

STUDENT TEACHER STRESS AND PHYSICAL EXERCISE

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ABSTRACT

This study examines the relationship between student teachers' stress and physical exercise. Forty-three student teachers at the University of Ottawa completed the Miller-Fraser Stress Tool (MFST) and the Teaching and Your Health Questionnaire (TYHS). A factor analysis revealed four factors related to student teacher stress (interpersonal conflict, assessment and driven behavior, workload and academic malaise). Further analysis revealed that assessment and driven behavior was the most stressful element of the student teacher experience, followed by workload, interpersonal conflict and academic malaise. Participants in the study performed aerobic activity most frequently, with strength training and flexibility training following. Strength training may be a useful strategy for coping with workload stress.

INTRODUCTION

Student teachers typically enter their teacher training expecting that they will be successful (Weinstein, 2002) and have little expectation of encountering stress (Montgomery, Demers & Morin, 2010; Kyriacou & Kunc, 2007). The practice of student teaching, however, is highly stressful (Chan, 2003; D'Rozario & Wong, 1996; MacDonald, 1993; Miller & Fraser, 2000; Montgomery, 2001; Montgomery & Rupp, 2005; Murray-Harvey, Slee, Lawson, Silins, Banfield, & Russell, 2000; Spangler, 2006; Sumsion & Thomas, 1999) due to the workload, practice teaching, financial pressures and interpersonal conflicts (Kyriacou & Kunc, 2007). These elements contribute to student teachers feeling stressed and even burned out before entering the profession as fully qualified teachers (Gold & Batchelor, 2001).

Student teachers assume plural roles while preparing for their careers in the classroom. They assume the role of university student, completing course work and acquiring the theoretical knowledge necessary to be a successful teacher and then assume the role of teacher during the practice teaching experience. It is during the practicum in a publicly-funded school that student teachers must prove they have the skills to teach in the system (Knowles, Cole & Presswood, 1994). However, unlike fully qualified teachers, student teachers are evaluated frequently, feel a need to conform to their supervisor's teaching style, and have an ambiguous role within the classroom and school community (MacDonald, 1993).

For the purpose of this study, stress can be understood as the tension that emanates from an individual's interaction with the environment. In this interaction, the individual perceives that the demands of the environment exceed his or her personal resources (Lazarus & Folkman, 1984). No event is inherently stressful; rather, it is an individual's perception of an event, in a specific context that determines whether an event is stressful or not. For Lazarus and Folkman, stress is profoundly connected to coping.

There is little consensus in the stress research on how to best cope with stress. In recent years, physical exercise, including, but not limited to running, walking, weight lifting and yoga, has emerged as a viable method for coping (Buckworth & Dishman, 2002; Johnsgard, 2004). This point is based on the idea that physical exercise, which we define as a group of activities that are planned and intended to ameliorate one's physical condition, is associated with improved mental health and lower levels of stress (Colangelo, 2004). Little, however, is known about student teacher stress and physical exercise. The present study seeks to understand the relationship between these two concepts and answers the following questions:

1. What are the principal sources of stress for student teachers?
2. What types of exercise do student teachers engage in most frequently?
3. What is the relationship between an individual's level of stress and his or her participation in physical exercise?

LITERATURE REVIEW

Reig, Paquette, and Chen (2007) argued that physical exercise is a useful coping strategy for student teachers and that they must develop the time management skills to ensure that physical exercise is part of their lifestyle. This idea is echoed in Brahmaiah (2009). In his book on student teaching, the author suggests that physical exercise is an important coping strategy for dealing with stress during their time as a student teacher.

In a study of teacher stress, burnout and physical activity, Colangelo (2004) suggests that teachers who exercised moderately experienced less stress than did teachers who did not exercise. Colangelo observed further that there is a relationship between physical well-being and coping and that if school boards are truly interested in supporting teachers' ability to cope with stress, they should find ways to incorporate exercise into their schools.

Similarly, in a study of teacher stress, exercise, and nutrition, Hannaman (2000) uncovered that teachers "who are generally satisfied with teaching and have not considered leaving teaching in the last two years exercise frequently, have high energy levels throughout the day or find their jobs less stressful" (p. 125). However, not all of the research suggests that physical exercise positively affects stress. Carmack, Boudreaux, Almaral-Melendez, Brantley, and de Moor (1999) relate in a study of 135 university students that those who engaged in leisure physical activities, such as walking around the park had lower levels of stress than did participants with high levels of aerobic fitness developed from intense cardiovascular training. Similarly, Bond, Lyle, Tappe, Seehafer and D'Zurilla (2002) stated that in their study of social problem solving, Tai chi and physical exercise, physical activity was not a significant variable in reducing stress.

