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Physical Activity Rates and Motivational Profiles of Adolescents While Keeping
a Daily Leisure-Time Physical Activity Record

Matthew Osden Fullmer

A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of

Master of Arts

Carol Wilkinson, Chair
Keven Prusak
Todd Pennington

Department of Teacher Education

Brigham Young University

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ABSTRACT

Physical Activity Rates and Motivational Profiles of Adolescents While Keeping a Daily Leisure-Time Physical Activity Record

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Master of Arts

The purpose of this study was to examine the relationship between keeping a daily leisure-time physical activity record and adolescent (a) feelings of competence toward leisure-time physical activity, (b) motivational profiles toward leisure-time physical activity, and (c) leisure-time physical activity behaviors. Participants were 124 junior high and high school physical education (PE) students. Students completed the Behavioural Regulation in Exercise Questionnaire–2, the Godin Leisure–Time Exercise Questionnaire, the Perceived Competence Scale, and were assigned to keep an online leisure-time physical activity record for three weeks as part of their regular PE class. A 2 (gender) x 4 (trials) repeated measures ANCOVA was used to examine the relationships between recording compliance and the variables of perceived competence, motivation, and physical activity. Results showed a significant interaction between recording compliance and leisure-time physical activity. As students kept the leisure-time physical activity record, boys' leisure-time physical activity levels significantly increased and girls' leisure-time physical activity levels significantly decreased. Also, a significant interaction between recording compliance and introjected regulation was found. The more students recorded the less motivated they were by guilt and obligation to exercise in their leisure time. Lastly a significant interaction was found between recording compliance and intrinsic regulation, showing that the more students recorded the more intrinsically motivated they were to exercise in their leisure time. Implications and suggestions are set forth for PE professionals.

Keywords: online physical activity log, Self-Determination Theory, log compliance, Behavioural Regulation in Exercise Questionnaire–2, Godin Leisure–Time Exercise Questionnaire, Perceived Competence Scale

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DESCRIPTION OF STRUCTURE AND CONTENT

In an effort to meet both university submission requirements and education journal submission requirements, this master's thesis has been written in hybrid format. *Physical Activity Rates and Motivational Profiles of Adolescents While Keeping a Daily Leisure-Time Physical Activity Record* has been specifically formatted to fulfill submission guidelines to the *Journal of Teaching in Physical Education*. In addition to featuring empirical studies in physical education, as well as reviews and analysis of educational and methodological issues in physical education, *The Journal of Teaching in Physical Education* discusses current topics of interest to physical educators.

This document also contains several appendices. Appendix A includes an extended review of the literature; Appendix B contains the questionnaire; Appendix C consists of the classroom scripts; Appendix D contains consent/assent forms; and Appendix E is the letter to the principal.

Furthermore, there are two reference lists in this document. The references included in the journal-ready article make up the first reference list. The second list only includes references that are in Appendix A. Although certain references from the journal-ready article are used again in Appendix A, repeated references are only listed in the journal-ready article reference list.

Background

In part, due to leisure-time inactivity, obesity and chronic health issues plague the lives of millions of adolescents in the United States (Centers for Disease Control and Prevention, 2013; Currie et al., 2012; Trost, Kerr, Ward, & Pate, 2001). Studies report that participating in physical activity on a regular basis is a key factor in maintaining good health (Aldana et al., 2005; Cecchini et al., 2010; Janssen & LeBlanc, 2010). Physical activity can enhance physical, psychological, and social well-being (Hallal, Victora, Azevedo & Wells, 2006); therefore, the interest of regular physical activity in adolescents is an important public health issue (Sallis, Prochaska, & Taylor, 2000).

Adolescence is a fundamental time when health-related behaviors are formed and continue into adulthood (Ortega, Ruiz, Castillo, & Sjöström, 2008); and yet, physical activity levels typically drop during adolescence (Armstrong & Welsman, 2006; Zimmermann-Sloutskis, Wanner, Zimmermann, & Martin, 2010). In other words, physically active adolescents tend to become physically active adults (Hallal et al., 2006), and conversely, physically inactive adolescents tend to become physically inactive adults. Unfortunately many adolescents rarely meet the recommendation of 60 minutes of moderate to vigorous physical activity each day (Currie et al., 2012). In order to bolster declining health-related behaviors in adolescence, Sallis et al. (1992) proposed that preventative measures and early intervention might be wisest and most cost effective.

When contemplating how to tackle the problems associated with childhood and adolescent physical inactivity, experts have often looked to physical education (PE) programs in the public schools as major players in the fight against adolescent health issues (McDavid, Cox, & Amorose, 2012; Sallis & McKenzie, 1991; Sallis et al., 2012). Since most adolescents attend

and are exposed to PE curriculum and its health-related content (American Alliance for Health, Physical Education, Recreation and Dance, 2013; Ribeiro et al., 2010; Yetter, 2009), PE programs and PE teachers can influence adolescents to be more physically active in their leisure time (Mayorga-Vega & Viciano, 2014; McDavid et al., 2012). Recognizing that the responsibility for changing the leisure-time physical activity habits of adolescents falls on many shoulders outside of PE, this burden can seem overwhelming for PE teachers (Blades, 2009). Ultimately, the reasons why adolescents choose to participate in leisure-time physical activity are complex and difficult to understand. Johnson, Prusak, Pennington, and Wilkinson (2011) studied the impact of skill test type and gender on students' (in a western state in the U.S.) situational motivation levels during a football unit in PE and their results suggested that the motivation needed to successfully pursue healthier lifestyles could be positively influenced by what students learn and do in PE.

Self-Determination Theory

Researchers often turn to Deci and Ryan's (1985) Self-Determination Theory (SDT) as a framework to understand the motivations of human behavior. Motivated behaviors, according to SDT, can be measured by an individual's position along an intercorrelated continuum of regulation (Ryan & Deci, 2000). At one end of this self-determination continuum is amotivation (lacking the intention toward a particular behavior), and on the other end of the continuum is intrinsic regulation (engaging in an activity for the inherent satisfaction or sheer enjoyment of the activity itself). There are four types of extrinsically motivated behaviors between amotivation and intrinsic regulation; these behaviors vary based on the extent to which their regulation is autonomous, or self-determined vs. controlled externally. From least to most self-determined, they are: (a) external regulation (behaviors are performed to satisfy an external demand; e.g., I'm

physically active so my teacher doesn't give me a bad grade), (b) introjected regulation (taking in a regulation but not fully accepting it as one's own; e.g., I'm physically active because I'll feel guilty or ashamed if I'm not), (c) identified regulation (a conscious valuing of a behavioral goal or regulation; e.g., I'm physically active because I recognize value in becoming healthier), and (d) integrated regulation (when identified regulations are fully assimilated to the self; e.g., I'm physically active because it is a part of who I am; Deci & Ryan, 2000). As individuals become more self-determined they move along the continuum toward intrinsic regulation and are more likely to adopt new behaviors for the long-term (Deci & Ryan, 1985). Within the framework of SDT, Deci and Ryan (2000) added that when the three basic psychological needs of (a) competence (I can do), (b) autonomy (I can choose what I do), and (c) relatedness (I can be successful in the social environment) are satisfied, individuals became more self-determined.

Seeking to understand motivation as it relates to PE, several researchers have used SDT in PE settings. Suggesting that PE experiences in middle school settings can predict how physically active students are, Mayorga-Vega and Viciano (2014) evaluated the changes in objective physical activity levels and perceived effort during PE, recess, and organized sport of adolescents and found that self-determined motivation toward PE was an important indicator of physical activity levels in adolescents because as self-determination increased, so did physical activity levels. Their findings support the idea that experiences in PE can influence adolescent physical activity levels outside of school. In addition, Ntoumanis (2005) found that when the needs for competence, autonomy and relatedness were satisfied students were more likely to engage in optional PE. Another study conducted by Ferriz, Sicilia, and Sáenz-Álvarez (2013) found that a good predictor of fulfillment in PE was the satisfaction of these basic psychological needs. Carroll and Loumidis (2001) have also found that students participate in physical activity

more often and with greater intensity if they feel competent in PE. Furthermore, Standage, Duda, and Ntoumanis (2003) assessed the motivational responses of secondary PE students and found that self-determined motivation positively predicted students' leisure-time physical activity intentions.

Recording of Physical Activity

Corbin and Le Masurier (2014) proposed that logging/recording of daily physical activity may act as a motivational tool to potentially increase leisure-time physical activity levels, and help students feel more competent toward leisure-time physical activity. Further, American Alliance for Health, Physical Education, Recreation and Dance (2013) standards recommend the practice of student self-monitoring via activity logs as an effective practice for middle and high school students. Proponents suggest that as students take a more active and assertive role in managing their personal behaviors that a greater sense of ownership results. This increased sense of autonomy, or being in charge of their behavioral decisions is, however, largely unexamined, particularly in the PE setting.

Paper-based and electronic logs, journal and diary entries, and recording behaviour and activities are all different ways for individuals to self-report. Self-reporting is also commonly used in epidemiological research (Armstrong & Welsman, 2006; Cale, 1994), and a variety of psychological fields, including personality (e.g., Mroczek & Almeida, 2004), and health (e.g., Skaff et al., 2009). Foreyt and Goodrick (1993) considered self-reporting to be the cornerstone of behavioral weight loss treatment. Additionally, self-reporting has long been recommended as an appropriate method of physical activity assessment (e.g., Saris, 1985; Wilson, Paffenbarger, Morris & Havlik, 1986). Gleeson-Kreig (2006) asked adults with type II diabetes to keep activity diaries for six weeks and found that activity diaries had a significantly large effect on improving

their physical activity levels. Wormald et al. (2003) similarly asked English children and adolescents to keep a physical activity diary for seven days and concluded that the diary portrayed useful and detailed information regarding physical activity habits of young people. Rich contextual, and descriptive data over time, as well as convenience, unobtrusiveness, and time and cost effectiveness are all advantages of using self-reporting methods when conducting research (Cale, 1994). Conversely, limitations to self-reporting include memory loss, underestimation and overestimation of physical activity, accessibility, and language barriers (Dollman et al., 2009). Recent technologies, however, have provided a number of electronic self-reporting products (e.g., Fitbit, Garmin Vivofit Fitness Band, Microsoft Band, Apple Watch, Presidential Active Lifestyle Award Challenge (PALAC) website) that may offer advantages over traditional paper-based methods. Further, when compared with paper-based self-reporting formats, research acknowledges that adolescents prefer electronic-based formats (Herndon et al., 2011; Hutchesson, Rollo, Callister, & Collins, 2015).

Considering the tech-savvy nature of today's adolescent population, an electronic-based daily self-reporting leisure-time physical activity record may present an appealing alternative for studying adolescent leisure-time physical activity. While vendors and proponents of self-monitoring and recording tools recommend the practice and claim that users will experience positive changes in, for example, motivation or actual leisure-time physical activity, such outcomes remain undetermined.

Statement of the Problem

Evidence confirms that obesity and chronic health issues are linked to physical inactivity (Cecchini et al., 2010; Trost et al., 2001), and some (McDavid et al., 2012; Sallis & McKenzie, 1991) make a convincing case that PE programs in school are perfectly positioned to play a

major role in combating these health-related issues. Creating contexts supportive of competence are of great importance for physical educators who wish to motivate students in a way that stimulates both PE related and leisure-time physical activity. This study will examine the effects of daily online recording of physical activity on student perceptions of competence for, motivational indices toward, and personal recall of leisure-time physical activity.

Keeping a daily, online leisure-time physical activity record may be an effective intervention to help students feel more competent, and thus, self-determined, with the hope that leisure-time physical activity will increase. However, little is actually known about the relationship between recording leisure-time physical activity on the motivational profiles or leisure-time physical activity levels of students enrolled in PE.

