Aerobic Exercise in Adolescence:
Self-efficacy and Stage of Change

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Abstract

The purpose of this cross-sectional exploratory study was to examine the relationships among self-efficacy, stage of change, and exercise behaviour in a sample of younger (Grade 9) and older (Grade 12) adolescents.

A secondary objective of this study was to apply the transtheoretical model of Stage of Change, as a measure of intention to change, in order to discover the applicability of the model to an adolescent cohort in relation to exercise behaviour. This five-stage model is a self-report measure of an individual's readiness to adopt a new behaviour (e.g., regular exercise). The transtheoretical model incorporates Bandura's self-efficacy factor, which is purported to be a predictive measure of exercise behaviour and a covariant of stage.

Exercise behaviour was measured with the Physical Activity Scale, and the University of Rhode Island Change Assessment Scale (URICA) was used to measure the stage of change and self-efficacy variables. The results of this study indicated significant differences between younger and older adolescents, and between males and females in their exercise behaviour. No significant differences were found for grade and gender on stage of change as measured by either a single-item question or a continuous measure of stage. Although grade and gender subgroups were not significantly different in their self-efficacy, significant interaction was found in the grade*gender variable.
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Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>iii</td>
</tr>
<tr>
<td>List of Tables</td>
<td>v</td>
</tr>
<tr>
<td>List of Figures</td>
<td>vi</td>
</tr>
<tr>
<td>CHAPTER ONE: INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Background of the Problem</td>
<td>1</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>2</td>
</tr>
<tr>
<td>Rationale</td>
<td>3</td>
</tr>
<tr>
<td>Problem Statement</td>
<td>5</td>
</tr>
<tr>
<td>Objectives</td>
<td>6</td>
</tr>
<tr>
<td>Methodological Assumptions</td>
<td>6</td>
</tr>
<tr>
<td>CHAPTER TWO: LITERATURE REVIEW</td>
<td>7</td>
</tr>
<tr>
<td>Exercise and Health</td>
<td>7</td>
</tr>
<tr>
<td>Determinants of Adoption and Maintenance of Exercise Behaviour</td>
<td>8</td>
</tr>
<tr>
<td>Self-efficacy and Exercise</td>
<td>9</td>
</tr>
<tr>
<td>Stages of Change and Exercise</td>
<td>11</td>
</tr>
<tr>
<td>Adolescents and Exercise Behaviour</td>
<td>14</td>
</tr>
<tr>
<td>CHAPTER THREE: METHODOLOGY AND PROCEDURES</td>
<td>16</td>
</tr>
<tr>
<td>Research Methodology</td>
<td>16</td>
</tr>
<tr>
<td>Research Design</td>
<td>16</td>
</tr>
<tr>
<td>Hypotheses</td>
<td>18</td>
</tr>
<tr>
<td>Minor Changes to Scales</td>
<td>18</td>
</tr>
<tr>
<td>Selection of Participants</td>
<td>19</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>20</td>
</tr>
<tr>
<td>Field and Classroom Procedures</td>
<td>21</td>
</tr>
<tr>
<td>Data Collection and Recording</td>
<td>22</td>
</tr>
<tr>
<td>Data Processing and Analysis</td>
<td>23</td>
</tr>
<tr>
<td>Creating Stage of Change Scores</td>
<td>25</td>
</tr>
<tr>
<td>Creating the Self-efficacy Scores</td>
<td>26</td>
</tr>
<tr>
<td>Limitations</td>
<td>28</td>
</tr>
<tr>
<td>Restatement of the Problem</td>
<td>28</td>
</tr>
<tr>
<td>CHAPTER FOUR: RESULTS</td>
<td>29</td>
</tr>
<tr>
<td>Overview</td>
<td>29</td>
</tr>
<tr>
<td>Sample Description</td>
<td>29</td>
</tr>
<tr>
<td>Exercise Behaviours</td>
<td>31</td>
</tr>
<tr>
<td>Stage of Change</td>
<td>37</td>
</tr>
<tr>
<td>Self-efficacy for Exercise Behaviour</td>
<td>51</td>
</tr>
<tr>
<td>CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDITIONS</td>
<td>55</td>
</tr>
<tr>
<td>Discussion</td>
<td>55</td>
</tr>
<tr>
<td>Conclusions</td>
<td>56</td>
</tr>
<tr>
<td>Recommendations</td>
<td>65</td>
</tr>
<tr>
<td>References</td>
<td>68</td>
</tr>
<tr>
<td>Appendix A: Aerobic Exercise Questionnaire</td>
<td>73</td>
</tr>
<tr>
<td>Appendix B: Memo from Standing Subcommittee on Research with Human Participants</td>
<td>82</td>
</tr>
<tr>
<td>Appendix C: Letter from Board</td>
<td>84</td>
</tr>
<tr>
<td>Appendix D: Letter to Principal</td>
<td>86</td>
</tr>
<tr>
<td>Appendix E: Letter to Parent/Guardian</td>
<td>87</td>
</tr>
<tr>
<td>Appendix F: Consent Form</td>
<td>88</td>
</tr>
<tr>
<td>Appendix G: Aerobic Exercise Questionnaire Guidelines</td>
<td>90</td>
</tr>
</tbody>
</table>
List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>Categorical Variables</td>
<td>30</td>
</tr>
<tr>
<td>Table 2</td>
<td>Mean Scores for Individual Exercise Behaviour Variables</td>
<td>32</td>
</tr>
<tr>
<td>Table 3</td>
<td>Mean Scores for Team Exercise Behaviour Variables</td>
<td>33</td>
</tr>
<tr>
<td>Table 4</td>
<td>Analysis of Variance for Frequency of Involvement in Individual Exercise Behaviours</td>
<td>34</td>
</tr>
<tr>
<td>Table 5</td>
<td>Analysis of Variance for Frequency of Involvement in Team Exercise Behaviours</td>
<td>36</td>
</tr>
<tr>
<td>Table 6</td>
<td>Consistency in Stage Identification: Percentage of Total Sample in Cells of Single Item by Stage</td>
<td>50</td>
</tr>
<tr>
<td>Table 7</td>
<td>Mean Scores for Self-efficacy for Exercise</td>
<td>52</td>
</tr>
<tr>
<td>Table 8</td>
<td>Analysis of Variance for Self-efficacy for Exercise</td>
<td>53</td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Figure 1</td>
<td>Visual Representation of the Research Design</td>
<td>17</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Stage of Change, Single Item: Total Sample</td>
<td>38</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Stage of Change, Single Item: Grade 9 &amp; Grade 12</td>
<td>39</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Stage of Change, Single Item: Males and Females</td>
<td>40</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Stage of Change, Single Item: Grade 9</td>
<td>41</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Stage of Change, Single Item: Grade 12</td>
<td>42</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Stage of Change, Stagein: Total Sample</td>
<td>44</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Stage of Change, Stagein: Grade 9 and Grade 12</td>
<td>45</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Stage of Change, Stagein: Males and Females</td>
<td>46</td>
</tr>
<tr>
<td>Figure 10</td>
<td>Stage of Change, Stagein: Grade 9</td>
<td>47</td>
</tr>
<tr>
<td>Figure 11</td>
<td>Stage of Change, Stagein: Grade 12</td>
<td>48</td>
</tr>
<tr>
<td>Figure 12</td>
<td>Self-efficacy for Exercise: Interaction Term</td>
<td>54</td>
</tr>
</tbody>
</table>
CHAPTER ONE: INTRODUCTION

This is a study of the exercise patterns of younger and older adolescents and their propensity for the adoption of regular exercise behaviour. It is known that exercise of certain regularity, intensity, and duration is a factor in the prevention and treatment of diseases, including coronary heart disease (Harris, Casperson, DeFriese, & Estes, 1989). It is also known that the Canadian population, as a whole, is not exercising at a level adequate to achieve positive health outcomes (Russell & Craig, 1996).

Lifelong patterns of regular exercise behaviour could change the disease profile of the Canadian population. Based on findings by Russell and Craig (1996), there is a need for research about individuals’ readiness to adopt regular exercise behaviours. If most adults are not getting enough exercise to avoid coronary heart disease, we should be looking not only at how to change their present exercise behaviour patterns, but also at how health promoters can help establish healthier exercise behaviour patterns in the younger generation.

To effectively teach the younger generations how to incorporate exercise into daily activities and, therefore, reduce the levels of cardiovascular disease (CVD), more needs to be known about the readiness and motivation of adolescents to adopt regular exercise behaviour.

Background of the Problem

Taking action on the major risk factors can reduce the prevalence of cardiovascular disease. These risk factors include high cholesterol, high blood pressure, obesity, and sedentary lifestyle. In the Niagara Region, the Regional Public Health Department and the local school boards have been implementing a healthy heart program for Grade 9 students in all secondary schools since 1989. This program is presented in two parts: a classroom information session for students and a clinic
day when each student receives individual assessment of blood pressure, body mass index, and cholesterol levels. Individual counselling follows this assessment. The information includes ways to reduce blood pressure, the importance of body mass index, a low cholesterol diet, and regular exercise. Counselling includes identification of smoking status and information about the adverse health effects of smoking.

It is known that children are generally more active than adults are, but that this activity level starts to decrease in Grade 7 and continues to decrease throughout adolescence. The pattern of decreased physical activity has an earlier onset for females than males (Russell, Hynford, & Beaulieu, 1992). The problem is to determine how health promoters can motivate students, especially females, to initiate and maintain an exercise regimen, as they become adults.

Purpose of the Study

The purpose of this study was to examine the relationships among self-efficacy, stage of change, and exercise participation in a sample of younger and older adolescents. The correlates of exercise behaviour could provide the basis for an intervention study, which could assist in the development of curriculum for adolescent heart health education.

A second purpose of this study was to apply the transtheoretical model, as a measure of intention to change, in order to discover the applicability of the model to the adolescent group. The instrument proposed for the study was the University of Rhode Island Change Assessment (URICA) questionnaire which was designed to describe characteristics of the stages of change (e.g., self-efficacy) as well as to identify the stage of the individual relative to his/her readiness to adopt regular exercise behaviour.
To succeed in changing exercise patterns, it is first necessary to understand the characteristics of the individuals who comprise the target population. Specifically, this would require the researcher to determine the adolescents' current exercise behaviour and their readiness to adopt new patterns of regular exercise. The present study was done in an effort to discover the best tools for the assessment of these characteristics in an adolescent secondary school population.

Traditionally, most health education curricula have been taught to encourage students to adopt the appropriate health behaviour. The traditional approach was to include the relevant information in the curricula and to assume that the target population was ready to hear the message. Such classroom presentations were meant to instill the appropriate exercise behaviour in youth. It is now understood that the desired health behaviour (e.g., exercise) has not been generally adopted (Fitness Canada, 1991). The transtheoretical model of change encourages the tailoring of such health messages to the readiness factor of the recipient (Prochaska, 1994). The transtheoretical model defines five stages an individual may exhibit for changing a particular health behaviour. These stages range from the precontemplation stage (e.g., where the person is not contemplating any change), to contemplation (e.g., thinking about change), to preparation (e.g., getting ready to change), and then to action and maintenance (e.g., where change has actually occurred). There have been some interventions for changing health behaviour (e.g., smoking cessation, Prochaska, 1994) which have tried to tailor the intervention to the individual's current stage to see if this would improve the rate of success in changing the behaviour. This approach is referred to as stage-based intervention.

Recent studies have shown that this stage-based intervention approach may be helpful to individuals and may increase the positive
outcomes of lifestyle interventions when used as a strategy for lifestyle counselling for adult populations (Prochaska & Velicer, 1997). To date, most research has been restricted to adult samples. The only study using the transtheoretical model on adolescents was primarily interested in smoking behaviour (McDonald, Lawrance, Silverman, Towson, Lafreniere, McCaffery, Little, & Vincent, 1996).

Before stage-based interventions are created for adolescent populations, health educators need to know if the stage model is appropriate for adolescents. It is not known what the stage characteristics are in adolescent populations. It cannot be assumed, therefore, that adolescents would respond the same way as adults to stage-based health behaviour interventions. It is also essential to know if the available instruments are able to accurately identify the stages of change in adolescents. This study also addressed the question whether the Stage of Change model could reflect adolescent exercise behaviour.