METHODOLOGY

After obtaining permission from the Director of the Bachelor of Education program, an email was sent, via the director's assistant, to all students in the Bachelor of Education program asking for their participation in the study. As part of this email, the participants received a link to the web-based survey. All data were collected electronically using this web-based survey site, Survey Monkey, during the month of July, 2010. At the end of the study, all data was downloaded as an Excel spread sheet which contained each participant's numeric scores as well as any written responses to the open questions.

Demographic Questions

Before completing either of the questionnaires, participants were asked to complete demographic questions. Firstly, participants were asked to identify their gender, as prior research has indicated that women and men perceive (D'Rozario & Wong, 1996; Murray-Harvey et al., 2000) and cope with stress differently (Chan, 2003; Osseiran- Waines & Elmacian, 1994). In addition, participants were asked to reveal if they were gaining qualifications in the primary, junior, intermediate, or senior divisions. The demographic section asked the student teachers to indicate their undergraduate degree. This measure was added simply to verify the number of physical education majors that were in the study.

Sample

Two questionnaires were administered at the end of the Bachelor of Education program to the entire cohort of 776 students divided between primary, junior, intermediate and senior divisions in 2008. There were more women than men in all programs; however, exact numbers were unavailable for the faculty. All participants possessed an undergraduate degree prior to entering the Bachelor of Education program. Moreover, to gain entry to the program, all students needed to possess a minimum average of approximately 70% on their last 5 full courses and had adequate English language skills to gain entry to the program.

The study received responses from 63 participants; however, many of the respondents did not complete even half of either questionnaire and consequently these questionnaires were not used in the study. Forty-three participants' responses were analyzed for the results.

The sample was composed of 76.4% ($n = 35$) women and 23.6% ($n = 8$) men. All of the women in the study were in the primary/junior instructional division, while all the men were in the intermediate senior division. It could, therefore, be assumed that any conclusions made about gender could also be made about instructional division.

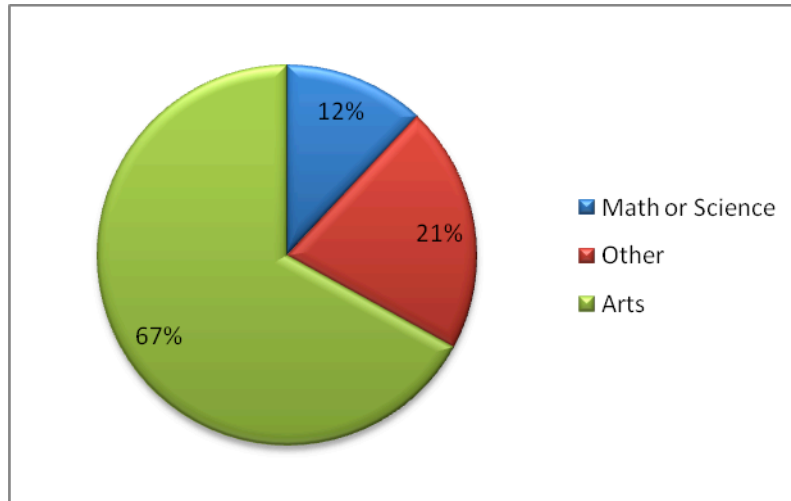
There was a great deal of diversity in the participants' educational backgrounds. The majority of the participants ($n = 29$) had arts or fine arts degrees, including majors in psychology, English, history, philosophy and sociology. Five of the participants possessed degrees in mathematics or science and only one had a degree in physical education. The remaining participants ($n = 9$) held a variety of degrees that did not conform to these categories. These included degrees in social sciences, recreation management, social work, and environment studies.

Results are presented in Figure 1.

Figure 1

Table 2

Degree distribution of participant



A reconstructed version of a questionnaire employed by Miller and Fraser (2000) was used. The Miller Fraser Stress Questionnaire (*MFST*) is adapted from the Academic Stress Questionnaire (ASQ) created by Abouserie (1994). This tool was employed in a study of sophomore university students at the University of Wales.

