALUE FOR ALL TEST RESPONDENTS

STRESS ITEMS	MEAN SCORE	N=11 M B.B.	N=12 F B.B.	N=12 M V.B.	N=12 F V.B.	N=9 M G	N=8 F G	N=20 M HOCK	N=17 F HOCK	N=11 M SWIM	N=10 F SWIM	MEAN M	MEAN F
1. Death of spouse	2013	2491	1505	6550	1400	810	2588	869	2041	1495	775	2443	1382
2. Death of close family member	1823	2441	1470	5720	1308	691	2381	842	1791	1055	840	2150	1558
3. Death of close friend	1433	2141	1291	3616	1242	6 8	1400	807	1540	927	795	1628	1254
4. Jail term	1002	1192	838	1146	865	494	2231	887	1118	741	760	892	1162
5. Divorce	871	1207	785	1209	892	536	731	686	1044	800	695	888	829
6. Marital separation	839	1148	759	1336	836	533	681	653	950	725	680	879	781
7. Pregnancy	741	655	1017	873	717	612	938	599	815	535	680	655	833
8. Change in health close family	533	493	783	825	523	316	494	437	616	269	498	468	583
9. Fired from work	524	476	527	692	540	281	694	484	626	385	461	464	570
10. Marriage	500	500	500	500	500	500	500	500	500	500	500	500	500
11. Marital reconciliation	474	453	479	788	479	253	463	406	519	313	508	443	490
12. Foreclosure on a loan	451	380	500	610	359	339	1300	324	437	265	392	384	598
13. Taking loan $10,000	450	393	536	654	390	296	814	317	515	235	423	379	536
14. Sexual performance difficulty	422	477	530	476	354	366	421	403	487	298	384	404	435
15. Being dropped from team	413	349	677	302	552	257	374	474	478	232	272	323	470

M = male F = female B.B. = Basketball V.B. = Volleyball G=Gymnastics Hock=Hockey Swim=Swimming

TABLE III Continued

STRESS ITEMS	MEAN SCORE	M B.B.	F B.B.	M V.B.	F V.B.	M G	F G	M HOCK	F HOCK	M SWIM	F SWIM	M MEAN	F MEAN
16. Change in arguments with partner	387	219	305	368	385	281	321	385	397	288	403	288	362
17. Breaking up with girl/boy friend	385	319	554	258	456	353	400	335	550	262	307	305	453
18. End of formal schooling	377	349	400	363	414	275	336	341	542	250	395	316	417
19. Change in financial state	364	326	388	463	309	227	288	350	515	243	412	322	401
20. Discrimination Coaches/Team	345	329	398	332	463	242	341	253	455	147	255	261	382
21. Taking Loan < $10,000	337	328	418	423	314	258	514	250	393	186	315	289	391
22. Outstanding achievement	327	248	273	346	377	159	314	317	392	320	473	278	366
23. Sexual adjustment of roles	319	232	478	287	338	275	307	284	368	223	384	260	375
24. Discrimination home/ community	315	300	320	279	408	179	344	252	396	286	366	259	367
25. Dropped to lessor team status	307	290	566	238	419	147	262	349	316	149	250	235	363
26. Trouble with head coach	305	276	445	343	429	252	213	268	324	122	335	252	349
27. Demonstrating ability	297	196	411	248	410	261	243	228	371	238	338	234	355
28. Playing time loss/ injury	278	137	378	160	400	279	261	234	379	201	318	202	347

TABLE III Continued

STRESS ITEMS	MEAN SCORE	M B.B.	F B.B.	M V.B.	F V.B.	M G	F G	M HOCK	F HOCK	M SWIM	F SWIM	M MEAN	F MEAN
29. Errors at matches	272	155	348	196	306	173	209	232	469	195	332	190	333
30. Change in comp.level	269	240	331	255	303	152	188	325	306	152	327	225	291
31. Increased class workload	265	179	392	170	282	339	224	238	356	184	342	222	319
32. Change in performance	264	144	306	200	429	126	206	274	305	209	360	197	321
33. Spouse begins or ceases work	263	124	377	203	308	261	356	210	300	195	329	199	334
34. Change in living condition	258	156	244	207	327	190	228	273	295	250	360	195	291
35. Change to new team or sport	245	103	350	153	294	268	299	250	264	146	330	184	307
36. Entering college	242	139	346	256	169	167	281	215	329	179	295	191	284
37. Change in residence	241	126	245	151	300	190	331	214	284	214	374	179	306
38. Difficulty with eligibility	236	194	335	236	256	200	200	191	294	108	318	186	280
39. Trouble with in-laws	217	169	265	163	256	98	199	194	364	182	207	161	258
40. Trouble with Ass't coaches	213	145	220	205	406	203	208	166	262	91	204	162	260
41 Change in social habits	209	176	187	126	212	256	189	187	279	214	263	192	226
42. Change in eat/sleep habits	198	80	231	195	237	229	164	175	229	173	263	170	225

TABLE III Continued

STRESS ITEMS	MEAN SCORE	M B.B.	F B.B.	M V.B.	F V.B.	M G	F G	M HOCK	F HOCK	M SWIM	F SWIM	M MEAN	F MEAN
43. Vacation	192	125	118	130	306	81	170	168	298	183	280	137	234
44. Change in personal habits	185	141	176	120	195	178	175	197	278	139	201	155	205
45. Change in diff. faculty/program	179	143	166	188	163	139	168	176	206	185	244	166	189
46. Minor violations of law	172	160	196	145	163	98	149	164	241	119	253	137	200
47. Change in team responsibility	170	103	182	135	271	87	123	170	265	126	149	124	198
48. Change in family get-togethers	169	110	213	133	265	84	148	147	278	118	125	118	206
49. Change in playing hours	167	102	272	141	229	105	93	177	177	141	176	133	189
50. Change in recreation	166	88	135	102	210	145	124	147	243	188	248	134	192
51. Change position on team	156	74	280	141	155	46	136	187	222	95	122	109	183
52. Trouble with athletic director	149	56	133	302	210	93	150	117	135	135	174	140	160
53. Brother/sister leaves home	141	118	232	166	171	60	160	126	110	77	211	109	177
54. Difficulties with M.D., therapist	138	68	161	144	208	121	108	126	169	64	179	105	165