Statement of the Purpose

The purpose of this study was to examine the relationship between keeping a daily leisure-time physical activity record and (a) adolescent feelings of competence toward being physically active in their leisure time, (b) adolescent motivational profiles toward being physically active in their leisure time, and (c) adolescent leisure-time physical activity behaviors.

Statement of the Hypotheses

It was hypothesized that keeping a daily leisure-time physical activity record would (a) help adolescents feel more competent toward physical activity in their leisure time, (b) move adolescent motivational profiles along the continuum toward being more intrinsically motivated to participate in physical activity in their leisure time, and (c) be positively related to adolescent leisure-time physical activity levels.

Methods

This study was conducted in a public charter school located in the Intermountain West of the United States. The K-11 charter school had a total of 955 students (male = 481, female = 474); 35.3% were ethnic minority, 41.7% were economically disadvantaged, 13.2% were English language learners and 11% were special education students. Ethnicity varied among students, 3% of the students were Asian, 1% were Black, 65% were Caucasian, 27% were Hispanic, 1% were American Indian, 3% were multiracial, and 2% were Pacific Islander. Initially, 173 male ($n=83$) and female ($n=90$) PE students (grades 7–11) from 10 classes were asked to volunteer to participate in this study. Attrition (due to absences, incomplete data sets, etc.) reduced the final number of participants to 124 (61 males and 63 females).

Approval to conduct this study was obtained from the university Institutional Review Board and the principal. This particular charter school is its own district; therefore permission to do the study was obtained from the principal of the school, who was also the head of the district. The school for this study did not require Governing Board approval. Participants in the study signed assent forms provided by the principal investigator, and parents signed informed consent forms provided in Spanish or English.

Instruments

Behavioural Regulation in Exercise Questionnaire-2. The Behavioural Regulation in Exercise Questionnaire-2 (BREQ-2) is a 19 item, 5-factor questionnaire that measures an individual's level of self-determined motivation to exercise. Amotivation, external regulation, identified regulation, and intrinsic regulation are each assessed by four items and introjected regulation is assessed by three items. For example, an intrinsic regulation item on the BREQ-2 states, "I exercise because it's fun." Mean scores for each set of items relating to each

motivational construct are calculated. The heading of the questionnaire administered to participants in the present study was modified to include the phrase “We simply want to know how you personally feel about exercise in your free time,” as used by McDavid et al. (2012), to further clarify to the participants that they were to record leisure-time physical activity only, throughout the questionnaire. Previous research of this instrument has shown satisfactory internal consistency and reliability when measuring adolescent motivation toward leisure-time physical activity (Hagger et al., 2009; Mullen et al., 1997), as well as factorial validity ($\alpha > .76$; Markland, & Tobin, 2004).

Perceived Competence Scale. The Perceived Competence Scale (PCS) measures the extent to which individuals feel competent about making behavioral changes (such as exercising regularly). This questionnaire is made up of four statements that ask students to “Please indicate the extent to which each statement is true for you, assuming that you were intending either to begin now a permanent regimen of exercising regularly or to permanently maintain your regular exercise regimen.” The following is one of the four statements, “I now feel capable of exercising regularly.” Students used a Likert scale of 1 (not at all true) to 7 (very true; see Appendix C) to respond to each statement. By averaging the responses to the four statements, the principal researcher was able to determine each individual’s level of perceived competence toward leisure-time exercise. Williams and Deci (1996) found that internal consistency for the PCS had an alpha value of .80 and Williams, Freedom and Deci (1998) found the PCS to be reliable at alpha level .90. Advantages to the PCS are its brevity and adaptability to study a variety of behaviors (Carroll & Loumidis, 2001; Standage, Duda, & Ntoumanis, 2005).

Godin Leisure-Time Exercise Questionnaire. The Godin Leisure-Time Exercise Questionnaire (GLTEQ) is a 7-day, self-report recall of leisure-time physical activity that

measures the frequency of mild, moderate, and strenuous leisure-time exercise. The questionnaire asks, “During a typical 7–day period (a week), how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time? The individual then records the number of times they participated in mild, moderate, and vigorous leisure-time physical activity during a typical week. Responses can range from zero to infinity. Student responses were calculated to determine a weekly and total leisure activity score. Multiple researchers have deemed the GLTEQ valid and a reliability of $\alpha > .74$ has been confirmed (e.g., Godin & Shephard, 1985; Sallis, Buono, Roby, Micale, & Nelson, 1993).

Presidential Active Lifestyle Award Challenge. The Presidential Active Lifestyle Award Challenge (PALAC; 2014) is a web-based self-reporting tool which allowed participants to log into their password protected personal account and record their daily leisure-time physical activity by type and duration from an extensive list of leisure-time physical activity choices. To record their daily leisure-time physical activity, participants first had to log into their account and select from a drop down box the type, or types (e.g., soccer), of physical activity they engaged in. Next, participants selected the duration and intensity for each selected leisure-time physical activity. Then participants selected the date they engaged in the leisure-time physical activity using a point-and-click calendar. Finally participants clicked the save button to save their entry/changes. Students joined a class group, accessible only to the principal investigator, allowing him to download an Excel spreadsheet daily for each group from the PALAC website containing type and duration of leisure-time physical activity, and the date. The spreadsheets served as a time stamp for the principal investigator, indicative of data quality and respondent compliance (Iida, Shrout, Laurenceau, & Bolger, 2012), thus allowing the principal investigator to record daily PALAC compliance for each participant. The online tool was described to the

students as a daily lifestyle record, rather than a daily leisure-time physical activity record, to eliminate any compromising influence that “physical activity” may have on behavior outcomes as advised by Wormald et al. (2003).

Design

This study employed a 2 (gender) x 4 (trials) between and within repeated measures ANCOVA. Regarding the selection of participants, a convenience sampling of 7th -11th grade boys and girls was used.

Procedures

The principal investigator obtained approval from the University Institutional Review Board, the school district, and the principal at the selected secondary charter school. The principal investigator was a PE teacher at this school and asked his students to participate in the study. The other PE teacher at the school was contacted and she permitted her students to participate in the study. Students attend PE on an every-other-day basis. During the middle of March, 2015, the principal investigator asked for volunteers to be part of the study and distributed consent and assent forms to each student who volunteered so that parental permission and student assent could be obtained. Alternative assignments (health and fitness related worksheets and quizzes) were administered to non-volunteers. A copy of the parental permission form was given to the parents who consented to have their student participate in the study (see Appendix E). A copy of the Child Assent form was given to the students who assented to participate in the study (see Appendix E). Keeping the daily leisure-time physical activity record was a regular course assignment for all students in both the principal investigator’s classes and the other PE teacher’s classes, regardless of whether students were part of the study. As part of the leisure-time physical activity recording assignment, all students were graded on whether or

not they recorded their leisure-time physical activity by 11:00 P.M. each day. It was made clear to all students in all PE classes that their grade for the assignment was based on whether or not they recorded their leisure-time physical activity, or lack thereof, and was not based on how physically active they were in their leisure time.

To provide baseline information on motivation, and perceived competence to exercise during leisure time, and leisure-time physical activity, two weeks prior to keeping the leisure-time physical activity record, the principal investigator administered the BREQ-2, PCS, and GLTEQ as one questionnaire. The principal investigator read the scripted instructions to the students (see Appendix D). Participants then had 10-15 minutes to complete the questionnaire and asked any questions for clarification. Several days before all students in all PE classes started keeping the leisure-time physical activity record, the principal investigator taught and demonstrated to the students how to access and use the online leisure-time physical activity record website (PALAC) using the school computer lab. The principal investigator administered the questionnaire during the first week of April. Two weeks later, students began to record daily leisure-time physical activity using the PALAC website. The principal investigator sent daily e-mails to all PE students reminding them to record their leisure-time physical activity. The principal investigator also verbally reminded all PE students every other day, in class, to record their daily leisure-time physical activity. The questionnaire was administered at the end of each week, for 3 weeks. During each weekly administration of the questionnaire, the principal researcher repeated the survey procedures stated above.

During administration of the questionnaire given by the principal investigator, a co-investigator performed procedural checks by making random visits to the class to make sure the questionnaire was administered appropriately. After each administration, a co-investigator

gathered completed questionnaires from the principal investigator's classes and substituted each student's name with numbers so responses were confidential. At the end of all data collection these same numbers were substituted for names on the Excel spreadsheets for research purposes only. The data will be kept under lock and key in the principal investigator's office until the results of the study are published to ensure anonymity, confidentiality, and protection of data. After the study is published all data will be destroyed.

Data Analysis

Data were screened for outliers, missing data, normality, collinearity, etc. prior to any analysis. Mean scores for each motivational subscale were calculated from their respective items. Analysis of descriptive statistics, correlation analysis among all variables of interest, simplex pattern among SDT motivational indices (adjacent correlations are expected to be higher than those that are more distant), and reliability analysis for each subscale was conducted. A repeated measures ANCOVA was conducted to determine a statistically significant difference between genders and within trials on the dependent variables, while controlling for the baseline mean scores (co-variates) of each dependent variable. Lastly a one-way ANOVA was conducted to see if there was a significant gender difference for PALAC compliance. All statistical procedures were completed using SPSS (version 22) and SAS (version 9.3) software.

Independent variables included student gender, PALAC compliance, and four trials. Dependent variables included amotivation, external regulation, introjected regulation, identified regulation, intrinsic regulation, perceived competence, and leisure-time physical activity scores on the BREQ-2, PCS, and GLTEQ.

Results

Descriptive statistics and scale reliabilities are displayed in the following section. Initial mean score insights are set forth.

Descriptive Statistics and Scale Reliabilities

Table 1 displays descriptive statistics (mean subscale scores) and alpha coefficients (Cronbach, 1951) for all measures. All measures from .74 to .95 were found to meet reliability standards based on $\alpha = .70$ (Nunnally & Bernstein, 1994). These initial mean scores are from students who both kept the leisure-time physical activity record, and students who did not keep the record. PALAC compliance percentage mean scores consistently stayed in the low 40s. An increase in mean scores for perceived competence, intrinsic regulation and leisure-time physical activity was expected. Regardless of PALAC compliance scores, perceived competence and all the motivational factors stayed about the same; however, leisure-time physical activity mean scores increased from baseline to week one, and dropped off again after week two, before increasing to a high score ($M = 98.65$, $SD = 54.02$) in week three.

Table 2 displays descriptive statistics (mean subscale scores), kurtosis, and skewness for each measure by gender. As in similar studies (Martin, 2004; Sirin & Rogers-Sirin, 2005; Wang & Eccles, 2012), greater PALAC recording compliance among girls than boys was expected, and generally, mean scores show that girls indeed, kept the leisure-time physical activity record more often than boys. An examination of mean scores regarding motivational factors toward leisure-time physical activity shows that girls were (a) more externally regulated and (b) introjectedly regulated than were the boys. On the other hand, boys were (a) more intrinsically regulated and (b) perceive themselves to be more competent than girls toward leisure-time physical activity.