In discussion with David Miller, a co-creator of the questionnaire, two words were changed from the original tool. In the original tool, Miller and Fraser (2000) used the word tutor, which was changed to associate teacher. In addition, Miller and Fraser used the term college, which was changed to university. The 36-item questionnaire elicits information in three distinct but overlapping areas. While this may seem somewhat short, the questionnaire elicits information about the practicum experience, the academic portion of the teacher education program and personal life factors.

The tool employs a seven-point scale in which one represents minimal stress and seven represents high stress. This means the lowest possible score is 36, a middle score of 144 and a maximum score is 256. This scale is explained in the instructional portion of the tool. The instructional portion of the tool explains that participants should make their numeric selection based upon their typical response to each item on the questionnaire.

The second tool utilized is the *Teaching and Your Health Questionnaire* conceived by John Hannaman (2000). Hannaman based his questionnaire on the work of Wozniak (1994) and used the tool in his doctoral dissertation on teacher stress, burnout, physical exercise, and nutrition. Wozniak developed a tool for her doctoral dissertation to examine the relationship between a variety of health factors and stress in organizational leaders. Prior to using the tool,

Hannaman piloted the study with a group of teachers similar to those he intended to study in his dissertation. The tool contains five questions and uses a six-point scale in which zero represents low frequency and five represents high frequency. The tool elicits information about aerobic, anaerobic exercise, flexibility training. The maximum score on the tool is 15 and the lowest possible score is zero.

Open-ended Items

The study included two open-ended items to compliment the information gained through the questionnaires. The first item was "Please indicate any other stressors." This question appeared at the end of the *MFST*. The second question "Please add any personal comments about stress, physical exercise or student teaching." The open-ended item responses were collected and then sorted into two major categories after a content analysis: coping or sources of stress by determining the thematic content of the response. The sources of stress were then regrouped according to the common themes of the stress questionnaire. Four factors (assessment and driven behavior, interpersonal conflict, workload and academic malaise) were discovered in the factor analysis based on these themes. The results were then used in tandem with the quantitative data to answer the three research questions. Also, the qualitative data was used in the analysis of the data.

DATA ANALYSIS

To analyze the data, we used several methods. Firstly, the inter-item reliability for the results of the *MFST* was determined using Cronbach's alpha. We performed a correlational analysis to test the relationships between items on the *TYHQ*. Then we used descriptive statistics, mean, and standard deviation, to examine the results on the *MFST* and the *TYHQ*. At this point, an exploratory factor analysis, which was used to group factors on the *MFST*, was performed. These groups were labeled conceptually and used in all subsequent analyses. We determined the inter-item reliability of the factors using Cronbach's alpha. T-tests were employed to see the differences between the average levels of stress and physical exercise of males and females. Finally, a correlation analysis, Spearman rho, was performed to see the relationships between the groups of stressors and the three forms of physical exercise.

RESULTS

Research Question One: What are the principal sources of stress for student teachers?

The first research question was established to discover the principal sources of stress for student teachers.

Prior to this investigation, all of the responses on the *MFST* were subjected to reliability analysis. On all 36 items, Cronbach's alpha was .93. This is acceptable, as .70 is typically considered acceptable (Gliem & Gliem, 2003).

The descriptive statistics for the total stress scores were found. The mean stress score for all participants was 131.16 with a standard deviation of 42.33. This represents an average score of 3.6 on each item, almost perfectly in the middle of the seven-point scale. The descriptive statistics for men and women were determined. Men had an overall average score of 130.5 with a standard deviation of 51.87 and women 133.75 with a standard deviation of 40.72. These scores are somewhat higher than Miller and Fraser's (2000) results where men had an average score of 103 and women an average score of 123. Results are compared in Table 2.

Table 2
Mean stress scores and standard deviation on the MFST

Group	Mean	Standard Deviation
Entire sample	131.6	42.3
Men	130.5	51.8
Women	133.75	40.7

To test the statistical significance of the difference, a t-test was used. The difference in mean scores was statistically insignificant ($t(9.07) = 41, p=.875$).