TABLE IV COMPARISON OF RANKING OF 27 LIKE ITEMS IN THE S.R.R.S. IN AMERICAN AND PRESENT STUDIES

LIFE EVENTS	AMERICAN RANK (N=167)	CANADIAN UNIVERSITY RANK (N=122)
Death of spouse	1	1
Divorce	2	5
Marital separation	3	6
Jail Term	4	4
Death of close family member	5	2
Marriage	6	10
Fired at work	7	9
Marital reconciliation	8	11
Change in health/family	9	8
Pregnancy	10	7
Sex difficulties	11	14
Change in financial state	12	17
Death of close friend	13	3
Change in number of arguments/spouse	14	15
Loan > $10,000.00	15	13
Foreclosure on loan	16	12
Trouble with in-laws	17	22
Outstanding personal achievement	18	18
Spouse starts/stops work	19	19
End of formal schooling	20	16
Change in living conditions	21	20
Change in personal habits	22	25
Change in residence	23	21
Change in recreation	24	28
Change in social activities	25	23
Change in number of family gatherings	26	27
Vacation	27	24
Minor violations of law	28	26

Spearmans RHO p = .92

crit p = .448 at .01 level of confidence

Another rank order as determined by the mean scores of the like 47 items in the S.R.R.S. used in this study is compared with the S.R.R.S. as scored by an American College football sample (Bramwell, 1975). Table V lists the rank order. A Spearmans rho of .80 (p .01) was obtained. The two samples coincided on eight items to be ranked in the first 10. 'Jail term' and 'marital reconciliation' were ranked higher at the 4th and 10th rank respectively by the Canadian University athletic sample. The two samples coincided on 15 items to be ranked in the second 20. 'Separation from girlfriend or boyfriend, discrimination at home or in the community, taking a loan under $10,000.00 and playing time lost due to injury or illness' are all rated higher by the Canadian University sample. 'Being dropped from the team' is ranked higher by the American College football sample. Of the items to be ranked in the last 17, 'change to a new sport or team, entering college, difficulties with elegibility, trouble with athletic director or manager' are ranked lower by the Canadian University athletes than the American College football sample.

To evaluate the reliability of the test instrument (S.R.R.S.), a random sample of nine stress items from the S.R.R.S. was readministered to 93 (70%) of the test population. A reliability coefficient of .841 was obtained overall between the nine random samples and the original scores. When administering the nine random samples, a confounding factor was administered to 23 of the test population. The retest items were not administered to these 23 athletes in the same manner as was the original testing instrument. These 23 athletes were telephoned and asked for responses for the nine retest items rather than given the handout in

TABLE V COMPARISON OF RANKING OF 46 LIKE ITEMS IN THE S.R.R.S. IN THE AMERICAN COLLEGE FOOTBALL SAMPLE AND PRESENT STUDY.

LIFE EVENTS	COLLEGE FOOTBALL RANK N=79	CANADIAN UNIVERSITY RANK N=122
Death of spouse	1	1
Death of close family member	2	2
Marriage	3	9
Death of close friend	4	3
Divorce	5	5
Marital separation	6	6
Being dropped from team	7	14
Being fired from work	8	8
Entering college	9	32
Change in health of family member	10	7
End of formal schooling	11	17
Change in financial state	12	18
Jail term	13	4
Outstanding personal achievement	14	20
Skill level changes	15	28
Troubles with head coach	16	23
Sexual difficulties	17	13
Change in course work	18	27
Forclosure on loan	19	11
Change in number of arguments/partner	20	15
Dropped to lessor playing status	21	22
Taking loan >$10,000.00	22	12
Change to new sport or team	23	31
Difficulties with eligibility	24	34
Difficulty demonstrating ability	25	24
Trouble with ass't coaches	26	36
Partner starts/stops work	27	29
Marital reconciliation	28	10
Trouble with athletic director/manager	29	45
Personal errors at games	30	26
Change in living conditions	31	30
Playing time lost due to injury	32	25
Separation from girl/boyfriend	33	16
Change to new position on team	34	44
Change in social activities	35	37
Trouble with inlaws	36	35
Change in personal habits	37	39
Discrimination at home/community	38	21
Taking loan <$10,000.00	39	19
Change in team responsibility	40	41
Brother/sister leaving home	41	46

TABLE V Continued

LIFE EVENTS	COLLEGE FOOTBALL RANK N=79	CANADIAN UNIVERSITY RANK N=122
Difficulties with M.D., trainer	42	47
Vacation	43	38
Change in location of residence	44	33
Change in number of family get-togethers	45	42
Minor violations of law	46	40
Change in recreation	47	43

Spearmans RHO p = .80
crit p = .432 at .01 level of confidence.

Appendix B. Consequently, a correlation matrix was then constructed without the 23 contaminated retest scores which resulted in a reliability coefficient for the remaining 70 (58%) of the test population. The resulting reliability coefficient was .891. Table VI shows comparisons between the reliability coefficients of the nine random sample scores and the original test scores of both contaminated and uncontaminated groups.

Correlations were calculated between the sum of stress scores for each athlete during four different time periods (0-6 months ago, 6 months-1 year ago, 1-2 years ago and 2-3 years ago) and the number of time periods which sequentially followed. The sum of stress scores for the athletes during these four time periods were also correlated with the athletes own description of injuries which occurred during these time periods, with year of playing varsity sport and with experience playing the sport. The correlations are shown in Table VII. Significant correlations were found between the sum of stress scores from 2-3 years ago and the injuries recorded by the athlete for 1-2 years ago; between the sum of scores for 2-3 years ago and the number of injuries recorded by the athletes; between the sum of stress scores 1-2 years ago and Type A and Type B injuries for 1976 and 1977 recorded by the Athletic Injuries Clinic; between the sum of stress scores 1-2 years ago and the number of injuries recorded by athletes over 3 years ago; and finally between the sum of stress scores 6 months-1 year ago and the effect of the injuries recorded by the athletes on their playing ability during that time period.