Table 1

Descriptive Statistics and Internal Consistency for Each Measure

Variable	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	α
PALAC Compliance %					
Baseline					
Week 1	42.5	35.95	.153	-1.437	—
Week 2	44.32	35.18	.023	-1.492	—
Week 3	41.37	33.31	.239	-1.259	—
Overall	42.67	29.36	.082	-1.161	—
Amotivation					
Baseline	.40	.72	2.138	4.172	.85
Week 1	.40	.67	1.830	2.631	.83
Week 2	.36	.65	2.440	7.152	.87
Week 3	.32	.63	2.190	4.727	.88
External Regulation					
Baseline	.98	.88	.917	.497	.77
Week 1	.95	.93	.653	-.698	.86
Week 2	.90	.99	.919	-.221	.89
Week 3	.90	.99	.858	-.499	.90
Introjected Regulation					
Baseline	1.55	1.23	.408	-1.016	.86
Week 1	1.56	1.20	.330	-.891	.82
Week 2	1.56	1.28	.405	-.971	.89
Week 3	1.51	1.33	.347	-1.187	.92
Identified Regulation					
Baseline	2.80	.88	-.550	-.057	.74
Week 1	2.81	.89	-.685	.113	.76
Week 2	2.80	.91	-.835	.539	.76
Week 3	2.92	.85	-.713	-.011	.75
Intrinsic Regulation					
Baseline	3.06	1.03	-1.480	1.643	.92
Week 1	2.96	1.00	-1.131	.867	.90
Week 2	2.96	1.09	-1.105	.415	.93
Week 3	3.01	1.05	-1.256	1.141	.93
Perceived Competence					
Baseline	5.14	1.72	-.848	.033	.94
Week 1	5.18	1.69	-.938	.491	.92
Week 2	5.28	1.68	-.885	.088	.93
Week 3	5.33	1.79	-1.035	.185	.95
Physical Activity					
Baseline	78.09	54.02	2.168	7.676	—
Week 1	92.79	108.43	3.940	18.194	—
Week 2	89.61	87.87	3.999	23.949	—
Week 3	98.65	110.79	4.185	24.535	—

Note. Weekly PALAC compliance was calculated by average days recorded in a particular week, overall PALAC compliance was calculated by averaging total days recorded during the three-week period. Amotivation, external regulation, introjected regulation, identified regulation, and intrinsic regulation (motivation) interpreted via BREQ-2 and scored on a 5-point scale ranging from 0 = “not true for me” to 4 = “very true for me.” Mean subscale scores were reported. Perceived competence (via PCS) 1-7 scale, 1 (not at all true) to 7 (very true). Physical activity (via GLTEQ) responses were calculated as a total leisurely activity score each week. N = 124.

Table 2

Descriptive Statistics and Internal Consistency for Each Measure by Gender

Variable	Male (N = 61)			Female (N = 63)		
	<i>M (SD)</i>	Skewness	Kurtosis	<i>M (SD)</i>	Skewness	Kurtosis
PALAC Compliance %						
Week 1	31.62(32.81)	.610	-1.018	53.03 (35.96)	-.289	-1.308
Week 2	35.84 (34.90)	.436	-1.389	52.52 (33.73)	-.360	-1.162
Week 3	35.82 (33.39)	.429	-1.274	46.75 (32.60)	.093	-1.147
Overall	34.34 (28.16)	.426	-1.177	50.75 (28.43)	-.235	-.760
Amotivation						
Baseline	.42 (.80)	2.205	4.342	.38 (.64)	1.927	3.034
Week 1	.38 (.68)	2.058	3.848	.43 (.68)	1.663	1.852
Week 2	.34 (.71)	2.924	9.836	.37 (.59)	1.634	1.834
Week 3	.34 (.70)	2.332	5.313	.31 (.56)	1.868	2.839
External Regulation						
Baseline	.88 (.85)	1.211	2.073	1.08 (.91)	.693	-.405
Week 2	.89 (.98)	.766	-.629	1.00 (.88)	.564	-.704
Week 3	.84 (1.00)	.952	-.371	.97 (.98)	.932	.045
Week 4	.82 (1.03)	1.120	-.007	.99 (.96)	.622	-.841
Introjected Regulation						
Baseline	1.45 (1.28)	.586	-.949	1.65 (1.18)	.252	-.978
Week 1	1.41 (1.27)	.498	-.899	1.70 (1.12)	.230	-.737
Week 2	1.35 (1.28)	.704	-.658	1.77 (1.26)	.163	-.991
Week 3	1.31 (1.34)	.638	-.958	1.70 (1.29)	.100	-1.181
Identified Regulation						
Baseline	2.88 (.90)	-.737	.405	2.71 (.86)	-.402	-.317
Week 1	2.89 (.92)	-.958	.852	2.73 (.86)	-.439	-.441
Week 2	2.84 (.96)	-.884	.524	2.76 (.86)	-.827	.723
Week 3	2.97 (.87)	-.870	.525	2.87 (.84)	-.585	-.399
Intrinsic Regulation						
Baseline	3.12 (1.02)	-1.630	2.187	3.01 (1.04)	-1.384	1.431
Week 1	3.04 (.99)	-1.401	1.859	2.88 (1.01)	-.919	.289
Week 2	3.06 (1.11)	-1.301	.856	2.87 (1.06)	-.971	.252
Week 3	3.18 (1.03)	-1.519	2.027	2.85 (1.06)	-1.122	.854
Perceived Competence						
Baseline	5.57 (1.53)	-1.300	1.639	4.72 (1.81)	-.516	-.532
Week 1	5.51 (1.54)	-1.324	2.072	4.86 (1.78)	-.653	-.152
Week 2	5.64 (1.46)	-1.377	1.467	4.93 (1.81)	-.568	-.494
Week 3	5.70 (1.61)	-1.273	.727	4.98 (1.90)	-.843	-.156
Physical Activity						
Baseline	82.62 (47.94)	1.141	1.624	73.71 (59.37)	2.790	10.851
Week 1	92.37 (95.17)	4.876	30.351	93.19 (120.66)	3.447	13.195
Week 2	90.82 (61.46)	1.959	6.091	88.44 (107.98)	4.018	20.747
Week 3	92.72 (60.57)	1.808	4.580	104.39 (143.98)	3.612	16.155

Note. See the note for Table 1.

Also, as expected, boys showed higher consistent levels of leisure-time physical activity mean scores. While girls started out with lower leisure-time physical activity mean scores, their mean scores ended up being higher than the boys' mean scores.

Bivariate correlations among SDT factors revealed a simplex pattern (Markland & Tobin, 2004; Ryan & Connell, 1989), in that adjacent correlations of BREQ-2 scores were higher than those that were more distant (Deci & Ryan, 1985).

Table 3 presents the correlation matrix for the baseline responses. Findings indicate that perceived competence scores were negatively and moderately associated with amotivation and external regulation, positively and weakly associated with introjected regulation, and positively and moderately associated with both identified regulation and intrinsic regulation. Correlations indicated that leisure-time physical activity scores were positively and moderately associated with perceived competence scores, positively and weakly associated with identified regulation and intrinsic regulation scores, and negatively and weakly associated with external regulation scores.

Table 4 displays the correlation matrix for week 1 leisure-time physical activity record and questionnaire responses. Correlations illustrated that perceived competence scores were negatively and moderately associated with amotivation scores and negatively and weakly associated with external regulation scores. While identified regulation and intrinsic regulation scores were positively and moderately associated with perceived competence scores. Additionally, leisure-time physical activity scores were negatively and weakly associated with amotivation and external regulation scores, yet positively and weakly associated with intrinsic regulation and perceived competence scores.

Table 3

Bivariate Correlations Among Study Variables (Baseline)

Variable	1	2	3	4	5	6	7
Perceived Competence		.316**	-.528**	-.326**	.249**	.662**	.650**
Physical Activity			-.176	-.265**	-.015	.288**	.255**
Amotivation				.293**	-.173	-.475**	-.590**
External Regulation					.227*	-.088	-.162
Introjected Regulation						.493**	.338**
Identified Regulation							.715**
Intrinsic Regulation							–

Note. Amotivation, external regulation, introjected regulation, identified regulation, and intrinsic regulation (motivation) interpreted via BREQ-2 and scored on a 5-point scale ranging from 0 = “not true for me” to 4 = “very true for me.” Perceived competence (via PCS) 1-7 scale, 1 (not at all true) to 7 (very true). Physical activity (via GLTEQ) responses were calculated as a total leisurely activity score each week. The correlation between the motivational subscales suggests they generally conform to the simplex pattern (Ryan & Connell, 1989), in that distal items are increasingly inversely related.

** . Correlation is significant at the .01 level (2-tailed).

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

Table 4

Bivariate Correlations Among Study Variables (Week 1)

Variable	1	2	3	4	5	6	7	8
PALAC Compliance %	–	-.053	-.050	-.148	-.111	-.067	.034	-.006
Perceived Competence			.235**	-.499**	-.254**	.151	.627**	.655**
Physical Activity				-.208*	-.243**	-.061	.141	.246**
Amotivation					.259**	-.166	-.425**	-.492**
External Regulation						.375**	-.031	-.210*
Introjected Regulation							.473**	.265**
Identified Regulation								.702**
Intrinsic Regulation								–

Note. See the note for Table 3. Additionally, weekly PALAC compliance was calculated by average days recorded in a particular week.

** . Correlation is significant at the .01 level (2-tailed).

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

Table 5 shows the correlation matrix for week 2 leisure-time physical activity record and questionnaire responses. Results demonstrated that amotivation and external regulation scores were negatively and moderately associated with perceived competence scores. Furthermore, identified regulation and intrinsic regulation scores were positively and moderately associated with perceived competence scores. External regulation scores were negatively and weakly associated with leisure-time physical activity, while perceived competence scores were positively and weakly associated with leisure-time physical activity.

Table 6 presents the correlation matrix for week 3 leisure-time physical activity record and questionnaire responses. Perceived competence scores were negatively and moderately associated with amotivation and negatively and weakly associated with external regulation. Also, perceived competence scores were positively and moderately associated with identified regulation and intrinsic regulation scores. Leisure-time physical activity scores were positively and weakly associated with perceived competence.

The correlations between amotivation and intrinsic regulation were strongly and negatively correlated, whereas adjacent factors were positively and moderately correlated and this was supported across all four trials, suggesting a simplex pattern (Ryan & Connell, 1989), which is in line with Deci and Ryan's (1985) SDT. In consideration of strong relative scores and evidence of simplex pattern of the correlation matrix it appears the BREQ-2 performed as it was designed to for this population.

Repeated Measures Analysis of Co-variance

A 2 (gender) x 4 (trials) repeated measures analysis of co-variance (ANCOVA) was conducted to assess any statistically significant between genders and within trials differences on the dependent variables (amotivation, external regulation, introjected regulation, identified

regulation, intrinsic regulation, perceived competence, and leisure-time physical activity), while controlling for the baseline mean scores (co-variates) of each dependent variable. Of primacy to this study was to see if PALAC compliance significantly predicted the changes in leisure-time physical activity, motivational factors, and perceived competence among participants at the 0.05 level. Skewed GLTEQ scores were subjected to a log transformation for further analysis and then a reverse transformation was executed for interpretation purposes.

Leisure-time physical activity. A significant PALAC compliance-by-gender interaction on leisure-time physical activity was noted ($F(1,244) = 12.78, p < 0.0004$). Specifically, as girls were more PALAC-compliant, their leisure-time physical activity decreased, in contrast, as boys were more PALAC-compliant, their leisure-time physical activity increased. For every 1% increase in PALAC compliance we saw a 0.2% decrease in how many times per week girls engaged in leisure-time physical activity and a 0.2% increase in how many times per week boys engaged in leisure-time physical activity. While this finding was statistically significant, it may lack practical significance. Also, a significant difference in leisure-time physical activity between genders was found ($F(1,121) = 5.01, p < 0.0270$), indicating males were, on average, 11% less than female scores.

