

Students' self-determined motivation in physical education and intention to be physically active after graduation: The role of perceived competence and identity

ERDVIK, IRINA BURCHARD, ØVERBY, NINA CECILIE, HAUGEN, TOMMY
Department of Public health, Sport and Nutrition, University of Agder, NORWAY

Published online: June 25, 2014

(Accepted for publication June 05, 2014)

DOI:10.7752/jpes.2014.02035;

Abstract:

Purpose: This study examined whether high school students' degree of self-determined motivation in school physical education predicted their intentions to be physically active after graduation, and whether perceived physical competence and physical activity identity mediated this hypothesized cross-sectional relationship. Additionally, the possibility of conditional effects of gender on these associations was considered.

Method: A cross sectional study involving 1650 high-school students allowed for the examination of indirect effects using a bias-corrected bootstrapping technique.

Results: Results showed that self-determination in PE may positively affect adolescents' intentions to be physically active after graduation, both independently and through the strengthening of students' physical activity identity and perceived physical competence. Moderation analysis identified that the indirect effect of perceived competence on the adolescents' physical activity intentions was only significant in boys. Identity however, was a significant mediator of physical activity intention in both genders.

Conclusions: School interventions aiming to improve adolescents' physical activity intentions might take advantage of increasing adolescents' physical activity identities as well as perceived physical competence.

Key Words: Self-determination, physical activity, physical education, physical competence

Introduction

Several studies show a negative trend in physical activity participation in the populations of industrialized countries (Dollman, Norton, & Norton, 2005; J. F. Sallis, 2000). This trend is also evident in the Norwegian population (Anderssen, Kolle, Steene-Johannessen, Ommundsen, & Bo Andersen, 2008; Ommundsen, 2008). Research evidence indicates that physical activity declines with age, with the steepest decline occurring between the ages of 13 and 18 (J. F. Sallis, 2000). Reduced physical activity levels in children and adolescents may affect health negatively, and inactivity may increase risks of developing health threatening conditions such as obesity (González-Gross & Meléndez, 2013) and coronary heart disease (Lavie, Thomas, Squires, Allison, & Milani, 2009) among other.

Studies indicate that physical education (PE) makes a significant contribution to the physical activity level of American children (Morgan, Beighle, & Pangrazi, 2007) and adolescents (Pate, Ward, O'Neill, & Dowda, 2007). A review by Bailey (2006) suggests that PE may contribute to the development of fundamental movement skills, physical competence, social skills, social behaviours, self-esteem and pro-school attitudes in children. This indicates that PE has potential to influence long term health, which perhaps is the most important objective of quality PE (Shepard & Trudeau, 2000). Research also suggests that participation in PE and a physically active lifestyle in adolescence may contribute to adulthood leisure time physical activity level (Bjørneboe & Aadland, 2003; Shepard & Trudeau, 2000). This is supported by a longitudinal study on Finnish adolescents, indicating a positive association between physical activity level in adolescence and adult physical activity (Huotari, Nupponen, Mikkelsen, Laakso, & Kujala, 2011). Research by Chatzisarantis, Biddle and Meek (1997) has also revealed that the degree to which students are self-determined in PE acts as a predictor of leisure-time physical activity intentions and subsequent leisure time physical activity behaviour.

Models such as the Theory of Planned Behaviour (TPB) have been created in an attempt to predict and explain human behaviour in many contexts (Ajzen, 1991, 2005). The TPB states that people's behaviours are determined by their intentions to act, a relationship which is well acknowledged among researchers (Ajzen, 2005; Bandura, 1986). The intention-behaviour relationship has been supported in several studies and meta-analyses (Godin & Kok, 1996; Hagger, Chatzisarantis, & Biddle, 2002; McEachan, Conner, Taylor, & Lawton, 2011; Sheppard, Hartwick, & Warshaw, 1988). Studies indicate that 24 to 60% of reported intentions precede behaviour (e.g. Hagger et al., 2002; McEachan et al., 2011; Rhodes, Courneya, & Jones, 2003; Sheeran, 2002)

and that behaviour is largely non-existent without positive intentions (de Bruijn & van den Putte, 2012; Rhodes et al., 2003; Sheeran, 2002). In a meta-study, Webb and Sheeran (2006) summarized 47 experimental tests and concluded that medium to large changes in intentions were associated with small to medium changes in subsequent behaviour. According to McEachan and colleagues (McEachan et al., 2011) positive intentions are better predictors of physical activity behaviour compared to other types of health behaviour. Based on the latter, it seems reasonable to believe that experiences from PE which contribute to adolescents' physically activity intentions also might influence activity patterns into adulthood.

Hagger and Chatzisarantis (2009) have argued for the integration of Self-Determination Theory (SDT; Deci & Ryan, 1985) in the TPB. Through path analysis they found significant effects of self-determined motivation on intentions and behaviour which were partially mediated by the proximal predictors from the TPB. The concept of motivation is interesting due to the assumption that activities experienced as intrinsically rewarding are more likely to be performed again (Pelletier, Fortier, Vallerand, & Brière, 2002). In a recent study, Moreno-Murcia, Huéscar Hernández and Cervelló (2012) found a correlational relationship between students' intrinsic motivation in PE and their intention to remain physically active after graduation ($r=.57$), a finding similar to Stanley, Cumming, Standage and Duda (2012) and Standage Duda and Ntoumanis (2003). Furthermore, a school based intervention by Chatzisarantis and Hagger (2009) identified autonomous motivation in PE and intention to be active in leisure time as mediators of the relationship between their intervention program and self-reported physical activity behaviour at follow up. This indicates that motivation in the PE domain has the potential to be transformed into both intention and motivation in leisure time, and is in line with other studies (Bagøien, Halvari, & Nesheim, 2010; N. L. D. Chatzisarantis et al., 1997; Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003; M. Standage, Duda, & Pensgaard, 2005).