TABLE VI COMPARISON OF RELIABILITY COEFFICIENTS OF NINE RANDOM SAMPLE ITEMS AND ORIGINAL TEST SCORES WITH CONTAMINATED AND UNCONTAMINATED GROUPS

RETEST ITEMS	Trouble with Head Coach	Brother or sister leaves home	Being dropped from team	Playing time due to injury or illness	Death of close family member	Death of close friend	Divorce	Change in Financial State	Jail term	OVERALL
Contaminated Reliability Coefficients N=93	.728	.544	.786	.689	.856	.908	.597	.543	.461	.841
Uncontaminated Reliability Coefficients N=70	.654	.473	.544	.831	.961	.974	.565	.565	.438	.891

Discussion

It may be noted visually that the womens scores are distinctly higher than male scores from items 6 through 54 and that female mean scores on items 1 to 6 were lower. This may be due to a phenomena documented by Anastasi, (1), whereby the respondent tends to answer in a socially desirable manner. That is, males do not rate stress items high because it is socially undesirable, whereas women may rank stress items higher because it is socially acceptable. Even though women tend to rate stress items higher, they rank the stress items in virtually the same order. (Spearmans rho = .98 ($p<.01$)).

Comparison of the S.R.R.S. of the general American sample and Canadian University athletes indicates a high correlation in the relative order of magnitude of the perception of 28 like stress events. It also discloses that the heirarchy of important stress events for Canadian University athletes is consistent with those of the general American sample. As expected there is some individual differences in the rank order of life events which reflects the cultural and age variables of the two samples. However, the high correlation supports the speculation that Canadian society mirrors the changes and transformations of American society. The higher ranking of 'death of a close friend' may reflect the significance of a friendship in a population that is generally unmarried and living away from home. The lower ranking of 'trouble with in-laws' may again reflect a largely unmarried population who has not had to cope with the possible agitation of in-laws. The lower ranking of 'marital reconciliation' may be anticipated in a younger unmarried population within an increasingly divorce oriented society.

Comparison of the S.R.R.S. of the Canadian College football sample on the 47 like items show a moderately high Spearmans rho of .80. This comparison shows more variation in the ranking of stress events than the comparison of Canadian University athletes and the general American sample. The Canadian athletes ranked 'marital reconciliation, jail term, separation from girlfriend or boyfriend, discrimination at home or in the community, taking a loan under $10,000.00 and playing time lost due to injury or illness' higher than the American College football sample. 'Being dropped from the team, change to a new sport or team, entering college, difficulties with eligibility, troubles with assistant coaches and trouble with athletic director or manager' are all ranked lower by the Canadian athletes than by the American College football sample. There may be several reasons for this. Firstly, the female contingency of the Canadian University athletic sample may have influenced the rank order of the stress levels to closely mimic the rank ordering of the general American sample which also included females. The American College football sample consisted of only males and consequently the rank order of stress events may have been unduly influenced by this factor. Secondly, the testing population of the Canadian athletes (N=122) more closely resembles that of the general American sample (N=167). Bramwell's (2) sample consisted of only 67 male athletes. Thirdly, Bramwell's test population included a black minority whose rank order of stress events when correlated with the rank order of stress events with a white majority was .420 (2:12). This may have influenced the total rank order of stress events. Finally, these differences may simply reflect the cultural variations which exist between these two groups.

The test-retest coefficients on nine random samples was .841 with the possibility of contaminated results on 23 of the test population. Without the contaminated test population a test-retest coefficient was .891. An experimentor cannot measure accurately the extent of a confounding factor. However the differences in reliability coefficients of the contaminated and uncontaminated samples are so minute (.05 difference) it seems safe to assume that the confounding factor was of little consequence to the reliability of answering of the nine random sample retest items for the 23 contaminated test population.

Correlations between 21 variables were constructed and are listed in Appendix C. Of the correlations between sum of stress scores and the other variables as shown in Table VII, the three that are most important are those between the sum of stress scores 1-2 years ago and injuries that occurred in the 1976-77 season and the sum of stress scores 2-3 years ago and the injuries recorded by athletes 1-2 years ago. These correlations suggest a relatively small positive relationship between stress that occurred during a specific time period and the injuries which followed.

One important negative correlation occurred between sum of stress scores 0-6 months ago and type A injury for 1976-77. This gives rise to the implication that injury which occurred in the 1976-77 athletic season reduces the stress which occurred in the past six months. Speculation may follow that the injury reduced the amount of stress by forcing the athlete to rest or reduce physical training.

However, an explanation for so few significant correlations in comparison to Bramwell's study is required. Several avenues have been explored; firstly, Bramwell's study dealt with football alone, which is a contact sport, while the present study dealt with four non-contact

TABLE VII MENS HOCKEY AND SWIMMING TEAM CORRELATIONS

MENS HOCKEY

	Sum of stress scores 0-6 mons. ago	Sum of stress scores 6mon.-1yr.ago	Sum of stress scores 1-2yrs.ago	Sum of Stress scores 2-3yrs.ago
Type A 1976-77	-.375	.380	.424	-.141
Type B 1976-77	-.053	-.171	.540*	.095
Type A 1977-78	.233	.045	.152	-.212
Type B 1977-78	.140	.337	.130	-.232

Crit value at .05 = .444
.02 = .516
.01 = .561

SWIMMING TEAM

	Sum of stress scores 0-6 mons. ago	Sum of stress scores 6mons.-yr.ago	Sum of stress scores 1-2yrs. ago	Sum of stress scores 2-3yrs. ago
Type A 1976-77	-.215	.029	.229	-.069
Type B 1976-77	-.006	.537*	-.147	.181
Type A 1977-78	.051	-.202	-.093	-.223
Type B 1977-78	.181	.055	-.029	.406

