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# Effects of a brief one-day autonomy-supportive intervention on improving basic psychological needs, motivation, and behaviours of physical activity among middle-school students: A multidimensional approach

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*Most of the previous self-determination theory based autonomy-supportive interventions have considered autonomy-supportive and controlling behaviours as unidimensional constructs. In this study, an intervention program for physical education (PE) teachers was conducted to test whether it would lead to changes in their students' perceptions of multidimensional autonomy-supportive (i.e., cognitive, organisational and procedural) and controlling behaviours (i.e., intimidation, negative conditional regard, controlling use of grades), psychological need satisfaction and frustration, identified regulation and intrinsic motivation, and self-reported leisure-time physical activity. Forty two middle-school PE teachers (15 men and 27 women) and their 415 students (221 boys and 194 girls) were randomly assigned into either an experimental or control group. Teachers aged between 23 and 68 years (Mage = 44.76, SD = 13.69) and students aged between 12 and 15 years (Mage = 13.16, SD = 0.80). Experimental group teachers participated in a brief one-day 8-hour Autonomy-Supportive Intervention Program for Physical Education (ASIP-PE). We found that the ASIP-PE significantly increased students' perceptions of their PE teachers' cognitive and procedural autonomy support, and experiences of need satisfaction for autonomy and competence. Also, a significant decrease was found for students' perceptions of their PE teachers negative conditional regard, intimidation and need frustration for autonomy. These findings suggest that ASIP-PE was partly effective to change students' perceptions.*

KEY WORDS: Autonomy support, Controlling behaviour, psychological needs, motivation, physical activity.

A considerable amount of evidence suggests that subjectively and objectively measured physical activity (PA) is in constant decline among children

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and adolescents (Van Hecke et al., 2016). In addition, the research data from Estonia demonstrates that children and adolescents do not meet the recommended PA levels – a minimum of 60 min of moderate-to-vigorous physical activity (MVPA; Mooses et al., 2017; Kalajas-Tilga et al., 2020). Considering that low PA is related to several health risks later in life (Janssen & LeBlanc, 2010), it is a public health priority to promote PA participation among children and adolescents. As students spend most of their daytime in school, it is potentially an environment where young people can experience a variety of physical activities which could support their overall PA. More particularly, it is physical education (PE) where teachers can communicate health-related messages to students (Shephard & Trudeau, 2000). Activities experienced and learnt during childhood may determine students' participation in PA later in life as it has been shown that PA tracks from childhood to adulthood (Jones et al., 2013). Based on the above, one may argue that one of the aims of PE lessons is to provide necessary theoretical and practical knowledge to children and adolescents to continue PA participation during their leisure time.

Self-determination theory (SDT; Ryan & Deci, 2017) is a framework of motivation that has been used in educational settings (Niemiec, Ryan, & Deci, 2009), including PE (see for review, Hagger & Chatzisarantis, 2016) to explain the influence of social factors (e.g., teachers' autonomy-supportive and controlling behaviour) on humans' (e.g., students') motivation and adaptive outcomes. According to SDT, individuals strive to satisfy three psychological needs: the need for autonomy (i.e., to feel self-determined in one's actions rather than feeling controlled), competence (i.e., to feel competent in interactions with the environment and experience opportunities in which to express their capabilities), and relatedness (i.e., to feel a secure sense of belongingness to others; Ryan & Deci, 2017). Fulfilment of these psychological needs is related to autonomous motivation (Deci & Ryan, 2008) and is found to be related to objectively measured MVPA among adolescents (Escriva-Boulley et al., 2018). Previous research has demonstrated that it is perceived autonomy-supportive behaviour that effectively fulfils psychological needs for autonomy, competence and relatedness (Kalajas-Tilga et al., 2020).