Previous research has connected adolescents' physical activity intentions and behaviour to psychosocial constructs such as perceived physical competence (Biddle & Armstrong, 1992; Biddle & Goudas, 1996; Kimiecik, Horn, & Shurin, 1996; Moreno, Moreno, & Cervelló, 2007) and identity (Rise, Sheeran, & Hukkelberg, 2010). Self-perceptions can be considered as 'the awareness of good possessed by the self' (Harter, Fischer, Harter, & Serwator, 1999) and is most generally thought of as an individual's overall positive evaluation of the self (Cast & Burke, 2002; Rosenberg, Schooler, Schoenbach, & Rosenberg, 1995; Sonstroem, 1998). Self-perceptions are thought to direct human behaviour because people tend to act as they perceive themselves (Harter et al., 1999). Based on an assumption that the society rewards achievement, people engage in activities they believe will lead them to success (Sonstroem, 1998). Susan Harter (1999) suggests that people are motivated to demonstrate competence in and avoid incompetence in specific achievement domains. Self-evaluations are expected to influence all kinds of activities one engage in, and demonstrating competence should result in feelings of pleasure and well-being, increasing the likelihood of the behaviour being repeated (Bagøien et al., 2010; Harter et al., 1999; Shapka & Keating, 2005). The study of perceived competence in the physical domain has previously been proposed as being important for adolescents' physical activity behaviour (Biddle & Armstrong, 1992; Biddle & Goudas, 1996; Kimiecik et al., 1996; James F. Sallis, Prochaska, & Taylor, 2000). Wang and Biddle (2001) have also linked perceived physical competence to intrinsic motivation in adolescents, showing that the most intrinsically motivated adolescents possessed more positive perceptions of their own physical competence. In the present work perceived physical competence will be used to address the perception of one's physical self, and it seems reasonable to assume that higher levels of perceived physical competence positively predict students' intentions to participate in physical activity after graduation.

Identity theory connects an individual's identity to social roles maintained by the individual (K. R Fox, 2000). The core of an identity is the categorization of the self as an occupant of a role, and the incorporation, into the self, of the meanings and expectations associated with that role and its performance (Stets & Burke, 2000). The development of one's identity represents an on-going process between individuals and their social environment illustrating the values, roles, and beliefs adopted by individuals over time as they shift between contexts (Wilson & Muon, 2008). As integral parts of one's self-concept, role identities are thought to help individuals give meaning and value to past behaviour as well as provide direction for future behaviour (Anderson & Cychosz, 1994). In a study by Wilson and Muon (2008) a positive relationship between exercise identity and physical activity was found. As PE has been argued to be a significant part of children's and adolescents' physical activity level (Morgan et al., 2007; Pate et al., 2007), self-determination in the PE-domain might stimulate the development of a strong physical activity identity. Vlachopoulos, Kaperoni and Moustaka (2011) found that motivational regulation explained an addition of 43 % of variation in exercise identity scores, beyond the 5 % predicted by age, gender and BMI. Further, they identified motivational regulations, which reflected more internalized exercise behaviour to be associated with exercise role identity.

In a recent study by Rise, Sheeran and Hukkelberg (2010) exercise role-identity was found to explain an increment of 9% of the variance in intention after controlling for past behaviour and TPB-components, results which also are in line with findings by Sparks and Guthrie (1998). Rise, Sheeran and Hukkelberg (2010) reported the influence of self-identity on behaviour to largely be mediated by the strength of behavioural intention, and regression analyses by de Bruijn and van den Putte (2012) identified self-identity as the second strongest predictor of exercise behaviour, interacting with exercise intention. Sparks and Guthrie (1998) have argued for researchers to take serious account of the role of self-identity in influencing behavioural intentions.

As a central physical activity domain, experiences in physical education may stimulate the development of students' general perceptions of physical competence and physical activity identity (Vlachopoulos et al., 2011; Wang & Biddle, 2001; Wilson & Muon, 2008). A general perception of physical competence and identity as a physically active individual might positively influence the development of intentions and physical activity behaviour in physical activity domains such as leisure time physical activity. It seems reasonable to assume that the development of a general perception of physical competence and a positive physical activity identity might positively influence physical activity intentions and -behaviour in physical activity domains such as leisure time physical activity.

The purpose of this paper was twofold. The first aim was to examine the relationship between adolescents' self-determined motivation in the domain of PE and their intention to be physically active after graduation. The second aim was to investigate the possible mediating effect of the socio-psychological variables perceived physical competence and physical activity identity. Additionally, we aimed to investigate whether the effect of the proposed mediators on intention to be physically active after graduation was conditional on gender. Figure 1 shows the relationships between variables, as hypothesized in the present study.

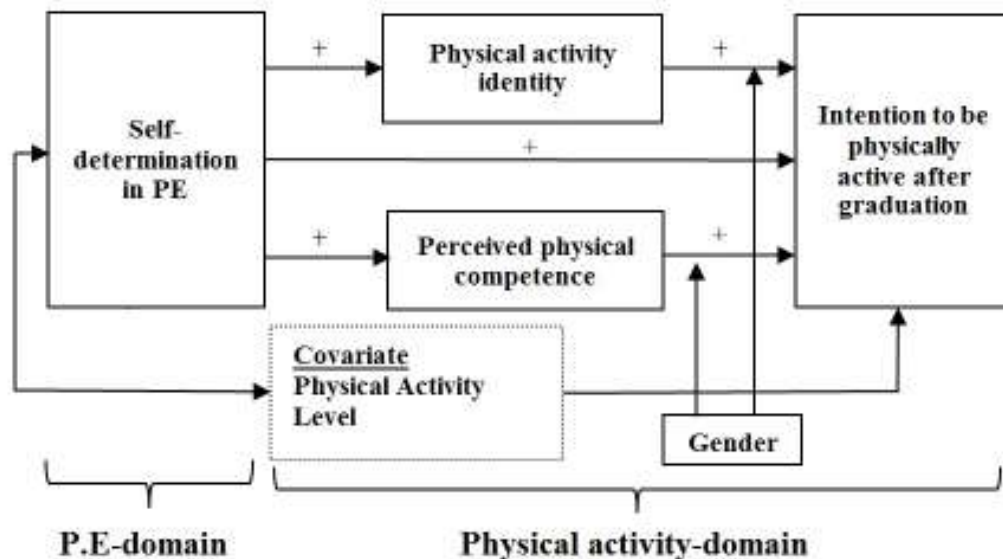


Figure 1. Research model: Hypothesized relationships among variables: The mediating effect of perceived physical competence and physical activity identity on the relationship between self-determined motivation in PE and intention to be physically active after graduation while controlling for gender, physical activity level and potential school-clustering effects.