Self-efficacy, which is a co-variant of stage (Marcus, Selby, Niaura, & Rossi, 1992), is the confidence the individual has that he/she is capable of the acquisition and retention of new behaviour patterns (Bandura, 1977). According to Bandura (1977), the stronger the perceived self-efficacy, the more likely the individual will persist in trying to acquire the new behaviour. Self-efficacy, in this study, was related to the adoption of a regular exercise regimen as a new health behaviour. As a co-variant of stage, self-efficacy was expected to provide insight into the individual's attitude to change. In previous studies on adult samples, self-efficacy has been found to be a predictor of exercise behaviour (Marcus, et al. 1992). The integration of self-efficacy into the stages of change model occurred when the pattern of self-efficacy was shown to consistently increase across stages from a low level in precontemplation to its highest level in maintenance (Marcus et al. 1992). The present study examined the patterns of self-
efficacy in an adolescent cohort to discover differences, and similarities, with the adult cohorts previously studied. It was considered important to know if self-efficacy was significantly related to the motivation of adolescents to adopt regular exercise behaviour.

Problem Statement

The use of the transtheoretical model for assessing motivation for exercise behaviour and for designing health promotion interventions has been increasing. Researchers are looking for ways to predict the kinds of interventions that may be effective in achieving desired health behaviour change. The transtheoretical model of change has been used to assess various adult populations for a variety of health behaviours (Prochaska, Velicer, Rossi, Goldstein, Marcus, Rakowski, Fiore, Harlow, Redding, Rosenbloom, & Rossi, 1994). Self-efficacy, a measure of the belief that one has about one’s ability to undertake any specific behaviour, has also been identified as a predictor of adoption of exercise behaviour (Strecher, DeVillis, Becker, & Rosenstock, 1986). A literature review revealed no evidence of adolescent studies using self-efficacy, or the transtheoretical model.

This exploratory study examined the stages of change and the self-efficacy characteristics of adolescents in relation to their current exercise behaviour. The problems involved in this endeavour were, first, whether the existing instruments were capable of accurately measuring the stage of change of adolescents, and, second, whether adolescents had the same stage of change patterns as reported for the adult samples. It was also the intent of this study to investigate whether there were gender and age differences in adolescent readiness to adopt regular exercise.
Objectives

The objectives of the study were: (a) to determine whether the transtheoretical model of Stages of Change can reflect reported exercise behaviour of younger and older adolescents, and (b) to detect differences in exercise behaviour, self-efficacy, and stage of change in the younger and older, male and female adolescents.

Methodological Assumptions

The URICA (University of Rhode Island Change Assessment Scale) stage questions identifies five stages of readiness for regular exercise adoption. The URICA questionnaire, designed for use with adult samples, was the only validated instrument located, which would measure readiness to adopt exercise behaviour using the transtheoretical model. The URICA had been used on an adult sample and was found to adequately identify five stages (Reed, 1995). This is an assumption that will be answered by this investigation.
CHAPTER TWO: LITERATURE REVIEW

Exercise and Health

Coronary heart disease (CHD) is the leading cause of death today in both the United States and Canada (Despres, Bouchard, & Malina, 1990). According to Despres et al. (1990), the risk factors for CHD have been identified by epidemiological studies, and include plasma lipoprotein levels, blood pressure, smoking, diabetes, obesity, sedentary lifestyle, and family history. Despres et al. (1990) noted that these risk factors are related to atherosclerosis and that this disease can be detected in its early stages in children and adolescents. The authors suggest that increasing the level of regular exercise for children and adolescents may decrease the incidence of CHD for those individuals who are at risk.

Haskell (1994) states that the benefits of exercise accrue to most individuals depending on the intensity, frequency and duration, and type of the activity. Exercise has the potential to activate various systems in the body such as the muscular, skeletal, cardio-respiratory, metabolic, neuro-endocrine, gastrointestinal, and immune systems. Exercise can produce health benefits such as increased bone density in youth, increased fat metabolism, and lowered heart rate and blood pressure (Haskell, 1994).

To obtain these health benefits, the commonly accepted amount of exercise to increase aerobic capacity is an aerobic activity at high or moderate intensity for a minimum of 20 minutes, three or more times per week (Shephard, 1994). This prescription does not predict the amount of improvement, only that there would be improvement. According to Dishman (1994), there are few studies of children and youth and exercise adoption. It is suggested that obese children stand to improve the most with improved metabolic condition and possible slower accumulation of lipids in the arteries (Despres et al. 1990).
In adults, regular aerobic exercise may reduce plasma lipoproteins and, therefore, have an effect on atherosclerosis (Haskell, 1986). According to Sallis and Hovell (1990), exercise must be practised consistently for positive effects on health to be realized. They note that although the dose of exercise for improvement in one’s risk status is known, only 10% of the American population are physically active enough to obtain these health benefits. Russell and Craig (1996) report that 37% of Canadians are now active at a level which enables them to derive heart and other health benefits. Russell and Craig add that 35% of Canadians are sedentary or active only at a low level, and the remainder are active at the moderate level. The large difference between the American and Canadian estimates may be attributable to the use of different exercise criteria.

Determinants of Adoption and Maintenance of Exercise Behaviour

To understand the motivational process leading adolescents to exercise adoption and maintenance, two theory-based models of behaviour change have been chosen: (a) Bandura’s (1986) theory of self-efficacy, and (b) the transtheoretical model of change (Prochaska & Marcus, 1994). Regular exercise behaviour begins with the adoption of exercise behaviour (Dishman, 1994; Sallis & Hovell, 1990). Dishman (1994) points out that maintaining physical activity behaviour may require repeated adoption behaviours following relapses into periods of inactivity. Carmody, Senner, Manilow, and Matarazzo (1980) found that relapse is a common occurrence and 50% of those individuals who begin a structured exercise program will drop out within 6 months to a year.

In a community sample of adults, some of the predictors of vigorous exercise were found to be exercise self-efficacy (e.g., confidence in one’s ability to exercise regularly), health knowledge, attitudes to exercise, and participation in moderate-intensity physical
activity (Sallis, Haskell, Fortman, Vranizan, Taylor, & Solomon, 1986). Sallis and Hovell (1990) point out that the Sallis et al. (1986) study did not examine all factors determining adoption of exercise and also lacked a theoretical focus. There has been little research done on the adoption factors which determine the initiation of exercise behaviour. Dishman (1994) also pointed out in his review of the literature that exercise adoption for special groups such as children and adolescents has not been well studied.

Self-efficacy and Exercise

One theory related to exercise adoption that has potential as a predictor of the adoption of a behaviour is the self-efficacy theory (i.e., the confidence one has that one is capable of performing a certain task (Bandura, 1977, 1982). Bandura’s (1977) theory of "self-efficacy" is based on concepts of intrinsic motivation. This means that individuals can change behaviour not only because of a stimulus from external factors, such as environment or social regulation, but also because of the way they deal with change within their realm of cognition. Bandura (1977, 1986, 1990) stated that cognitive mechanisms such as self-efficacy are essential for a change of behaviour to occur. According to Bandura (1986), one’s expectation of the probable outcome of a behaviour may or may not translate into actual implementation of that behaviour. Bandura (1990) elaborated on the relationship of outcome expectancy and its relationship to efficacy theory explaining that outcome expectancy is partly governed by self-efficacy about ability to perform the particular behaviour.

Bandura (1986) stated that self-motivation involves setting personal standards for performance. If one perceives a discrepancy between one’s performance and one’s self-expectations, or as individuals set their goals and there is a difference between what they actually do
and what they had set out to do, motivation to change behaviour is enhanced (Bandura, 1986). It is a sense of dissatisfaction that creates the motivation.

Bandura (1977, 1986) referred to two forms of expectations: (a) efficacy expectations, and (b) outcome expectations. Outcome expectations are what one expects to be the result of the activity. Bandura (1986) noted that outcome expectations are not enough to achieve the adoption of a behaviour. Added to these particular aspects of motivation is that of personal efficacy or one's belief or expectation that one is capable of performing a certain task at a certain level. Bandura (1986) indicated that feeling efficacious about a task leads one to feel competent and interested in the task. McAuley, Wraith, and Duncan (1991) concluded in their study that highly efficacious subjects proved to be more intrinsically motivated than those with low efficacy. The McAuley et al. (1991) study confirmed that there is a relationship between self-efficacy and intrinsic motivation for aerobic exercise.

In Bandura's (1986) theory, it is the efficacy expectation that is the determinant of an individual's engagement in an action. In addition to the initiation of an activity, efficacy expectations determine the amount of energy an individual will expend on the activity and the duration of effort in face of difficulties (Bandura, 1977). Efficacy expectations have dimensions that have implications for performance. The first dimension, magnitude of efficacy, refers to the skill difficulty level at which a person is able to perform. The magnitude can be classified as simple, moderate, or advanced. Efficacy expectations are based on information acquired by an individual in four ways: (a) performance accomplishments (e.g., mastery), (b) vicarious experience (e.g., observation of others), (c) verbal persuasion (e.g., education), and (d) emotional arousal (e.g., anxiety level, thought patterns) (Bandura, 1986).

Health behaviour studies frequently use self-efficacy as one major
predictor of behaviour change (Bandura, 1986; Marcus et al. 1992; McAuley, 1992). In a review of self-efficacy in health behaviour research (Strecher et al. 1986), it was found that self-efficacy was a consistent predictor of short- and long-term success in initiating and maintaining health behaviour change. There is, however, a lack of information about self-efficacy patterns in adolescents, as well as about how adolescents arrive at the action and maintenance stages in adopting new health behaviours (Prochaska, 1994).

Stages of Change and Exercise

Another theoretical structure to be considered in the interpretation of exercise adoption is the transtheoretical model of change as described by Prochaska and Marcus (1994). The stages of the transtheoretical model are (a) precontemplation, (b) contemplation, (c) preparation, (d) action, and (e) maintenance. Each stage has its own characteristics which are descriptors of the individual’s intentions, behaviour, and thoughts about a given health behaviour which, in this context, is exercise.

Prochaska and Marcus (1994) describe each stage as follows:

1. The precontemplation stage: The individual typically is not thinking about changing a behaviour or adopting a new one (e.g., not within the next six months).

2. The contemplation stage: The individual seriously intends to change in the next six months.

3. Preparation for action: The individual intends to change, has a plan for the near future (e.g., usually within the next month), and may have been making some effort already.

4. Action: Behaviour changes have occurred within the past six months. The individual is using processes to support the decision (e.g., spending time with friends who exercise) and is at highest risk
for relapse (e.g., resuming sedentary behaviour).

5. Maintenance: Six months or more of persistent behaviour. Fewer processes are needed to prevent relapse.

Prochaska and Marcus (1994) add that, in the case of exercise, precontemplation may not be as stable over time as it would be for other health behaviours because of the high adoption and dropout rate observed by Carmody et al. (1980).

The transtheoretical model of change, also called the Stages of Change model, incorporates Bandura's concept of self-efficacy (Prochaska, Velicer, DiClemente, Guadagnoli, & Rossi, 1991). Prochaska et al. (1991) stated that self-efficacy increases linearly across the stages of change, while temptation not to change decreases linearly from the precontemplation stage to the maintenance stage. In a Stage of Change study on smoking cessation, DiClemente, Prochaska, Fairhurst, Velicer, Valasquez, & Rossi (1991) found that, although temptation not to change behaviour is higher before the action stage, the gap between temptation not to change and self-efficacy to adopt a new behaviour decreases as the individuals move across the stages from precontemplation to contemplation and preparation. The authors describe the action stage as the stage where self-efficacy for the behaviour and temptation not to do the behaviour are about equal, and they explain that this is the stage where relapse occurs most frequently. In maintenance, self-efficacy for performing the new behaviour is higher than temptation not to, and if the person reaches the six-month level of maintenance, temptation not to do the behaviour is at a minimal level (Prochaska & Marcus, 1994).

Prochaska's transtheoretical model of change is a theory-of-change model developed and used extensively in the research area of addiction to nicotine (Prochaska & Marcus, 1994) but has also been used for other health behaviours such as eating behaviour, drug abuse, condom use for AIDS prevention, bleaching of needles for AIDS prevention, sun exposure
and sun screen use, radon exposure, mammography screening, psychological distress, and exercise acquisition (Prochaska et al. 1994). Many of these topics have provided strong support for the core constructs of this model across behaviours (Prochaska et al. 1994). Prochaska et al. (1994) also indicated that the model has predictive validity when dynamic variables such as stages and processes are compared to static variables such as demographics. Researchers in the United Kingdom, Australia, Finland, and Canada have employed the transtheoretical model for various studies which have produced similar results regarding the validity of the model (Gorely & Gordon, 1994; Prochaska, 1992; Prochaska et al. 1994).