Autonomy support is described as a tone of interpersonal behaviour if someone in a position of authority (e.g., a teacher) takes the others' (e.g., students) perspective, recognises him or her feelings, and provides relevant information and opportunities for choice (Black & Deci, 2000). Stefanou and colleagues (2004) have proposed that autonomy support could be described by three distinctive dimensions (i.e., cognitive, organisational and procedural). Based on this, several recent studies (e.g., Tilga et al., 2017;

Tilga, Hein, Koka et al., 2020; Montero-Carretero & Cervelló, 2020) have adopted the multidimensional approach to autonomy-supportive behaviour as it enables to investigate specific aspects of autonomy-supportive behaviour such as organisational (e.g., allowing to choose between different exercise), procedural (e.g., explaining the effect of exercises) and cognitive autonomy support (e.g., understanding students' needs). The advantage of using a multidimensional approach in measuring autonomy support is that it provides specific information about aspects of autonomy support that need special focus. Also, previous research has demonstrated that the multidimensional autonomy-supportive scale for physical education (MD-PASS-PE; Tilga et al., 2017) could predict a significantly larger amount of variance in students' competence need satisfaction compared to the unidimensional scale Learning Climate Questionnaire (LCQ; Williams & Deci, 1996) modified for PE.

On the other hand, the teacher may also use controlling behaviour such as the threat of punishment to make students comply (Reeve, 2009). Previous research has demonstrated that it is not only increasing autonomy support but also there is a need to decrease controlling behaviour if the aim is to enhance students' adaptive outcomes such as health-related quality of life (Tilga, Hein, Koka, Hamilton et al., 2019) and intrinsic motivation (Tilga et al., 2020). Bartholomew and colleagues (2010) have proposed that controlling behaviour could be described by four dimensions (i.e., controlling use of praise and extrinsic rewards, negative conditional regard, intimidation, and excessive controlling behaviour). Based on this, Bartholomew and colleagues (2010) developed and initially validated the multidimensional controlling coach behaviours scale (CCBS) which was later adopted to the PE context by Hein and colleagues (2015). Several recent studies (e.g., Hein et al., 2018, Tilga, Hein, Koka et al., 2020) have adopted the multidimensional approach to controlling behaviour as it enables to investigate specific aspects of controlling behaviour such as intimidation (e.g., using the threat of punishment to keep students in line during a lesson), controlling use of grades (e.g., only way using grades is to make students exercise harder) and negative conditional regard (e.g., being less supportive of students when they do not exercise and perform well). The advantage of using a multidimensional approach in measuring controlling behaviour is that it provides specific information about which aspects of controlling behaviour need more focus. For example, a recent Web-Based Autonomy-Supportive Intervention Program (WB-ASIP) for PE teachers conducted by Tilga and colleagues (2019) found a significant decrease in students' perceptions of intimidation, but not in negative conditional regard and controlling use of grades in experimental group compared to the control group. Based on this, PE teachers used WB-ASIP to learn how to be less intimidating toward

their students. However, future autonomy-supportive intervention programs should focus on how to decrease PE teachers negative conditional regard and controlling use of grades.

Overall, previous intervention programs with the aim to promote autonomy-supportive behaviour in PE have been most effective (e.g., Su & Reeve, 2011; Cheon et al., 2016; Cheon et al., 2018). Based on Su & Reeve (2011), interventions that focused more on what autonomy support is, rather than how to be autonomy-supportive, were less effective. We argue that by using the multidimensional approach to autonomy-supportive and controlling behaviour the intervention will be more effective. The reason for this is that the multidimensional approach offers a specific approach with a detailed description of each dimension and changes in all those dimensions are being measured. To our best knowledge, there is only one multidimensional autonomy-supportive intervention program set up for PE teachers (Tilga, Hein, & Koka, 2019). Based on students' self-reports, this intervention was effective in enhancing PE teachers' autonomy-supportive behaviour and minimising intimidating behaviour at a one-month follow-up. Later, the analysis revealed that the WB-ASIP effects partly endured at 15-month follow-up (Tilga, Hein, & Koka, 2019). WB-ASIP for PE teachers (Tilga, Hein, & Koka, 2019) was conducted through a web-based platform as it is cost-effective, convenient, easily accessible and provides attendees anonymity (Murray, 2012).