Introjected regulation. Another significant interaction was found between PALAC compliance and gender on introjected regulation ($F(1,245) = 4.05, p < 0.0452$). In general, for both boys and girls, as PALAC compliance scores increased, introjected regulation scores decreased. Simply stated, as students were more PALAC-compliant, their reasons for exercising in their leisure-time had less to do with guilt and obligation. There was also a significant difference between genders ($F(1,121) = 7.84, p < 0.0060$), indicating males had a significantly lower sense of introjected regulation than did females, scoring on average 0.27 points less than

females, a 5% difference on the 5-point BREQ-2 scale. Although statistically significant, these findings may lack practical significance.

Intrinsic regulation. Perhaps, most notably, a significant PALAC compliance-by-gender interaction on intrinsic regulation was found ($F(1,244) = 4.47, p < 0.0356$). Generally, as PALAC compliance scores increased, intrinsic regulation scores increased for both boys and girls. Or in other words, students who recorded more often were more intrinsically motivated to exercise in their leisure time. Furthermore, there was a significant difference between genders ($F(1,121) = 8.21, p < 0.0049$), indicating that males had a significantly higher sense of intrinsic regulation scoring on average 0.18 points higher than females. In other words, male intrinsic regulation scores were, on average, 4% higher than female scores on the 5-point BREQ-2 scale. Considering the minor change in scores, these findings may not be practically significant.

Perceived competence and remaining motivational factors. PALAC compliance was not found to be a significant predictor of perceived competence, or any of the remaining motivational factors (amotivation, external regulation, identified regulation). Also, no significant difference between PALAC compliance across genders was found for perceived competence, nor the remaining motivational factors. Lastly, a one-way ANOVA revealed that girls were significantly more PALAC-compliant than boys ($F(1,122) = 10.41, p < .01$).

Table 5

Bivariate Correlations Among Study Variables (Week 2)

Variable	1	2	3	4	5	6	7	8
PALAC Compliance %	—	.055	-.034	-.047	-.052	.014	.162	.152
Perceived Competence			.298**	-.387**	-.314**	.121	.600**	.637**
Physical Activity				-.081	-.244**	-.152	.036	.164
Amotivation					.331**	.009	-.322**	-.412**
External Regulation						.426**	.100	-.141
Introjected Regulation							.516**	.253**
Identified Regulation								.668**
Intrinsic Regulation								—

Note. See the note for Table 4.

** . Correlation is significant at the .01 level (2-tailed).

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

Table 6

Bivariate Correlations Among Study Variables (Week 3)

Variable	1	2	3	4	5	6	7	8
PALAC Compliance %	—	.102	.057	-.165	-.168	-.094	.172	.018
Perceived Competence			.295**	-.368**	-.241**	.094	.627**	.599**
Physical Activity				-.150	-.106	-.082	.142	.159
Amotivation					.341**	.025	-.306**	-.361**
External Regulation						.479**	.114	-.094
Introjected Regulation							.434**	.199*
Identified Regulation								.639**
Intrinsic Regulation								—

Note. See the note for Table 4.

** . Correlation is significant at the .01 level (2-tailed).

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

Discussion

The objective of this study was to examine the relationship between keeping an electronic leisure-time physical activity record (specifically, PALAC) and (a) adolescent perceived competence toward exercising in their leisure time, (b) motivation to exercise in their leisure time, and (c) adolescent levels of leisure-time physical activity. PE students across the US are commonly assigned to keep physical activity records in a variety of formats (paper and pencil, electronic, or online). Teachers use physical activity records with the hope that they promote self-management and goal-setting skills and motivate them toward physical activity. Although this practice is considered appropriate in the PE field (American Alliance for Health, Physical Education, Recreation and Dance, 2013; Corbin & Masurier, 2014), there is little research on how keeping a leisure-time physical activity record influences adolescents toward adopting physical activity during their leisure time. Present findings provide insight into how electronic leisure-time physical activity records relate to perceived competence toward leisure-time physical activity, motivation, and leisure-time physical activity levels. The results of this study reveal weak, yet differing relationships between keeping a leisure-time physical activity record and leisure-time physical activity levels for boys and girls.

Correlation results revealed a noteworthy consistency across all four trials. All correlation table values were very similar and did not reveal notable changes in the nature of the relationships among PALAC compliance, perceived competence, motivational indices, and leisure-time physical activity levels.

PALAC Compliance

Before addressing the different hypotheses of this study, it is important to discuss PALAC compliance findings for both boys and girls. As expected, the one-way ANOVA results show that girls were significantly more PALAC-compliant than boys. This finding is in line with previous research in that girls are found to be generally more compliant in educational behaviors (Blondal & Adalbjarnardottir, 2012; Li & Lerner, 2011; Martin, 2004; Sirin & Rogers-Sirin, 2005; Wang & Eccles, 2012). Results indicated that PALAC compliance scores were consistent for girls (around 50%) and boys (around 35%). Thus, it seemed logical to think that keeping a leisure-time physical activity record would have a greater effect on girls than on boys; surprisingly, this was not the case. Although a greater number of girls were consistently PALAC-compliant, results show that the effect of keeping a record was less impactful for girls than it was for boys.

Also, after examining the fairly low overall PALAC compliance scores for both genders it seems fair to question the effectiveness of asking students to keep a leisure-time physical activity record. Students in this study were sent reminders to record their leisure-time physical activity daily via e-mail, and every other day in class as they attended school. And yet, most students simply did not consistently record their leisure-time physical activity, or lack thereof, perhaps limiting recording effectiveness. However, it is important to note that these reminders may have undermined students' autonomy by inadvertently creating a controlling environment, and thereby undermining students' autonomous regulations (identified and intrinsic).

Perceived Competence Toward Leisure-time Physical Activity

This study investigated three different hypotheses. The first hypothesis was that keeping a leisure-time physical activity record would help students feel more competent toward leisure-

time physical activity. Interestingly, PALAC compliance was not a significant predictor of perceived competence toward leisure-time physical activity, nor was there a significant difference between PALAC compliance and genders for perceived competence, suggesting that the act of recording leisure-time physical activity behavior and duration does not increase adolescent perceived ability to exercise during leisure time. Perhaps adolescents need to understand more about exercise (e.g., techniques, exercise ideas, duration principles, intensity principles) for perceived competence toward leisure-time physical activity to increase. On the other hand, some research suggests that health-related fitness knowledge has no relation to perceived competence to engage in leisure-time physical activity (Haslem, Wilkinson, Prusak, Christensen, & Pennington, 2016).

Self-Determination Theory Motivational Profiles Toward Leisure-time Physical Activity

The second hypothesis was that keeping a leisure-time physical activity record would move adolescent motivational profiles along the continuum toward being more intrinsically motivated to exercise in their leisure time. Results indicate some support for this hypothesis.

Intrinsic regulation. In general, as PALAC compliance scores increased, intrinsic regulation scores significantly increased for both boys and girls. It is possible that students who kept the record more often became more intrinsically motivated to exercise in their leisure time.

Therefore, if the goal for physical educators is to increase student intrinsic regulation toward leisure-time exercise, leisure-time physical activity records may be an effective intervention. The significant finding between PALAC compliance, as implemented in this study, and intrinsic regulation may help physical educators seeking to motivate adolescents to exercise in their leisure time determine how much emphasis and time to put into keeping leisure-time physical

activity records. The implementation of the leisure-time physical activity assignment in this study was meant to align with what teachers and students typically experience in a PE setting.

Interestingly, a significant difference between PALAC compliance across genders was found for intrinsic regulation, in that males were 4% more likely to be intrinsically motivated to exercise in their leisure time than females. Implying that the process of keeping a leisure-time physical activity record may help boys move along the continuum toward being more intrinsically motivated to engage in leisure-time physical activity than girls. Moreno, Hellín, Hellín, Cervelló, and Sicilia (2008) studied different motivational profiles and the existence of differences in perceived competence and physical condition among 736 PE students at state secondary schools and colleges in the Region of Murcia, Spain and revealed that a greater number of boys than girls were represented in the highly motivated group. Similarly, Wang & Biddle (2001) examined physical activity motivation among 12- to 15-year-old boys and girls from all different geographic regions of England and many different PE classes. Regarding motivation to be physically active, they found that boys are more likely to fall in the highly motivated group and girls outnumber boys in the low motivation group. Thus, boys are generally more motivated to exercise than are girls and, the results of the present study are in line with those previous findings.

Introjected regulation. Furthermore, as students were more PALAC-compliant, their reasons for exercising in their leisure time had significantly less to do with guilt and obligation. In general, for both boys and girls, as PALAC compliance scores increased, introjected regulation scores decreased. There may be something about the leisure-time physical activity record that eliminates adolescent guilt and obligation to exercise in their leisure time. Visual proof (access to a viewing of the PALAC record) and a long-term record of leisure-time physical

activity behavior may eliminate guilt as a motivating factor. Moreover, as students kept the record, their motivation to participate in leisure-time physical activity may have shifted toward being more self-determined based on the intrinsic regulation results discussed previously. For educators seeking to eliminate guilt and obligation as the primary motivator of adolescents to exercise in their leisure time, keeping a leisure-time physical activity record may be a meaningful intervention.

Additionally, a significant difference between PALAC compliance across genders was found for introjected regulation, in that males were 5% less likely to be introjectedly motivated to exercise in their leisure time than females. It is interesting to consider why males became less motivated by guilt than girls. In school environments girls have been found to be more motivated by guilt and obligation (introjected regulation) in general (Mayorga-Vega & Viciano, 2014; Standage et al., 2005; Vallerand, Fortier, & Guay, 1997; Yli-Piipari, Watt, Jaakkola, Liukkonen & Nurmi, 2009), because girls don't want to disappoint peers, parents, or teachers more so than boys. This may be a possible explanation for why girls in this study were more motivated than boys to exercise in their leisure time because of guilt and obligation.

External regulation and amotivation. Rewards and prizes are often used to motivate desired behaviors among adolescents in schools. It is important for teachers to be cognizant as to whether their practices are perceived as controlling in nature, especially if their goal is to achieve more self-determined forms of regulation (identified regulation and intrinsic regulation). Deci (1971), Lepper, Greene and Nisbett (1973) and Harackiewicz (1979) all found that when students received rewards or prizes (external regulators) for participating in a particular activity, then once the prizes and awards were taken away, participants tended to lose interest and willingness to participate in the activity; thus implying that reasons for participating in the

activity were external, and not internal. It seemed reasonable to believe that similar results would occur in the present study, in that PALAC compliance would significantly predict students' external regulation because it was a graded assignment (external regulator), therefore introducing the element of control. Surprisingly, PALAC compliance did not significantly predict students' external regulation. The absence of significance suggests that asking an adolescent to keep a leisure-time physical activity record for a grade or other external rewards (external regulation) will most likely not motivate students to exercise more in their leisure time. Similarly, PALAC compliance did not significantly predict amotivation. Yet, this finding was not surprising if one makes the assumption that adolescents who are amotivated to exercise in their leisure time are likely to be amotivated towards keeping the leisure-time physical activity record as well.

Identified regulation. Although there were significant differences between genders for both intrinsic regulation and introjected regulation across trials, there was no significant difference between genders for identified regulation. Somehow, identified regulation was skipped over in terms of order on the continuum as it sits between both introjected and intrinsic regulation. However, this finding is consistent with SDT tenets due to the fact that the continuum isn't always a step-by-step progression, but rather individual motivation can skip over factors along the continuum as it does with identified regulation in this study (Ryan & Deci, 2000).