It appears that all studies using the transtheoretical model to determine readiness for exercise behaviour have used adults ranging in age from college students (18 years and up) to seniors over 65 years of age. One Canadian study using an adolescent sample, examined smoking behaviour and the Stages of Change model (McDonald, Lawrance, Silverman, Towson, Lafreniere, McCaffery, Little, & Vincent, 1996). The findings in this 1996 study indicated that there is some evidence that adolescents differ from adults in their change patterns. McDonald et al. (1996) stated that they were able to classify the subjects into only three stages: precontemplation, contemplation/action, and maintenance. As well, the adolescents moved through them more quickly and had more quit-relapse episodes (e.g., individuals who quit smoking and went back to smoking) than adults. The McDonald et al. (1996) study provides evidence that the adult transtheoretical model might not be the same for adolescents. Little is known about adolescents' predisposition to adopt regular exercise behaviour.

Prochaska and Marcus (1994) asserted that in other health areas, such as smoking, only 10% to 20% of people at risk are in the preparation or action stage, yet most interventions are action-oriented (e.g., cessation). They postulated that, if interventions were designed
to help sedentary populations to adopt exercise behaviour using this action-oriented approach, it would not be appropriate to their needs. What is needed, Prochaska and Marcus (1994) concluded, is to survey the intended population to offer stage-matched interventions. The Stage of Change model has generally been used for changing negative behaviours (e.g., tobacco, alcohol, and cocaine use). The present study focused on the adoption of a positive health behaviour, namely, exercise.

Marcus et al. (1992) developed scales to measure stages of change for exercise and self-efficacy for exercise using a sample of government and hospital employees. The results of their study showed that individuals at various stages demonstrated different degrees of self-efficacy for exercise. Those who were exercising had a higher self-efficacy score while those who were not exercising had little confidence in their ability to exercise. This and other recent studies on exercise (Armstrong, Sallis, Hovell, & Hofsetter, 1993) have supported the use of the transtheoretical model for the study of exercise adoption.

Adolescents and Exercise Behaviour

The Canadian Fitness and Lifestyle Research Institute and the Active Living Alliance for Children and Youth have produced a document which outlines the statistical profile of Canadian children and youth regarding their physical activity patterns, preferences, attitudes, and beliefs (Russell et al. 1992). In this document the researchers indicated that children and youth are more active than adults, that the physical activity levels of children begin to drop during adolescence, and that this decrease occurs earlier for females than for males. Furthermore, Russell et al. (1992) reported that more males are inclined to be involved with competitive physical activities than are females. The researchers compiled information available on Canadian youth and exercise behaviour patterns and stated that this information gives
direction for research in a very important area, the physical fitness, health, and well-being of Canada's children.

In 1988, 37% of Canadians could be said to be exercising enough to benefit their cardiac health (Russell & Craig, 1996). The 1988 Campbell survey found that among 10 to 14-year-old adolescents, 72% of males and 49% of females were "active", which means expending three or more kilocalories per kilogram of body weight per day (Russell et al. 1992). In the older adolescent cohort of 15 to 19-year-olds, Russell et al. (1992) reported that 69% of males and 39% of females could be categorized as active. Godin, Desharnais, Jobin, and Cook (1987) asserted that more powerful strategies are needed to bring about exercise behaviour change in groups of adolescents. Success in the stage-based approach could have long-term results in general population health.

Results from studies on the Minnesota Community-wide Youth Exercise Promotion suggested that the multiple-intervention approach, such as behavioural intervention in schools and supportive community-wide strategies, may produce lasting improvement in adolescent physical activity. It was found that female students in this Minnesota program reported higher levels of physical activity than the reference group (Kelder, Perry, & Klepp, 1993). Kelder et al. (1993) stated that school-based interventions must address questions on how to increase physical activity in children and how to maintain that preferred behaviour pattern into adulthood. Further, the authors stated that few education interventions for physical activity had produced lasting effects with classroom programs which did not have a physical education component. Adding to these observations, Kelder et al. (1993) noted there is a trend to decrease exercise outside of class and this trend begins in seventh grade accelerating through the high school years. Based on the results of studies of the Minnesota project, Gidding, Deckelbaum, Strong, and Moller (1995) suggested the high school years might be the best time to encourage regular physical activity.
CHAPTER THREE: METHODOLOGY AND PROCEDURES

Research Methodology

This study used a comparative design to evaluate a set of predictors for exercise behaviour in independent samples of Grade 9 and Grade 12/13 students, hereafter referred to as Grade 12. The evaluative strategy was a cross-sectional design in which a specific set of variables, reported to be predictors of physical activity, were correlated with current exercise behaviours. A survey questionnaire was used to gather self-report information from this adolescent cohort (see Appendix A).

Research Design

The variables for this study are set out in Figure 1. The independent variables were gender and grade (as a proxy for age). The dependent variables were: (a) current level of exercise behaviour, (b) stage of change, and (c) self-efficacy. The exercise behaviour variable was divided into six classifications, each analyzed separately. The classifications were high, moderate, and low intensity exercise performed individually or in teams (i.e., $3 \times 2 = 6$ groupings). The other dependent variables, which were expected to be correlates of exercise, were:

1. Single Item Stage - a measure for stage of change taken from five statements, each representing one stage. The subject was to choose only one of the five statements as representing self (see Appendix A, Question 15).

2. Stagein - a second measure of stage of change. This variable was measured with a series of items related to each of the five stages and it provided a continuous measure for intention to exercise (see Appendix A, Question 17).
<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Dependent Variables</th>
<th>Exercise Behaviour</th>
<th>Stage of Change</th>
<th>Self-efficacy</th>
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</thead>
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<td>Low Ind</td>
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<td>Gender</td>
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</tbody>
</table>

**Figure 1.** Visual Representation of the Research Design

**Note:**

- High Ind = High Individual Exercise
- Mod Ind = Moderate Individual Exercise
- Low Ind = Low Individual Exercise
3. Self-efficacy for exercise - a measure of self-efficacy, derived from a series of seven questions, each answered on a 5-point Likert scale (see Appendix A, Question 19).

Hypotheses

The research problem was to determine if there were any differences in the characteristics of exercise behaviour in Grade 9 and Grade 12 male and female students. The following null hypotheses were tested:

1. There is no difference in exercise behaviour between Grade 9 and Grade 12 male and female students.
2. There is no difference in stage of change for regular exercise behaviour between Grade 9 and Grade 12 male and female students.
3. There is no difference in self-efficacy for regular exercise behaviour between Grade 9 and Grade 12 male and female students.

Minor Changes to Scales

Instruments selected for this study were validated in previous research (Reed, 1995) and were altered only minimally for the present study. There were minor changes in wording to adapt the questions to the adolescent age group (e.g., school replacing the word work). In the continuous measure of the stages of change, one question was eliminated from the "Contemplation" group as it appeared to be duplication. The question, "I have been thinking that I may want to begin exercising regularly" was omitted and "I have been thinking that I might want to start exercising regularly" was retained in the questionnaire.

Other changes were made to avoid ambiguity, and to enhance the understanding for the respondents. "I am satisfied with being a sedentary person" was changed to "I am satisfied with being a person who
doesn't exercise." In the self-efficacy scale, the question "When I am feeling depressed" was changed to "When I am feeling down" and "When I am under a lot of time pressure" to "When I am under pressure." In the Single Item Stage scale, the word "exercising" was added for clarification in the first two questions and the phrase "I have not been exercising" was added to the last three questions. Since many of the instruments had originally been used on adult subjects, it was deemed necessary to see if the vocabulary was comprehensible to an adolescent. The questionnaire was given to one female Grade 9 student and one male Grade 12 student to check for comprehension of vocabulary. No difficulties were noted by either subject. When the questionnaire was administered to all subjects in the cohort, no comprehension difficulties were reported.

Selection of Participants

This study was designed to evaluate the exercise behaviours and intent to exercise in a sample of adolescents. The study was a comparison of older versus younger adolescents in their readiness to adopt regular aerobic exercise. The younger adolescent group was comprised of Grade 9 male and female students. The older adolescent group was comprised of Grade 12 and 13 male and female students. It was anticipated that this grade difference would provide a comparison of different age levels and, therefore, maturity levels of adolescents.

The participants were from four different secondary schools in the Region of Niagara. One of the four schools was in a rural district and three were in an urban area. The participants were recruited through a convenience sample obtained from the participating schools. These data were gathered in May and June of 1997 and a determining factor in the availability of schools depended somewhat on the current end-of-the-year events which had been planned for each school.
Instrumentation

The Aerobic Exercise Questionnaire was the instrument used to collect self-report survey data from this sample (see Appendix A). This questionnaire had 24 questions, each corresponding to a scale except for items 1-14. Of these 14 demographic items, 7 were used to collect data to describe the sample. These items included grade, age, gender, current-year enrolment in a physical education course, smoker or non-smoker status and employment status. Descriptors were selected from the Yardley and McCaul (1996) study. The scales used for collecting data with respect to the dependent variables are identified and described below.

1. The Physical Activity Scale was used to measure current exercise behaviour (see Appendix A, Question 22). The Physical Activity Scale used six items to assess frequency of physical activity and intensity during involvement. The use of this scale with an adolescent population was previously reported by Yardley and McCaul (1996). In the present study, it was used to record the self-reported current levels of exercise behaviour.

2. The URICA Questionnaire. The stage of change for exercise was measured in two ways with the URICA questionnaire (Reed, 1995). The first was a Single Item Stage scale of five items used to measure current regular exercise behaviour with a component which reflected the intention to exercise (see Appendix A, Question 15). The second stage measure was a series of 23 embedded items and in this study is referred to as Stagein or the continuous measure of stage of change (see Appendix A, Question 17). Both instruments had a 5-point Likert scale ranging from 0 to 5, strongly disagree to strongly agree.

In the literature review no information was found for the reason to measure stage of change by two measures as found in the Reed (1995) URICA scale. A comparison of the results will be reported in the
results section.

Self-efficacy for exercise adoption was measured using a scale within the URICA questionnaire (see Appendix A, Question 19). Seven items, with responses in a 5-point Likert scale, were used to measure confidence in one's ability to exercise in various situations. Each item was rated on a scale: 1 (not at all confident) to 5 (very confident). The self-efficacy for exercise scale had reported a test-retest reliability over a two-week period of 0.90 (Marcus et al. 1992).

Field and Classroom Procedures

After permission was granted from the Brock University Standing Subcommittee on Research with Human Participants (see Appendix B), and the Lincoln County Board Research Review Committee (see Appendix C), secondary school principals were approached by telephone to request permission to administer the questionnaire to the Grade 9 and Grade 12 students in their schools. Four out of six of the schools accommodated the request.

The first step was to meet with the principal of each school, discuss the study, and present a copy of the introductory letter to principals (see Appendix D), the letter to parents (see Appendix E), consent forms (see Appendix F), and the questionnaire (see Appendix A). If teachers were to assist with the administration of the questionnaire, then a meeting was arranged for the researcher to meet with teachers to provide procedural instructions. At the time the study materials were distributed to the schools, written procedural information for the teacher was included (see Appendix G). In some schools the researcher administered the questionnaire directly. The involvement of teachers as research assistants was necessary because of time limitations and preference of some individual schools.

All students received the questionnaire as a group during regular
school hours. Some students completed the questionnaire in their classroom while others did so in a cafeteria and/or in a vacant classroom. Only students with a signed consent were accepted as participants in this study. The questionnaires were distributed and students were assured that the completion of the questionnaire was not a test and that all answers were acceptable. The students were instructed that they had the right to refuse to answer any question and could withdraw from the study at any time. An incentive to participate was a $20 cash draw when the data collection was completed in all schools. Students handed in their questionnaires to the teacher or researcher and they were immediately put into an envelope. When all questionnaires for the group were collected, the envelope was sealed and returned to the researcher. These envelopes were coded by grade and school number for identification. Each questionnaire was coded by the participant with the first initial of the last name and the day and month of birth. This participant identification allowed for a subject to withdraw from the study at any time after the data collection. All data were stored in a confidential location.

