



BSc in Psychology

Physical activity and self-esteem among adolescents: Gender difference and the impact of physical activity intervention on adolescent's self-esteem

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Author name: Íris Björg Birgisdóttir

Author ID number: 210480-3239

Department of Psychology

School of Business

Foreword

Submitted in partial fulfillment of the requirements of the BSc Psychology degree, Reykjavik University, this thesis is presented in the style of an article for submission to a peer-reviewed journal.

Abstract - English

Physical activity benefits our physical and psychological health as well as our self-esteem but one of the many challenges during adolescent years is developing identity and self-esteem. The aim of this study was to examine adolescent's self-esteem, gender difference and the impact of physical activity intervention. The sample was randomly drawn from four upper-secondary schools with a total number of 233 participants (150 females and 83 males) and a mean age of 16 years. The study was a physical activity intervention using pedometer and diaries with repeated measures at baseline and follow-up. The first hypothesis was that a 3-week physical activity intervention could increase adolescent's self-esteem. The second hypothesis was that a 3-week physical activity intervention would be more beneficial for girls than boys. The study was a randomized control trial intervention with a four (group) by two (time) by two (gender) factorial design. Results showed main effect of time on self-esteem for research groups and gender as well as main effect between research groups and between gender. However, results did not support the two hypotheses as there were no significant interactions between self-esteem over time and research group or self-esteem over time and gender.

Keywords: physical activity, intervention, self-esteem, gender difference

Abstract - Icelandic

Rannsóknir sýna að hreyfing hefur jákvæð áhrif á líkamlega og andlega heilsu fólks. Eins greina rannsóknaniðurstöður frá jákvæðum tengslum hreyfingar og sjálfsálits en ein af fjölmörgum áskorunum einstaklinga á unglingsárum er að þróa eigin sjálfsmynd og sjálfsálit. Markmið þessarar rannsóknar var að skoða sjálfsálit unglinga og áhrif hreyfihlutunar á sjálfsálit. Úrtakið var dregið af handahófi úr fjórum völdum framhaldsskólum á höfuðborgarsvæðinu. Heildarfjöldi þátttakenda var 233 (83 strákar og 150 stúlkur) og var meðalaldur 16 ár. Rannsóknin var slembivals hreyfihlutunarrannsókn með fyrir og eftir mælingum og samanburðarhóp. Íhlutun rannsóknar var skrefmælir og dagbók. Fyrsta tilgáta rannsóknar var að 3 vikna hreyfihlutun hefði áhrif á sjálfsálit unglinga. Önnur tilgáta rannsóknar var að 3 vikna hreyfihlutun hefði meiri áhrif á stúlkur en stráka. Framkvæmd var 4 sinnum 2 og 2 sinnum 2 blönduð dreifigreining. Niðurstöður rannsóknar voru marktæk meginhrið af tíma á sjálfsálit fyrir bæði rannsóknarhópa og kyn þar sem sjálfsálit jókst á milli tímapakta. Einnig komu fram marktæk meginhrið af kyni og rannsóknahópum. Þar sem strákar mældust með herra sjálfsálit en stúlkur og marktækur munur var á milli viðmiðunarhóps og skrefmælahóps annars vegar og viðmiðunarhóps og dagbókarhóps hinsvegar. Rannsóknaniðurstöður studdu þó ekki tilgáturarnar þar sem ekki greindust marktæk samvirknihrið.

Lykilorð: Hreyfing, hreyfihlutun, sjálfsálit, kynjamunur

Physical activity and self-esteem among adolescents: Gender difference in self-esteem and the impact of physical activity on adolescents' self-esteem

Regular physical activity among the adult population benefits their physical health, both in chronic disease prevention (e.g., breast and colon cancer, obesity and cardiovascular disease) and as treatment (e.g., cardiovascular disease and diabetes) (Warburton, Nicol, & Bredin, 2006). Likewise, physical activity and exercise at moderate intensity has positive effect on psychological well-being both among the adult population (Cohen & Shamus, 2009; Netz, Wu, Becker, & Tenenbaum, 2005) as well as among adolescents (Dwyer, Baur, Higgs, & Hardy, 2009). For example, physical activity reduces depression and anxiety symptoms (Carek, Laibstain, & Carek, 2011; Larun, Nordheim, Ekeland, Hagen, & Heian, 2006). Furthermore, physical activity increases self-esteem both for adults self-esteem (McAuley, Blissmer, Katula, Duncan, & Mihalko, 2000) as well as for adolescents self-esteem (Slutzky & Simpkins, 2009; Tremblay, Inman, & Willms, 2000) but one of the many challenges during adolescence is developing identity and self-esteem (Þórólfur Þórlindsson, Inga Dóra Sigfúsdóttir, Jón Gunnar Bernburg, & Viðar Halldórsson, 1998).