Crit value at .05 = .433
.02 = .503
.01 = .549

TABLE VIII CORRELATION COEFFICIENTS

	Sum of 0-6mons. ago stress scores	Sum of 6-1 yr. ago stress scores	Sum of 1-2 yrs. ago stress scores	Sum of 2-3 yrs. ago stress scores
Year of varsity sport	-.210	-.319	-.053	.072
Years of experience	-.110	-.156	-.024	-.142
# of past injuries as recorded by athletes	-.017	.083	.193	.219*
# past injuries 0-6 mons.ago as recorded by athletes	.132	.074	.007	-.060
affects	-.096	.220*	-.055	.023
# past injuries 6-1yr. ago as recorded by athletes	.055	.067	.070	.099
affects	.001	.044	.141	.087
# past injuries 1-2yrs. ago as recorded by athletes	-.085	.088	.122	.258**
affects	-.048	.072	.046	.122
# past injuries 2-3yrs. ago as recorded by athletes	-.044	-.032	-.005	.177
affects	.056	-.056	-.021	.126
# past injuries over 3 yrs. ago as recorded by athletes	-.100	-.013	.205*	.131
affects	-.158	-.008	.206*	.010
Type A injury for 1976-77	-.248	0.14	.316**	.118
Type B injury for 1976-77	-.111	.006	.296**	.178
Type A injury for 1977-78	-.027	.007	.095	-.052
Type B injury for 1977-78	.018	.082	-.063	-.025

* sig. at .05 level
** sig. at .01 level

df = 120 crit value at .01 = .254
at .05 = .195

sports, basketball, volleyball, gymnastics and swimming and one contact sport, hockey. To investigate the influence of contact, correlations were calculated using the same 21 variables as in Table VII for men's hockey which had the highest injury rate and the swimming team which had the lowest injury rate to find the differences in correlations. The results of the correlations are shown in Table VIII. Only one significant correlation was obtained on each matrix which indicates no major difference between correlations on teams with high injury and teams with low injury rates. There were no significant differences between correlations for these two teams. The correlations for the mens hockey team also negates the second possibility that the womens' teams may have unduly influenced the correlations between stress and injury. A third possibility is that the Canadian university athletic setting is not conducive to the study of stress levels and athletic injuries. That is, because athletic scholarships are not granted to Canadian athletes the stresses which may influence an American college athlete are not of consequence to a Canadian university athlete. A fourth possibility is that there is only a mild relationship between Canadian university athletes' stress levels and an athletes' injuries, whereas in other situations and other times there may be a strong relationship. These are yet to be investigated. Finally, it is possible that the modified S.R.R.S. used in this study does not accurately measure stresses affecting the Canadian university athlete. (See recommendation

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The main purpose of this study was to investigate the relationship between stress levels of university athletes and the number of athletic injuries which occur to these athletes. A sample of 122 intervarsity athletes, 63 male and 59 female, placed a numerical score on 54 stress items. Rank order of these 54 stress items was determined by the mean scores of all the athletes. Each athlete then indicated in a Schedule of Recent Events during what time period in the past three years, any of these stress items occurred. The sum of stress scores for each time period; 0-6 months, 6 months-1 year, 1-2 years, 2-3 years, was then determined and correlated with recorded injuries for each athlete. These injuries were recorded both by the athletes and the Athletic Injuries Clinic staff, at the University of Alberta.

Few significant correlations were found between stress levels and athletic injuries. Stress levels and athletic injuries were then correlated for the mens hockey team which had a high injury rate and the swimming team which had a low injury rate. Only one positive significant correlation was found in either group.

Conclusions

1. The stress levels of athletes as determined by 54 items in the S.R.R.S. used in this study does not have a large sig-

nificant relationship with injuries as recorded either by the athletes themselves or by the Athletic Injuries Clinic at the University of Alberta.

2. The stress levels of the mens hockey team at the University of Alberta which is a high injury sport, as determined by 54 items on the S.R.R.S. has little significant relationship with injuries as recorded by the athletes themselves or records in the Athletic Injuries Clinic.

3. The stress levels of the swimming team at the University of Alberta, which is a low injury sport, as determined by the 54 items on the S.R.R.S. has little significant relationship with injuries as recorded by the athletes themselves or in the Athletic Injuries Clinic.

4. The differences of the correlations for sum of stress scores and injury, between the mens hockey team and the swimming team, are not significant.

5. Although females tend to rate stress items higher than males, the rank order of stress items between the two groups is almost the same. (Spearmans rho = .98).

Recommendations

1. Further research on this topic should attempt to validate the 54 stress items in the modified S.R.R.S. used in this study because the changes in the S.R.R.S., although minor, may be responsible for the low correlations found between stress and injury.
2. Further studies on this topic may investigate the differences between men and women in rating of stress events.
3. Future studies should attempt to assess the validity of assigning a numerical value for subjective stress events. For example, is marriage worth 500 life change units of value or can it be measured?
4. Investigation in the future should attempt to define the cumulative effect of stress, if there is any. For example, is a high stress item equal to the sum of several lower stress items?
5. Further investigation should attempt to specify what types of stress are related to what type of injury. For example is one specific stress such as divorce very highly related to injury or is it two or three stresses together which are responsible for certain injuries?

SELECTED REFERENCES

1. Anastasi, A. Psychological Testing. (4th Ed.) Macmillan, 1976.

2. Bramwell, S., Masuda, M., Wagner, N., Holmes, T., Psychosocial factors in athletic injuries. J. of Hum. Stress. 1(2): 6-20, 1975.

3. Carranz, E. The relationship of life change to academic performance among selected college freshmen at varying levels of college readiness. Ph.D of Education thesis, East Texas State University, Commerce, Texas, 1972.

4. Christenson, W.N., F.D. Kane, H.G. Wolff, and L.E. Hinkle. Studies in human ecology: perception of life experiences as a determinant of occurrence of illness. Clin. Res. 6: 238, 1958.

5. Edwards, M.K. Life crises and myocardial infarction. Master of Nursing thesis, University of Washington, Seattle, 1971.

6. Fischer, H., Blin, B., Winters, W., Hagner, S., Russell, G., Wiess, E., Emotional factors in coronary occlusion II. Time Patterns and factors related to onset. Psychosom. 5: 280-291, 1964.

7. Fischer, H.K., B.M. Blin, W.L. Winters, S.B. Hagner, and E. Weiss. Time patterns and emotional factors related to the onset of coronary occlusion. Psychosom. Med. 24: 516, 1962.

8. Graham, D.T. The pathogenesis of hive: Experimental study of life situations, emotions and cutaneous vascular reactions. Proc. A. Research Nervous and Mental Disorders. Cited by H.G. Wolff, Stress and Disease. Springfield, Illinois: Thomas, 1953.