Data Collection and Recording

All data were manually entered by the researcher into a computer database using Microsoft Word version 6.0.1 on a Macintosh computer. The data were subsequently transferred to a Silicon Graphics Inc., UNIX work station where they were analyzed using both the Statistical Analysis System (SAS) version 6 and the Statistical Package for Social Sciences (SPSS).
Scoring for Current Exercise Behaviour

The Physical Activity Scale (see Appendix A, Question 22) used a 7-point Likert scale ranging from 1 (Not at all) to 7 (Every day). Three items indicated frequency of high, moderate, or low intensity individual exercise, and three measured the same intensity levels for team exercise. Each item was scored independently.

Current Exercise Behaviour

For this study, Shephard's (1994) definition of exercise behaviour, as that level of planned exercise behaviour required to maintain current levels of cardiovascular fitness, was used. He also provides the exercise criterion for maintaining cardiovascular fitness as exercising three times or more per week, for 20 minutes or longer per session, at the high or moderate intensity level. Examples presented to the participants included brisk walking, jogging, swimming, biking, in-line skating, rowing, and similar activities. The following low intensity activities were offered as examples of unacceptable exercise behaviour for meeting the criterion for this study: bowling or walking slowly to school. Exercise behaviour was measured as a frequency score with a range of 1 to 7. Data from six items of the Physical Activity Scale were recorded. The minimum recorded score was 1 and the maximum recorded score was 7. A score of 5 represents a frequency of 2 to 3 times per week or more, which would be within the criterion (Shephard, 1994) for regular exercise for this study.

Exercise behaviours are difficult to quantify in population health studies because there are several components to exercise behaviour scores. For example, while an individual may report involvement in a
planned, purposeful physical activity, the intensity of involvement and the duration of involvement may vary. Therefore, any single activity may be comprised of at least three elements: (a) whether or not the individual was involved, (b) the intensity of involvement, and (c) how long the session was in which the individual was involved. As such, the approach used to simplify the complex score of exercise behaviour was to consider exercise behaviour in its least complicated form. Therefore, exercise behaviours were organized into six separate and independent scores.

The metric was frequency of involvement in a particular exercise type (e.g., high intensity individual exercise). Each exercise type corresponds to an item on the Physical Activity Scale (presented in list fashion to the respondents) and the six categories were: (a) high intensity individual exercise, (b) moderate intensity individual exercise, (c) low intensity individual exercise, (d) high intensity team exercise, (e) moderate intensity team exercise, and (f) low intensity team exercise.

**Statistical Analysis of Exercise Variables**

The six exercise variables (see a to f above) were analyzed as separate dependent variables using analysis of variance procedures, where the independent variables were gender and grade. This approach was used to reduce the complexity of the exercise behaviour score and address the simpler question: Is there a significant difference in the frequency of involvement in specific exercise behaviours by males versus females, and younger (e.g., Grade 9) versus older (e.g., Grade 12) secondary school students? An alpha level of 0.05 was used as a significance level for testing the hypotheses. These analyses are important because they provide information to the reader about the exercise behaviours of these groups. The information may contribute to
an understanding of the relationships between intentions to exercise and actual exercise behaviour of adolescents.

Creating Stage of Change Scores

There were several suggested scoring techniques for the transtheoretical model of change. In this study, we applied two techniques to classify the participants according to a specific stage of change.

Single Item Stage

The first stage of change score created was a single item measure denoting the individual's self-selected stage relative to their intention to exercise (see Appendix A, Question 15). This first score is based on a single, multiple choice question with a 5-item response. The response items, from which the individual selected only one, included the words "Yes, I have been exercising" or the words "No, I have not been exercising." At the end of each statement, the item included a time description such as "for more than 6 months" or "for less than 6 months."

A response item score of 1 indicated that the individual was in the precontemplation stage and a response item score of 2 indicated that the individual was in the contemplation stage. A response item score of 3 indicated that the individual was in the preparation to exercise stage; a response item score of 4 indicated that the individual was in the action stage for exercise; and a response item score of 5 indicated that the individual was in the maintenance stage for exercise.
Developing a Score to Represent an Individual’s Intention to Exercise:

Stagein

Individuals were presented a 23-item questionnaire (see Appendix A, Question 17) to determine their intent to exercise. Each item was scored on a 5-point Likert scale ranging from strongly agree to strongly disagree. Earlier work by Reed (1995) suggested that the sum of scores on selected items could be used to indicate an individual's intent to exercise or change their exercise behaviour. Questions from the original set of 23 items were selected (Reed, 1995) to create classifications of an individual's intention to exercise. Separate stage scores were created by summing the items as follows (see Appendix A, Question 17): Questions 17.1, 17.3, 17.6, 17.9, 17.11, 17.18, 17.20, and 17.23 were the precontemplation stage items; Questions 17.7, 17.13, and 17.21 represented the contemplation stage items; Questions 17.14, 17.16, 17.19, and 17.22 represented the preparation stage items; Questions 17.4, 17.8, 17.10, and 17.12 represented the action stage items, and Questions 17.5, 17.2, 17.15, and 17.17 represented the maintenance stage items.

The decision rule used to classify the participants relative to stage was to take the highest stage score achieved by each participant. When two stage scores were equal, the score assigned to the highest stage was selected as the stage to represent the individual's intention to exercise. The Stagein score represented the stage that the individual was in relative to their intention to exercise.

Creating the Self-efficacy Scores

The measure of self-efficacy for exercise is based on Marcus et al. (1992) as used in the URICA questionnaire (Reed, 1995). The scale was presented to the participant using seven statements in Question 19
The questionnaire used a 5-point Likert scale ranging from *not at all confident* to *very confident*. The statements were prefacesd by an instruction to relate the statements to the definition of exercise used throughout this study. A self-efficacy score for each subject was created.

The following step-wise procedure was used to produce a representative score for each subject's self-efficacy. The analysis was conducted using a T-score technique as recommended by Reed (1995) and Herrick, Stone, and Mettler (1997). The analysis was conducted as follows:

1. **Step 1** - Calculate the mean and standard deviation for each statement in Question 19.

2. **Step 2** - Calculate the standard score for each statement in Question 19 for each individual using:

   \[ Z_{ik} = \frac{X_{ik} - M_k}{S_k} \]

   where \( i = \text{individual} \) and \( k = \text{Items 19.1-19.7} \).

3. **Step 3** - Calculate an arbitrarily labelled "T" score (e.g., "T" referring to transformed) for each item (19.1-19.7) for each individual using the formula \((Z_{ik} \times 10) + 50 = T\) score.

   This "Transformed score" is recommended to shift the data set to the right and produce a set of positive scores. The self-efficacy score is the sum of the transformed item scores based on Question 19: items 1 through 7.

The self-efficacy score was first evaluated using analysis of variance to determine if Grade 9 and Grade 12 students differed significantly, if males and females differed significantly, and, finally, if there was a significant interaction term (i.e., grade*gender). Secondly, the self-efficacy scores were used to determine if a relationship existed between self-efficacy and stages of...
change (e.g., both Single Item Stage and continuous measure of stage, called Stagein) and exercise behaviour scores.

Limitations

A limitation to this data set is that some individuals chose not to answer all of the items in the survey. Therefore calculations for the specific items within the various constructs (i.e., precontemplation, contemplation, preparation, action, and maintenance) may be based on different sample sizes. However, the differences are less than .5 of 1%. Therefore, considering that each sample is intended to represent a homogenous group of individuals, these differences should not pose any problems to the algebraic computations throughout these analyses. Any data transformation or modification (e.g., mean substitution for missing data) would be an arbitrary transformation of the data. The URICA instrument has five identifiable stages of change based on an adult sample. An assumption was made that the same five stages would apply to an adolescent sample.

Restatement of the Problem

Whether the stage of change, self-efficacy for exercise, and the current exercise behaviour of these students were correlated with grade and gender was a focus of this study. The responses for this sample were evaluated against hypothetical normal distributions using two-way analyses of variance and Chi-square analyses. The dependent variables were also correlated with each other, within the total group, and the subgroups: grade and gender.
CHAPTER FOUR: RESULTS

Overview

This chapter presents the results of the testing of the null hypotheses that exercise behaviour, stage of change, and self-efficacy were identical for grade, gender, and grade*gender (e.g., independent variables). Null hypotheses one and three were tested using two-way analyses of variance. Null hypothesis two regarding stage of change was tested using the Chi-square statistic because of the categorical organization of the stage data.

For each dependent variable, the results are reported for total Grade 9 and Grade 12; for total males and females; and for each of the subgroups of grade*gender.

Sample Description

The total sample size was 307 subjects, 161 males and 146 females. The age range in Grade 9 was 13 to 15 years and in Grade 12, 16 to 19 years. The Grade 9 cohort consisted of 193 subjects, 101 males and 92 females (see Table 1). The Grade 12 cohort was comprised of 114 subjects, 60 males and 54 females. In the Grade 9 cohort, 55.4% of the males and 39.1% of the females had a paying job. In Grade 12, 66.7% of the male subjects and 68.5% of the females had a paying job.

In Grade 9, 98.9% of the males and 89.1% of the females were enrolled in physical education in the current academic year (Table 1). This was expected since one credit of physical education was mandatory and most students meet the requirement in their first year. Lower rates of participation in physical education were noted in Grade 12 with only 51.7% of the males and 44.4% of the females enrolled in such classes in the current academic year (1996-97).

In the Grade 9 subgroup, 5.1% of the males and 8.9% of the females
| Characteristic | Grade 9 | | | Grade 12 | | |
|---------------|---------|---|---|---------|---|
|               | Males % | Females % | n = 101 | Males % | Females % | n = 60 |
| Paid Job      | 55.4    | 39.1    |        | 66.7    | 68.5    |        |
| Physical Education | 98.9    | 89.1    |        | 51.7    | 44.4    |        |
| Smoker        | 5.1     | 8.9     |        | 39.0    | 25.9    |        |
said they were smokers (Table 1). In Grade 12, smoking rates went up with 39% of the males and 25.9% of the females indicating that they were smokers.

Exercise Behaviours

The mean scores and standard deviations for the six exercise behaviour variables are presented in Tables 2 and 3. Table 2 presents results for individual involvement and Table 3 presents results for team involvement. The results are organized according to gender and grade level within three exercise intensity levels (high, moderate, and low) for individual and team activities. The reader is reminded that the intensity levels on the scale were as follows: 1 = not at all; 2 = less than once a month; 3 = 1 - 3 times a month; 4 = once a week; 5 = 2-3 times a week; 6 = 4-6 times a week; and 7 = every day.

Analysis of Variance for Each Individual Exercise Behaviour

Results of the analysis of variance using each exercise behaviour score as a separate, dependent variable with gender, grade, and the interaction term (e.g., gender*grade) are presented in Table 4. The results for frequency of involvement in high-intensity, individual exercise behaviour, indicate that there were significant differences between males and females and between Grade 9 and Grade 12 students. Grade 9 students reported significantly more frequent involvement in high-intensity exercise versus Grade 12 students. Likewise, males reported significantly more frequent involvement in high-intensity exercise compared to female respondents. There was no significant interaction between age and gender for high intensity individual exercise behaviour.

The analysis of variance for frequency of involvement in moderate-
Table 2

Mean Scores for Individual Exercise Behaviour Variables

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<th>Grade</th>
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<th>Females</th>
<th>Total for Grade</th>
<th>Total Sample</th>
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Mean Scores for Team Exercise Behaviour Variables

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### Table 4

**Analysis of Variance for Frequency of Involvement in Individual Exercise Behaviours**

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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
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<td>39.71</td>
<td>39.71</td>
<td>13.24</td>
<td>0.0003*</td>
</tr>
<tr>
<td>Gender</td>
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<td>51.42</td>
<td>51.42</td>
<td>17.14</td>
<td>0.0001*</td>
</tr>
<tr>
<td>Grade*Gender</td>
<td>1</td>
<td>3.08</td>
<td>3.08</td>
<td>1.03</td>
<td>0.3</td>
</tr>
<tr>
<td>Error</td>
<td>294</td>
<td>881.91</td>
<td>2.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Moderate Intensity Exercise</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
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<td>62.75</td>
<td>62.75</td>
<td>23.05</td>
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</tr>
<tr>
<td>Gender</td>
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<td>8.06</td>
<td>8.06</td>
<td>2.96</td>
<td>0.09</td>
</tr>
<tr>
<td>Grade*Gender</td>
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<td>2.1</td>
<td>2.1</td>
<td>0.77</td>
<td>0.38</td>
</tr>
<tr>
<td>Error</td>
<td>295</td>
<td>802.9</td>
<td>2.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Low Intensity Exercise</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>1</td>
<td>23.52</td>
<td>23.42</td>
<td>7.7</td>
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</tr>
<tr>
<td>Gender</td>
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<td>2.78</td>
<td>2.78</td>
<td>0.91</td>
<td>0.34</td>
</tr>
<tr>
<td>Grade*Gender</td>
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<td>2.7</td>
<td>2.7</td>
<td>0.88</td>
<td>0.35</td>
</tr>
<tr>
<td>Error</td>
<td>292</td>
<td>892.8</td>
<td>3.05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.05
intensity, individual exercise behaviour indicated that there was a significant difference between Grade 9 and Grade 12 students, but not for gender. Grade 9 students reported significantly more frequent involvement in moderate-intensity, individual exercise compared to Grade 12 students. Again, the interaction term (grade*gender) was not significant for the moderate intensity individual exercise behaviour variable.