From the *MFST*, we performed a factor analysis. A factor analysis is a statistical method that is employed to analyze the interrelationships between a large group of variables in order to find the underlying common dimensions or factors. We used it to reduce the number of variables and discover those factors that explain the greatest variance in the collected data. These groups were then labeled based upon the conceptual nature of the items: interpersonal-conflict, *assessment and driven behavior* (ABD), *workload* and *academic malaise*. The exploratory factor analysis shows that the first group, *interpersonal-conflict*, accounted for 25.35% of the total variance. The second group, *assessment and driven behavior*, accounted for 9.88% of the variance; the third group, *workload*, accounted for 9.47% and the fourth group, *academic malaise* 6.84%. All factors with a variance less than 6% were eliminated. It is important to note that as result of the factor analysis, several items were eliminated because they did not factor into the analysis: Items 3, 4, 6, 7, 8, 10, 11, 12, 13, 18, 20, 21, 22, 27, 28, and 31. The results are in Table 3.

Table 3

Factor analysis of MFST results

Item	Interpersonal	ADB -	Workload -	Academic Malaise -
Peer pressure	.888	-	-	-
Conflict-peers	.851	-	-	-
Conflict-professor	.846	-	-	-
Conflict-spouse	.799	-	-	-
Loneliness	.798	-	-	-
Homesickness	.770	-	-	-
Conflict-roommates	.754	-	-	-
Health	.741	-	-	-
Assignments	.735	-	-	-
Interpersonal (associate)	.697	-	-	-
Unclear assignments	-	.729	-	-
Assessment results	-	.718	-	-
Evaluation (associate)	-	.712	-	-
Need to do well (Self-imposed)	-	.658	-	-
Time for study	-	-	.894	-
Time for interests	-	-	.755	-
Time for family	-	-	.735	-
Amount to learn	-	-	.589	-
Boring classes	-	-	-	.948
Boring curriculum	-	-	-	.867

For each factor, we created a sub-scale that was used in the subsequent data analysis. Inter-item reliability for each sub-scale was acceptable with .70 (Gliem & Gliem, 2003) being considered acceptable. Results are presented in Table 4.

Table 4
Inter-item Reliability of Sub-scales

Factor	Cronbach's alpha	Number of Items
Interpersonal-Conflict	.940	10
Assessment and Driven Behavior	.786	4
Workload	.857	4
Academic	.941	2

The mean scores and standard deviation for each factor was then determined. In Table 5 the factors are ordered from highest mean to lowest.

Table 5
Descriptive statistics for stress factors

Factor	Mean	Standard Deviation
Assessment and Driven Behavior	4.50	1.60
Workload	4.20	871.55
Interpersonal Conflict	2.78	1.40
Academic Malaise	2.65	1.72

Research Question Two: What types of exercise do student teachers engage in most frequently?

The results of the *TYHQ* were then subjected to Pearson’s correlations. The results show a statistically significant correlation between the three forms of exercise, aerobic, strength and flexibility training, as shown in Table 6.

Table 6
Pearson correlations between factors and forms of physical exercise

Types of Exercise	Aerobic	Flexibility	Strength
Aerobic	1.00	.396**	.513**
Flexibility	.396**	1.00	.523**
Strength	.513**	.532**	1.00

Note. ** Correlation is significant at the 0.01 level (2-tailed)

The scores in Table 6 indicate the average frequency of participants’ engagement in a specific form of activity. Of the three forms of physical activity, aerobic activity was performed the most frequently. The overall mean score for aerobic exercise was 3.16.

The second most frequently performed form of physical exercise was strength training, with a mean score of 2.20, while flexibility was third with a mean score of 1.88.

Question Three: What is the relationship between an individual's level of stress and his or her participation in physical exercise?

We examined the mean scores of men and women on each form of physical exercise. These results are presented in Table 7.

Table 7
Descriptive statistics of men and women’s exercise scores

		N	Mean	Std. Deviation
Flexibility	Women	35	1.74	1.314
	Men	8	2.50	1.414
Strength	Women	35	2.00	1.260
	Men	8	3.13	1.727
Aerobic	Women	35	3.11	1.510
	Men	8	3.38	1.302

Using a t-test, we noticed a statistically significant difference between men and women in regards to mean frequency of strength training ($t(41) = 2.124, p=.04$).

From this point, we used a bivariate correlation analysis to determine any relationships

between the factors and the forms of physical exercise. This revealed one significant relationship between workload stress and strength training. This negative correlation suggests that as strength training increases, workload stress decreases. The results are presented in Table 8.