Leisure-time Physical Activity Levels

The third hypothesis was that keeping a leisure-time physical activity record would be positively related to adolescent leisure-time physical activity levels. In support of this hypothesis, a significant interaction was found between PALAC compliance and gender for leisure-time physical activity. As hypothesized, compliance with the leisure-time physical activity record significantly predicted an increase in leisure-time physical activity for males. For every 1%

increase in PALAC compliance, we saw a 0.2% increase in how many times per week boys engaged in leisure-time physical activity. The findings of the present study are in-line with previous research among adults; keeping a leisure-time physical activity record has been identified as a statistically significant factor that contributes to increases in physical activity levels (Carels et. al., 2005; Gleeson-Kreig, 2006). This finding may provide some insights into the influence of keeping a leisure-time physical activity record and behavior change among adolescent boys. Perhaps, in general, compliance for boys is a more novel behavior than it is for girls that allows us to see more positive gains. Or, possibly, the actual evidence that PALAC recording provided motivated boys. For physical educators seeking ways to increase leisure-time physical activity levels among adolescent boys, this finding may support the supposition that keeping a leisure-time physical activity record may be an effective method.

Contrary to the third hypothesis that PALAC compliance will be positively related to leisure-time physical activity levels, PALAC compliance significantly predicted a decrease in leisure-time physical activity for girls. This finding is the opposite of what proponents of physical activity recording would hope for. For every 1% increase in PALAC compliance, we saw a 0.2% decrease in how many times per week girls engaged in leisure-time physical activity. It is possible that as girls recorded leisure-time physical activity they became discouraged by how little leisure-time physical activity they were doing and the record became a deterrent to their leisure-time physical activity behavior. Low self-esteem, depression, and anxiety have been linked to a decrease in physical activity among adolescent girls (Crocker, Sabiston, Kowalski, McDonough, & Kowalski, 2006; Garcia et. al., 1995; Shepherd, Krägeloh, Ryan, & Schofield, 2012). Perhaps keeping the record contributed to feelings of depression and anxiety, therefore negatively impacting self-esteem and resulting in a significant decrease in leisure-time physical

activity among the girls in the current study. This finding implies that keeping a leisure-time physical activity record may not be the most effective method for increasing leisure-time physical activity behaviors among adolescent girls. Or possibly, the way the PALAC assignment was delivered in this context was not effective and could be modified to yield higher leisure-time physical activity scores for girls.

Although a statistically significant change occurred, in that, as boys kept the leisure-time physical activity record they were more physically active in their leisure time and as girls kept the record they were less physically active in their leisure time, perhaps these results are not practically important. It is crucial to note that scores on the leisure-time physical activity scale were large and change on the scale was minimal. Simply put, findings suggest that when adolescents keep a leisure-time physical activity record as described in this study, change in leisure-time physical activity behavior is minimal—at least in the short term. However, it may be that leisure-time physical activity records could be more effective if presented and managed in a pervasively needs-supportive environment, such as allowing students to record in groups (relatedness), or even rewarding students with double points on the assignment if their group records the most leisure-time physical activity during the assignment. Recording effectiveness may also improve if the recording experience itself was more needs-supportive, in that different technologies are used to create such an environment or perhaps letting students choose how they record their leisure-time physical activity (autonomy).

Lastly, a significant difference between genders was found; leisure-time physical activity scores for boys were 11% less than girls on average. Kahn et al. (2008) support this finding as they found that girls' physical activity levels were similar to boys in the later adolescent years and by age 18 physical activity levels were higher in girls than in boys. On the other hand it is

important to note that boys are generally more physically active than girls in the United States (Jago, Anderson, Baranowski, & Watson, 2005; Sallis, Zakarian, Hovell, & Hofstetter, 1996; Troiano et. al., 2008), and worldwide (Hallal et. al., 2012; Olds et. al., 2009; Seabra et. al., 2012).

Conclusion

The purpose of this study was to investigate how keeping a daily online leisure-time physical activity record was linked with perceived competence toward exercise during leisure time, motivation toward exercise during leisure time within the framework of Self-Determination Theory (SDT), and leisure-time physical activity behavior. Findings provide insight into the effectiveness of leisure-time physical activity records on adolescent leisure-time physical activity behaviors and motivation to be physically active in their leisure time. The key findings in this study are that (a) keeping a leisure-time physical activity record did not help students feel more competent to exercise in their leisure time, (b) keeping a leisure-time physical activity record may help both boys and girls move towards being more self-determined in their feelings towards leisure-time physical activity, and (c) the outcome of keeping a leisure-time physical activity record on leisure-time physical activity behavior is statistically significant, although actual differences may not be practically important for both boys and girls.

Furthermore, the lack of Presidential Active Lifestyle Award Challenge (PALAC) compliance, despite the fact the leisure-time physical activity record was a graded assignment, suggests that leisure-time physical activity records may not be the most effective intervention for this population as implemented in this study, and how leisure-time physical activity records are implemented warrants further study. It is recommended that physical educators evaluate the usefulness of leisure-time physical activity records within their course curriculum to ensure their

students are benefitting from the assignment. Or alternately consider the manner in which they are being used with respect to needs support as an environmental factor.

Future Research

Future research should further examine the effectiveness of improving leisure-time physical activity behaviors via leisure-time physical activity records among adolescents, to see if such physical activity records may be presented in a way that improves leisure-time physical activity. Moreover, future studies ought to investigate ways physical educators can craft leisure-time physical activity record assignments to improve behavior for boys and girls, in terms of increasing recording compliance and leisure-time physical activity levels. Examining students' perceptions of recording their leisure-time physical activity may provide meaningful insights into how, if at all, this practice can assist adolescents in increasing their leisure-time physical activity. Researchers may also explore the effects of keeping a leisure-time physical activity record on self-esteem and feelings of depression and anxiety, specifically among adolescent girls.

Limitations

The present study had several limitations that warrant mention. First, all 7-11th grade students were from one public charter school in the Intermountain West of the United States. Second, students may have answered dishonestly when self-reporting on both questionnaires and the online leisure-time physical activity record. Lastly, the PALAC method of recording leisure-time physical activity was a graded assignment.

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APPENDIX A: REVIEW OF LITERATURE

Society faces a situation where obesity and related chronic health problems continue to be widespread among adolescents both internationally and in the United States, in part because of leisure-time inactivity. Trost, Kerr, Ward, and Pate (2001) compared physical activity patterns of obese and non-obese children in South Carolina and concluded that physical inactivity was a central contributing factor to childhood obesity. As of 2013, about 17% (12.5 million) of children and adolescents (ages 2-19) were obese (Centers for Disease Control and Prevention, 2013). Inadequate levels of physical activity are associated with obesity, cardiovascular disease, and type II diabetes (Biddle, Gorely, & Stensel, 2004). Currie et al. (2012) examined the social determinants to young people's health, well-being and development and their findings indicated that most adolescents rarely met the recommendation of 60 minutes of moderate to vigorous physical activity each day. Their data revealed that among 13 year-olds, only 13% of females and 24% of males were physically active each day for at least 60 minutes; and among 15 year-olds, only 10% of females and 19% of males were physically active each day for at least 60 minutes.

Regular physical activity is a key factor in sustaining a healthy lifestyle. For example, an extensive systematic review of studies examining the relationship between physical activity, fitness, and health in school-aged children and youth by Janssen and LeBlanc (2010) stated that physical activity was associated with numerous health benefits, such as lowered cholesterol levels, reduced blood pressure, decreased obesity risk, improved bone density, and lowered depression levels. Furthermore, a study by Aldana et al. (2005) assessed the clinical impact of lifestyle change education on chronic disease risk factors within an Illinois community and found that adults who participated in a 40-hour, four-week education intervention showed

improvements in physical activity behavior, thus leading to significant improvements in chronic disease prevention. In support of regular physical activity promotion in adolescents as an important public health issue (Sallis, Prochaska, & Taylor, 2000), Hallal, Victora, Azevedo and Wells (2006) conducted a systematic review of the evidence on short- and long-term health effects of adolescent physical activity and deduced that physical activity can enhance physical, psychological, and social well-being.

A study by Armstrong and Welsman (2006) backs the notion that physical activity levels usually drop during adolescence (Zimmermann-Sloutskis, Wanner, Zimmermann, & Martin, 2010), a crucial time when health-related behaviors are formed and continue into adulthood (Ortega, Ruiz, Castillo, & Sjöström, 2008). Armstrong and Welsman (2006) reviewed the habitual physical activity patterns of children and adolescents from member countries of the European Union and determined that as both male and female adolescents grew older, their physical activity levels dropped. They also found that for most European adolescents, moderate or vigorous physical activity is not part of their lifestyle. Furthermore, Friedman, Martin, Criqui, Kern, and Reynolds (2008) tracked the physical activity behaviors of the same 1277 (723 males, 554 females) California children (mostly white) for almost six decades and concluded that there were long-term consistencies in physical activity levels from childhood into adulthood. Simply put, physically active adolescents become physically active adults (Hallal et al., 2006). After studying the state of knowledge on the type, frequency, duration and intensity of children's physical activity behavior, Sallis et al. (1992) proposed that preventative measures and early intervention may be the wisest and most cost-effective means to address adolescent health-related behaviors.

In order to address the health-related lifestyle problems associated with physical inactivity, experts advocate that schools, especially PE programs, should be utilized as a primary method of combating the many health issues adolescents are currently facing (Sallis et al., 2012). After exploring the relative contributions of perceived parent and physical education teacher autonomy support, involvement, and modeling to adolescent leisure-time physical activity motivation and behavior, McDavid, Cox, and Amorose (2012) found that PE teachers played an important role in supporting adolescent leisure-time physical activity behavior. Mayorga-Vega and Viciano (2014) recently examined the differences in Spanish adolescent physical activity levels and perceived effort during PE, school recess, and extra-curricular organized sport by motivational profiles and concluded that schools can play an important role in physical activity promotion for adolescents and that students' motivation toward PE was positively associated with leisure-time physical activity levels.

Many health-promoting interventions have taken place in schools in the last decade (Naylor & McKay, 2009), many of which focused on promoting physical activity (Cale & Harris, 2006). Not all school based health-promoting interventions were successful. One study by Bush, Laberge, and Laforest (2010) conducted a 16-week social marketing intervention among underserved middle school students and assessed their pre- and post-intervention leisure-time physical activity levels, as well as their physical activity enjoyment levels. The social marketing intervention included a kick-off event, variety shows, and a rally. Each day's activity was announced over the school intercom, schedules of activities were posted in all the classrooms, and photographs of students participating in the activities were also posted under banners. Results indicated that the social marketing intervention did not increase leisure-time physical activity levels or the physical activity enjoyment of the participants.

However, many health-promoting interventions have been successful in schools. Stone, McKenzie, Welk, and Booth (1998), looked at the numerous studies involving physical activity interventions in youth and they deduced that school-based physical activity interventions were advantageous because the intervention programs could merge with the regular school curriculum. One health-promoting intervention that has been highlighted as a successful intervention in schools is PE. For example, Kahn et al. (2002) conducted a systematic review to evaluate the various approaches to increasing physical activity among children and adolescents and concluded that there was strong evidence that school-based PE was effective in increasing levels of physical activity and improving physical fitness. Further, Harris and Cale's (1997) comprehensive review of health-related PE programs examined to what extent school physical education contributed to young people's health. Their review suggested that positive outcomes in physiological, clinical, behavioral, cognitive and affective measures could be achieved through health-related physical education programs.

The K-12 school system appears to be one of the best vehicles for promoting physically active lifestyles in that almost every adolescent attends and is exposed to PE curriculum and its health-related content (American Alliance for Health, Physical Education, Recreation and Dance, 2013; Ribeiro et al., 2010; Yetter, 2009). Johnson, Prusak, Pennington, and Wilkinson (2011) studied the impact of skill test type and gender on students' (in a western state in the U.S.) situational motivation levels during a football unit in PE and their results suggested that the motivation, knowledge and skills needed to successfully pursue healthier lifestyles can be positively influenced by what students learn and do in PE. Seeking to understand the motivations of human behavior, researchers have often turned to Deci and Ryan's (1985) Self-Determination Theory (SDT) as a framework.