Finally, the analysis of variance for frequency of involvement in low-intensity, individual exercise showed a significant difference between Grade 9 and Grade 12 students, but not for gender. Grade 9 students were significantly more frequently involved in low intensity exercise compared to Grade 12 students. Grade*gender subgroups were not found to be significantly different in the low intensity individual exercise variable.

Analysis of Variance for Each Team Exercise Behaviour

The results of the analyses of variance for team exercise behaviours are presented in Table 5. The results for frequency of involvement in high intensity, team exercise behaviour indicate that there were significant differences between males and females and between Grade 9 and Grade 12 students. The Grade 9 students reported significantly more frequent involvement in high intensity team exercise compared to Grade 12 students. Males reported significantly more frequent involvement in high intensity team exercise behaviours compared to females. The subgroups of grade*gender were not significantly different in this form of exercise behaviour.

The analysis of variance for frequency of involvement in moderate intensity team exercise behaviour indicated that there was a significant difference between Grade 9 and Grade 12 students. Grade 9 students reported significantly more frequent involvement in moderate intensity
Table 5

Analysis of Variance for Frequency of Involvement in Team Exercise Behaviours

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Intensity Exercise</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>1</td>
<td>124.63</td>
<td>124.63</td>
<td>37.37</td>
<td>0.0001*</td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>158.11</td>
<td>158.11</td>
<td>47.41</td>
<td>0.0001*</td>
</tr>
<tr>
<td>Grade*Gender</td>
<td>1</td>
<td>0.51</td>
<td>0.51</td>
<td>0.15</td>
<td>0.7</td>
</tr>
<tr>
<td>Error</td>
<td>295</td>
<td>983.87</td>
<td>3.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Moderate Intensity Exercise</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
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<td>73.3</td>
<td>73.3</td>
<td>25.84</td>
<td>0.0001*</td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>56.0</td>
<td>56.0</td>
<td>19.74</td>
<td>0.0001*</td>
</tr>
<tr>
<td>Grade*Gender</td>
<td>1</td>
<td>2.28</td>
<td>2.28</td>
<td>0.80</td>
<td>0.37</td>
</tr>
<tr>
<td>Error</td>
<td>292</td>
<td>828.35</td>
<td>2.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Low Intensity Exercise</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>1</td>
<td>0.41</td>
<td>0.41</td>
<td>0.12</td>
<td>0.73</td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>22.18</td>
<td>22.18</td>
<td>6.37</td>
<td>0.01*</td>
</tr>
<tr>
<td>Grade*Gender</td>
<td>1</td>
<td>0.88</td>
<td>0.88</td>
<td>0.25</td>
<td>0.61</td>
</tr>
<tr>
<td>Error</td>
<td>292</td>
<td>1016.23</td>
<td>3.48</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.05
team exercise compared to Grade 12 students. Males reported significantly more frequent involvement in moderate intensity team exercise compared to females. The interaction (grade*gender) was not significant for moderate intensity team exercise behaviour.

Finally, the analysis of variance for frequency of involvement in low intensity team exercise behaviour showed a significant difference between males and females. Males were significantly more frequently involved in low intensity exercise behaviour than females. No significant differences were found for Grade 9 versus Grade 12 or for the subgroups of grade*gender for low intensity team exercise involvement.

Stage of Change

**Single Item Stage**

The results of the Single Item Stage scale demonstrated a clear prevalence of the maintenance stage and action stage for exercise in the total sample (see Figure 2). There was a low-to-high trend across the stages with less than 2% in precontemplation and each stage increasing in proportion with more than 57% in maintenance. The same low-to-high pattern was reported by the Grade 9 and Grade 12 cohorts (see Figure 3) and the total males and females cohorts (see Figure 4). The stage selection by Grade 12 students was similar to the stage selection by Grade 9 students. The lowest percentages in both groups were in the precontemplation, contemplation, and preparation stages.

When subjects were asked to choose one stage description as most typical of their exercise behaviour and intent to exercise, the pattern for all four subgroups was similar (see Figures 5 & 6). All groups reported most often to be in the maintenance stage, with the highest frequency observed in the Grade 9 males at 63.4% and the second highest
Figure 2. Stage of Change, Single Item: Total Sample

Note:
Precon = Precontemplation  Con = Contemplation
Prep = Preparation  Main = Maintenance
Figure 3. Stage of Change, Single Item: Grade 9 & Grade 12

Note:
Precon = Precontemplation  Con = Contemplation  Prep = Preparation  Main = Maintenance
Figure 4. Stage of Change, Single Item: Males & Females

Note:
Precon = Precontemplation  Con = Contemplation
Prep = Preparation  Main = Maintenance
Figure 5. Stage of Change, Single Item: Grade 9

Note:
Precon = Precontemplation  Con = Contemplation
Prep = Preparation   Main = Maintenance
Figure 6. Stage of Change, Single Item: Grade 12

Note:
Precon = Precontemplation  Con = Contemplation
Prep = Preparation  Main = Maintenance
in the Grade 9 females group at 60.9%. Although the frequencies were lower in the Grade 12 groups, maintenance continued to be the most frequent stage with 48.3% for the males and 46.2% for the females.

Very few of the Grade 9 males or females said they were in the precontemplation or contemplation stages. For example, 1% of Grade 9 males and 0% of Grade 9 females were in precontemplation, and 2.2% of Grade 9 females and 0% of Grade 9 males were in contemplation. Similarly, there was low representation of Grade 9 males or females in the preparation stage. In the action stage, 23.8% of the males and 25% of the females in Grade 9 stated they identified with this stage.

Chi-square analyses were used to test the significance of the distributions for males versus females, and Grade 9 versus Grade 12 students. No significant differences from expected proportions were observed.

Stage of Change as a Measure of an Individual's Intention to Exercise
(Stagein)

The distribution of scores for the total sample, representing an individual's stage of intention to exercise (i.e., Stagein) is presented in Figure 7. More than 60% of the sample were in the action or maintenance stage for intention to exercise. The least represented stage was preparation, with 4% of the total sample being identified in this stage. Similarly, 5% were identified as precontemplators of exercise. Finally, the contemplation stage had 29.8% of the total sample. This represents almost 30% of the sample as non-exercisers. This pattern was consistent for the Grade 9 and Grade 12 comparison (see Figure 8), the males and females comparison (see Figure 9) as well as for the grade*gender subgroup comparisons (see Figures 10 & 11). The results for the two-group, chi-square comparisons indicate that the distribution for males' stage identification was not significantly
Figure 7. Stage of Change, Stage in: Total Sample

Note:
Precon = Precontemplation  Contem = Contemplation
Prep = Preparation  Main = Maintenance
Figure 8. Stage of Change, Stage in: Grades 9 and 12

Note:
Precon = Precontemplation  Contem = Contemplation
Prep = Preparation  Main = Maintenance
Figure 9. Stage of Change, Stagein: Males and Females

Note:
Precon = Precontemplation  Contem = Contemplation
Prep = Preparation  Main = Maintenance
Figure 10. Stage of Change, Stage in: Grade 9

Note:
Precon = Precontemplation  Contem = Contemplation
Prep = Preparation   Main = Maintenance
Figure 11. Stage of Change, Stage in: Grade 12

Note:
Precon = Precontemplation  Contem = Contemplation
Prep = Preparation  Main = Maintenance
differed from the distribution for females’ stage identification. Likewise, a comparison of the distribution for Grade 9s’ stage identification did not differ significantly from the Grade 12s’ stage identification.

A further breakdown of these proportions into subclassifications of gender within grade is presented in Figures 10 and 11. The distributions of males versus females within each grade level were compared using two-group chi-square analysis. The results reported in Figures 10 and 11 indicate that the proportions of males did not differ significantly from females in their stage identification within either grade group. However, in both Grade 9 and Grade 12, most respondents indicated that they were in the maintenance stage for intention to exercise, with the exception of Grade 12 females, 47.1% of whom reported to be in the contemplation stage.

Consistency in Stage Identification: Single Item Stage Compared to Stagein Variables

The SPSS procedure, cross-tabulation, was used to determine if participant responses were identified similarly using the Single Item Stage scale and the Stagein, multi-question scale (see Table 6). It was found that 57.9% were identified as being in the same stage. Additionally, the results demonstrated that 62.7% of the total sample were identified as in the action or maintenance stage by both measures (i.e., they were similarly identified as currently exercising).

However, among the responses in the precontemplation stage, contemplation stage, and preparation stage, 30.8% of the total sample were not identified as being in the same stage by the two different scales. The cells whose respondents were not identified correctly are those nine cells to the top right of Table 6. This 30.8% of responses were in a lower stage of readiness for exercise using the Stagein scale.
Table 6.
Consistency in Stage Identification: Percentage of Total Sample in Cells of Single Item by Stagein

<table>
<thead>
<tr>
<th>Single Item</th>
<th>Precon</th>
<th>Con</th>
<th>Prep</th>
<th>Action</th>
<th>Main</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precon</td>
<td>1.6</td>
<td>1.0</td>
<td>1.3</td>
<td>1.3</td>
<td>.3</td>
</tr>
<tr>
<td>Con</td>
<td>3.2</td>
<td>9.3</td>
<td>9.6</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>Prep</td>
<td>1.0</td>
<td></td>
<td>1.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action</td>
<td></td>
<td></td>
<td>11.3</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>Main</td>
<td>.6</td>
<td>4.2</td>
<td>40.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:
Precon = Precontemplation
Con = Contemplation
Prep = Preparation
Action = Action
Main = Maintenance
than they were for the Single Item Stage scale.

Further evidence of the relatedness of the two measurements was provided by creating a Pearson Product Moment correlation coefficient between Single Item Stage and Stagein variables. The coefficient was moderately high and significant (i.e., $r = .67, p = < 0.01$), however, the amount of shared variance is only 45% (i.e., $r^2 = .45$).

Self-efficacy for Exercise Behaviour

Self-efficacy mean scores and standard deviations are presented in Table 7. The data are organized by grade and gender and include scores for the total sample. An analysis of variance for self-efficacy as the dependent variable is reported in Table 8. The ANOVA indicated a significant interaction term (i.e., grade*gender) which is illustrated in Figure 12.

Table 8 demonstrates the average score for Grade 9 males ($M = 342.6, s = 50$) and Grade 12 males ($M = 353.48, s = 50.9$) was not significantly different. Similarly, Grade 9 females’ average score ($M = 30.99, s = 99$) was not significantly different than Grade 12 females ($M = 341.73, s = 45.2$). However, the ANOVA indicated a significant interaction ($F = 7.12, p = 0.05$) for the grade*gender term (see Table 8 & Figure 12). The interaction (grade*gender) reveals the average self-efficacy for exercise behaviour score for males increases for the Grade 12 cohort. However, females have the opposite trend, with self-efficacy for exercise behaviour scores decreasing for the Grade 12 cohorts. Note well, this information would not be revealed by the nonsignificant main effects of grade and gender scores. It is only with the interaction term that the significant differences were revealed.
Table 7

Mean Scores for Self-efficacy for Exercise

<table>
<thead>
<tr>
<th>Grade</th>
<th>Males</th>
<th>Females</th>
<th>Total for Grade</th>
<th>Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>n</td>
<td>M</td>
</tr>
<tr>
<td>9</td>
<td>342.6</td>
<td>50</td>
<td>99</td>
<td>360.99</td>
</tr>
<tr>
<td>12</td>
<td>353.48</td>
<td>50.9</td>
<td>58</td>
<td>341.73</td>
</tr>
<tr>
<td>Total for Gender</td>
<td>346.62</td>
<td>50.6</td>
<td>157</td>
<td>354.12</td>
</tr>
</tbody>
</table>

Note: Range 140 to 560.
Table 8

Analysis of Variance for Self-efficacy for Exercise

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Sum of Scores</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Probability</th>
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</thead>
<tbody>
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</tr>
<tr>
<td>Gender</td>
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<td>763.43</td>
<td>0.35</td>
<td>0.56</td>
</tr>
<tr>
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<td>15,711.11</td>
<td>15,711.11</td>
<td>7.12</td>
<td>0.008*</td>
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<tr>
<td>Error</td>
<td>296</td>
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<td>2,207.89</td>
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<td></td>
</tr>
</tbody>
</table>

*p < 0.05
Figure 12. Self-efficacy for Exercise: Interaction Term
CHAPTER FIVE: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Discussion

Summary

The main purpose of this study was to investigate whether exercise behaviour, stage of change, and self-efficacy for exercise were associated with grade and gender for adolescents. As a first step in determining motivation to exercise, this study examined the above-mentioned variables as they occur in a younger (Grade 9) versus an older (Grade 12) adolescent cohort, and in males versus females. A cohort of students enrolled in Grades 9 and 12 in secondary schools in the Region of Niagara provided data using a self-report questionnaire (URICA).