Table 8
Bivariate correlations between factors and forms of exercise using Spearman rho

Exercise/Factor	Interpersonal Conflict	Assessment and Driven Behavior	Workload	Academic Malaise
Aerobic	-.257	-.150	-.238	-.137
Flexibility	-.001	-.173	-.049	.025
Strength	.011	-.288	-.314*	.131

Note. * Correlation is significant at the .05 level (2-tailed)

Open-ended items

Less than half (n = 19) of the respondents completed the open-ended items. A phrase or sentence was taken from each entry to show the fundamental ethos of the entry and why it was placed in that factor grouping. There were three comments made about physical exercise; however, two of these references discuss that their workload is a barrier to their participation in physical exercise and the final comment was placed in the coping and physical exercise column. The results can be viewed in Table 9.

Table 9
Reduction of participants' open-ended verbatim responses (representative examples)

Interpersonal-conflict	Assessment	Workload	Academic Malaise	Coping and Physical Exercise
For me, I found that while I was a student teacher there was no time for exercise, between juggling family (husband and child), I didn't exercise like I was doing before I started teachers college	On-line courses; rubrics with levels that don't match university grading systems	I would say the amount of assignments given were both redundant and not well spaced. Many times I found myself sacrificing my lesson planning in order to complete trivial	More assignments does not mean a better education and the more assignments and time spent on work that is not always necessary or "efficient" to our practice, exercise.	I worked out regularly at goodlife fitness during my year as a student teacher and found it to be one of the best stress relievers.

<p>It was very difficult to accept the limited amount of time I had for my children. We all had to sacrifice this time for the eight months I was in the program.</p>		<p>The stress level in the on-site program was HUGE. Too many assignments, all due at the same time, while teaching full time at our</p>		<p>I also find I experience stress and exercise is an outlet for me to manage my stress</p>
<p>Lack of direction and feedback from associate teachers.</p>		<p>No time for exercise in the on-site program - too much work!!</p>		<p>Exercising with classmates helped build strong friendships and release stress and greatly contributed to my success (although I had problems continuing during my</p>
<p>Children</p>		<p>I found that trying to fit exercise into my schedule and not being overly successful at this was a source of stress</p>		

In addition to the responses above, there were several other responses that did not fit into the two categories. Two participants indicated that traveling to and from the university was a source of stress. One participant indicated that being a mature student was a source of stress. One participant indicated that group work was stressful. It is unclear, however, if the stress came from interpersonal sources or workload sources. For this reason, it was not included in the Table 9. Finally, one participant indicated that unclear “next steps” were stressful. Again, it was not clear if the next steps were linked to assessment or career development and were therefore not included above.

DISCUSSION

Research Question One: What are the principal sources of stress for student teachers?

Before discussing each factor independently, it is first important to compare the results of the present study with that of Miller and Fraser (2000), as this is the only other study to employ this tool. A more detailed discussion of each factor will follow.

Miller and Fraser (2000) found similar results to those found in the present study. Miller and Fraser results also indicate that the top ten stressors for student teachers fall under what we have labeled *assessment and driven behavior*. Miller and Fraser found that assessment by the associate teacher, the self-imposed need to do well, unclear assignments and assessment results, all items in our *assessment and driven behavior* factor, ranked within the top ten stressors in Miller Fraser’s study. It is important to point out that Miller and Fraser used descriptive statistics in their

study and did not use a factor analysis.

Items in the *academic malaise* factor in our study also produced low stress scores in Miller and Fraser's (2000) study. In particular, the items boring classes and boring curriculum had mean scores of 2.78 and 2.80 respectively. This is only slightly higher than our mean scores on our *academic malaise* factor ($m = 2.65$) which contains the same items.

There are some similarities between Miller and Fraser's (2000) results and our *workload* factor. The means scores for the items lack of time for study, lack of time for family and friends, lack of time for own interests is 3.62 while our study found a mean score of 3.78 for the factor containing these items. In contrast, however, Miller and Fraser found that working for assignments, and too much to do were highly stressful to their participants. These items were eliminated in our factor analysis.

Miller and Fraser (2000) had very different scores on the items contained in our *interpersonal conflict* factor. Miller and Fraser's research found results that were much lower with a mean score of 2.11 compared to our mean score of 3.78 on the same items which are contained in our *interpersonal conflict factor*.

In examining the mean scores of the stress factors, the *assessment and driven behavior* factor had the highest mean score of the four factors and this is consistent with many other studies on student teacher stress. Item 1, assessment by the associate teacher, is in this grouping and suggests that the evaluative portion of the practicum is highly stressful. This finding is consistent with the literature. MacDonald (1993) found that many students were stressed by the evaluation done by the associate teacher. Murray-Harvey et al. (2000) found similar results as their participants listed evaluation by their supervisor as one of the most stressful elements of their training.