Self-determination Theory

As previously specified, self-determination theory (SDT) declares that behavior motivation can be measured by an individual's position along an intercorrelated continuum of regulation (Ryan & Deci, 2000). At one end (left) of this self-determination continuum is amotivation (an unwillingness to act), and on the other end (right) of the continuum is intrinsic motivation (engaging in an activity because the activity itself is satisfying and enjoyable, having no expectation of reward). Four types of extrinsically motivated behavior fall between amotivation and intrinsic motivation. These extrinsically motivated behaviors vary based on the different degrees to which their regulation is autonomous, or self-determined. In order from least to most self-determined, they are (a) external regulation (e.g., I'm physically active so I can get a trophy for being the top scorer on the fitness test), (b) introjected regulation (e.g., I'm physically active because I'll feel embarrassed if my favorite jeans won't fit anymore), (c) identified regulation (e.g., I'm physically active because I value my personal state of health), and (d) integrated regulation (e.g., I'm physically active because it aligns with my personal belief system as the right thing to do in taking care of my body; Deci & Ryan, 2000). New lifestyle behavioral changes are more likely sustainable for the long-term as behaviors become more self-determined (Deci & Ryan, 1985).

Hierarchical Model of Intrinsic and Extrinsic Motivation. As stated earlier, Vallerand's (1997, 2001) Hierarchical Model of Intrinsic and Extrinsic Motivation supports the notion that motivation occurs on three levels of generality within the individual (a) situational (e.g., daily activities in PE), (b) contextual (e.g., how students feel about PE), and (c) global (e.g., physical activity lifestyle). This model is known to have bottom-up and top-down effects among neighboring levels of generality, in that situational motivation can have an effect on contextual

motivation, which can then have an effect on global motivation, and vice versa. An illustration of this bottom-up and top-down effect played out in the study by Gillet, Vallerand, Amoura, and Baldes (2010) as they examined how the autonomy support of judo coaches facilitated athletes' self-determined motivation toward judo. Perceptions of autonomy support were found to be positively associated with contextual self-determined motivation. Simply put, athletes were more self-determined to practice judo the more they perceived their coach to be autonomy supportive. Blanchard, Mask, Vallerand, Sablonnière, and Provencher (2007) provided further support to the bottom-up and top-down effects as contextual motivation of college basketball players predicted their situational motivation relevant to their sport activity. In other words, players that felt more self-determined during specific game situations (i.e., situational level) displayed greater self-determination toward their sport (i.e., contextual level). In turn, the extent in which athletes were self-determined at the sport level influenced their level of self-determination at the game level.

Vallerand (2000) also suggested that motivational consequences took place at each of the three levels of generality, and consequences occurred on the same level that induced them. For example, global motivation produces global consequences (e.g., satisfied with one's physical activity lifestyle), contextual motivation leads to contextual consequences (e.g., better feelings toward PE), and situational motivation results in situational consequences (e.g., sense of enjoyment in the moment while participating in a particular activity).

Psychological need satisfaction. Deci and Ryan (2000) further proposed that within the framework of SDT, an individual's state of self-determined motivation was dependent upon the satisfaction of the following three basic psychological needs (a) competence (I can do), (b) autonomy (I can choose what I do), and (c) relatedness (I can be successful in the social environment). People generally pursue goals that support these three basic needs and progress

along the continuum toward more autonomously motivated behaviors and higher levels of self-determination (Ryan & Deci, 2000). Baard, Deci, and Ryan (2004) studied two work organizations and found that performance was predicted by how autonomous workers felt and perceived autonomy-support by their manager. Further, Wilson, Longley, Muon, Rodgers, and Murray (2006) examined the relationship between perceived psychological need satisfaction and well-being in exercise among adults and concluded that satisfaction of the basic psychological needs for competence, autonomy, and relatedness had a positive effect on psychological well-being in exercise settings. In a two-week study of university students, Reis, Sheldon, Gable, Roscoe, and Ryan (2000) looked at how the fulfillment of the basic psychological needs of autonomy, competence, and relatedness were associated with emotional well-being. They found that the fulfillment of basic psychological needs predicted variations in well-being throughout the day, and that well-being improved over the weekend partly because need satisfaction, specifically for autonomy and relatedness, occurred more often during the weekend. Thus, finding out if individuals are able to satisfy their basic psychological needs as they pursue and attain their valued outcomes is an important issue within SDT (Deci & Ryan, 2000).

Self-determination Theory in PE. Numerous researchers have used SDT in PE settings to study student motivation as it relates to physical activity. Suggesting that PE experiences in middle school settings can predict how physically active students are in their leisure time, Mayorga-Vega and Viciano (2014) evaluated the changes in objective physical activity levels and perceived effort during PE, recess, and organized sport of adolescents and found that self-determined motivation toward PE was an important indicator of leisure-time physical activity levels in adolescents because as self-determination increased, so did physical activity levels. Their findings support the idea that experiences in PE can influence adolescent physical activity

levels outside of school. In addition, Standage, Duda, and Ntoumanis (2003) assessed the motivational responses of secondary school students in PE and found that students' *intention* to be physically active in their leisure time was linked to student self-determined motivation in PE.

Various studies have looked at how the satisfaction of the basic psychological needs within SDT influence student enjoyment and motivation in a PE setting. Ferriz, Sicilia, and Sáenz-Álvarez (2013) explored the relationship between basic psychological need satisfaction and motivation on secondary students' feelings of satisfaction in PE and found that satisfaction of the basic psychological needs can predict satisfaction in PE for both boys and girls. Their findings suggest that satisfaction of the three basic psychological needs (especially relatedness) was a better predictor of enjoyment in PE when compared to motivation.

Research shows how the satisfaction of the three basic psychological needs is related to adolescent physical activity behaviors. Cox, Smith, and Williams (2008) concluded that psychological need satisfaction and motivation-related experiences in PE were positively related to leisure-time physical activity among middle school students in the Midwest United States, i.e., students' increased perceptions of competence, autonomy, and relatedness in PE were associated with an increase in leisure-time physical activity; and as student perceptions of enjoyment increased so did self-determined motivation in PE. These results back the notion that when students experience autonomy-support, competence-support, and relatedness-support in PE they are more intrinsically motivated to participate in PE and be physically active outside of the school setting. Furthermore, Ntoumanis (2005) found that students were more likely to participate in optional PE when the needs for competence, autonomy, and relatedness were satisfied. These findings signify that voluntary participation in physical activity, via an optional PE class, is related to need satisfaction.

Specifically relating to the basic psychological need of competence, Carroll and Loumidis (2001) studied the relationship between children's perceived competence in PE and physical activity behaviors outside of school among year 6 primary school students and confirmed that students who felt more competent in PE participated in physical activity more often and with greater intensity outside of school. Additionally, Standage, Duda, and Ntoumanis (2005) examined the basic psychological need perceptions of British adolescents and discovered that when students felt more competent in PE they were more intrinsically motivated toward and positively engaged in PE. Moreover, Haslem, Wilkinson, Prusak, Christensen, and Pennington (2016) explored the relationships between knowledge of health and fitness concepts, perceptions of competence, motivation for physical activity, and actual reported physical activity behaviors of high school students and found that perceived competence was a) the greatest indicator of physical activity and b) significantly helped high school students become more self-determined to exercise.

Self-reporting as a motivator in PE. PE teachers utilize self-reporting as a motivational tool to hopefully help students develop leisure-time physical activity habits. One example of using self-reporting can be found within the Fitness For Life curriculum where physical activity logs are designed to help students physically track whether or not they are achieving their personal short-term and long-term physical activity goals (Corbin & Masurier, 2014). As noted earlier, the national curriculum standards for PE encourages keeping a physical activity log as part of a PE class assignment and considers it an appropriate and effective practice for middle school and high school-aged students (American Alliance for Health, Physical Education, Recreation and Dance, 2013).

Self-reporting

Activities such as keeping a diary, or a journal, writing a daily log and electronically recording behaviors or activities are all different methods for individuals to self-report over time. Self-reporting methods are common in a variety of psychological fields, including personality (e.g., Mroczek & Almeida, 2004), and health (e.g., Skaff et al., 2009). Not only is self-reporting considered to be the cornerstone of behavioral weight loss treatment by some (e.g., Foreyt & Goodrick, 1993), according to Cale (1994) and Armstrong and Welsman (2006), self-report is the most widely used practice in epidemiological research. Self-reporting has long been recommended as a good method of physical activity assessment (e.g., Iida, Shrout, Laurenceau, & Bolger, 2012; Saris, 1985; Wilson, Paffenbarger, Morris & Havlik, 1986).

Advantages and limitations of using self-reporting methods when measuring physical activity. A review of the literature points out that advantages of using self-reporting methods when conducting research are (a) convenience of administration, (b) time and cost-effectiveness, (c) unobtrusiveness, and (d) ability to provide rich contextual and descriptive data over time (Cale, 1994). Some researchers found that adolescents successfully completed diary entries. For example, Wormald et al. (2003) explored the methodological issues that occurred when having adolescents keep a physical activity diary in a school setting and they concluded that the physical activity diary offered a useful representation of adolescents' physical activity lifestyle and habits. Koo and Rohan (1999) evaluated habitual physical activity in female children and adolescents by comparing four habitual physical activity questionnaires and assessing their long-term reliabilities. Their results maintain that self-reporting of physical activity is more feasible when studying habitual physical activity for children and adolescents on a large scale because direct observation or activity monitoring can be costly and unreasonably

time consuming. Lastly, daily self-reporting may “minimize retrospective bias,” thus resulting in a “more valid and reliable measure” (Iida et al., 2012, p. 278).

On the other hand, Sirard and Pate (2001) reviewed studies that used self-reporting techniques to measure physical activity in children and adolescents and found that adolescents do not cope well with diary completion at times. Other studies show that self-reporting methods may be accompanied by various possible limitations. For instance, Burke, Wang, and Sevick, (2011) reviewed weight loss studies and found that one limitation to self-reporting was the lack of commitment and dedication by participants to complete the study. While Wormald et al. (2003) discovered that forgetfulness to complete the self-report entry in the designed time period was a struggle for adolescents keeping a physical activity diary in school. Length of self-report entries, frequency of self-report entries, and length of the self-reporting period may also contribute to participant burden, resulting in noncompliance and attrition (Iida et al., 2012). In their attempt to provide a user’s guide for selecting physical activity assessment instruments appropriate for use with children and adolescents, Dollman et al. (2009) point out other limitations to self-reporting include (a) memory loss, (b) underestimation of physical activity, (c) overestimation of physical activity (d) accessibility, and (e) language barriers. Lastly, Chinapaw, Mokkink, van Poppel, van Mechelen, and Terwee (2010) examined measurement properties of self-administered and proxy-reported physical activity questionnaires in their review of literature and concluded that adolescents may suffer from recall bias, and as a result, data can possibly be inaccurate.

Research on self-reporting of physical activity. Various studies have used self-reporting as a means to study physical activity among individuals in the past. Gleeson-Kreig (2006) discovered that activity diaries for adults with type II diabetes had a significantly large

effect on improving their physical activity levels. English children and adolescents kept physical activity diaries for seven days and researchers found that when effective implementation strategies were used, the diary was “a useful portrayal of young people’s lifestyles” and included “detailed information of physical activity habits” (Wormald et al., 2003, p. 230).