Results from the literature on self-esteem reveal a conclusive finding on the difference in gender and development in lifespan, where males frequently report higher self-esteem than females (Bleidorn et al., 2016) although, both gender show high self-esteem in childhood, which decreases in adolescence, more for girls than boys, increases gradually throughout adulthood and then, declines during older age (Orth & Robins, 2014; Robins & Trzesniewski, 2005). Low self-esteem in adolescents is related to poor physical and mental health, as well as with an increased risk of external and criminal behaviour, such as antisocial behaviour, aggression and delinquency in adulthood (Slutzky & Simpkins, 2009; Tremblay et al., 2000). On the other hand high self-esteem is related to greater well-being (Baumeister, 2013; Trzesniewski et al., 2006). Adolescents with high self-esteem are thus more likely to avoid

things that are morally wrong and/or against their will (Baumeister, 2013; Jackman & MacPhee, 2015). They are more confident, have a healthier view of their future, are more likely to respect other individuals and do good things for themselves, others and society (Baumeister, 2013; Jackman & MacPhee, 2015; Nurmi, 1991). Additionally, high self-esteem correlates with decreased depression and anxiety as well as increased body image and self-efficacy (Strong et al., 2005; Trzesniewski, Donnellan, & Robins, 2003).

Both physical activity and self-esteem are comprehensive concepts that are often presented inaccurately with other concepts. Physical activity is used interchangeably with concepts like exercise and physical fitness (Caspersen, Powell, & Christenson, 1985; US Department of Health and Human Services, 2008). However, physical activity differs in definition as it refers to increased energy consumption from the work of the skeletal muscles beyond the state of resting and can be further defined by intensity, duration and frequency. Thus, physical activity comprises of activities that involve movement in one way or another for example, housework, playing of any kind, traveling between places, whether on foot or on non-motorized vehicles, as well as sports or other organized training (Caspersen et al., 1985; US Department of Health and Human Services, 2008). Self-esteem is used interchangeably with related concepts like self-image, self-concept, self-worth and self-efficacy (Fennell, 2009). These concepts relate to the self and refer to the beliefs and values we have about our self's as individuals with each concept differing in definition but self-esteem refers to our opinion and view of ourselves as individuals, opinion and view that can either be good or bad (Baumeister, 2013; Fennell, 2009).

Growing literature from cross-sectional, longitudinal, mediational and interventional studies support positive relationship between physical activity and self-esteem (Li, Xu, & Liu, 2014; Maher et al., 2013). For example, results from Tremblay, Inman and Willms (2000) study showed that 12 year olds who were more physically active and exercised more had

greater self-esteem than their peers. Similarly, Li et. al (2014) found that overall physical activity and physical activity at moderate intensity significantly increased self-esteem in ethnic minority group, aged 18-23 year old (Schmalz, Deane, Birch, & Davison, 2007). Furthermore, physical activity decreased the risk of mental disorders and high self-esteem was a preventive factor for student's mental health. In a study of non-Hispanic adolescent females results showed that physical activity at a younger age predicted higher self-esteem at an older age. Thus, girls who were more physically active at the age of 9 and 11 had higher self-esteem at the age of 11 and 13. Among emerging adults, aged 18-25 year old, the impact of physical activity on life satisfaction, showed that daily amount of physical activity affected their overall satisfaction with life rather than their activity level of physical activity over time but self-esteem is strongly correlated with satisfaction with life (Maher et al., 2013). Slutzky and Simpkins (2009) found in adolescents, aged 12 to 14 years, that the time devoted to sport is positively correlated with adolescent's perception and experience of their ability and skills in sport, which consequently supports their self-esteem and self-image. Moreover, they found that the relationship is not dependent on the number of hours spent in sport, but on positive relations with their coach and team-mates. Findings from a physical activity intervention, among female students, indicate that those who benefitted most were pre-adolescent females with low self-esteem (Boyd & Hrycaiko, 1997). Females, age 13-15, in an Australian pedometer based intervention study showed positive relation between physical self-worth and physical activity (Cuddihy, Tomson, Jones, & Johnston, 2006). Ekeland, Heian, and Hagen (2005) concluded in their meta-analysis that both physical activity interventions alone as well as physical activity interventions combined with other interventions had positive effect on self-esteem. In Liu, Wu, & Ming, (2015) meta-analysis on intervention studies, where impact of physical activity on self-esteem in children and adolescent was explored, results indicated that randomised controlled studies with control groups and merely physical activity

intervention positively affected self-outcomes, self-concept and self-worth. Furthermore, in relation to physical activity intervention settings, they found, compared to other settings, stronger effects in school- and gymnasium-based intervention.