However, WB-ASIP did not lead to significant intervention effects in experimental group students' perceptions of their PE teachers negative conditional regard and controlling use of grades compared to the control group students. Previously, Bartholomew and colleagues (2018) have reported that teachers should pay attention to their body language and to non-verbal behaviours which underpin the negative conditional regard (e.g., a glimpse of disappointment or rejecting a student when he or she has not acted as the teacher said; Pianta et al., 2002). In a face-to-face intervention program, PE teachers are able to get feedback of their body language and non-verbal behaviour which is complicated when using a web-based approach. Also, WB-ASIP did not lead to a significant change in PE teachers' controlling use of grades based on students' self-reports. Previously, it has been found that students' can be quite sensitive to their controlling behaviours, even if the incidence of the controlling behaviours rated by the observers is low (De Meyer et al., 2014). One possible reason might be that under pressure, PE teacher might resort back to controlling techniques in delivering messages about the grades to his or her students (e.g., PE teacher uses grades to make students stay focused on tasks during the lesson). Based on this, a face-to-face autonomy-supportive intervention program should be conducted to

test if it would demonstrate significant changes in students' perceptions of their PE teachers' negative conditional regard and intimidation. To our best knowledge, there are no face-to-face intervention programs for PE teachers that have adopted the multidimensional approach to autonomy-supportive and controlling behaviours. The current study was conducted to fill this gap.

## The Present Study

The current study examined the effects of a face-to-face autonomy-supportive intervention program for PE teachers. In this intervention program, PE teachers were trained to provide cognitive, organisation and procedural autonomy support to their students and avoid intimidation, negative conditional regard and controlling use of grades. Based on the above, we hypothesised the following:

(1) The experimental group students would report higher cognitive, organisational and procedural autonomy support from their PE teachers than the control group students at a one-month follow-up.

(2) The experimental group students would report lower negative conditional regard, intimidation and controlling use of grades from their PE teachers than the control group students at a one-month follow-up.

(3) The experimental group students would report higher need satisfaction for autonomy, competence and relatedness than the control group students at a one-month follow-up.

(4) The experimental group students would report lower need frustration for autonomy, competence and relatedness than the control group students at a one-month follow-up.

(5) The experimental group students would report higher identified regulation and intrinsic motivation than the control group students at a one-month follow-up.

(6) The experimental group students would report higher physical activity than the control group students at a one-month follow-up.

## Method

### Participants

In total, 42 PE teachers (15 men and 27 women) and their 415 students (221 boys and 194 girls) from 33 different schools in Estonia agreed to participate in this study. Schools were selected from 15 Estonian counties with the criterion that no more than three schools from

the same county were selected. Teachers' were on average 44.76 years old (*SD* = 13.69, range = 23-68) with 18.24 years of experience in teaching on average (*SD* = 14.63, range = 1-46). Students' were on average 13.16 years old (*SD* = 0.80, range = 12-15). All the teachers and students were provided with detailed information about the survey and voluntarily agreed to participate in this study. Also, approval from students' parents and from the local university ethical committee was obtained.

## Procedure

In this study, randomized controlled design was adopted in which teachers and their students were assigned to the experimental or control group (see Figure 1). A baseline question-