Material & methods

Participants

First grade students from all high schools in the two Norwegian counties of Aust-Agder and Vest-Agder were offered to participate in the present study. The study used a cross-sectional design for the administration of an internet-based survey to all 11th grade students (in their first year of high school) among the 10 out of 16 schools that agreed to participate. Permissions were received from the school principal and the Norwegian Social Science Data Services (NSD), and 1650 of 2121 students completed the questionnaire (77.8%). All students invited to participate in this study had turned 16, and were able to give informed consent regarding participation. All responses were anonymous and responses could not be traced back to individual students at a later point of time.

Procedure

Data was collected during regular school hours using SurveyXact, a web-based program for conducting electronic questionnaires. A project researcher was offered to assist teachers in the data collection process to answer potential questions related to the survey. Participation was voluntary, and the completion of the questionnaire took approximately 30-40 minutes.

Measurements

Intention to be Physically Active after Graduation (IPAG) was measured using a four item questionnaire as designed by Hein, Müür & Koka (2004) with the following items: (1) 'I'm interested in developing my physical fitness,' (2) 'Outside PE lessons I like to do sport', (3) 'After graduation I would like to take part in sport club

training' and (4) *'After graduation I would like to be physically active'* (Hein et al., 2004). Answers were reported on a seven-point Likert scale ranging from (1) *'strongly disagree'* to (7) *'strongly agree.'* Higher scores indicated higher psychological readiness for physical activity. The content validity of the four items was considered appropriate and the four items emerged in one factor with strong factor loading over .60 (Hein et al., 2004). The internal consistency by Cronbach's alpha was by Hein, Mür and Koka (2004) measured to be .80. The IPAG-questionnaire was translated and back-translated in line with recommendations from Kvamme, Mainz, Helin, Ribacke, Olesen and Hjortdal (1998), and a test-retest that was performed prior to the main study provided Cronbach's alpha values of .84 and .84 in the test and retest respectively (unpublished data). Cronbach's alpha in the present study was measured to be .84, which according to Cortina (1993) can be considered acceptable.

The 16-item Situational Motivation Scale (SIMS), developed by Guay, Vallerand and Blanchard (2000), has been shown to be a valid and reliable tool in many physical activity contexts assessing intrinsic motivation, identified regulation, external regulation and amotivation (Martyn Standage et al., 2003). The SIMS-items are based on the following stem: *'Why do you participate in PE?'*, and was measured on seven-point scales ranging from (1) *'does not correspond at all,'* to (7) *'corresponds exactly.'* Four items were used to measure each type of behavioural regulation. The four different variations of motivation measured by SIMS were computed into a Self-Determination Index (SDI) describing the degree to which students were self-determined in PE. This was done using the formula from Lemyre, Treasure and Roberts (2006: ; 2 x intrinsic motivation + 1 x identified motivation - 1 x external motivation - 2 x amotivation), which is based on Grolnick and Ryan's (1987) Relative Autonomy Index (RAI). Respondents with a higher score on the SDI are thought to possess a higher degree of self-determined motivation in PE.

Physical activity identity (PAI) was assessed using a four item scale used by Lorentzen (2007). This scale is a modification of the scales originally used by Charng, Piliavin and Callero (1988) and Sparks and Guthrie (1998) concerning other health related behaviours. Four descriptive statements with respect to physical activity were provided, with possible answers ranging from (1) *'suits badly'* to (5) *'suits well'* (e.g. *'I view myself as a person who is concerned about physical activity'*). The PAI-items have previously been translated into Norwegian by Lorentzen (2007) and the scale has been modified to fit physical activity behaviour. An internal consistency test demonstrated a Cronbach's alpha of .93 for this study.

Students' perceived physical competence (PPC) was measured using one of the subscales from the revised Norwegian version (Wichstrøm, 1995) of Harter's Self-Perception Scale for Adolescents (SPPA; Harter, 1988). PPC was measured by asking students to respond to five different statements regarding the perception of their own competence in the sports domain (i.e. *'I do well in all kinds of sport'*) scaled from 1 to 4: scaled from 1 to 4: (1) *'Describes me very poorly'*, (2) *'Describes me fairly poorly'* (3) *'Describes me quite well'*, (4) *'Describes me very well'* (Wichstrøm, 1995). Cronbach's alpha for this study was .81.

Physical activity level (PAL) was measured by two self-report questions retrieved from the Norwegian version of the International Physical Activity Questionnaire (IPAQ) short version (Craig et al., 2003): (1) *'During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, running or fast bicycling?'*, and (2) *'During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, jogging or bicycling at a regular pace? Do not include walking.'* Moderate physical activity was defined as activities that take moderate physical effort and make you breathe somewhat harder than normal, whereas vigorous physical activity was defined as activities that take hard physical effort and make you breathe much harder than normal. The respondents were asked only to report activities with duration of at least 10 minutes.

Demographical data were also obtained through the questionnaire (e.g. gender, age, height, weight, ethnicity, and school grades in PE).