Adolescence is a transitional time in individual's life, a time when individuals go from being children to adult and a time of many changes both physically, psychologically and socially (Archibald, Graber, & Brooks-Gunn, 2003; Santrock, 2013). Upon finishing grade school and starting upper secondary school a new era starts. An era in which many adolescents are faced with resisting temptations and difficult challenges of many sorts (Jackman & MacPhee, 2015). As noted earlier, physical activity can increase self-esteem and high self-esteem is helpful for individuals to resist challenges in adolescence. It is then the aim of this intervention study, based on the literature reviewed above, to explore the relationship between adolescents' self-esteem and physical activity and to test if physical activity intervention can increase self-esteem among adolescents. Accordingly, the first hypothesis is: A 3-weeks physical activity intervention increases adolescent's self-esteem. Furthermore, with respect of the conclusive findings on gender difference in self-esteem and with boys frequently having higher self-esteem than girls it raises the possibility that physical activity intervention could be more beneficial for girls than boys. Thus, the second hypothesis is: A 3-weeks physical activity intervention is more beneficial for girls than boys.

Method

Participants

Participants in the study were 15-17 year old adolescents of both gender. From four upper-secondary schools selected from the Capital region in Iceland, three first year classes were randomly drawn from each school. From the combined total number of 340 students 251, 47% males, agreed to participate. Of the agreed participant's, data from three students were not received, resulting in a total number of 248 participants. Criteria for the final analysis was a minimum of two days of valid step data for both baseline and follow-up measures, resulting in a total number of 233 participants, 83 males and 150 females, meeting the criteria. Participants divided between the four groups in the study as listed: 58 in the group with pedometers, 61 in the group with both pedometers and physical activity diaries, 57 in the group with physical activity diaries and 57 in the control group.

All participants in the study received two tickets to the cinema as compensation for their participation in baseline and follow-up measure. Additionally, participants with pedometer received credits on their mobile phone, covering their expenses associated with their daily text messages, as well as two more cinema tickets as a compensation for wearing and returning the pedometers at the end of the intervention period.

Apparatus and measures

Pedometers. To assess participants steps we used Yamax CW-701 pedometers, one of the most accurate and reliable measure on steps available at the time (Schneider, Crouter, Bassett, & others, 2004; Schneider, Crouter, Lukajic, & Bassett, 2003). At baseline measures, prior to the intervention period, and at follow-up measures, immediately after the intervention period, participant's daily weekday steps were assessed over a four-day period as it is considered, regarding reliability and validity, that two days are adequate to determine one's daily steps (Craig, Tudor-Locke, Cragg, & Cameron, 2010). All participants wore the

pedometers sealed during baseline and follow-up measures. However, participants in the two intervention groups with pedometers wore the pedometers unsealed during the three-week intervention period.

Questionnaire. Only those questions relevant to this thesis will be listed and described. A total of 12 questions from the questionnaire used in the original research, comprising of 85 in total, was used to assess participant's demographic variables and self-esteem. Participants answered the questionnaire at baseline and follow-up. Demographic variables entailed questions about gender: "What is your gender?" with following responses: "Boy", "Girl", and age: "What year were you born?" with following responses: "1994", "1995", "1996", "1997", "1998", "other: year 19_". To assess student's self-esteem "The Rosenberg self-esteem scale" was used as it has a good internal reliability $\alpha = 0,80$ (Salyers et al., 2001). The Rosenberg self-esteem scale consists of ten statements that measure global self-worth, five of them which measure positive feelings, (e.g. "I feel that I have a number of good qualities"), and five of them which measure negative feelings, (e.g. "I feel that I do not have much to be proud of"). Responses were on a four point Likert scale, "strongly agree", "agree", "disagree" and "strongly disagree". The Rosenberg's self-esteem scales internal reliability in this study was good at both measures, or $\alpha = 0,921$ at baseline and $\alpha = 0,911$ at follow-up.

Diaries. The physical activity diary entailed questions about the student's physical activity (e.g. "How much physical activity did you do today?"). The non-physical activity diary included questions about their sleep quality, which participants answered in the morning, and questions about feelings, which participants answered in the evening.

Procedure

The study took place from the second week of September 2012 to the second week of October 2012. After receiving approval from the school administrators, three first year classes were randomly drawn from each school. During school hours, the students, in each of the

three first year classes, in each of the chosen schools, received a formal introduction of the study, its aim, measures and time frame. They were as well informed that participating, both at baseline and follow-up, in the study would entail a compensation of movie tickets. Those students interested in partaking in the study received an introduction letter and two copies of an informed consent, one for themselves to keep and one to return to the research team, signed by themselves and their parents or guardians.