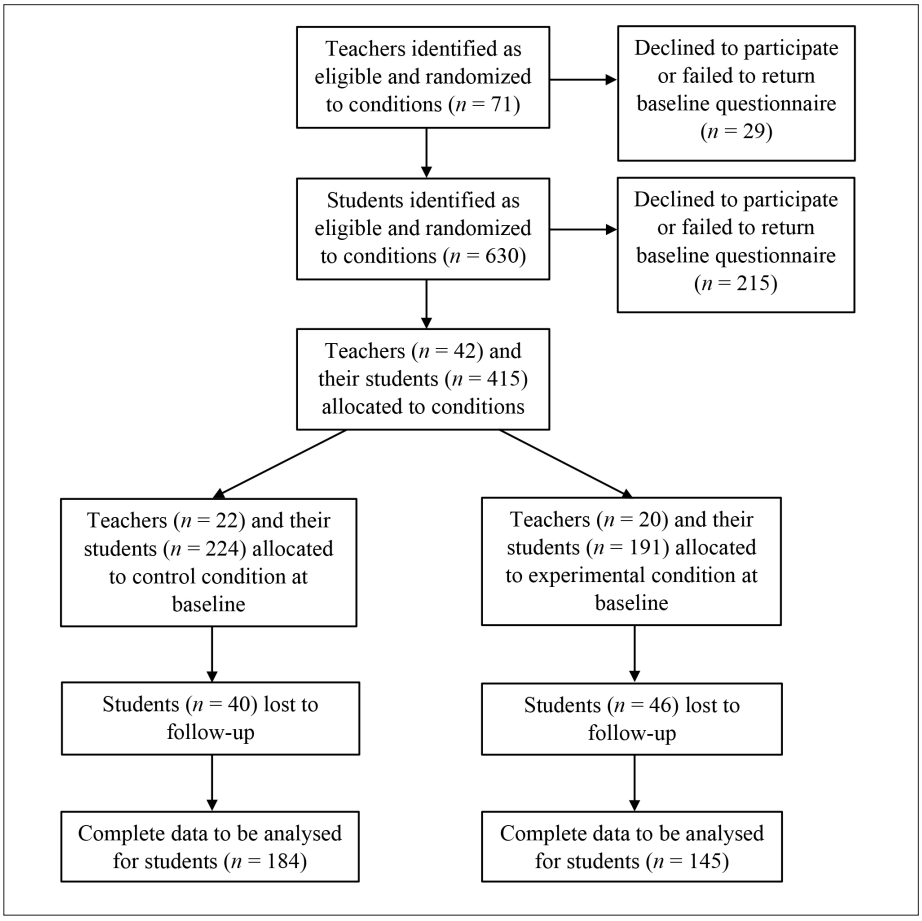


Figure 1. Participant flow chart.

naire was completed by all 415 students containing measures of students' perceptions of their PE teachers' autonomy-supportive and controlling behaviour by using a multidimensional approach, experiences of need satisfaction and need frustration, experiences of identified regulation and intrinsic motivation, and self-reported leisure-time PA. One week later, experimental group teachers participated in a one-day Autonomy-Supportive Intervention Program for Physical Education (ASIP-PE) workshop. Experimental and control group students completed a one-month follow-up questionnaire five weeks after baseline questionnaires (see Figure 2). Baseline and follow-up questionnaires were completed online and were designed so that the participants were required to complete all the items.

*Autonomy-Supportive Intervention Program for Physical Education (ASIP-PE)*

We provided the ASIP-PE within one day in an 8-hour workshop divided into four parts. The following description introduces exactly how the study material was delivered to the PE teachers during this one day workshop.

*Part 1.* The topic of the first part of the intervention was motivation. Specifically, we introduced the basics of SDT including different forms of motivational regulations (i.e., intrinsic motivation, identified regulation, introjected regulation, external regulation and amotivation). Several examples were provided to teachers for each form of motivation. After this, there was a group discussion about how teachers understood the different forms of motivation and how to identify these in a PE lesson. Teachers were also asked to fill in a questionnaire about different forms of motivation. Next, based on the learning materials, teachers had to identify each item in the questionnaire. After this, there was a group discussion about how teachers identified each item in the questionnaire and what characteristics determine each type of motivational regulation. Finally, teachers had to complete a short interactive quiz about different forms of motivation to ensure whether they understood the study materials.