An important objective of this study was to apply the Transtheoretical Model of Stages of Change (Prochaska, 1994) to identify the stage of readiness to adopt or maintain exercise behaviour for a cohort of adolescents. The Stage of Change model described previously (see Chapter Two) is based on the concept that interventions, when tailored to the stage of the individual or group of individuals, can improve the outcome of behaviour change (O'Connor, 1994; Prochaska & Velicer, 1997). This study was conducted with an instrument (URICA) previously developed and validated for adults (Reed, 1995). A second objective of the present study was to determine if age and gender were associated with exercise behaviour. This objective was accomplished by comparing the difference in stage of change, exercise behaviour, and self-efficacy for Grade 9 versus Grade 12, male versus female students. These objectives were formulated as three hypotheses that were tested using three statistical procedures: Chi-square analysis, analysis of variance, and Pearson Product-Moment correlation.
Conclusions

1. Individual and Team Exercise Behaviour

The first null hypothesis, that there is no difference in exercise behaviour between Grade 9 versus Grade 12, was rejected by finding significant differences among five of six exercise behaviours (i.e., high, moderate and low individual and high and moderate team). This is very strong evidence to reject the null hypothesis. This hypothesis was also rejected for males versus females by finding four significant differences among six exercise behaviours (i.e., high individual and high, moderate and low team). This is strong evidence to reject the null hypothesis. The fact that the older adolescents in this cohort exercise significantly less in most forms of individual and team exercise supports the contention that, as they mature, adolescents reduce their participation in exercise activities (Russell et al. 1992). The findings of the present study indicate that when adolescents enter secondary school in Grade 9, they are, on average, typically involved in regular exercise behaviour. However, although the present study was cross-sectional, the results provide evidence that, for many respondents in this cohort, the pattern of exercise behaviour is not maintained for the duration of the secondary school years.

In the present study, males in both grades reported themselves to be significantly more frequently involved than females in high intensity individual activities and in all team exercise activities. On average, males were more frequently involved than females in any of the team exercise activities and high intensity individual activities. This supports the contention that, as they mature, adolescent females are less frequently involved in these types of exercise activities. However, this study does not provide enough information to explain the reason for such declines in these physical activity pursuits. According
to Russell et al. (1992), the onset of a decrease in frequency of exercise in adolescents occurs earlier for females than for males, and the results of this study support that contention.

Although the Grade 9 males were, on average, meeting the exercise criteria established by Shephard (1994) (see Table 3), relative to high intensity team activity, no significant differences were identified between the grade and gender subgroups. According to the Shephard (1994) criterion, the Grade 9 males were the only group to meet the minimum frequency of exercise stimulus (mean score higher than 5) to maintain cardiovascular benefits in one type of exercise activity (e.g., high intensity team). However, in order to estimate exercise levels more accurately, it would be better to combine the different intensity levels and types of exercises into a single score. For example, the exercise data could be converted to MET equivalents (i.e., metabolic equivalents). Future studies should take this into consideration when measuring the exercise behaviour of adolescents. The findings that Grade 9 males were more involved in high intensity exercise activities are consistent with the U.S. Surgeon General’s Report (1996) that younger male adolescents were more likely to participate in vigorous exercise activities.

The results of the present study are also consistent with the Yardley et al. (1997) study which demonstrated a significant difference in the participation in exercise at the high intensity level for younger and middle age adolescents when compared to older adolescents. A trend to reduced participation in high intensity exercise among older adolescents was reported in the Yardley et al. study. Both of these studies were conducted in the Niagara Region, approximately two years apart.

The present study also found a trend of reduced exercise levels among Grade 12 subjects compared to the Grade 9 subjects, and reduced levels of high intensity exercise among female subjects as compared to
the male subjects. Again, this is a finding that is consistent with the trend reported by Russell et al. (1992). Furthermore, Russell et al. (1992) reported that more males were inclined to be involved in competitive activities than are females. The present study had similar findings in that males were significantly involved more frequently than females in all of the three levels of team exercise. One may, therefore, conclude that the findings of the present study are similar to other adolescent cohort studies which measured exercise behaviours. The benefit of this information is that programs used in other cohorts to enhance exercise participation may be equally effective in the cohort used in the present study.

2. Stage of Change: Single Item Stage

This study failed to reject the null hypotheses that there were no significant differences between Grade 9 versus Grade 12, males versus females, and grade and gender subgroups across the stages of change reported in the Single Item Stage measurement. If we understand that all respondents who placed themselves in the action or maintenance stages are exercising according to the criteria for this study, then the following information can be used to describe the exercise involvement of the cohort and its subgroups. Using the Single Item Stage scale to identify stage, similar proportions of the Grade 9 students (85%) and Grade 12 students (77%) were categorized in a combination of the action and maintenance stages (see Table 2).

The findings indicate that the sample used in this study self-reported that their exercise behaviour was sufficient to meet the basic criteria of exercise for this study (Shephard, 1994). Most important, at the time of this data collection, the Single Item Stage results indicate that a majority of these students were not at risk for cardiovascular disease in terms of exercise behaviour. The general
conclusion that can be drawn from these results is that the students were exercising adequately.

This study failed to reject the null hypotheses that there were no significant differences between Grade 9 versus Grade 12, males versus females, and grade and gender subgroups across the stages of change reported in the Single Item Stage measurement. If we understand that all respondents who placed themselves in the action or maintenance stages are exercising according to the criteria for this study, then the following information can be used to describe the exercise involvement of the cohort and its subgroups. Using the Single Item Stage scale to identify stage, similar proportions of the Grade 9 students (85%) and Grade 12 students (77%) were categorized in a combination of the action and maintenance stages (see Table 2).

The findings indicate that the sample used in this study self-reported that their exercise behaviour was sufficient to meet the basic criteria of exercise for this study (Shepherd, 1994). Most important, at the date of this data collection, the Single Item Stage results indicate that a majority of these students was not at risk for cardiovascular disease in terms of exercise behaviour. The general conclusion that can be drawn from these results is that the students are exercising adequately.

In comparison to other studies which investigated self-reports of exercise behaviour intentions, the exercise intention findings of the present study are high when the Single Item Stage scale is used. For example, Russell et al. (1992) reported that in a cohort of 15- to 19-year-olds, 69% of the males and 39% of the females could be categorized as active. This difference in exercise profile may indicate that the Single Item Stage algorithm has not captured the true exercise behaviour of the cohort in this study, or that the difference in exercise criteria in different studies is responsible for different findings (Reed et al. 1997). The Reed et al. study found that stage of change, self-report
research demonstrated that the more complex definitions of exercise produced larger numbers of subjects in the early stages (e.g., precontemplation and contemplation) indicating no exercise activity. The short definitions produced a higher percentage of respondents in the late stages (e.g., preparation and action) where exercise is occurring. The Russell et al. (1992) study involved physiological measurement of exercise and the present study relied on self-report only.

It is also possible that the Single Item Stage scale is so "transparent" that subjects respond according to their interpretation of "social desirability" (i.e., exercising is healthy). The multi-item Stage-in scale is less "transparent" and adolescents might be less likely to perceive what the "desirable" response is. If this were the case, then the multi-item staging scale would be preferable when assessing readiness for exercise behaviour in an adolescent population.

The lack of significant differences across the cohorts identified in this study relative to their stage of readiness to exercise suggests that the grade and gender subgroups are similar in the number of individuals who are exercising (i.e., those in the action and maintenance stages). However, since a single multiple-choice question was used to provide these data, one may consider that little information was available from this single question and, that may explain why the Single Item Stage measure failed to differentiate between the Grade 9 and Grade 12, male and female subgroups.

In a recent study of four health behaviours, Herrick, Stone, and Mettler (1997) used a single multiple-choice question to stage adults in a worksite environment for their readiness to exercise. The researchers reported that many of the adult respondents were in the maintenance stage and many were in the preparation stage (i.e., 43%). This would indicate that these adults were either exercising regularly for more than six months or were making small and inconsistent changes as they prepare to start to exercise. In the adolescent cohort in the present
study, approximately 12% were reporting to be in preparation using the Single Item Stage scale and 4% were in the preparation stage using the multi-item stage scale. As stated above, most adolescents were in the action or maintenance stages. The results for the present study may indicate either that adolescents are a more active cohort, or that adolescents over-report their intention to exercise, especially when compared to the findings of Herrick et al. (1997).

3. Stagein: Continuous Measure of Intention to Exercise

The study results failed to reject the null hypotheses that there were no significant differences between Grade 9 versus Grade 12, males versus females, and grade and gender subgroups across the stages of change reported in the continuous measure of intention to exercise (Stagein) measurement. As with the Single Item Stage of change measure, no significant differences were found between the grade or gender subgroups. All subgroups appear to have similar characteristics in stage of readiness for regular exercise behaviour. There is consistent ordering across subgroups of the stage dominance (i.e., maintenance, contemplation, and action) except for the older female subgroup whose dominant stage was contemplation (47.1%). It is interesting to note that the McDonald et al. (1996) adolescent study on smoking cessation (an area to which much of the stage research has been applied) found that the least represented stage was preparation. The preparation stage ranged from 2% to 5.4% across the subgroups of grade and gender in the present study. This was small compared to the action plus maintenance stages which ranged from 43.1% to 66.4%.

This is in direct contrast to the adult cohort studied by Herrick et al. (1997) which had many adults (43%) in the preparation stage. These two studies demonstrate some large differences in stages. Many adults are planning for exercise. Interventions for these adults should
concentrate on assisting them to begin exercise behaviours. If we are
to prevent the drop-off of exercise, which occurs by adulthood,
interventions with adolescents, most of whom are exercising regularly,
would need to focus on strategies for maintaining exercise behaviours.

Another contrast to the present study was the study done by
McDonald et al. (1996) which showed a significant number of individuals
to be in the precontemplation stage. Such differences between the
present study and the previously published studies could be related to
the difference between quitting smoking and beginning to exercise as two
different health behaviours. It could also be related to the fact that
smoking is an unhealthy behaviour with an addiction component, while
exercise is a healthy behaviour.

4. Consistency in Stage Identification: Single Item Stage Compared to
Stagein Variables

The findings of strong correspondence for the action and
maintenance stages using the single and multiple-item measures indicates
some consistency in the stage identification for this group. However,
the lack of correspondence among the non-exercisers for
precontemplation, contemplation, and preparation stages implies that it
is still not clearly understood how to best identify the stage they are
in. What is made clear with this comparison of the two stage of change
scales is that 30.8% of the non-exercisers were measured at higher
stages with the single item scale than they did with the stagein scale.
This may imply that there is an inflated number of positive responses
with the Single Item Stage scale and that this means it is more
difficult to detect the accurate stage for exercise behaviour using this
scale.

It is widely known that single item measures are often unreliable
and it is likely that these 30.8% were misplaced due to unreliability of
the Single Item scale. Since the correlation coefficient ($r = .65$) between the Single Item and Stagein indicates the lack of shared variance (i.e., 55%) there is a need for further research to ascertain which is the better measure of stage of change for adolescents, especially for non-exercising adolescents. One way of determining this would be to compare each measure in terms of actual exercise behaviours by adolescents.