After receiving signed informed consent from students willing to participate, baseline measures started in each school, on a Monday in the second week of September 2012. Baseline measures entailed each student answering a questionnaire, each marked with an individual research number. The questionnaire entailed questions regarding their demographic characteristics (e.g., age, gender) and self-esteem. Beforehand, students were informed not to write their names or ID number on their questionnaire and upon finishing to put the questionnaire in a provided unmarked envelope. Following, each student received a sealed pedometer, marked with a research number, to wear for four consecutive weekdays for a minimum of 8 hours per day during waking hours. Students also received a visual and written instruction on how to wear and handle the pedometer and instructions to maintain their normal physical activity habits whilst wearing the pedometers. At the completion of the baseline period students were asked to return their pedometers to the school's main office. After the baseline assessments were completed each school was randomly assigned to each of the four study groups.

On a Monday, the following week, the intervention period started and lasted for three weeks. From the research team, all three intervention groups received an educational session on the positive effect of physical activity and a motivational message where they were encouraged to be more physically active in their everyday live, (e.g., go for a brisk walk and/or use every opportunity to be more physically active like taking the stairs instead of the

elevator). The two pedometer groups additionally received their unsealed pedometers, for motivational purposes, as well as information about the pedometers, and a step goal aim of 10 to 12 thousand steps per day, as it has been regarded, as a recommended guideline for adolescents, and to be equivalent to 60 minutes of moderate to vigour's physical activity (M. A. Adams, Johnson, & Tudor-Locke, 2013; Tudor-Locke et al., 2011). Additionally, the group with both pedometer and diaries and the group with only diaries, received their diaries. During the intervention period, all groups received text messages in the morning, at 7 am, and at 9 pm in the evening, from the research team. The morning messages to the groups with pedometer was a reminder to wear the pedometers whereas the evening message were a reminder to submit their daily step-count via text message to the research team. To the groups with diaries the morning and evening messages was a reminder to fill in relevant fields in the diary. In order to control for potential motivational effects of the text messages, all groups received a non-physical activity diary with questions regarding their emotional feelings and sleep. Upon the completion of the intervention period, all groups returned their pedometers and diaries to their school's main office, and an execution of follow-up assessments began. The follow-up measure was immediately after the intervention period and entailed identical measures to the baseline assessments, students answering questionnaires and wearing sealed pedometers for four consecutive weekdays. Contamination between groups was minimized by randomly selecting each of the four upper-secondary school to one of the four groups. To minimize error in the study it was ensured that standard instructions were used.

Ethical Consideration

Approval for ethical standard was given by The National Bioethics Committee in Iceland (reference 11-099-V3) and The Icelandic Data Protection Authority was provided information about the study. All students and their parents were informed about the study and

signed informed consent was obtained by each student and their parent or guardian prior to the study.

Study design and data analysis

The study was a randomized control trial intervention with a four (group) by two (time) by two (gender) factorial design. For analysing statistics SPSS IBM statistic version 23 was used. Daily step-counts below the suggested level of 2500 steps per day, as according to Tudor-Locke and colleagues (Tudor-Locke, Craig, Thyfault, & Spence, 2012) is equivalent to individual's daily energy expenditure, were excluded from the data before the execution of data analysis. Also, data from students who did not provide sufficient data, that is a minimum of two days of valid baseline and follow-up step data was required, was excluded. From both baseline and follow-up measures a mean step-count was calculated. A between and within subject design was used. Thus, the relationship between physical activity and self-esteem was tested with a four (group) by two (time) mixed ANOVA and between gender and self-esteem tested with a two (gender) by two (time) mixed ANOVA with an alpha criterion for significance set at .05 for both tests. The homogeneity of variance assumption was not met for baseline and follow-up measures of self-esteem for gender as the Levene's test was significant; the test for baseline was $F(1, 220) = 7.391, p = .007$ and for follow-up was $F(1, 220) = 13.476, p < .001$, indicating that the gender ratio was uneven.

Results

Sample characteristics and descriptive statistics

Of the total number of participants fitting the criteria for final analysis ($N = 233$) the majority of participants were female students (64.4%). The gender ratio between each of the four research groups at baseline and follow-up is illustrated in figure 1. The majority of participants in every group were female with gender bias being greatest in the control group; both at baseline and follow-up (79.7% and 79.4%).