Statistical analyses

Descriptive statistics are presented as percentage distributions, means and standard deviations, and gender differences were assessed by correlational testing and independent samples t-tests. Internal consistency of scale-items was investigated through Cronbach's alpha values. Preacher and Hayes' (2004, 2008) technique for bootstrapped mediation analysis was utilized for the testing of indirect effects when controlling for covariates. Bootstrapping is a procedure for non-parametric resampling which can be applied in order to test the null hypothesis for an indirect effect. Bootstrapping includes repeated extractions with replacement of samples from the data set and the estimation of the indirect effect in each resample data set. In the case of this study, 20.000 samples were drawn. In addition to normal theory regression procedures, this technique also produces point estimates and bias-corrected (BC) confidence intervals for the indirect effect. Statistically significant indirect effects are indicated by 95% BC confidence intervals not including zero.

With respondents from 10 different schools, there was a possibility of clustering effect on school level, and school variation was thus controlled for by including the school-variable as nine dummy variables (and treated as covariates). As previous studies have found significant gender differences among the present research variables (Kamtsios, 2010), the moderating effect of gender on intention to be physically active was also investigated using model 15 in the PROCESS-macro (Hayes, 2013).

Results

Among participating students 1583 (95.9%) provided data on the dependent variable, namely IPAG. Participants' mean age was 16.4 years (SD: 0.99, see table 1). 75.9% of the respondents had two Norwegian parents, while 16.4% had two parents of foreign origin.

Table 1. Demographical characteristics of the study sample

	Age (%)	BMI and Prevalence (%)						Grades PE	Ethnicity (%)		
		Mean (SD)	Mean (SD)	UW	NW	OW	OB	Mean (SD)	TNP	ONP	NNP
Boys	48.8	16.4 (0.89)	22.2 (3.31)	2.3	74.2	18.8	4.7	4.4 (0.98)	75.6	6.6	17.9
Girls	51.1	16.4 (1.08)	21.5 (3.10)	9.5	75.8	12.7	2.0	4.0 (1.1)	76.3	8.8	17.9
Total		16.4 (0.99)	21.9 (3.23)	5.9	75.0	15.8	3.4	4.2 (1.06)	75.9	7.7	16.4

Note. SD: Standard deviation, BMI: Body Mass Index, BMI Cut-off points (according to Cole et al., 2000), Girls; UW: Underweight (<17.91), NW: Normal weight (17.81 – 24.37), OW: Overweight (24.37 – 29.43), OB: Obese (>29.43), Boys; UW: Underweight (<17.54), NW: Normal weight (17.54 – 23.9), OW: Overweight (23.9 – 28.88), OB: Obese (>28.88). TNP: Two Norwegian parents, ONP: One Norwegian parent, NNP: No Norwegian parents. N=1460.

As can be seen in table 2, bivariate correlation-analyses revealed significant positive relationships between all of the measures included in the research model, and IPAG correlated strongly with SDI, PPC and PAI in both boys and girls. Boys reported to be significantly more self-determined in PE compared to girls, and boys' perception of physical competence was also significantly higher compared to girls'. Levels of IPAG, PAI and PAL did not differ between genders (table 2).

Table 2. Descriptive statistics and bivariate correlations according to gender

Variabe	Boys	Girls	Total	1.	2.	3.	4.	5.
1. IPAG	5.33 (1.57)	5.31 (1.44)	5.32 (1.51)	-	.51**	.39**	.67**	.43**
2. SDI	6.99 (6.71)**	5.94 (7.30)	6.46 (7.03)	.52**	-	.42**	.45**	.27**
3. PPC	2.74 (0.70)**	2.31 (0.64)	2.53 (0.70)	.54**	.40**	-	.49**	.29**
4. PAI	3.67 (1.04)	3.63 (0.95)	3.65 (0.99)	.73**	.43**	.56**	-	.51**
5. PAL	5.97 (3.56)	5.40 (3.41)	5.67 (3.49)	.42**	.27**	.38**	.49**	-

Note. N = 1343. Descriptive statistics are presented as mean (standard deviation). IPAG: Intention to be physically active after graduation, SDI: Self-determination index, PPC: Perceived physical competence, PAI: Physical activity identity, PAL: Physical activity level. SD: Standard deviations, Pearson's correlations are presented above the diagonal for girls, below the diagonal for boys. p<.01**.

Figure 2 shows the hypothesized model including point estimates. After controlling for the effect of gender, PAL and school related variation, results revealed that the research model predicted 54.1% of the variation in IPAG ($F=108.8311$, $R^2_{adj} = .5356$, $p<0.01$).

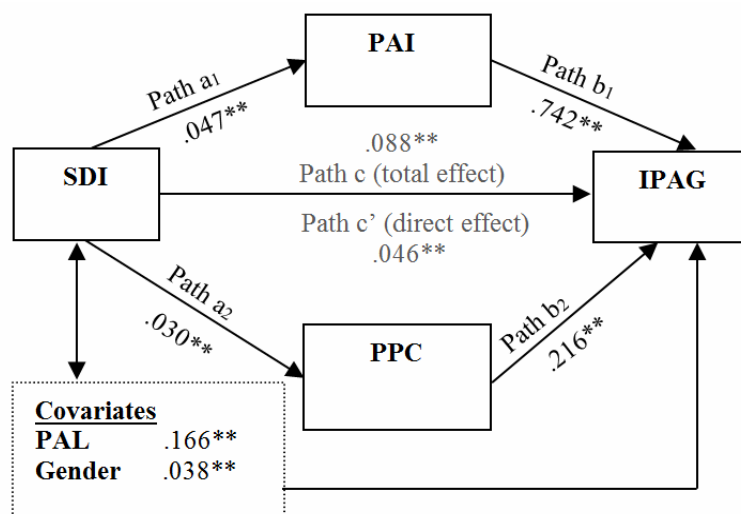


Figure 2. Mediating effects of PAI and PPC in the relationship between self-determination in PE on IPAG.

Note. IPAG: Intention to be physically active after graduation, SDI: Self-determination index, PPC: Perceived physical competence, PAI: Physical activity identity, PAL: Physical activity level. p<.01**. School included in the analysis as dummy variables (not shown in table, for clarity purpose).