5. Self-efficacy for Exercise Behaviour

The non-significant results for differences in the self-efficacy for exercise variable failed to reject the null hypotheses that average scores for self-efficacy measures were not significantly different between Grade 9 versus Grade 12 students, or between males versus females in this study. Such a finding is expected in light of the stage similarities between these subgroups as indicated by both the Single Item Stage and continuous measure of stage of change (i.e., Stagein) results in the present study.

Examination of the self-efficacy for exercise variable with the analysis of variance identified an interaction between the independent variables, grade and gender (see Figure 12). There were no significant differences between grade and gender. However, an interaction term demonstrating a negative relationship (i.e., descending slope) for females across age and a positive relationship (i.e., ascending slope) for males across age was found. This relationship was not apparent with the examination of the grade or gender variables alone and may have been overlooked if the interaction term grade*gender had not been included in this study. It shows how self-efficacy for females begins at a higher level in Grade 9 and declines for the Grade 12 females. The present study did not set out to find interactions, but it is important to note this finding when differences in main effects have not been found, but
an interaction has been identified. The Grade 9 females appear to have
begun their secondary school years with higher self-efficacy for
exercise than the Grade 12 females who have been in secondary school for
at least four years. The confidence attitudes of these students toward
exercise, indicated by self-efficacy for exercise, provides evidence
that confidence may fall as females mature.

Self-efficacy for exercise for males had an ascending relationship
for Grade 9 to Grade 12 respondents. This finding should be examined by
recalling that the same cohort of Grade 9 males was, on average, meeting
the criterion for exercise by involvement in high intensity team
exercise. According to the theory (Bandura, 1986; Prochaska, 1994),
self-efficacy for exercise should be high in the Grade 9 males cohort.
It is beyond the scope of this study to discover why self-efficacy
appears to be increasing, but it could be speculated that it is related
to maturational characteristics, social environment, or even the
validity of the instrumentation for self-efficacy measurement used for
this cohort. The analysis of variance showed no significant difference
between Grade 9 and Grade 12 males in their exercise behaviour or their
stage of change characteristics. It would be expected, therefore, that
the Grade 12 males cohort would have had as strong a sense of self-
efficacy for exercise as the Grade 9 males.

5. Other Sample Characteristics

Although the statistical requirements for control were beyond the
scope of this project, the reader should be aware that the findings
might be different if the following variables were introduced into the
analysis. The self-report smoking rates observed in this study
indicated a lower smoking rate among the younger cohort. Smoking
behaviour has implications for the physical well being of an adolescent
and for his/her ability to perform vigorous exercise activities
(Shephard, 1994). Smoking was found to be more prevalent in the older group of adolescents who also exercised less than the younger adolescents. Considering the implications of smoking on health, the reduced respiratory ability during exercise, and the fact that approximately 27.6% of young people in Ontario grades 7 to 12 are smoking (Adlaf, Ivis, & Smart, 1997), smoking behaviour is a factor to be considered when assessing exercise behaviour in adolescents.

Another factor to be considered is the number of adolescents who have part-time employment. The present cohort of adolescents reported that many had paid jobs as they entered secondary school and more than 65% of the older cohort reported to have jobs. The added time commitment to work could be a contributing factor to reduced exercise levels in the older adolescent cohort.

**Recommendations**

Based on these findings of the high exercise behaviour of the adolescents in this cohort, and the higher proportion of subjects in the action/maintenance stages, it would appear that health behaviour interventions with these particular students should concentrate on maintaining exercise behaviour. Younger students were exercising more than older students were, but they were also taking physical education courses in the current year while many of the older students were not. This could account for variations in team activities, but not necessarily for the individual exercise behaviour.

To accommodate the gender differences in types of exercise preferred, more information should be gathered to discover adolescents' likes and dislikes in exercise activities. It is also important to discover the accuracy of self-reporting by adolescent cohorts. It is recommended, therefore, that future exercise studies include an objective measure of exercise effectiveness which could then be cross-
checked with self-report data.

Although both stage of change measures revealed the fact that most students exercise, these scales placed 30.8% of respondents in different stages. The stage measurements which were not identical in both scales of measurement indicated a different picture for the non-exercisers. Programming for non-exercisers who are in precontemplation would need to be different than for those in contemplation or preparation stages. Therefore, accuracy in stage identification is important and the present study has shown that for this non-exercising group, it is still not known how to identify the precise stage of readiness. Further research is recommended to find the best scale to use for measuring stage of readiness for exercise in adolescents. It is suggested that such research compare each individual's stage identification with their exercise behaviour scores. Since the stage of change scales delineate those respondents who are exercising and those who are not, discrepancies and similarities could be easily identified in terms of stage of readiness. This, in turn, could help identify which stage scale is more accurate. The objective measure of exercise involvement could enhance the self-report stage model of assessment of adolescents. If only staging is done, using either a single multiple-choice question or a continuous measure of stage, then this could lead to misinterpretation of the needs of a particular group and an inappropriate intervention strategy. Stage of readiness over time would be the logical next step to determine stage stability in adolescents when exercise behaviour is to be assessed. This would require intermittent sampling of data from the same cohort. Another approach, which could be valuable, is one that introduces an intervention based on initial stage of readiness to adopt exercise behaviour. Such a study would require a pretest and posttest intervention model and would have the advantage of determining not only stability of stages over time with adolescents, but also of determining the potential for improved outcome
with stage-based interventions.

Further investigation of self-efficacy in an adolescent population should be carried out to determine if self-efficacy characteristics of adolescents differ from adults, are positively correlated to stage of change for exercise, and are stable over time. Further instrument development may be necessary to probe into the real self-efficacy characteristics of adolescents and, particularly for males. Based on the finding of the interaction of grade and gender, it is recommended that future studies include testing for interactions as well as for main effects.
References


Strecher, V.J., DeVellis, B.M., Becker, M.H., & Rosenstock, I.M.
The role of self-efficacy in achieving health behaviour change. *Health Education Quarterly, 12*(1), 73-91.


Appendix A

Aerobic Exercise Questionnaire
Aerobic Exercise Questionnaire

Conducted By:
Brock University

Instructions:

1) Please put your first initial of your last name in the code box in the top right hand corner of this page. Then add the day and month of your birth in the boxes provided and labeled “Day” and “Month”.

2) Read each question carefully and take your time to answer.

3) If a question is unclear, raise your hand and a research assistant will assist you.

4) When you have finished, please put your questionnaire in the box provided by the researcher.

5) Please use pencil when possible to fill in the dots or tick off your answers.

6) You may begin now at question 1 on page 1.
1. In what grade are the majority of your courses?
   - ○ Grade 9
   - ○ Grade 10
   - ○ Grade 11
   - ○ Grade 12
   - ○ Grade 13

2. Your Age: ________ years

3. Gender:  
   - ○ Male
   - ○ Female

4. I am taking a physical education course in this school year
   - ○ Yes
   - ○ No

5. What was your overall class average last year?
   - ○ less than 50
   - ○ 50-54
   - ○ 55-59
   - ○ 60-64
   - ○ 65-69
   - ○ 70-74
   - ○ 75-79
   - ○ 80-84
   - ○ 85-89
   - ○ 90-94
   - ○ 95-100

6. What is your approximate class average so far this year?
   - ○ less than 50
   - ○ 50-54
   - ○ 55-59
   - ○ 60-64
   - ○ 65-69
   - ○ 70-74
   - ○ 75-79
   - ○ 80-84
   - ○ 85-89
   - ○ 90-94
   - ○ 95-100

7. I live in:
   - ○ Grimsby
   - ○ Beamsville
   - ○ Vineland
   - ○ Smithville
   - ○ Niagara-on-the-Lake
   - ○ St. Catharines
   - ○ Other (specify) ____________

8. The first language spoken in my home is:
   - ○ English
   - ○ French
   - ○ Aboriginal/Native
   - ○ Other

9. How many times do you eat a fast food meal in one week?
   - _______ times per WEEK

10. How much caffeine do you drink daily?  
    (one serving = 1 cup of coffee, tea or 1 12 oz. regular cola).
    - _______ servings per DAY

11. Would you describe yourself as a:
    - ○ Smoker
    - ○ Non-smoker
    
    If smoker, how many cigarettes:
    - per DAY? _______
    - per WEEK? _______
12. Do you currently have a paid job?
   - Yes
   - No

   If yes, on average, how many hours per WEEK do you work?
   ______ hours per WEEK

13. On average, how much money do you have to spend every week, any way you want?
   ______ per WEEK

14. How much “free time” or “leisure time” do you have every WEEK?
   ______ hours per WEEK

**Question 15**

Regular exercise is defined as: 3 times or more per week for 20 minutes or longer. This includes brisk walking, jogging, swimming, biking, in-line skating, rowing, etc. This DOES NOT include activities such as bowling, walking slowly to school, etc.

Using this definition of regular exercise, indicate which of the following responses best represents your exercise behaviour:

- yes, I have been exercising for more than 6 months
- yes, I have been exercising, but for LESS THAN 6 MONTHS
- no, I have not been exercising, but I intend to in the NEXT 30 DAYS
- no, I have not been exercising, but I intend to in the NEXT 6 MONTHS
- no, I have not been exercising, and I do NOT intend to in the NEXT 6 MONTHS

**Question 16**

The following statements represent different opinions about regular exercise. Please rate how important each statement is to your decision to exercise. Please answer using the five point scale provided.

<table>
<thead>
<tr>
<th></th>
<th>NOT IMPORTANT</th>
<th>SLIGHTLY IMPORTANT</th>
<th>IMPORTANT</th>
<th>VERY IMPORTANT</th>
<th>EXTREMELY IMPORTANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To exercise regularly takes too much time.</td>
<td></td>
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<tr>
<td>2. I would have more energy for my friends and family if I exercised regularly.</td>
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<td>3. Regular exercise would help me deal with stress.</td>
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<tr>
<td>4. I would feel more confident if I exercised regularly.</td>
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<tr>
<td>5. I would be too tired to do my daily work after exercising.</td>
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<tr>
<td>6. I would feel more comfortable with my body if I exercised regularly.</td>
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<tr>
<td>7. I would have less time for my friends and family if I exercised regularly.</td>
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<tr>
<td>8. At the end of the day, I am too tired to exercise.</td>
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</tr>
</tbody>
</table>
Question 17

Regular exercise is defined as: 3 times or more per week for 20 minutes or longer. This includes brisk walking, jogging, swimming, biking, in-line skating, rowing, etc. This DOES NOT include activities such as bowling, walking slowly to school, etc.

Using this definition of regular exercise, indicate which of the following responses best represents your exercise behaviour.

1. As far as I am concerned, I don’t need to exercise regularly.
2. I have been exercising regularly for a long time and I plan to continue.
3. I don’t exercise and right now I don’t care.
4. I am finally exercising regularly.
5. I have been successful at exercising regularly and I plan to continue.
6. I am satisfied with being a person who doesn’t exercise.
7. I have been thinking that I might want to start exercising regularly.
8. I have started exercising regularly within the last 6 months.
9. I could exercise regularly, but I don’t plan to.
10. Recently, I have started to exercise regularly.
11. I don’t have the time or energy to exercise regularly now.
12. I have started to exercise regularly, and I plan to continue.
13. I have been thinking about whether I will be able to exercise regularly.
14. I have set up a day and a time to start exercising regularly within the next few weeks.
15. I have managed to keep exercising regularly during the last 6 months.
16. I have lined up a friend with whom I will start exercising regularly in the next few weeks.
17. I have completed 6 months of regular exercise.
18. I know that regular exercise is worthwhile, but I don’t have time for it in the near future.
19. I have been calling friends to find someone to start exercising with in the next few weeks.
20. I think regular exercise is good, but I can’t fit it into my schedule right now.
21. I really think I should work on getting started with a regular exercise program in the next 6 months.
22. I am preparing to join a regular exercise group in the next few weeks.
23. I am aware of the importance of regular exercise, but I can’t do it right now.
Regular exercise is defined as: 3 times or more per week for 20 minutes or longer. This includes brisk walking, jogging, swimming, biking, in-line skating, rowing, etc. This DOES NOT include activities such as bowling, walking slowly to school, etc. The following experiences can affect the exercise habits of some people.