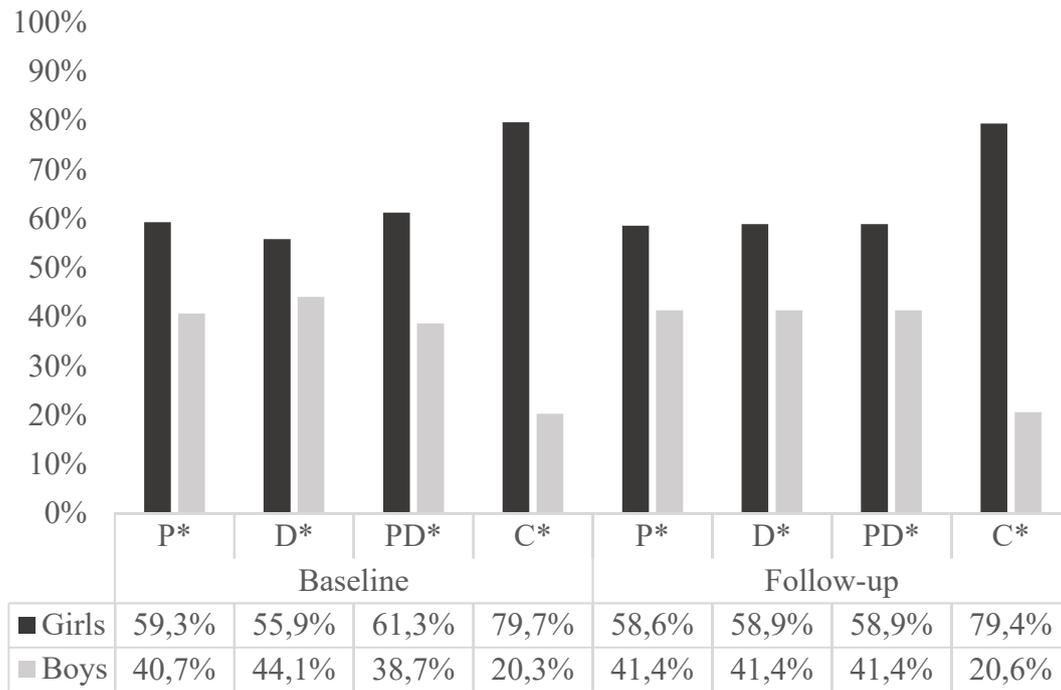


Figure 1. Gender ratio between research groups at baseline and follow-up

*Group: P = group with pedometers, D = group with physical activity diaries, PD = group with pedometers and physical activity diaries, C = control group

The mean age of the participants in the study, born from the year 1995-1997, was 16 years covering 96.7 % of the total participants. Two participants were 15 years old and six participants were 17 years old. The overall average for participant’s self-esteem was high for both time points and increased from baseline ($M = 21.8, SD = 6.4$) to follow-up ($M = 23.2, SD = 6.2$), as seen in table 1 below. Furthermore, both girl’s and boy’s self-esteem was measured higher at follow-up than at baseline with boys having higher self-esteem than girls at both baseline ($M = 24.6, SD = 4.8$) and follow-up ($M = 25.5, SD = 4.5$). For the groups, the greatest augmentation in self-esteem over time was seen in the pedometer group as mean self-esteem ascended by 1.5 points from baseline to follow-up whereas self-esteem in other groups ascended between 1.0 to 1.2 points over time. However, the results for change in groups self-esteem by time and gender the results showed that the greatest augmentation over time was for girls in the pedometer group as mean self-esteem ascended by 2.7 points whereas the

greatest augmentation in mean self-esteem for boys was 2.2 points in the physical activity diary group. Additionally, the results for change in groups self-esteem by time and gender show that boys self-esteem in the pedometer group reduced by 0.5 points over time.

Table 1.

Descriptive statistics for self-esteem for research groups and gender by time

Time	Group	N	Boys	Girls	Goup	Std. Deviation	Minimum	Maximum
			Mean	Mean	Mean			
Baseline	P*	60	26.3	21.1	23.1	5.9	5	30
	PD*	58	24.7	20.5	22.2	6.5	6	30
	D*	58	23.9	21.2	22.5	5.9	6	30
	C*	64	22.5	18.9	19.7	6.9	2	30
	Total	240	24.6	20.3	21.8	6.4	2	30
Follow-up	P*	56	25.8	23.8	24.6	4.9	9	30
	PD*	56	26.2	21.5	23.3	6.4	5	30
	D*	52	26.1	22.2	23.7	6.2	7	30
	C*	62	22.8	20.1	20.7	6.4	6	30
	Total	226	25.5	21.7	23.2	6.2	5	30

*Group: P = group with pedometers, D = group with physical activity diaries, PD = group with pedometers and physical activity diaries, C = control group

As seen in table 2 below, there was a change in the overall mean step count at follow-up as it was greater by 1.310 mean steps than at baseline. Likewise, there was a change in mean step count at follow-up between different research groups where both pedometer groups ascended their mean step count (3.546 and 2.525). However, there was a reduction in mean step count in the group with physical activity diaries (756) and in the control group (570). At both baseline and follow-up boys mean step count was greater than girls but both genders ascended their overall mean step count over time with boys mean step count ascending more (1.379) than girls (1.304). From the two pedometer groups combined, girls on average ascended their overall mean step count more ($M = 3.144$) than boys ($M = 2.851$).

Table 2.