Murray-Harvey et al. (2000) found similar results in their study of student teachers. In their study of 300 Australian student teachers, having high expectations of their teaching was the highest-ranking source of stress.

The stress tied to evaluation and assessment may be tied into the employment situation in the province of Ontario. The market is extremely competitive and some student teachers may believe that higher marks and excellent evaluations during their practice teaching will help them obtain employment (MacDonald, 1993). The students are not necessarily mistaken. Currently, student teachers applying to the Ottawa-Carleton Catholic School Board must provide copies of their practicum evaluations to the board as part of their initial applications.

Workload had the second highest mean of the factors in the study. This is not particularly surprising as so much of the literature supports the idea that *workload* is a major source of stress (Miller & Fraser, 2000; Murray-Harvey et al., 2000). Although the current results are by no means unique, it seems our study reveals that the stress created by workload is particularly significant for

students in the onsite program. The open-ended responses in the *workload* category show that this condition created a great deal of stress. One on-site student rejoins:

“Too many assignments, all due at the same time, while teaching full time at our placement. So much work to do [no days off] between assignments and teaching prep that there is no time to work [at a job]”

Interestingly, *workload* as a barrier to exercise was the most frequently cited preclusive condition ($n = 6$). In particular, two students who participated in the on-site program of study, a program in which the student teachers spend four days a week in practicum and one day a week in academic classes at the university, found time to be a particular problem. One participant writes “No time for exercise in the on-site program-- too much work!!” And although this was the only on-site student to refer specifically to workload as a barrier, it is clear that the on-site program is a stressful experience for some student teachers.

Other students also noted that the student teaching *workload* interfered with their physical exercise routines. One participant remarked “Physical exercise was always good for improving my general state of mind, but at the times I was most stressful I was also at my busiest, and simply could not get out of the work I needed to do long enough to exercise.” This idea is echoed by other student teachers and one participant notes the need for time management skills:

“I found that I would have liked to have managed my time better to include yoga as part of my daily routine. I often felt that because of my work load and my stress levels surrounding that work I did not allow myself to take the time I may have needed to do yoga.”

Another student wrote “I found that trying to fit exercise into my schedule and not being overly successful at this was a source of stress to me.” These points reinforce the fact that *workload* is a predominant stressor in the lives of student teachers.

The third highest mean was the *interpersonal conflict* factor. Again, the items in this factor are easily connected to the literature. For example, Matte (2008) found interpersonal relationships to be particularly stressful in her study of university professors. She found that interpersonal factors, particularly their fear of students, were the predominant sources of stress.

Within the *interpersonal conflict* factor other items are directly connected to the existent literature on student teachers. The first of these factors is Item 26, interpersonal difficulties with the associate teacher. In her study of student teacher stress, also at the University of Ottawa, MacDonald (1993) noted that student teachers often experienced interpersonal stress with their associate teacher because the student perceived their evaluation was based upon their ability to conform to the associate teacher’s style of teaching. In particular, stress was created when the associate teacher’s method of disciplining the students was incongruent with the student teacher’s methods. In tandem with interpersonal problems with the associate teacher, the participants in the study had conflict with university professors. This may be connected to the fact that many students question the value of their teacher training (Hascher, Cocard & Moser, 2004).

The fourth factor is *academic malaise*. It must be pointed out that the mean score for this

item is low ($m = 2.65$, $sd = 1.72$) and therefore does not seem like a serious stressor in this cohort. The idea of *academic malaise* did emerge in the open-ended items. Two participants felt that the teacher education program was both a stressor and a barrier to physical exercise. In particular, the number of assignments was problematic. One participant wrote:

Just as we are often taught in life, it is important to be efficient. This is often stressed by teachers, trainers etc. (sic) Just as we should be efficient when exercising and it is more quality than quantity, the same rules should apply to student teaching. More assignments does not mean a better education and the more assignments and time spent on work that is not always necessary (sic) or "efficient" to our practice, the less time opportunity we have on our well-being, ie. Exercise. This is not an uncommon view for student teachers. Garner and Rosaen (2009) suggest that often student teachers feel that it is only when they are in the classroom and teaching do they feel they are doing something valuable.