9. Graham, D.T., and I. Stevenson. Disease as a response to life stress I. The nature of the evidence. In the Psychological Basis of Medical Practice. H.I. Lief, V.F. Lief and N.R. Lief Ed. New York: Harper & Row, 1963. pp. 115-136.

10. Green, W.A. Psychological factors and reticuloendothelial disease: I. Preliminary observations on a group of males with lymphomas and leukemias. Psychosom. Med. 16: 220-230, 1954.

11. Green, W.A., L.E. Young, and S.N. Swisher. Psychological factors and reticuloendothelial disease: II. Observations on a group of women with lymphomas and leukemias. Psychosom. Med. 18: 284-303, 1956.

12. Green, W.A., G. Miller. Psychological factors and reticuloendothelial disease: LV. Observations on a group of children and adolescents with leukemia: An interpretation of disease development in terms of the mother-child unit. Psychosom. Med. 20: 124-144,1958.

13. Harmon, D.K., M. Masuda, and T.E. Holmes. The social readjustment rating scale: A cross-cultural study of Western Europeans and Americans. Unpublished paper presented at the Annual Meeting of the American Psychiatric Association, Pal Harbour, Florida, May, 1969.

14. Harris, P.W. The relationship of life change to academic performance among selected college freshmen at varying levels of college readiness. Ph.D. of Education thesis. East Texas State University, Commerce, Texas, 1971.

15. Hawkins, N.G., R. Davies, and T.H. Holmes. Evidence of psychosocial factors in the development of pulmonary tuberculosis. Am. Review of Tuber. and Pul. Dis. 75: 768-780, 1957.

16. Hinkle, L.E., and H.G. Wolff. Illness, life experience and social environment. Ann. Int. Med. 49: 1373, 1958.

17. Hinkle, L.E., and N. Plummer. Life stress and industrial absenteeism. The concentration of illness absenteeism in one segment of a working population. Indust. Med. Surg. 21: 365, 1952.

18. Hinkle, L.E., and H.G. Wolff. The nature of mans' adaptation to his total environment and the relation of this to illness. A.M.A. Arch. Int. Med. 99: 442, 1957.

19. Hinkle, L.E., R. Redmont, N. Plummer, and H.G. Wolff. An examination of the relationship between symptoms, disability and serious illness in two homogeneous groups of men and women. Am. J. of Pub. Health. 50: 1327-1336, 1960.

20. Holmes, L.E., and M. Masuda. Psychosomatic Syndrome. Psychology Today. April, 1972, pp. 71.

21. Holmes, T., Goodell, H., Wolf, S., Wolff, H., The Nose. An Experimental Study of Reactions Within The Nose in Human Subjects During Varying Life Experiences. Thomas, Springfield, Ill. 1950.

22. Holmes, T.H. Multidiscipline studies of tuberculosis. In: Sparer, P.J. (Ed.), Personality, Stress and Tuberculosis. New York: International Universities Press, 1956.

23. Holmes, T.H., and R.H. Rahe. The social readjustment rating scale. J. of Psychosom. Res. 11: 227-237, 1967.

24. Holmes, T.H., and M. Masuda. Life change and illness susceptibility. Reprinted from Separation and Depression. A.A.A.S. 1973. pp. 161-186. Pub. #94.

25. Kissen, D.M. Specific psychological factors in pulmonary tuberculosis. Health Bull., Edinburgh. 14: 44, 1956.

26. Kissen, D.M. Some psychological aspects of pulmonary tuberculosis. Int. J. of Social Psych. 3: 252, 1958.

27. Komararoff, A.L., M. Masuda, and T.H. Holmes. The social readjustment rating scale: A comparative study of Negro, Mexican and white Americans. J. of Psych. Med. 13: 121-128, 1968.

28. Lief, A., Ed. The Commonsense Psychiatry of Dr. Adolf Meyer. New York: McGraw-Hill, 1948.

29. Masuda, M., and T.H. Holmes. The social readjustment rating scale: A cross-cultural study of Japanese and Americans. J. of Psychosom. Res. 11: 227-237, 1967.

30. Mechanic, David. Some problems in the measurement of stress and social readjustment. J. of Human Stress. September: 43-48, 1975.

31. Rahe, R., Meyer, M., Smith, M., Kjaer, G., Holmes, T., Social Stress and illness onset. J. of Psychosom. Res.8: 35-45, 1964.

32. Rahe, R.H. Multi-cultural correlations of life change scaling: America, Japan, Denmark and Sweden. J. of Psychosom. Res. 13: 191-195, 1969.

33. Rahe, R.H., J.D. McKean, and R.J. Arthur. A longtitudinal study of life change and illness patterns. J. of Psychosom. Res. 10: 355, 1966.

34. Rahe, R.H., and E. Lind. Psychosocial factors and sudden cardiac death: a pilot study. J. of Psychosom. Res. 15: 19-24, 1971.

35. Rahe, R.H., J. Paasikivi. Psychosocial factors and myocardial infarction II. An outpatient study in Sweden. J. of Psychosom. Res. 15: 25-31, 1971.

36. Rahe, R.H. Life change measurement as a predictor of illness. Proceedings of the Royal Society of Medicine. 61: 1124-1126, 1968.

37. Rahe, R.H., U. Lundberg, L. Bennett, and T. Theorell. Prediction of near-future health change from subjects preceeding life changes. J. of Psychosom. Res. 14: 401-406, 1970.

38. Seyle, Hans. The Stress of Life. Toronto: McGraw-Hill, 1956.

39. Stevenson, I., and D.T. Graham. Disease as a response to life stress II. Obtaining the evidence clinically. In the Psychological Basis of Medical Practise. H.I. Lief, V.F. Lief, N.R. Lief, Ed. New York: Harper & Row, 1963.

40. Theorell, T., and R.H. Rahe. Psychosocial factors in myocardial infarction I. An outpatient study in Sweden. J. of Psychosom. Res. 15: 25-31, 1971.

41. Thurlow, H,J. Illness in relation to life situation and sick-role tendency. J. of Psychosom. Res. 15: 73-88, 1971.

42. Tollefson, D.J. The relationship between the occurrence of fractures and life crises events. Master of Nursing thesis, University of Washington, Seattle, 1972.

43. Williams, C., Williams, R., Griswold, M., Holmes, T., Pregnancy and life change. J. of Psychosom. Res. 19: 123-129, 1974.