Descriptive statistics for mean step count for research groups and gender by time

Time	Group	N	Boys	Girls	Goup	Std. Deviation	Minimum	Maximum
			Mean	Mean	Mean			
Baseline	P*	61	6812	6209	6446	1909	3446	10786
	PD*	58	7472	6689	6997	2164	3645	13798
	D*	56	8216	7027	7557	2079	4668	12776
	C*	57	8629	7510	7765	2269	3635	12981
	Total	230	7684	6886	7178	2156	3446	13798
Follow-up	P*	57	8805	9068	8971	2819	4826	17792
	PD*	55	11181	10118	10543	2680	5594	17441
	D*	42	6740	6848	6801	2342	3707	13925
	C*	54	9124	6757	7195	2772	3061	15252
	Total	208	9063	8190	8488	3046	3061	17792

*Group: P = group with pedometers, D = group with physical activity diaries, PD = group with pedometers and physical activity diaries, C = control group

Correlation analysis showed no significant correlation between self-esteem and physical activity at neither time points ($p > .05$).

Repeated measures mixed ANOVA

To test the first hypothesis, whether the intervention increases adolescent's self-esteem, a 4 (group) by 2 (time) mixed ANOVA was performed. Results of the 4 by 2 mixed ANOVA showed significant main effect of time on self-esteem, $F(1, 218) = 30.452, p < .05$, as the overall self-esteem increased over time from baseline ($M = 21.85, SE = 0.43$) to follow-up ($M = 23.19, SE = 0.40$). Likewise, results revealed significant main effect of groups on self-esteem $F(3, 218) = 4.727, p = .003$. Participant's grand mean self-esteem was 22.52, lowest in the control group ($M = 20.18, SE = 0.75$) and highest in the pedometer group ($M = 24.06, SE = 0.80$). In the group with pedometers and physical activity diaries the mean self-esteem was 22.60 ($SE = 0.79$) and 23.23 ($SE = 0.82$) in the group with physical activity diaries only. A

Bonferroni post-hoc test revealed a significant difference between the control group and the pedometer group ($p = .003$) and between the control group and the physical activity diary group ($p = .040$). However, the interaction between time and research groups was found to be non-significant $F(3, 218) = 0.371, p = .774$, indicating that the intervention did not have effect on self-esteem. As seen in figure 2 below, where the mean self-esteem by research group is illustrated from baseline to follow-up, self-esteem increased for all research groups.

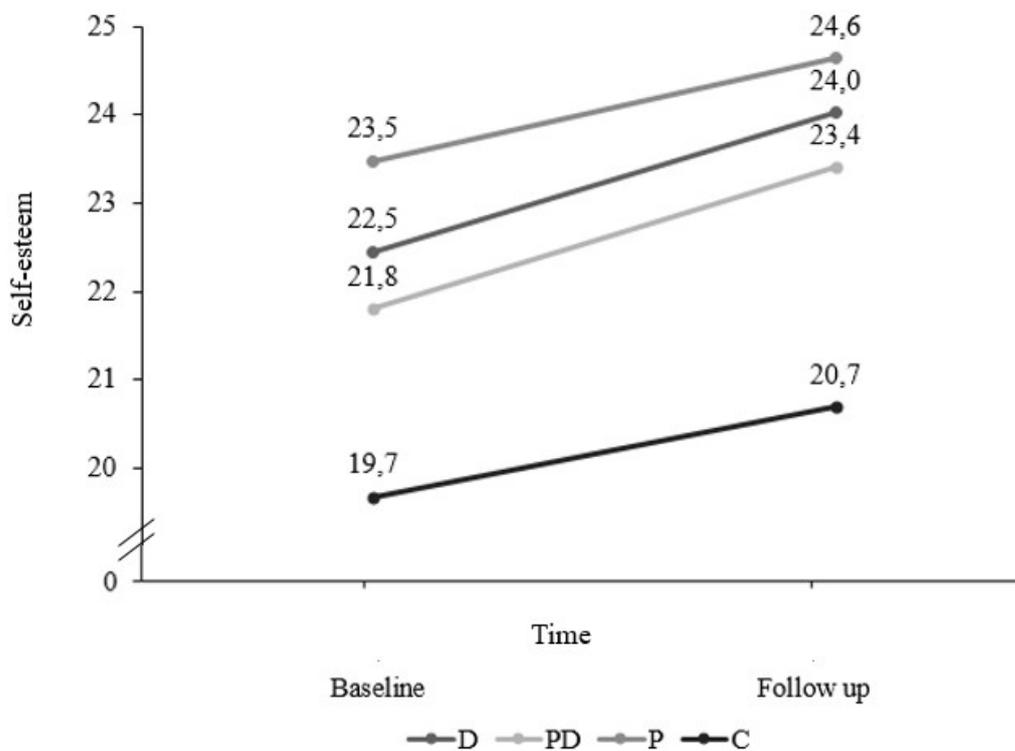


Figure 2. Mean self-esteem between the four research groups at baseline and follow-up

*Group: D = group with physical activity diaries, PD = group with pedometers and physical activity diaries, P = group with pedometers, C = control group

As there was a significant difference in self-esteem between groups at baseline, $F(3, 236) = 3.427, p = .018$, a subsequent univariate analysis of variance controlling for baseline differences in self-esteem was conducted. Results revealed no significant main effect of the intervention on self-esteem at follow-up $F(3, 217) = 1.440, p = .232$.