Results revealed that both PAI and PPC act as unique mediators of the relationship between SDI and IPAG (see table 3). However, the mediating effect of PAI appeared to be stronger than the mediating effect of PPC (see contrast, table 3).

The possibility of conditional indirect effects by gender was also analysed (table 3), indicating that PAI mediated the relationship between SDI and IPAG in both genders. However, analysis of conditional indirect effects revealed that gender functioned as a moderator on the mediating effect of PPC on IPAG. The mediating effect was only significant in boys.

Table 3. The mediating effect of competence and identity on the self-determination-intention relationship, including conditional gender effects

Mediator	PE	SE	BCA 95% CI	
			Lower	Upper
PPC	.0066	.0018	.0033	.0104
PAI	.0350	.0034	.0286	.0422
<i>Contrast</i>				
PPC vs. PAI	.0284	.0042	.0204	.0370
<i>Conditional direct effect SDI – IPAG</i>				
Interaction (SDI x G)	-.009	.0091	-.0265	.0092
<i>Conditional direct effect PAI – IPAG</i>				
Interaction (PAI x G)	-.0338	.0703	-.1717	.1040
<i>Conditional direct effect PPC – IPAG</i>				
Interaction (PPC x G)	-.1974	.1006	-.3947	-.0001
Boys	.0100	.0027	.0050	.0158
Girls	.0036	.0025	-.0011	.0087

Note. Bootstrap results of indirect effects and contrasts. PE: Point estimates, SE: Standard error, BCA 95% CI: Bias Corrected and Accelerated 95% Confidence Interval, PPC: Perceived physical competence; PAI: Physical activity identity; SDI: Self-determined motivation in PE, based on the self-determination index; IPAG: Intention to be physically active after graduation; G: Gender. School included in the analysis as dummy variables (not shown in table, for clarity purpose). Statistically significant values in bold (CI does not include zero). Number of bootstrap resamples: 20'000.

Discussion

In this study we aimed to examine whether self-determined motivation in school PE predicted students' intentions to be physically active after graduation, both directly and through the proposed mediators perceived physical competence and physical activity identity. Results revealed a strong correlational relationship (.52, $p < .01$) between the degree to which students were self-determined in PE and their intentions to be physically active after graduation. Correlations also revealed that perceived physical competence, physical activity identity and physical activity were positively related to students' physical activity intentions (.54, .73 and .42 accordingly).

Results indicated that students' experience of self-determination in PE is positively related to adolescents' intentions with regards to future physical activity participation. This is in line with a meta-analysis by Hagger and Chatzisarantis (2009) where path analysis revealed a significant effect of self-determined motivation on intentions with respect to physical activity and other health-related behaviours, mediated by proximal predictors derived from the TPB. The association between intrinsic motivation in the prediction of high school students' intentions to be physically active after graduation has also been identified by Hein and colleges (2004). Provided that self-determined motivation contributes to adolescents' intentions to be physically active after graduation, strengthening self-determination in PE should result in more adolescents developing positive physical activity intentions.

Mediation analyses supported the hypothesized model, and self-determined motivation in PE appears to contribute to students' intentions to be physically active after graduation through higher levels of perceived physical competence and physical activity identity. Like Hagger and Chatzisarantis (2009) and Hein and Mür (2004), we found self-determined motivation to be associated with increased physical activity intentions. Presenting students with different activity options enable students to choose activities which they perceive to be consistent with their goals and interests (Assor, Kapla, & Roth, 2002). This may increase the chances of each student having positive mastery experiences during school PE, stimulating the development of perceived physical competence and physical activity identity, and in turn increasing the chances of adolescents developing positive physical activity intentions.

Harter argues that individuals are motivated to demonstrate competence and avoid incompetence in specific achievement domains. Demonstrating competence has been associated with increased likelihood of

behaviour being repeated, and has thus been proposed important in relation to physical activity (Bagøien et al., 2010; Harter et al., 1999). Allowing students to choose between different activities may allow them to work with optimally challenging activities, which may lead to an experience of success allowing their perception of physical competence to grow naturally (Deci & Ryan, 1985). Stets and Burke (2000) have suggested that peoples identities are composed of self-views emerging from the reflexive activity of self-categorization or identification into social groups or roles. Adolescents who value their own participation in physical activity are thought to be more susceptible to adopt physical activity into their identity. Accordingly, strengthening students' perceived physical competence and physical activity identity should contribute to making these individuals more likely to develop positive physical activity intentions and be physically active across the lifespan, consistent with the results of the present study.

Results from the mediation analysis revealed that the indirect effect through physical activity identity was stronger compared to the indirect effect of perceived physical competence (see table 3). While the results from this study are not readily explainable, one may speculate these results to reflect the nature of the IPAG, which aims to measure intentions related to all forms of physical activity. It is possible that different types of physical activity require different amounts of perceived physical competence to stimulate behaviour. Results from the present study indicate that the development of adolescents' identity related to physical activity may be even more important than perceived physical competence with regards to shaping adolescents physical activity intentions equally across genders. More research is needed in order to shed light on the relationship between physical competence and identity related to physical activity intentions and behaviour.

When investigating the moderating effect of gender, the results revealed that the mediating effect of perceived physical competence on the self-determination-intention relationship was only significant in boys. Physical activity identity, on the other hand, appeared to be a strong mediator in both genders. Many studies identify girls as less physically active than boys (Anderssen & Andersen, 2004; Crocker, Eklund, & Kowalski, 2000; Kenneth R Fox & Corbin, 1989) and researches have argued for the promotion of physical literacy and confidence among girls to stimulate subsequent physical activity participation (Kenneth R Fox & Corbin, 1989; Inchley, Kirby, & Currie, 2011).