44. Wolff, H.G. Stress and Disease. Baltimore: Williams and Wilkins, 1953.

45. Wolff, H.G. Protective reaction patterns and disease. Ann. Int. Med. 27: 955-969, 1947.

46. Wyler, A.R., M. Masuda, and T.H. Holmes. Seriousness of rating scale: Reproducibility. J. of Psychosom. Res. 14: 59,1970.

47. Wyler, A.R., M. Masuda, and T.H. Holmes. Seriousness of rating scale. J. of Psychosom. Res. 11: 363, 1968.

APPENDIX A

TEST INSTRUMENT

IF YOU HAVE ANY DIFFICULTIES IN ANSWERING THIS QUESTIONNAIRE: I can be reached at ph. # 435-3049 tonight between 9.00-11.00 o'clock. Do not hesitate to call.

This project will attempt to find a correlation between increases in stress levels and increases in athletic injuries.

Part one of this questionnaire asks you to list all past injuries, and include: in the following way:

(a) what area was affected
(b) how did the injury occur
(c) how long were you affected
(d) how it affects present playing ability
(e) how long ago did injury occur

FOR EXAMPLE: Shoulder dislocation
(a) right shoulder
(b) fell out of a tree
(c) had to stop activities for two months
(d) no
(e) 3 years ago

Part two asks you to put a numerical score on each of 55 items which elicit stress. Marriage has already been pre-set at 500. The two examples that follow are not included in part two:

1. Public humilation (eg. the Francis Fox incident) 1000
2. Marriage 500
3. Death of a favorite pet hamster 58

Part three simply asks you indicate when in the last five years any of these stress items may have occurred to you.

The results of this study are important for understanding the possible relationships between stress and athletic injuries. I need to know your names so that I can match them up with the Athletic Injury Clinic records. I will be the only one to see the completed questionnaires and the identification of respondents will be held in confidence. If

you do not wish to answer any particular item - DON'T. It will take about one hour to complete and I really appreciate you taking the time to do so. I will be happy to discuss with any of you, the results of your own questionnaire, if you wish to follow it up.

1. NAME _____

2. Sex M F (circle one)

3. Year of playing varsity sport 1 2 3 4 5 (circle one)

4. Years of experience playing the above sport _____

5. List below all past injuries (both athletic and non-athletic) and explain:

   (a) what area was affected

   (b) how did injury occur

   (c) how long were you affected by injury

   (d) does your past injury affect present playing ability

   (e) how long ago did injury occur

You are asked to rate a series of life events as to their relative degrees of necessary readjustments. In scoring, use all of your experience in arriving at your answer. This means personal experience where it applies as well as what you have learned to be the case for others. Some persons accommodate to change more readily than others; some persons adjust with particular ease or difficulty to only certain events. Therefore, strive to give your opinion of the average degree of readjustment necessary for each event rather than the extreme.

The mechanics of rating are these: Event 1, Marriage, has been given an aribtrary value of 500. As you complete each of the remaining events think to yourself, "Is this event indicative of more or less readjustment then marriage?" "Would the readjustment take longer or shorter to accomplish?" If you decide the readjustment is more intense and projected then choose a proportionately larger number and place it in the blank directly opposite the event in the column marked "VALUES." If you decide the event represents less and shorter readjustments than marriage then indicate how much less by placing a proportionately smaller number in the opposite blank. If the event is equal in social readjustment to marriage, record the number 500 opposite the event.

1. Marriage 500
2. Entering college_____
3. Pregnancy _____ (of wife, girlfriend or self)
4. Discrimination from coaches or team_____
5. Discrimination in community, at home or away_____
6. Trouble with head coach_____
7. Trouble with assistant coach_____
8. Brother or sister leaving home_____
9. Trouble with athletic director or general manager_____
10. Change in level of competition
    (high school to college; or college to pro.) _____
11. Major change in playing hours or conditions or practise hours or conditions_____
12. Major change in responsibility on team (captain, seniority etc.)_____
13. Change to new or different position on the team_____
14. Being dropped from the team_____
15. Being dropped to lesser playing status_____

16. Change to a new team or sport_____

17. Playing time lost due to illness or injury_____

18. Difficulties with athletic therapist, manager or team physician

_____

19. Difficulty with eligibility-scholastic, transfer of credits etc.

_____

20. Personal major errors in games or meets_____

21. Difficulty in demonstrating athletic ability_____

22. Breaking up with girlfriend or boyfriend_____

23. Death of spouse_____

24. Death of close family member_____

25. Death of close friend_____

26. Divorce_____

27. Marital separation_____

28. Being fired from work, if employed_____

29. Change in health of family member_____

30. The end of formal schooling_____

31. Change in financial state_____

32. Jail term_____

33. Outstanding personal achievement_____

34. Change to different faculty or program_____

35. Sexual performance difficulties_____

36. Sexual adjustment of roles_____

37. Increased work load in classes_____

38. Foreclosure on mortgage or loan_____

39. Change in number of arguments with live-in partner(s)_____

40. Taking a mortgage or loan greater than 10,000_____

41. Taking a mortgage or loan less than 10,000_____

42. Wife or husband begins or ceases work_____

43. Marital reconciliation_____

44. Change in living conditions

45. Change in location of residence

46. Change in recreation_____

47. Change of personal habits_____

48. Change of social habits_____

49. Trouble with in-laws_____

50. Change in eating or sleeping habits_____

51. Change in family get-togethers_____

52. Minor violations of the law_____

53. Vacation _____

54. Change in skill level performance_____

IF THE EVENTS IN QUESTION BELOW, OCCURRED IN ANY OF THE TIME PERIODS, PUT A CHECK IN THE APPROPRIATE TIME PERIOD OR PERIODS.