To test the second hypothesis in the study, whether the intervention benefits girls more than boys, a 2 (gender) by 2(time) mixed ANOVA was performed. Results of the 2 by 2 mixed ANOVA showed significant main effect of time on self-esteem, $F(1, 220) = 21.459, p < .05$, as the overall self-esteem for gender increased over time from baseline ($M = 22.41, SE = 0.43$) to follow-up ($M = 23.67, SE = 0.41$). Results also revealed significant main effect of gender on self-esteem, $F(1, 220) = 24.693, p < .05$, where the overall mean of self-esteem for boys was higher ($M = 25.05, SE = 0.65$) than for girls ($M = 21.03, SE = 0.47$). The interaction between time and gender was found to be non-significant $F(1, 220) = 0.887, p = .347$ indicating that the effects of the intervention were not dependent on gender. Both boy's and girl's self-esteem increased from baseline to follow-up and boy's self-esteem was on average higher at both time points, as seen in figure 3.

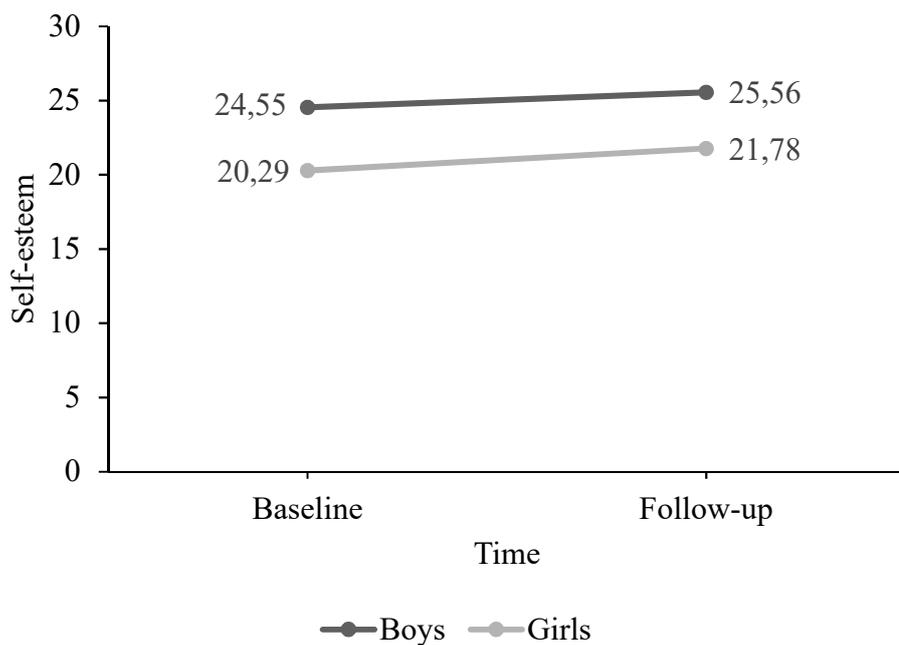


Figure 3. Boy's and girl's mean self-esteem at baseline and follow-up

Given the significant difference in self-esteem between gender at baseline, $F(1, 238) = 27.003, p < .05$, a univariate analysis of variance was conducted where baseline difference in self-esteem was controlled for. Results revealed no significant main effect of gender on self-esteem at follow-up $F(1, 219) = .706, p = .402$.

Discussions

The aim of the present study was to examine self-esteem among adolescent's in relation to gender difference as well as the impact of a 3-week physical activity intervention on adolescent's self-esteem. The study was conducted as a randomized control trial intervention in an effort to identify the possible contribution of physical activity on adolescent's self-esteem. Findings in the study showed that the grand mean self-esteem was high at both baseline ($M = 21.8$) and follow-up ($M = 23.2$) as self-esteem above 20 is considered to be high (Lopez & Snyder, 2003). Most people score between 15 and 25 with an average of 22 but the highest attainable score on the Rosenberg scale is 30. Participants overall mean step count also increased over time by 1.310. Interesting results in the study revealed that from the four research groups the greatest change occurred in the pedometer group. Participants in this group had the highest grand mean self-esteem ($M = 24.06$), increased their self-esteem the most over time as well as girls in the pedometer group, both compared to boys and girls in other groups, increased their overall mean self-esteem and their overall mean step count the most. Moreover, the two pedometer groups in the study were the only groups that increased their mean step count over time. In relation to gender, boys mean step count and mean self-esteem was higher than girls at both baseline and follow-up, but both gender increased their mean step count and mean self-esteem over time. The findings, of higher self-esteem among boys, are in accordance with previous studies (Bleidorn et al., 2016).