There is some literature to suggest that *academic malaise* can be a real stress for student teachers. For example, Malderez, Hobson, Tracy, and Kerr (2007) found that student teachers felt the theoretical portion of their training was irrelevant, viewed as unnecessary by in-service teachers and only useful during interviews. Hascher, Cocard, and Moser (2004) further contend that student teachers and many experts hold a pejorative view of the coursework component of the teacher education.

Research Question Two: What types of exercise do student teachers engage in most frequently?

The second question addressed the frequency of the different types of physical exercise. The most frequent form of exercise was aerobic training, followed by strength training and flexibility, respectively.

The results are not surprising. Taliaferro, Rienzo, Pigg, Miller, and Dodd (2009) asked 43 499 university students between the ages of 18 and 25 and found that aerobic physical exercise was performed more frequently than anaerobic physical exercise.

The fact that women participated in strength training less than men is not surprising either. Buckworth and Dishman (2002) in their overview of research connected to the biological and demographic determinants in physical exercise contend that men engage in strength training much more frequently than do women; however, the gender gap is much less obvious in regards to other forms of exercise. These authors suggest that ethnic and cultural norms may influence this difference between the sexes.

Research Question Three: What is the relationship between an individual's level of stress and his or her participation in physical exercise?

We cannot make a causal relationship in this study between physical exercise and student teachers' levels of stress. This assertion is predicated upon the fact that the majority of the relationships between stress and physical exercise were statistically insignificant. There are several possible explanations for the lack of significant results. Firstly, the sample is very small and may simply not have attracted a normal distribution. Secondly, it is possible that because the workload is considered a stressor in student teaching, physical exercise may in fact become another stress, another task to fit into an already busy week. This idea emerged in the qualitative results in which

exercise was identified as a source of stress. Thirdly, it may be that the participants' in this study did not exercise long enough, or intensely enough to experience the stress buffering effects. That is to say that while the participants went to the gym or worked out, they did not stress the body adequately to train the body to deal with the stress of daily life. Because we did not measure these facets of exercise, we cannot be sure.

Although there is a statistically significant correlation between *workload* stress and strength training, we cannot make a causal relationship between the two. It is quite possible that students with less *workload* stress simply had less work to do and therefore had more time to strength train. This is particularly important because the men in our study were all in the secondary panel and secondary student teachers are typically less stressed by workload (D'Rozario & Wong, 1999) and men are more likely to weight train (Buckworth & Dishman, 2002). The most we can say is that there is a relationship between the two; however, we cannot say that the relationship is unidirectional with strength training conclusively creating lower levels of *workload* stress. Therefore, the following discussion is simply predicated upon the *possibility* that strength training creates lower workload stress.

The negative correlation found in this study between *workload* stress and strength training is consistent with other literature, as there is research with various populations that connects weight training with coping with stress and improved mental health. Norvell and Belles (1993) purported that weight training helped police officers decrease their psychological stress. Additionally, a study of strength training, anxiety, and mood showed weight training improved mood and resulted in lower levels of anxiety (Tsutsumi, Don, Zaichkowsky, & Delizzona, 1997) an emotion often associated with stress (Matte, 2003).

The negative correlation between strength training and *workload* stress is consistent with Loehr's (1997, 2007) work. Loehr explains the link between strength training and workload saying "increasing your physical capacity for exerting and resisting force translates into your work and emotional activities" and "reaching for your full potential requires strong, well-conditioned muscles" (p.163). Loehr further contends that the structure of weight lifting, short bursts of exertion followed by rest, mirrors the nature of stress. According to Loehr, stress is not constant. It is dynamic and is marked by periods of stress and periods of non- stress and are therefore unlike traditional aerobic exercise.

CONCLUSION

The purpose of this study was to investigate student teachers' stress, the frequency of their physical exercise and the relationship between the two. The study explored student teachers' levels of stress and the predominant sources of stress they experience and how gender influenced the perception of stress. In addition, the study examined the relationship between three different forms of exercise— aerobic, strength training, and flexibility—and participants' levels of stress.

Student teachers from the University of Ottawa's Bachelor of Education program were contacted at the end of the 2009 academic year. Forty-three completed the questionnaires via the website Survey Monkey. From the analysis we concluded that *assessment and driven behavior* items were the most stressful elements of the student teacher experience. Additionally, we discovered that students engaged in aerobic training more than any other form of exercise. Finally,

we found a correlation between workload stress and strength training, showing that people who did strength training had lower scores on workload stress.

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