	0-6 mon	6 mo-yr.	1-2 yr.	2-3 yr.	4-5 yr.
1. Mark in the appropriate time period if you were married in the past	___	___	___	___	___
2. Mark in the appropriate time period when you entered college	___	___	___	___	___
3. Mark in the appropriate time period if you have been pre[illegible]	___	___	___	___	___
4. Mark in the appropriate time period when you felt discrimination from coaches or team	___	___	___	___	___
5. Mark in the appropriate time period when you felt discrimination in the community or at home	___	___	___	___	___
6. Mark in the appropriate time periods if you had trouble with the head coach	___	___	___	___	___
7. Mark in the appropriate time period if you had trouble with the assistant coach	___	___	___	___	___
8. Mark in the appropriate time period if a brother or sister left home	___	___	___	___	___
9. Mark in the appropriate time period if you had trouble with the athletic director or general manager	___	___	___	___	___
10. Mark in the appropriate time period if you had a change in level of competition (from high-school to college or college to pro.)	___	___	___	___	___

	0-6 mon	6 mo-yr.	1-2 yr.	2-3 yr.	4-5 yr.
11. Mark in the appropriate time period if you had major changes in playing or practise hours and conditions	___	___	___	___	___

	0-6 mon	6 mo-yr.	1-2 yr.	2-3 yr.	4-5 yr.
12. Mark in the appropriate time period if you had major changes in responsibility on the team (Captain, seniority, etc).	___	___	___	___	___
13. Mark in the appropriate time period if you changed to a new or different position on the team	___	___	___	___	___
14. Mark in the appropriate time periods if you were dropped from the team	___	___	___	___	___
15. Mark in the appropriate time periods if you were dropped to a lesser playing status	___	___	___	___	___
16. Mark in the appropriate time periods if you changed to a new team or sport	___	___	___	___	___
17. Mark in the appropriate time period if you lost playing time due to illness or injury	___	___	___	___	___
18. Mark in the appropriate time period if you had difficulties with the athletic therapist, manager or team physician	___	___	___	___	___
19. Mark in the appropriate time period if you had difficulty with eligibility-either scholastically or with transfer of credits	___	___	___	___	___
20. Mark in the appropriate time period if you had major personal error in games or at meets	___	___	___	___	___
21. Mark in the appropriate time period if you had difficulty in demonstrating your athletic ability	___	___	___	___	___

	0-6 mon	6 mo-yr.	1-2 yr.	2-3 yr.	4-5 yr.
22. Mark in the appropriate time period if you broke up with your girlfriend or boyfriend	___	___	___	___	___
23. Mark in the appropriate time period if you experienced the death of a spouse	___	___	___	___	___

	0-6 mon	6 mo-yr.	1-2 yr.	2-3 yr.	4-5 yr.
24. Mark in the appropriate time period if you experienced the death of a close family member	___	___	___	___	___
25. Mark in the appropriate time period if you experienced the death of a close friend	___	___	___	___	___
26. Mark in the appropriate time period if you experienced a divorce	___	___	___	___	___
27. Mark in the appropriate time period if you experienced marital separation	___	___	___	___	___
28. Mark in the appropriate time period if you were fired from work, if employed	___	___	___	___	___
29. Mark in the appropriate time period if a family member experienced a health change	___	___	___	___	___
30. Mark in the appropriate time period when you experienced the end of formal schooling	___	___	___	___	___
31. Mark in the appropriate time period if you've experienced a change in financial state	___	___	___	___	___
32. Mark in the appropriate time period if you experienced a jail term	___	___	___	___	___
33. Mark in the appropriate time period when you experienced outstanding personal achievement	___	___	___	___	___
34. Mark in the appropriate time period if you changed faculties or programs	___	___	___	___	___
	0-6 mon	6 mo-yr.	1-2 yr.	2-3 yr.	4-5 yr.
35. Mark in the appropriate time period if you experienced difficulty in sexual performance	___	___	___	___	___
36. Mark in the appropriate time period if you experienced difficulty in the adjustment of sexual roles	___	___	___	___	___
37. Mark in the appropriate time period if you experienced increased class work load	___	___	___	___	___

	0-6 mon	6 mo-yr.	1-2 yr.	2-3 yr.	4-5 yr.
38. Mark in the appropriate time period if you experienced a foreclosure on a mortgage or loan	___	___	___	___	___
39. Mark in the appropriate time period when you experienced a change in the number of arguments with your live-in partner(s)	___	___	___	___	___
40. Make in the appropriate time period when you took out a loan or mortage greater than 10,000. (to purchase a home, business etc.)	___	___	___	___	___
41. Mark in the appropriate time period when you took out a loan or mortgage less than 10,000 (to purchase a T.V. etc.)	___	___	___	___	___
42. Mark in the appropriate time period if your wife or husband began or ceased to work	___	___	___	___	___
43. Mark in the appropriate time period that you had a marital reconciliation	___	___	___	___	___
44. Mark in the appropriate time period that there was a major change in living conditions (remodelling or building of a new home or deterioration of home)	___	___	___	___	___
45. Mark in the appropriate time period when you changed the actual location of residence (moved across town)	___	___	___	___	___
46. Mark in the appropriate time period when you experienced a major change in recreational habits	___	___	___	___	___
	0-6 mon	6 mo-yr.	1-2 yr.	2-3 yr.	4-5 yr.
47. Mark in the appropriate time period when you had a major change of personal habits (eg. your daily schedule)	___	___	___	___	___
48. Mark in the appropriate time period when you had a major change in social habits	___		___	___	___
49. Mark in the appropriate time period when you experienced trouble with your in-laws	___	___	___	___	___

	0-6 mon	6 mo-yr.	1-2 yr.	2-3 yr.	4-5 yr.
50. Mark in the appropriate time period when you experienced a major change in your eating or sleeping habits	___	___	___	___	___
51. Mark in the appropriate time period when you experienced an increase or decrease in family get-togethers	___	___	___	___	___
52. Mark in the appropriate time period when you experienced minor violations in the law	___	___	___	___	___
53. Mark in the appropriate time period when you took vacations	___	___	___	___	___
54. Mark in the appropriate time period when you experienced a major change in skill level performance	___	___	___	___	___

APPENDIX B

RETEST INSTRUMENT

Please place a numerical score on the following items in the same fashion as was done before. Remember Marriage is worth 500 points.