Although perceived physical competence repeatedly has been reported to be stronger among boys (Kenneth R Fox & Corbin, 1989; Inchley et al., 2011), research has, to our knowledge, not previously identified perceived physical competence to have a different impact on girls' intentions to be physically active compared to boys'. Findings from this moderation analysis are thus interesting. What is also interesting to note is that, despite this finding, the level of physical activity identity was strongly related to physical activity intentions in both genders. Our findings run somewhat similar to findings from Wilson and Muon (2008), who found that exercise identity, compared to physical competence, was more strongly correlated with physical activity. The results of this study indicate that school-based interventions with the purpose of promoting life-long physical activity equally among adolescents may more strongly aim to promote students' identity related to physical activity, rather than purely focusing on increasing students' perceptions of physical competence.

Every study must be seen in light of its strengths and limitations. One of the major strengths of this study lie in the number of respondents and response rate (1650 students = 77.8%). One limitation may be that reporting high physical activity intentions during adolescence does not single-handedly predict physically active participation in adult life. Changes in family situation, economy, infrastructure, work, health or other factors occurring over the lifespan may facilitate or constrain future physical activity behaviour and are beyond scientific control. However, it has been identified that 24 to 60% of reported intentions are followed by behaviour, with the occurrence of physical activity behaviour being dramatically lower in the group of non-intenders than in the group of intenders (de Bruijn & van den Putte, 2012; McEachan et al., 2011; Rhodes et al., 2003; Sheeran, 2002).

Further, the cross-sectional and subsequent correlational nature of the study provides some limitations regarding the interpretation of data, and inferences about cause and effects based on this data material cannot be made. This discussion is thus based on a possible causal explanation of the relationship between the constructs of interest. Experimental and longitudinal research on this topic is necessary to shed more light on issues of causality. Hence, future scientific research might require changes in the here proposed model with concern to the relationship between self-determination in PE and physical activity intentions. Also, other factors that we have not controlled for might also contribute to the self-determination - intention relationship, possibly increasing the predictive value of the proposed model.

Conclusions

Findings reveal that a high level of self-determination in PE may affect adolescents' intentions to be physically active after graduation both independently and through the strengthening of students' physical activity identity and perceived physical competence. It appears that ensuring self-determination in PE may have a potential for stimulating the development of physical activity intentions beyond the boundaries of school and across the lifespan, indicating that public health might benefit from a PE-curricula focusing on self-determination. One of the most important contributions of this study is perhaps the identification that physical activity identity mediates the self-determination – intention relationship for both boys and girls. School interventions aiming to improve

adolescents' physical activity intentions should therefore also aim at increase adolescents' physical activity identities and not solely focus on the development of perceived physical competence.

References:

- Ajzen, I. (1991). The Theory of Planned Behavior. *Organ Behav Hum Dec*, 50(179-211), 179-211.
- Ajzen, I. (2005). *Attitudes, personality, and behavior* (2.nd ed. ed.). Maidenhead, Berkshire, England: Open University Press.
- Anderson, D. F., & Cychosz, C. M. (1994). Development of an Exercise Identity Scale. *Perceptual and Motor Skills*, 78, 747-751.
- Anderssen, S. A., & Andersen, L. B. (2004). Fysisk aktivitetsnivå i Norge 2003. -Data basert på spørreskjemaet "International Physical Activity Questionnaire" (pp. 45): Sosial- og Helsedirektoratet.
- Anderssen, S. A., Kolle, E., Steene-Johannessen, J., Ommundsen, Y., & Bo Andersen, L. (2008). Fysisk aktivitet blant barn og unge i Norge - En kartlegging av aktivitetsnivå og fysisk form hos 9- og 15-åringer. Helsedirektoratet.
- Assor, A., Kapla, H., & Roth, G. (2002). Choice is good, but relevance is excellent: Autonomy-enhancing and suppressing teacher behaviours predicting students' engagement in schoolwork. *British Journal of Educational Psychology*, 72, 261-278.
- Bagøien, T. E., Halvari, H., & Nesheim, H. (2010). Self-determined motivation in physical education and its links to motivation for leisure-time physical activity, physical activity, and well-being in general. *Perceptual and Motor Skills*, 111(2), 407-432.
- Bailey, R. (2006). Physical Education and Sport in Schools: A Review of Benefits and Outcomes. *Journal of School Health*, 76(8), 397-401.
- Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, N.J.: Prentice-Hall.
- Biddle, S., & Armstrong, N. (1992). Children's physical activity: An exploratory study of psychological correlates. *Social Science and Medicine*, 34(3), 325-331. doi: [http://dx.doi.org/10.1016/0277-9536\(92\)90274-T](http://dx.doi.org/10.1016/0277-9536(92)90274-T)
- Biddle, S., & Goudas, M. (1996). Analysis of children's physical activity and its association with adult encouragement and social cognitive variables. *The Journal of School Health*, 66(2), 75-75.
- Bjørneboe, G.-E. A., & Aadland, A. A. (2003). Fysisk aktivitet i skolehverdagen. Rapport. Forebyggingsdivisjonen. Avdeling for fysisk aktivitet (pp. 61). Sosial og Helsedirektoratet. Oslo.
- Cast, A. D., & Burke, P. J. (2002). A Theory of Self-Esteem. *Social Forces*, 80(3), 1041-1068.
- Charng, H.-W., Piliavin, J. A., & Callero, P. L. (1988). Role Identity and Reasoned Action in the Prediction of Repeated Behavior. *Social Psychology Quarterly*, 51(4), 303-317.
- Chatzisarantis, N. L., Hagger, M. S., Wang, C. K., John, & Thøgersen-ntoumani, C. (2009). The Effects of Social Identity and Perceived Autonomy Support on Health Behaviour Within the Theory of Planned Behaviour. *Current Psychology*, 28(1), 55-68. doi: <http://dx.doi.org/10.1007/s12144-009-9043-4>
- Chatzisarantis, N. L. D., Biddle, S. J. H., & Meek, G. A. (1997). A self-determination theory approach to the study of intentions and the intention-behaviour relationship in children's physical activity. *British Journal of Health Psychology*, 2(4), 343-360.
- Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology*, 78(1), 98-104. doi: 10.1037/0021-9010.78.1.98
- Craig, C. L., Marshall, A. L., Sjostrom, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., . . . Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise*, 35(8), 1381-1395.
- Crocker, P. R. E., Eklund, R. C., & Kowalski, K. C. (2000). Children's physical activity and physical self-perceptions. *Journal of Sports Sciences*, 18(6), 383-394. doi: 10.1080/02640410050074313
- de Bruijn, G.-J., & van den Putte, B. (2012). Exercise promotion: An integration of exercise self-identity, beliefs, intention, and behaviour. *Eur J Sport Sci*, 12(eb4), 354-366. doi: 10.1080/17461391.2011.568631
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic Motivation & Self-determination in Human Behavior*. New York: Plenum.
- Dollman, J., Norton, K., & Norton, L. (2005). Evidence for secular trends in children's physical activity behaviour. *British Journal of Sports Medicine*, 39(12), 892-897. doi: 10.1136/bjism.2004.016675
- Fox, K. R. (2000). Self-esteem, self-perceptions and exercise. *International Journal of Sport Psychology*, 31(2), 228-240.
- Fox, K. R., & Corbin, C. B. (1989). The Physical Self-Perception Profile: Development and Preliminary Validation. *Journal of Sport and Exercise Psychology*(11), 408-430.
- Godin, G., & Kok, G. (1996). The theory of planned behavior: a review of its applications to health-related behaviors. *American Journal of Health Promotion*, 11(2), 87-98.
- González-Gross, M., & Meléndez, A. (2013). Sedentarism, active lifestyle and sport: impact on health and obesity prevention. *SEDENTARISMO, VIDA ACTIVA Y DEPORTE: IMPACTO SOBRE LA SALUD Y PREVENCIÓN DE LA OBESIDAD.*, 28, 89-98. doi: 10.3305/nh.2013.28.sup5.6869