According to Iida et al. (2012, p. 283), “there is no general theory that explains when diary completion has an impact and when it does not.” Thus, studies using self-reporting methods range in length from one week (Hutchesson, Rollo, Callister, & Collins, 2015; Tayama, Yamasaki, Hayashida, & Shirabe, 2012), to two weeks (Herndon et al., 2011; Mayorga-Vega & Viciano, 2014), to months (Gleeson-Kreig, 2006; Yon, Johnson, Harvey-Berino, Gold, & Howard, 2007). There are pros and cons to shorter and longer time frames.

Self-report methods can provide precious information about adolescent development in studies lasting several months, while shorter intervals may miss some effects that take longer to manifest (Iida et al., 2012). On the contrary, longer intervals may result in inaccurate recall of events and biases from retrospective recall due to non-compliance or participant burnout. For example, Broderick, Schwartz, Shiffman, Hufford, and Stone (2003) investigated whether an auditory signaling methodology would improve compliance to daily diary completion among adults with chronic pain and found that compliance significantly dropped after one week, therefore leaving more room for inaccurate recall of actual events. Shorter intervals generally increase the possibility of accurate recall and decrease the chances of retrospective bias; while at the same time, shorter intervals may create more burdens on the participants (Iida et al., 2012). In her analysis of longitudinal data, Collins (2006) recommended choosing shorter intervals when the theory cannot inform how the processes or phenomenon will unfold over time.

Electronic vs. paper self-reporting. Research reports that electronic self-reporting formats are preferred over paper-based formats by adolescents. For example, while examining dietary self-monitoring of adolescent females Herndon et al. (2011) compared adolescent use of personal digital assistants to paper log use. They discovered that compared to paper log use, participants looked forward to using the personal digital assistants and found them to be more convenient. Likewise, Burke et al. (2011) investigated the literature concerning self-monitoring in weight loss and suggested that the use of technology may potentially lessen the burden of self-monitoring and in turn promote adherence. They point out that convenient and efficient access to extensive on-line information about foods and restaurants may eliminate the burden of looking up the values of foods eaten and recording consumption totals. The same idea of convenience and efficient access to on-line information about foods could apply to individuals' self-monitoring of physical activity levels, physical activity intensity, physical activity duration, and energy expenditure via an electronic forum, versus by hand. Adding more support for the use of electronic self-reporting methods, Hutchesson et al. (2015) explored the adherence and accuracy of electronic (computer and smartphone) and paper-based (diary) self-reporting methodology among adult females in weight management interventions. They revealed that most of the participants preferred computer recording to using a paper-based diary. Participants expressed that the paper-based record was annoying, inconvenient, and publically embarrassing, whereas keeping the electronic record was more convenient, user friendly, and took up less time. Also, many participants had their smartphone with them all the time or were on the Internet often, so they expressed having greater accessibility to the electronic records.

Research suggests that electronic-based self-reporting can yield higher rates of compliance compared to paper-based self-reporting. Results from a one-year self-reporting study

of patients with chronic pain (20 used a computer and 16 used paper diaries) showed that patients using the computer to self-report pain showed significantly higher rates of compliance and satisfaction for the length of the study (Jamison et al., 2001). Another possible benefit for using electronic-based self-reporting rather than paper-based is the potential elimination of data entry errors recorded by hand (Iida et al., 2012). Although Herndon et al. (2011) found that adolescents recorded physical activity more often during paper-based self-reporting, several recent studies find electronic self-reporting to be just as accurate as paper-based self-reporting (e.g., Burke et al., 2011; Hutchesson et al., 2015).

After studying if the use of personal digital assistants would improve dietary self-reporting frequency and weight loss of adults compared to paper diaries, Yon et al. (2007) found no significant differences in weight loss or dietary self-reporting among the two self-reporting venues and recommended that when deciding which self-reporting format to use, investigators should choose the format that best matches the population. Since electronic self-reporting is the most common type of self-reporting format in the last decade (Iida et al., 2012), an electronic based self-reporting leisure-time physical activity record is an appropriate method for this study.

Summary

The review of the literature offers a broad contextual background in SDT and the use of self-reporting to study physical activity. Studies have established that obesity and chronic health issues are related to physical inactivity, and some (McDavid et al., 2012; Sallis & McKenzie, 1991) make a strong case that PE programs in school can play a major role in combating these health-related issues.

Although a considerable number of studies have investigated the motivational processes that exist in the PE classroom in relation to physical activity behaviors, little is known about the

relationship between leisure-time physical activity records on the motivational profiles or leisure-time physical activity levels of students enrolled in PE. Therefore, the purpose of this study is to examine the relationship between keeping a daily leisure-time physical activity record and (a) adolescent feelings of competence toward being physically active in their leisure time, (b) adolescent motivational profiles toward being physically active in their leisure time, and (c) adolescent leisure-time physical activity behaviors.

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APPENDIX B: QUESTIONNAIRE

Questionnaire

Name: _____

Gender (Circle one): Male Female

Ethnicity (Circle one):

Grade: _____ Age: _____

African American

Asian

Hispanic

Native American

Pacific Islander

White

WHY DO YOU ENGAGE IN EXERCISE?

We are interested in the reasons underlying peoples' decisions to engage, or not engage in physical exercise. Using the scale below, please indicate to what extent each of the following items is true for you. Please note that there are no right or wrong answers and no trick questions.

We simply want to know how you personally feel about exercise in your free time. Your responses will be held in confidence and only used for our research purposes.

	Not true for me	1	2	3	Very true for me
1. I exercise because other people say I should	0	1	2	3	4
2. I feel guilty when I don't exercise	0	1	2	3	4

3. I value the benefits of exercise	0	1	2	3	4
4. I exercise because it's fun	0	1	2	3	4
5. I don't see why I should have to exercise	0	1	2	3	4
6. I take part in exercise because my friends/family/partner say I should	0	1	2	3	4
7. I feel ashamed when I miss an exercise session	0	1	2	3	4
8. It's important to me to exercise regularly	0	1	2	3	4
9. I can't see why I should bother exercising	0	1	2	3	4
10. I enjoy my exercise sessions	0	1	2	3	4
11. I exercise because others will not be pleased with me if I don't	0	1	2	3	4
12. I don't see the point in exercising	0	1	2	3	4
13. I feel like a failure when I haven't exercised in a while	0	1	2	3	4
14. I think it is important to make the effort to exercise regularly	0	1	2	3	4
15. I find exercise a pleasurable activity	0	1	2	3	4
16. I feel under pressure from my friends/family To exercise	0	1	2	3	4
17. I get restless if I don't exercise regularly	0	1	2	3	4
18. I get pleasure and satisfaction from participating in exercise	0	1	2	3	4
19. I think exercising is a waste of time	0	1	2	3	4

Please indicate the extent to which each statement is true for you, assuming that you were intending either to begin now a permanent regimen of exercising regularly or to permanently maintain your regular exercise regimen. Use the following scale:

1 2 3 4 5 6 7
 Not at all true somewhat true very true

- | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|
| 20. I feel confident in my ability to exercise regularly. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 21. I now feel capable of exercising regularly. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 22. I am able to exercise regularly over the long term. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 23. I am able to meet the challenge of exercising regularly. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

24. During a typical 7-day period (a week), how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time (write on each line the appropriate number).

	Times per week
<p>STRENOUS EXERCISE (Heart Beats Rapidly)</p> <p>(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)</p>	_____
<p>MODERATE EXERCISE (Not Exhausting)</p> <p>(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)</p>	_____
<p>MILD EXERCISE (Minimal Effort)</p> <p>(e.g., yoga, archery, fishing from river bank, bowling, horseshoeing, golf without using a cart, snow-mobiling, easy walking)</p>	_____

APPENDIX C: CLASSROOM ANNOUNCEMENT SCRIPTS

Classroom Announcement Script

Questionnaire

Today we are going to complete a questionnaire to learn more about your feelings towards physical activity in your free time and your physical activity behaviors in your free time. I thank you for your support and willingness to complete this questionnaire. I will read each question aloud to the class and then you may choose your response. The questionnaire will take approximately 10-15 minutes to complete. Remember that your opinion matters greatly, this study will only be meaningful and helpful if you tell us how you really feel, not what you think we want to know. Before we begin, remember to fill out the information at the top of the questionnaire including your name. Please answer each question honestly. Remember you're your answers to each question have no effect on your grade. Those of you who are not participating have been given an alternative activity to do during this time.

Classroom Announcement Script

Recruitment

Hi students, I am currently a student at Brigham Young University and am working on a study that will help me learn more about your feelings towards physical activity in your free time and the physical activities you do in your free time. I am asking for your help because your opinions matter to me. This form will tell you about the study to help you decide if you want to be in it. If you choose to be in the study you will take a questionnaire at four different times and each time will take 10-15 minutes to complete. I will answer any questions you have and keep your information safe and secret from others. You need to take this parental permission form home so your parent(s)/legal guardian(s) can sign it and then you need to return it to me. Whether you are in the study or not, you will need to log your physical activity as part of your PE assignment. If you do not choose to be in the study, you will complete another assignment when the other students complete the questionnaire. The grade you receive for the logging assignment will be based on whether or not you log your physical activity each day, and will not be based on how much you are physically active. Participation in the study is voluntary, you don't have to be in it, but once again, your participation will be a great help to me as a researcher.

APPENDIX D: CONSENT/ASSENT FORMS

Parental Permission for a Minor

Introduction

My name is Matt Fullmer. I am a graduate student at Brigham Young University. I am working with my faculty mentor, Carol Wilkinson (EdD) who is a professor in the Teacher Education Department. I am conducting a research study about the relationship between keeping a daily physical activity log, motivation to exercise, and physical activity behaviors of students enrolled in Physical Education courses. I am inviting your child to take part in the research because (he/she) is currently enrolled in *Physical Education*. Whether students are in the study or not, they will all need to log their physical activity as part of their PE assignment.

Procedures

If you agree to let your child participate in this research study, the following will occur:

- Your child will be given a questionnaire to determine his/her motivation to exercise, and physical activity behaviors.
- The questionnaire will be distributed four times in March and April during regular class time and will take a total of 10-15 minutes to complete. Aside from completing the questionnaire, no additional requirements will be asked of your child.
- If your child chooses not to participate in the research, he/she will continue to receive his/her regularly scheduled curriculum activities and non-participation will not impact student standing in the class.

Risks

There are minimal risks in participating in this study. There is a risk of loss of privacy, which the researcher will reduce by having a co-investigator replace names with numbers and by not using any real names or other identifiers in the written report. The researcher will also keep all data in

a locked file cabinet in a secure location. Only the researcher will have access to the data. At the end of the study, data will be destroyed.

Confidentiality

The data that is gathered will be kept confidential and all data will be protected by password and under lock and key where only the researchers will have access. After each administration, a co-investigator will gather completed questionnaires from the PI's classes and substitute each student's name with numbers so responses will be confidential. At the end of all data collection these same numbers will be substituted for names on the physical activity log for research purposes only. The data will then be kept under lock and key in the PI's office until the results of the study are published to ensure anonymity, confidentiality, and protection of data.

Benefits

There are no direct benefits to your child for participating in this study. This study may benefit society by giving insight into factors that motivate individuals to be physically active. This study may also be informative for PE teachers seeking to provide activities that are successful in helping students be more physically active.

Compensation

There will be no compensation for participation in this study.

Questions about the Research

You can contact Matt Fullmer anytime at phone: (801) 897-9760 or email:

mfullmer@freedomprep.net to inquire about any aspect of your child's participation in this study.

You may also contact Carol Wilkinson at phone: (801) 422-8779 or email:

Carol_Wilkinson@byu.edu.

You can also contact the IRB Administrator, Office of Research and Creative Activities (ORCA):

BYU IRB Administrator

irb@byu.edu

801-422-1461

You have been given a copy of this consent form to keep.