Marriage 500

Trouble with Head Coach_____

Brother or Sister Leaving Home_____

Playing Time Lost Due to Injury or Illness_____

Death of Close Family Member_____

Death of Close Friend_____

Divorce_____

Change in Financial State_____

Jail Term_____

APPENDIX C

ALL CORRELATION COEFFICIENTS

(CORRELATION MATRIX)

LIST OF VARIABLES

1. Years of varsity sport
2. Years of experience playing sport
3. Number of past injuries
4. Number of past injuries as recorded by athletes
5. Number of past injuies 0-6 mons. ago as recorded by athletes
6. Affects
7. Number of past injuries 6 mon.-1 year ago as recorded by athletes
8. Affects
9. Number of past injuries 1-2 years ago as recorded by athletes
10. Affects
11. Number of past injuries 2-3 years ago as recorded by athlete
12. Affects
13. Number of past injuries over 3 years ago as recorded by athletes
14. Sum of stress scores 0-6 mon. ago
15. Sum of stress scores 6 mon.-1 year ago
16. Sum of stress scores 1-2 years ago
17. Sum of stress scores 2-3 years ago
18. Type A injury for 1976-77
19. Type B injury for 1976-77
20. Type A injury for 1977-78
21. Type B injury for 1977-78

VARIABLES	1	2	3	4	5	6	7
1	1.000	0.431	0.162	-0.107	-0.046	-0.052	0.074
2	0.431	1.000	0.102	-0.075	-0.057	-0.019	0.120
3	0.162	0.102	1.000	0.551	0.395	0.445	0.389
4	-0.107	-0.075	0.551	1.000	0.635	0.181	0.052
5	-0.046	-0.057	0.395	0.636	1.000	0.156	0.180
6	-0.052	-0.019	0.445	0.181	0.156	1.000	0.766
7	0.074	0.120	0.389	0.052	0.180	0.766	1.000
8	0.142	0.030	0.483	0.214	0.132	0.105	0.122
9	0.168	0.089	0.437	0.220	0.174	0.201	0.189
10	0.148	-0.124	0.254	-0.034	0.017	-0.024	-0.103
11	0.124	-0.199	0.265	0.027	0.075	0.045	-0.035
12	0.216	0.276	0.566	-0.059	-0.001	-0.005	0.157
13	0.261	0.300	0.461	-0.023	0.042	-0.011	0.200
14	-0.210	-0.110	-0.017	0.132	-0.096	0.055	0.001
15	-0.319	-0.156	0.083	0.074	0.220	0.067	0.044
16	-0.053	-0.024	0.193	0.007	-0.055	0.070	0.141
17	0.072	-0.142	0.219	-0.060	0.023	0.099	0.087
18	0.187	0.216	0.334	0.192	0.042	0.139	0.258
19	0.181	0.178	0.217	0.017	-0.019	0.261	0.384
20	-0.031	0.140	0.201	0.287	0.090	0.170	0.052
21	-0.043	0.004	0.355	0.283	0.295	0.480	0.315

VARIABLES	8	9	10	11	12	13	14
1	0.142	0.168	0.148	0.124	0.216	0.261	-0.210
2	0.030	0.089	-0.124	-0.199	0.276	0.300	-0.110
3	0.483	0.437	0.245	.0265	0.566	0.461	-0.017
4	0.214	0.220	-0.034	0.027	-0.059	-0.023	0.132
5	0.132	0.174	0.017	0.075	-0.001	0.042	-0.096
6	0.105	0.201	-0.024	0.045	-0.005	-0.011	0.055
7	0.122	0.189	-0.103	-0.035	0.157	0.200	0.001
8	1.000	0.871	0.130	0.167	-0.018	0.070	-0.085
9	0.861	1.000	0.044	0.100	-0.044	0.044	-0.048
10	0.130	0.044	1.000	0.881	-0.114	-0.129	-0.044
11	0.167	0.100	0.881	1.000	-0.122	-0.128	0.056
12	-0.018	-0.044	-0.114	-0.122	1.000	0.775	-0.100
13	0.070	0.044	-0.129	-0.128	0.775	1.000	-0.158
14	-0.085	-0.048	-0.044	0.056	-0.100	-0.158	1.000
15	0.088	0.072	-0.032	-0.056	0.013	0.008	0.025
16	0.122	0.046	-0.005	-0.021	0.205	0.206	-0.211
17	0.258	0.122	0.177	0.126	0.131	0.010	-0.018
18	0.322	0.227	0.057	0.101	0.122	0.205	-0.248
19	0.313	0.270	0.026	0.050	0.027	0.070	-0.111
20	0.106	0.074	-0.008	0.007	-0.011	-0.060	-0.027
21	0.120	0.161	0.049	0.091	0.008	0.057	0.018

VARIABLES	15	16	17	18	19	20	21
1	-0.319	-0.053	0.072	0.187	0.181	-0.031	-0.043
2	-0.156	-0.024	-0.142	0.216	0.178	0.140	0.004
3	0.083	0.193	0.219	0.334	0.217	0.201	0.355
4	0.074	0.007	-0.060	0.192	0.017	0.287	0.283
5	0.220	-0.055	0.023	0.042	-0.019	0.090	0.295
6	0.067	0.070	0.099	0.139	0.261	0.170	0.480
7	0.044	0.141	0.087	0.258	0.384	0.052	0.315
8	0.088	0.122	0.258	0.322	0.313	0.106	0.120
9	0.072	0.046	0.122	0.227	0.270	0.074	0.161
10	-0.032	-0.005	0.177	0.057	0.026	-0.008	0.049
11	-0.056	-0.021	0.126	0.101	0.050	0.007	0.091
12	0.013	0.205	0.131	0.122	0.027	-0.011	0.008
13	0.008	0.206	0.010	0.205	0.070	-0.060	0.057
14	0.025	-0.211	-0.018	-0.248	-0.111	-0.027	0.018
15	1.000	0.081	0.139	0.014	0.006	0.007	0.082
16	0.081	1.000	0.213	0.316	0.296	0.095	-0.063
17	0.139	0.213	1.000	0.118	0.178	-0.052	-0.025
18	0.014	0.316	0.118	1.000	0.465	0.300	0.152
19	0.006	0.296	0.178	0.465	1.000	0.245	0.245
20	0.007	0.095	-0.052	0.300	0.245	1.000	0.348
21	0.082	-0.063	-0.025	0.152	0.245	0.348	1.000

df = 120 critical value at .01 = .254, critical value at .05 = .195