Using this definition of regular exercise, indicate which of the following responses best represents your own experiences:

1. I am moved when I hear about people whose lives were transformed by exercise.
2. When I exercise regularly, I feel I'm being a good role model.
3. I have made a commitment to exercise regularly.
4. I'll read information in magazines about how good exercise is for you.
5. Instead of just watching TV to relax at night, I take a walk first.
6. I have people around who encourage me to exercise regularly.
7. I have made a commitment to work out.
8. I have noticed that more and more teachers are encouraging their students to exercise regularly.
9. I'll look at articles that present information about exercise and its benefits.
10. I belong to a group that exercises together regularly.
11. I believe that I am the type of person who will make time in their life for regular exercise.
12. I set up times in advance with people so that I will remember to exercise regularly.
13. I get mad when people say they don't have time to exercise.
14. I realize that it is my responsibility to society to be as healthy as I can be and that means exercising regularly.
15. I am aware that when I exercise regularly, I get the benefit of looking better.
16. I want to be the type of person who stays looking young and has a lot of energy.
17. Commercials on TV are a cue to me to get up, stretch and exercise.
18. I try to think of exercise as a time to clear my mind rather than a workout for my body.
19. I believe that regular exercise will make me a healthier, happier person.
20. I am aware of more and more people encouraging me to exercise.
### Question 19

**Regular exercise is defined as:** 3 times or more per week for 20 minutes or longer. This includes brisk walking, jogging, swimming, biking, in-line skating, rowing, etc. This DOES NOT include activities such as bowling, walking slowly to school, etc.

Using this definition of regular exercise, indicate which of the following responses best represents **how sure you are** that you would exercise in each of the following situations:

<table>
<thead>
<tr>
<th>I would exercise when:</th>
<th>NOT AT ALL CONFIDENT</th>
<th>SLIGHTLY CONFIDENT</th>
<th>SOMEWHAT CONFIDENT</th>
<th>QUITE CONFIDENT</th>
<th>VERY CONFIDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A friend is waiting to exercise with me.</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>2. I am under a lot of stress.</td>
<td>0</td>
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<td>3. I am tired.</td>
<td>0</td>
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<td>4. I am feeling down.</td>
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<td>5. I am away from home on a trip.</td>
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<td>6. The weather is bad.</td>
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<td>7. I am under a lot of pressure.</td>
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### Question 20

Please rate **how sure you are** that you can exercise regularly (3 or more times a week), for at least 20 minutes each time. According to the above definition of regular exercise, write in the number on each line which represents **how sure you are you will exercise when**:

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<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
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<tr>
<td>CANNOT DO AT ALL</td>
<td>MODERATELY CERTAIN CAN DO</td>
<td>CERTAIN CAN DO</td>
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<tr>
<td>1. You are feeling tired.</td>
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<td>2. You are feeling under pressure from school.</td>
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<td>3. You are recovering from an injury.</td>
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<td>4. You are experiencing personal problems.</td>
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<td>5. You are feeling anxious.</td>
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<td>6. You are recovering from an illness that caused you to stop exercising.</td>
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<td>7. You feel physical discomfort while exercising.</td>
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<td>8. You have returned from vacation.</td>
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<td>9. You have too much work to do at home.</td>
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<td>10. You have company.</td>
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<td>11. There are other interesting things to do.</td>
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<td>12. You don't reach your exercise goals.</td>
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<td>13. You don’t have support from your friends and family.</td>
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<td>14. You are on vacation.</td>
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<td>15. You have other time commitments.</td>
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<td>16. You are experiencing family problems.</td>
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</table>
Question 21

Fill in the most appropriate response as it applies to you.

1. Other people think that I am good at sports.  
2. I am satisfied with the kind of person I am physically.  
3. Most sports are easy for me.  
4. Physically I am happy with myself.  
5. I have good sports skills.  
6. I feel good about who I am physically.  
7. I am better at sports than most of my friends.  
8. I feel good about what I can do physically.

Indicate how many times in the LAST MONTH, you participated in exercise at school, individually, and with club teams.

High-intensity means heavy perspiration, heavy breathing, and few rests.
Medium-intensity means some perspiration, faster than normal breathing, and some rests.
Low-intensity means little perspiration, normal breathing and plenty of rests.

1. High-intensity individual exercise. (hard levels of: running, swimming, cycling, speed walking, etc.)
2. Medium-intensity individual exercise. (moderate levels of: jogging, aerobics, in-line skating, etc.)
3. Low-intensity individual exercise. (easy levels of: walking, biking, etc.)
4. High-intensity team exercise. (hard levels of: soccer, hockey, basketball, etc.)
5. Medium-intensity team exercise. (moderate levels of: volleyball, football, baseball, etc.)
6. Low-intensity team exercise. (easy levels of: bowling, curling, billiards, darts, etc.)
### Question 23

Indicate how many times in the LAST MONTH you took part in the following out of school time activities (i.e. include before or after school, evenings and weekends... NOT in school).

<table>
<thead>
<tr>
<th>Activity</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>Social events (going to movies, dances, parties, etc.)</td>
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<tr>
<td>Hobbies (collecting comic books, making crafts, internet, etc.)</td>
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<tr>
<td>Hanging out with friends</td>
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<td>Dating (do NOT include time spent hanging out with friends)</td>
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<td>Individual passive recreation (video games, watching TV, reading, etc.)</td>
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<tr>
<td>Organized clubs (science club, chess club, drama club, etc.)</td>
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<tr>
<td>Competitive organized sports (sports which include games, practices, leagues, etc.)</td>
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<tr>
<td>Recreational/Social sports (intramurals, pick-up, etc.)</td>
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<tr>
<td>Exercising for health (working-out, aerobics, jogging, etc.)</td>
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<tr>
<td>Attending non-school lessons (music, art, dance, etc.)</td>
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<tr>
<td>Recreation with family members (visiting, picnics, etc.)</td>
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<tr>
<td>School work at home</td>
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<tr>
<td>Part-time paid job</td>
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<tr>
<td>Volunteer work</td>
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<tr>
<td>Church/religious activities</td>
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<tr>
<td>Gambling (betting on cards, pro-line, over-under, etc.)</td>
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<tr>
<td>Other (specify)</td>
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</table>

### Question 24

How often have you experienced the following symptoms in the LAST MONTH?

<table>
<thead>
<tr>
<th>Symptom</th>
<th>NEVER</th>
<th>SELDOM</th>
<th>SOMETIMES</th>
<th>OFTEN</th>
<th>VERY OFTEN</th>
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</thead>
<tbody>
<tr>
<td>Nausea or upset stomach</td>
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<td>Hot or cold spells</td>
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<td>Pains in the heart or chest</td>
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<td>Faintness or dizziness</td>
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<td>Feeling weak in parts of your body</td>
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<td>Trouble getting your breath when not exercising or working hard</td>
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<tr>
<td>Numbness or tingling in parts of your body</td>
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<td>Headaches</td>
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<td>Pains in your lower back</td>
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<td>Soreness in your muscles</td>
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<td>A lump in your throat</td>
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<td>Heavy feelings in your arms or legs</td>
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</tbody>
</table>
Appendix B

Memo from Standing Subcommittee on
Research with Human Participants
The Brock University Standing Subcommittee on Research with Human Participants has reviewed the research proposal:

**Aerobic Exercise Adoption in Adolescence: Self Efficacy and Stage Change**

The Subcommittee finds that your revised proposal conforms to the Brock University guidelines set out for ethical research.

DB/tar
Appendix C

Letter from Board
May 8, 1997

Sharon Lawler

Dear Sharon:

Research Request

This is to inform you that your request to conduct the above research project in the Lincoln County Board of Education has been approved.

Please provide me with a report of your results when the study has been completed.

Good luck on your project.

Yours truly,

MAE DENBY, Superintendent,
Curriculum and Staff Development.

Sharon, please note, hard copy of this letter will be mailed to your home.
NAME
SECONDARY SCHOOL
ADDRESS

RE: ADOLESCENT AEROBIC EXERCISE SURVEY

Dear Principal,

As a graduate student in the Faculty of Education and a Health Promoter\Public Health Nurse, I am conducting a survey of youth exercise patterns as part of my work for a degree in the Master in Education. The purpose of this study is to measure factors relevant to aerobic exercise levels in a sample of adolescents.

This study will involve grade nine and grade twelve students who would volunteer to fill out a questionnaire. There is an information letter to be sent to all parents involved, as well as consent forms to be signed by the parent\guardian or the over-eighteen student, as the case may be. All information gathered will remain confidential and anonymous, including individual schools, and participation is voluntary. Any participant may withdraw at any stage during the study.

I would like to ask your permission to have some of your students fill out a questionnaire at school. It would be administered by myself, and would take no longer than forty five minutes. Please let me know as soon as possible if you can accommodate this request. You may contact the Brock Assessment Centre at 688-5550, ext. 4228 for confirmation and\or further information.

Thank you in advance for your cooperation,

Sincerely Sharon Lawler RN, BA
Appendix E

Letter to Parent/Guardian

ADOLESCENT AEROBIC EXERCISE SURVEY

Dear Parent/Guardian:

Mrs. Sharon Lawler, a graduate student in the Faculty of Education and a Health Promoter/Public Health Nurse, is conducting a survey of youth exercise patterns as part of her work for a degree in the Master of Education. The purpose of the study is to measure factors relevant to aerobic exercise levels in a sample of adolescents.

Students will be requested to complete a questionnaire covering such topics as current exercise level, work/leisure time, self-efficacy for exercise, physical self-efficacy, tobacco use, and readiness to adopt an exercise routine. This survey will take no longer than 45 minutes and will be filled out at school.

We would like to request your permission to allow your son/daughter to take part in the survey. The selection of your child does not reflect any of his/her personal characteristics or behaviors. Your child's involvement in this study is voluntary and anonymous. He/she may withdraw at any time either before or during the study without penalty.

Feedback about the use of the data collected will be available during the month of June, 1998, in the office of William Montelpare, Health Studies Program at Brock University. A written explanation will be provided for you upon request.

If you are willing to allow your child to take part in the study, please complete the attached consent form and have your child return it to his/her teacher. If you have any questions or concerns please feel free to contact Sharon Lawler or William Montelpare at Brock University, (905) 688-5550, ext. 3385 or 4228.

Thank you for your help!

Researcher Name: Sharon Lawler RN, BA.
Appendix F

Consent Form
INFORMED CONSENT FORM
AEROBIC EXERCISE IN ADOLESCENCE

Researchers: Professor William Montelpare and Researcher Sharon Lawler.

Name of Participant: ____________________________

I understand that this study in which I have agreed to participate will involve filling out a questionnaire about regular exercise.

I understand that my participation in this study is voluntary and that I may withdraw from the study at any time and for any reason without penalty.

I understand that there is no obligation to answer any question/participate in any aspect of this project that I consider invasive.

I understand that all personal data will be kept strictly confidential and that all information will be coded so that my name is not associated with my answers. I understand that only the researchers named above will have access to the data.

Feedback about the use of the data collected will be available during the month of June, 1998, in the office of Dr. William Montelpare, Physical Education Department at Brock University. A written explanation will be provided for you upon request.

If you have any questions or concerns about your participation in the study, you can contact Sharon Lawler or Dr. William Montelpare at (905) 688-5550, extension 4228.

Thank you for your help!

Dated this ____________ day of __________, 1997.

Signed: ____________________________ (Parent\Guardian)

______________________________ (Student)

***

I have fully explained the procedures of this study to the above volunteer.
Appendix G

Aerobic Exercise Questionnaire Guidelines
AEROBIC EXERCISE QUESTIONNAIRE

Guidelines for Teachers (Test Administrators)

1. Please distribute the questionnaire only to students who have a consent form signed by their parent, or to students who are 18 years old and have signed their own.

2. Instructions to students:
   - Read the instructions on the front of the questionnaire.
   - Read the instructions of each individual question before answering.
   - Note there are 7 pages to be completed.
   - Raise your hand if you have any questions.

3. When they have finished, students can hand in the questionnaire and take a form to enter the $25 cash draw. A box or envelope will be provided for draw forms to be collected. These forms will be added to the main box for all survey participants.

4. Please place all completed questionnaires in the envelope provided. When the last questionnaire is collected, seal the envelope and return it to the principal of your school.

Please note:
In order not to influence student responses to this questionnaire, please do not make any positive or negative statements about exercise during this session.

Thanks to all students who are participating and I thank you for your most valuable assistance with this research. I will provide a copy of the findings to your principal to share with you and interested student participants.

Thanks again,
Sharon Lawler RN, BA.
Graduate Student
Faculty of Education
Brock University