Participation

Participation in this research study is voluntary. You are free to decline to have your child participate in this research study. You may withdraw you child's participation at any point without penalty.

Child's Name: _____

OPTIONS: *Please read and check only ONE of the following:*

Option 1

_____ I GRANT permission for my child's responses to the described research questionnaires to be used in a research study.

Option 2

_____ I DENY permission for my child's responses to the described research questionnaires to be used in a research study.

PLEASE SIGN AND RETURN

I have read this form and have chosen **one option** from the preceding list.

Parent/Guardian Signature: _____

Date: _____

Permiso de los padres de un menor

Introducción

Mi nombre es Matt Fullmer. Soy un estudiante de posgrado en la Brigham Young University. Estoy trabajando con mi facultad mentor, Carol Wilkinson (EdD) que es profesor en el Departamento de Educación Docente. Estoy realizando un estudio de investigación sobre la relación entre mantener una actividad física diaria registro, la motivación para realizar ejercicio y actividad física de los estudiantes matriculados en los cursos de educación física. ESTOY invitando a su niño a participar en la investigación, puesto que (él/ella) está actualmente matriculado en *Educación Física* . Si los estudiantes están en el estudio o no, todos tienen que registrar su actividad física como parte de su PE.

Procedimientos

Si usted está de acuerdo en que el niño participe en el estudio de investigación, ocurrirá lo siguiente:

- Su hijo le dará un cuestionario para determinar su motivación para realizar ejercicio y actividad física.
- El cuestionario se distribuirán cuatro veces en los meses de Marzo y Abril durante las clases regulares y tendrá un total de 10-15 minutos para completar. Además de rellenar el cuestionario, sin requisitos adicionales se pregunta de su hijo.
- Si su hijo decide no participar en las actividades de investigación, él/ella seguirá recibiendo su programada y regular las actividades curriculares y de la no participación estudiantil no tendrá impacto en la clase.

Riesgos

Hay riesgos mínimos para participar en este estudio. Hay un riesgo de pérdida de la privacidad que el investigador se reducirá por tener un co-investigador sustituir nombres con números y por no utilizar ninguna nombres reales u otros identificadores en el informe por escrito. El

investigador también mantendrá todos los datos en un archivo bloqueado gabinete en un lugar seguro. Sólo el investigador tendrá acceso a los datos. Al final del estudio, los datos serán destruidos.

Confidencialidad

Los datos que se recopilan se mantendrá confidencial y todos los datos estarán protegidos por contraseña y bajo llave y que sólo los investigadores tendrán acceso. Después de cada administración, un co-investigador se reunirán los cuestionarios de la PI y las clases de sustituir cada nombre del estudiante con números de respuestas será confidencial. Al final de todos los datos de estos mismos números serán sustituidos por nombres en la actividad física registro únicamente para fines de investigación. La información se guarda bajo llave en la oficina de PI hasta que los resultados del estudio se publican en garantizar el anonimato y la confidencialidad y protección de datos.

Beneficios

No hay beneficios directos a su hijo para participar en este estudio. Este estudio puede beneficiar a la sociedad por lo que conocer los factores que motivan a las personas a estar físicamente activo. Este estudio también puede ser útil para los profesores que buscan proveer actividades que tienen éxito en ayudar a los estudiantes ser más activo físicamente.

Compensación

No habrá ninguna compensación por la participación en este estudio.

Preguntas acerca de la investigación

Puede ponerse en contacto con Matt Fullmer en cualquier momento al teléfono: (801) 897-9760 o envíe un correo electrónico a: mfullmer@freedomprep.net para preguntar acerca de cualquier aspecto de su participación del niño en el estudio. También puede ponerse en contacto con Carol

Wilkinson al teléfono: (801) 422-8779 o envíe un correo electrónico

a: Carol_Wilkinson@byu.edu.

También puede ponerse en contacto con el IRB Administrador de la Oficina de Investigación y

Actividades creativas (ORCA):

BYU IRB Administrador

Irb@byu.edu

801-422-1461

Se le ha dado una copia de este formulario de consentimiento para mantener.

Participación

Participación en este estudio es voluntaria. Usted es libre de negarse a que su hijo participe en este estudio de investigación. Usted puede retirar su participación del niño en cualquier momento sin penalización.

Nombre del Niño: _____

OPCIONES: *lea y marque sólo una de las siguientes opciones:*

Opción 1

_____ ME conceda el permiso de mi hijo las respuestas a los cuestionarios describió las investigaciones que se va a utilizar en un estudio de investigación.

Opción 2

_____ ME NIEGAN permiso para que mi hijo las respuestas de los cuestionarios la describió las investigaciones que se han de utilizar en un estudio de investigación.

POR FAVOR, FIRMAR Y DEVOLVER

He leído este formulario y han elegido una **opción** de la lista anterior.

Padre/guardián Firma: _____

Fecha: _____

Child Assent (7-14 years old)

What is this research about?

My name is Matt Fullmer and I am from Brigham Young University. I am working with Carol Wilkinson (EdD) who is my professor on this study. I want to tell you about a research study I am doing. A research study is a special way to find the answers to questions. We are trying to learn more about the ways in which keeping a physical activity log influences students' feelings about being physically active. You are being asked to join the study because you are currently enrolled in a Physical Education class. Whether you are in the study or not, you will need to log your physical activity as part of your PE assignment. The grade you receive for the logging assignment will be based on whether or not you log your physical activity each day, and will not be based on how much physically active you are in your free time.

If you decide you want to be in this study, this is what will happen. You will take a questionnaire at four different times and will take a total of 10-15 minutes to complete. You will answer 24 questions asking you why you exercise and one question that will ask you to record what types of exercise you performed in the last 7 days. You will participate in class like always; I am simply asking if I can use your answers to the questionnaires and information from your logging assignment to do research.

Can anything bad happen to me?

There is a risk of loss of privacy, which the researcher will reduce by having a researcher other than your PE teacher gather questionnaires from you and replace names with numbers. Your name will not be used in the written report. At the end of all data collection numbers will be substituted for names on the physical activity log for research purposes only. The data will then be kept under lock and key in Mr. Fullmer's office until the results of the study are published to ensure anonymity, confidentiality, and protection of data.

Can anything good happen to me?

We don't know if being in this study will help you. But we hope to learn something that will help

other people some day. This study may help society better understand what motivates students to be physically active. This study may also be helpful for PE teachers seeking to provide activities that are successful in helping students be more physically active.

What happens if I get hurt?

Your parent(s)/legal guardian(s) have been given information on what to do if you are injured in anyway during the study.

What if I do not want to do this?

You don't have to be in this study. It's up to you. If you say yes now, but change your mind later, that's okay too. All you have to do is tell us. You will still need to keep the physical activity log as part of the class assignment, but I will not use your information in the study.

You will receive nothing for being in this research study. Before you say yes to be in this study; be sure to ask Matt Fullmer to tell you more about anything that you don't understand.

If you want to be in this study, please sign and print your name.

Name (Printed): _____ Signature: _____

Date: _____

Dictamen conforme Infantil (7-14 años)

¿Qué es la investigación?

Mi nombre es Matt Fullmer y estoy de la Brigham Young University. Estoy trabajando con Carol Wilkinson (EdD) que es mi profesor en este estudio. Quiero hablarles sobre un estudio de investigación que estoy haciendo. Un estudio de investigación es una forma especial, para encontrar las respuestas a las preguntas. Estamos tratando de aprender más acerca de las maneras en que mantener un registro de actividad física influye en los alumnos sentimientos de ser físicamente activo. Se le ha pedido a participar en el estudio porque se están actualmente matriculados en una clase de educación física. Si usted está en el estudio o no, tendrá que iniciar su actividad física como parte de su PE. El grado de la asignación de registro se basará en si o no usted registre su actividad física cada día , y no se basa en cuánto ejercicio físico realizan en su tiempo libre.

Si usted decide que quiere ser en este estudio, esto es lo que va a suceder. Usted tendrá un cuestionario en cuatro momentos diferentes y tendrá un total de 10-15 minutos para completar. 24 Lo va a contestar preguntas que usted ejercicio y una pregunta que le solicitará que registre lo que tipos de ejercicio que realiza en los últimos 7 días. Usted participará en la clase como siempre; simplemente estoy preguntando si puedo usar las respuestas a los cuestionarios y la asignación de su registro para realizar estudios.

Nada malo puede ocurrir a mí?

Hay un riesgo de pérdida de la vida privada, que el investigador se reducirá por un investigador de su PE profesor recopilar los cuestionarios de usted y reemplazar nombres con números. Su nombre no será utilizado en el informe por escrito. Al final de todos los datos serán sustituidos por nombres en la actividad física registro únicamente para fines de investigación. La información se guarda bajo llave en la oficina el Sr. Fullmer hasta que los resultados del estudio se publican en garantizar el anonimato y la confidencialidad y protección de datos.

Nada bueno puede ocurrir a mí?

No sabemos si en este estudio le ayudará. Pero que esperamos aprender algo que ayudará a otras personas algún día. Este estudio puede ayudar a la sociedad entender mejor lo que motiva a los estudiantes a estar físicamente activo. Este estudio también puede ser útil para los profesores que buscan proveer actividades que se realizan con éxito para ayudar a los estudiantes ser más activo físicamente.

¿Qué sucede si me haces daño?

Su padre(s) /tutor(es) ha dado información sobre lo que debe hacer si usted es herido en de todos modos durante el estudio.

¿Qué pasa si no quiero hacer esto?

No tienes que estar en este estudio. Todo depende de ti. Si dice que sí, pero cambia de opinión más adelante, también es aceptable. Todo lo que tienes que hacer es decirnos. Usted todavía necesitará para mantener el registro de actividad física como parte de la asignación de clase, pero no voy a usar su información en el estudio.

Usted recibirá nada para estar en este estudio de investigación. Antes de que usted diga sí para estar en este estudio; no se olvide de preguntar a Matt Fullmer saber más de lo que usted no entiende.

Si quieres estar en este estudio, por favor firmar e imprimir su nombre.

Nombre (impreso): _____ Firma: _____

Fecha: _____

APPENDIX E: LETTER TO PRINCIPAL

Letter to Principal

My name is Matt Fullmer and I am a graduate student at Brigham Young University. I am conducting a research study about the relationship between keeping a daily physical activity log, on motivation to exercise, and physical activity behaviors of students enrolled in Physical Education courses. I have obtained IRB approval to conduct the study from Brigham Young University and I am hoping to work with Mrs. Frisby and yourself at your school. If you grant approval, I will administer a questionnaire to the students in Physical Education class. The questionnaire will test students' motivation to exercise, and physical activity behaviors. The questionnaire will be distributed once in March and three times in April during regular class time and will take a total of 10 minutes each time to complete.

Risks

There are minimal risks in participating in this study.

Confidentiality

The data that is gathered will be kept confidential and all paper-based data will be protected under lock and key where only the researchers will have access. Online data will be protected by secure password, which only the researchers will know.

Benefits

There are no direct benefits to your students for participating in this study but we hope it will help us learn how physical activity logs can influence students' motivation to exercise and physical activity behaviors.

Compensation

There will be no compensation for participation in this study.

Questions about the Research

You can contact Matt Fullmer anytime at phone: (801) 897-9760 or email: mfullmer@freedomprep.net to inquire about any aspect of this study. You may also contact Carol Wilkinson at phone: (801) 422-8779 or email: Carol_Wilkinson@byu.edu.

You can also contact the IRB Administrator, Office of Research and Creative Activities (ORCA):

BYU IRB Administrator

irb@byu.edu

801-422-1461

Participation

Participation in this research study is voluntary.

Matt Fullmer