- Grolnick, W. S., & Ryan, R. M. (1987). Autonomy in children's learning: an experimental and individual difference investigation. *Journal of Personality and Social Psychology*, 52(5), 890-898.
- Guay, F., Vallerand, R. J., & Blanchard, C. (2000). On the Assessment of Situational Intrinsic and Extrinsic Motivation: The Situational Motivation Scale (SIMS). *Motivation and Emotion*, 24(3), 175-213. doi: 10.1023/a:1005614228250
- Hagger, M. S., Chatzisarantis, N. L., & Biddle, S. J. H. (2002). A Meta-Analytic Review of the Theories of Reasoned Action and Planned Behavior in Physical Activity: Predictive Validity and the Contribution of Additional Variables. *J Sport Exercise Psy*, 24, 3-32.
- Hagger, M. S., & Chatzisarantis, N. L. D. (2009). Integrating the theory of planned behaviour and self-determination theory in health behaviour: A meta-analysis. *British Journal of Health Psychology*, 14(2), 275-302. doi: 10.1348/135910708x373959
- Hagger, M. S., Chatzisarantis, N. L. D., Culverhouse, T., & Biddle, S. J. H. (2003). The Processes by which Perceived Autonomy Support in Physical Education Promotes Leisure-Time Physical Activity Intentions and Behavior: A Trans-Contextual Model. *Journal of Educational Psychology*, 95(4), 784-795.
- Harter, S. (1988). Manual for the Self-Perception Profile for Adolescents. In U. o. Denver (Ed.): Harter, Susan.
- Harter, S., Fischer, K. W., Harter, A. B., & Serwator, R. (1999). *The construction of the self: A developmental perspective*. New York: Guilford Press.
- Hayes, A. F. (2013). *Model Templates for PROCESS for SPSS and SAS*. <http://www.afhayes.com/>.
- Hein, V., & Müür, M. (2004). The mediating role of cognitive variables between learning oriented climate and physical activity intention *International Journal of Sport Psychology*, 35(1), 60-76
- Hein, V., Müür, M., & Koka, A. (2004). Intention to be Physically Active after School Graduation and Its Relationship to Three Types of Intrinsic Motivation. *Eur Phys Educ Rev*, 10(1), 5-19. doi: 10.1177/1356336x04040618
- Huotari, P., Nupponen, H., Mikkelsen, L., Laakso, L., & Kujala, U. (2011). Adolescent physical fitness and activity as predictors of adulthood activity. *Journal of Sports Sciences*, 29(11), 1135-1141. doi: 10.1080/02640414.2011.585166
- Inchley, J., Kirby, J., & Currie, C. (2011). Longitudinal changes in physical self-perceptions and associations with physical activity during adolescence. *Pediatric Exercise Science*, 23(2), 237-249.
- Kamtsios, S. (2010). Gender differences in elementary school children in perceived athletic competence, body attractiveness, attitudes towards exercise and participation in physical activity. *International Quarterly of Sport Science*, 2, 2010.
- Kimiecik, J. C., Horn, T. S., & Shurin, C. S. (1996). Relationships among children's beliefs, perceptions of their parents' beliefs, and their moderate-to-vigorous physical activity. *Research Quarterly for Exercise and Sport*, 67(3), 324-336.
- Kvamme, O. J., Mainz, J., Helin, A., Ribacke, M., Olesen, F., & Hjortdal, P. (1998). Oversettelse av spørreskjema: Et oversett metodeproblem. [Interpretation of questionnaires. An translation method problem] *Nordisk Medicin*, 10, 363-366.
- Lavie, C. J., Thomas, R. J., Squires, R. W., Allison, T. G., & Milani, R. V. (2009). Exercise training and cardiac rehabilitation in primary and secondary prevention of coronary heart disease. *Mayo Clinic Proceedings*, 84(4), 373-383.
- Lorentzen, C. (2007). *Psychological mediators of stages of change in physical activity*. doctoral dissertation. Norwegian School of Sport Sciences
- McEachan, R. R. C., Conner, M., Taylor, N. J., & Lawton, R. J. (2011). Prospective prediction of health-related behaviours with the Theory of Planned Behaviour: a meta-analysis. *Health Psychology Review*, 5(2), 97-144. doi: 10.1080/17437199.2010.521684
- Moreno, J. A., Moreno, R., & Cervelló, E. (2007). El autoconcepto físico como predictor de la intención de ser físicamente activo. [The physical self-concept as predictor of the intention of being physically active] [abstract]. *Psicología y Salud*, 17: 261-267.
- Moreno Murcia, J. A., Huéscar, E., & Cervelló, E. (2012). Prediction of Adolescents doing Physical Activity after Completing Secondary Education. *The Spanish Journal of Psychology*, 15(1), 90-100.
- Morgan, C. F., Beighle, A., & Pangrazi, R. R. (2007). What are the contributory and compensatory relationships between physical education and physical activity in children? *Research Quarterly for Exercise and Sport*, 78(5), 407-412.
- Ommundsen, Y. (2008). Tiltak for økt fysisk aktivitet blant barn og unge (pp. 58). Helsedirektoratet: Nasjonalt folkehelsearbeid.
- Pate, R. R., Ward, D. S., O'Neill, J. R., & Dowda, M. (2007). What Are the Contributory and Compensatory Relationships Between Physical Education and Physical Activity in Children? *Research Quarterly for Exercise and Sport*, 72(5), 407-412.
- Pelletier, L. G., Fortier, M. S., Vallerand, R. J., & Brière, N. M. (2002). Associations Among Perceived Autonomy Support, Forms of Self-Regulation, and Persistence: A Prospective Study. *Motivation & Emotion*, 25(4), 279-306.

- Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, & Computers*, 36(4), 717-731.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879-891.
- Rhodes, R. E., Courneya, K. S., & Jones, L. W. (2003). Translating exercise intentions into behavior: Personality and social cognitive correlates. *J Health Psychol*, 8, 447-458.
- Rise, J., Sheeran, P., & Hukkelberg, S. (2010). The Role of Self-identity in the Theory of Planned Behavior: A Meta-Analysis. *Journal of Applied Social Psychology*, 40(5), 1085-1105. doi: 10.1111/j.1559-1816.2010.00611.x
- Rosenberg, M., Schooler, C., Schoenbach, C., & Rosenberg, F. (1995). Global Self-Esteem and Specific Self-Esteem: Different Concepts, Different Outcomes. *American Sociological Review*, 60(1), 141-156.
- Sallis, J. F. (2000). Age-related decline in physical activity: a synthesis of human and animal studies. *Medicine and Science in Sports and Exercise*.
- Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity of children and adolescents. *Medicine and Science in Sports and Exercise (Formerly : Medicine and Science in Sports)*, 32(5), 963.
- Shapka, J. D., & Keating, D. P. (2005). Structure and Change in Self-Concept During Adolescence. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*, 37(2), 83-96. doi: 10.1037/h0087247
- Sheeran, P. (2002). Intention-behavior relations: A Conceptual and Empirical Review. *Eur Rev Soc Psychol*, 12(1), 1-36.
- Shepard, R. J., & Trudeau, F. (2000). The Legacy of Physical Education: Influences on Adult Lifestyle. *Pediatric Exercise Science*, 12(1), 34.
- Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The Theory of Reasoned Action: A Meta-Analysis of Past Research with Recommendations for Modifications and Future Research. *J Consum Res*, 15(3), 325-343.
- Sonstroem, R. J. (1998). Physical self-concept: assessment and external validity. *Exercise and Sport Sciences Reviews*, 26, 133-164.
- Sparks, P., & Guthrie, C. A. (1998). Self-Identity and the Theory of Planned Behavior: A Useful Addition or an Unhelpful Artifice?1. *Journal of Applied Social Psychology*, 28(15), 1393-1410. doi: 10.1111/j.1559-1816.1998.tb01683.x
- Standage, M., Duda, J. L., & Ntoumanis, N. (2003). A Model of Contextual Motivation in Physical Education: Using Constructs from Self-Determination and Achievement Goal Theories To Predict Physical Activity Intentions. *Journal of Educational Psychology*, 95(1), 97-110.
- Standage, M., Duda, J. L., & Pensgaard, A.-M. (2005). The effect of competitive outcome and task-involving, ego-involving, and cooperative structures on the psychological well-being of individuals engaged in a co-ordination task: A self-determination approach *Motivation & Emotion*, 29, 41-68.
- Stanley, D. M., Cumming, J., Standage, M., & Duda, J. L. (2012). Images of exercising: Exploring the links between exercise imagery use, autonomous and controlled motivation to exercise, and exercise intention and behavior. *Psychology of Sport & Exercise*, 13(2), 133-141. doi: 10.1016/j.psychsport.2011.10.002
- Stets, J. E., & Burke, P. J. (2000). Identity theory and social identity theory. *Social Psychology Quarterly*, 55, 388-399.
- Vlachopoulos, S. P., Kaperoni, M., & Moustaka, F. C. (2011). The relationship of self-determination theory variables to exercise identity. *Psychology of Sport and Exercise*, 12(3), 265-272. doi: <http://dx.doi.org/10.1016/j.psychsport.2010.11.006>
- Wang, C. K. J., & Biddle, S. J. H. (2001). Young People's Motivational Profiles in Physical Activity: A Cluster Analysis. *Journal of Sport and Exercise Psychology*, 23(1).
- Webb, T. L., & Sheeran, P. (2006). Does Changing Behavioral Intentions Engender Behavior Change? A Meta Analysis of the Experimental Evidence. *Psychological Bulletin*, 132(2), 249-268.
- Wichstrøm, L. (1995). Harter's Self-Perception Profile for Adolescents: Reliability, Validity and Evaluation of the Question Format. *Journal of Personality Assessment*, 65(1), 100-116.
- Wilson, P. M., & Muon, S. (2008). Psychometric Properties of the Exercise Identity Scale in a University Sample. *International Journal of Sport and Exercise Psychology*, 6, 115-131.