Beforehand it was hypothesized that a brief, 3 week, physical activity intervention would increase adolescent's self-esteem. Likewise, it was hypothesized that a brief, 3 week, physical activity intervention would be more beneficial for girls than boys. Findings revealed main effect of time on self-esteem for both research groups and gender. Nonetheless, results of the study supported neither hypotheses as the results for interaction were non-significant, stating that the effect of the intervention was not different depending on research groups or

gender. Those findings are not in accordance with previous studies (Boyd & Hrycaiko, 1997; Ekeland et al., 2005; Li et al., 2014; Maher et al., 2013) as both gender and all research groups in the current study increased their self-esteem over time.

As reviewed, both concepts, physical activity and self-esteem, are often confused with similar concepts which potentially may explain the studies discrepancies. Physical activity is used interchangeably with concepts like exercise, which refers to planned and structured physical activity, and physical fitness, that refers to the attributes individuals have or can achieve from being physically active (Caspersen et al., 1985; US Department of Health and Human Services, 2008). Self-esteem is used interchangeably with related concepts for example like self-image, self-concept and self-efficacy (Fennell, 2009). Self-image and self-concept refer to our overall view of ourselves and involve wide range of characteristics but does not involve any evaluation or judgement of ourselves (Fennell, 2009). Self-esteem and self-efficacy are similar in meaning but self-efficacy refers to beliefs and expectancy of one's ability to accomplish certain situations and overcome obstacles (Bandura, 1977). In a theoretical review by Brown and Marshall (2006) it is suggested that researchers and psychologist have been using the concept self-esteem in three different ways; as global self-esteem, as feelings of self-worth and as self-evaluation, thus, at least partly, explaining the confusion about the concept of self-esteem. Global self-esteem refers to individual's general sense of worth and is relatively stable over time and situations whereas feelings of self-worth are more temporary as this concept refers to our emotional reaction to relevant situations. On the other hand, self-evaluation refers to individual's evaluation to their attributes and abilities.

Another possible explanation for the discrepancy can be related to the time and length of the intervention. Baseline measures took place in the second week in September among adolescents starting their first year in upper secondary school. That mere fact can explain the discrepancy as these young individuals are embarking on a new era. An era entailing

transition from being the oldest students in the primary schools to being the youngest one's in the secondary schools, a school they haven't fully managed to embrace the existing rules and traditions (Adeyemo, 2009; Elin Thorarensen, 2005). This kind of transition can entail insecurity and anxiety for individuals. Therefore, the increase in self-esteem measured at follow-up a month later could merely be because these individuals have at that point developed increased security as they have become more custom to the rules and traditions of their new school. Additionally, in relation to the length of the intervention period in this study as it lasted only three weeks, it is possibly to short of a period to have a significant effect on participant's global self-esteem. For example in Liu et al. (2015) meta-analysis were 16 studies on the impact of physical activity on self-esteem was explored, the intervention periods ranged from 7 to 104 weeks with an average of 20 weeks and only 6 studies with a intervention period less than 10 weeks.

Despite the study's limitations, its strengths lie in having a relatively large randomly selected sample with an even distribution of participants between the four research groups. Large samples can detect small difference hence have more power to detect effect, as well as it reduces sampling error (Field, 2013). Likewise, the study was a randomized controlled trial with a control group making it possible to examine the effects of the intervention. Also, the study entailed repeated measures so assessment of effect over time within an individual was possible (Field, 2013). Furthermore, the analysis emphasized that the intervention was not affecting individual's self-esteem by controlling for baseline difference. Additionally, the type of intervention, pedometers and diaries, used in this study is a practical, easy to conduct and a cost-effective intervention (Cobiac, Vos, & Barendregt, 2009). Lastly, an important strength is that the results from the study add knowledge to the literature on the relation between physical activity and self-esteem.

In conclusion, the study's analysis revealed main effect of time on self-esteem for both research groups and gender but non-significant results for the interaction between self-esteem and physical activity proclaiming that the intervention in the study did not affect participant's self-esteem. Regardless of current study non-significant results the literature reflects on a positive relation between physical activity and adolescent's self-esteem. Thus, to further understand the contribution physical activity plays in adolescent's self-esteem future studies should firstly come to an agreement on which aspects of these concepts, physical activity and self-esteem, are most important to focus on and why. Secondly, future studies should be a randomized controlled intervention studies with follow-up data like the present study, but entailing a longer intervention period.

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