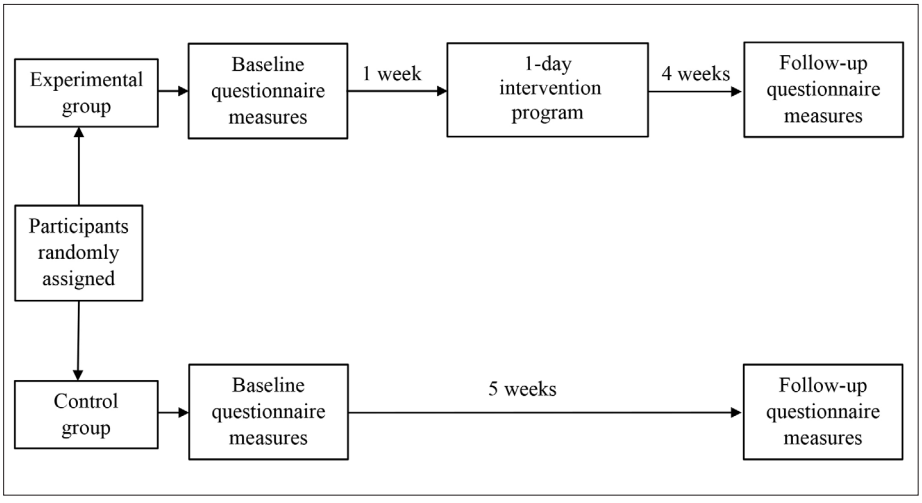


Figure 2. Overall study design.

*Part 2*. The topic of the second part of the intervention was teachers' interpersonal behaviour. Specifically, we introduced the basics of autonomy-supportive and controlling behaviours and asked teachers how they have provided autonomy support and used controlling behaviour in their current teaching practice. Next, different dimensions of autonomy-supportive behaviour (i.e., organisational, procedural and cognitive autonomy support) and controlling behaviour (i.e., negative conditional regard, excessive personal control, intimidation and controlling use of grades) were introduced to teachers. Several examples were provided to teachers for each dimension of autonomy-supportive and controlling behaviour including previously recorded video examples. After this, there was a group discussion about how to apply these behaviours in a PE lesson and what are the possible obstacles. Teachers were also asked to fill in a questionnaire about different dimensions of autonomy-supportive and controlling behaviours. Next, based on the learning materials, teachers had to identify each item in the questionnaire. After this, there was a group discussion about how teachers identified each item in the questionnaire and what characteristics determine each dimension of autonomy-supportive or controlling behaviour. Finally, teachers had to complete a short interactive quiz about different dimensions of autonomy-supportive and controlling behaviours to ensure whether they understood the study materials.

*Part 3*. In the third part of the intervention, all the teachers had to participate in two different PE lessons (each lesson lasted 45 minutes) that were delivered by our research team – one highly autonomy-supportive and another highly controlling PE lesson. Teachers were not told before the example PE lesson whether it would be highly autonomy-supportive or controlling PE lesson. The structure of both lessons was the same – participants had to complete different tasks in several preinstalled stations and the PE teacher was guiding this class. After each example lesson, there was a group discussion on what the participants noticed and how they felt during the lesson. That experience was associated with previously introduced different dimensions of autonomy-supportive and controlling behaviours and participants had to identify different aspects of behaviours they experienced in those lessons. Finally, participants were divided into small groups and were introduced to a group work. Participants had to prepare a short PE lesson where they integrate different aspects of autonomy-supportive behaviours, and then write it down on the paper.

*Part 4*. In the final part of the intervention, teachers presented these short PE lessons to other participants. PE teachers were divided into two groups and there were 10 PE teachers in each group. One PE teacher presented his/her PE lesson for 10 minutes on average. After each presentation, there was a group discussion on what the participants noticed and how they felt during the lesson. Also, different dimensions of autonomy-supportive behaviours were identified in all example lessons. Finally, there was a summarising group discussion about this whole intervention day including feedback from the participants.

## Measures

*Teachers' autonomy-supportive behaviour*. We measured teachers' autonomy-supportive behaviour by using students' self-reports on the MD-PASS-PE (Tilga et al., 2017). Items were presented by the common stem: "My PE teacher …," followed by the items tapping the three subscales: (a) cognitive autonomy support (e.g., "… is interested in what students want to do"), (b) organisational autonomy support (e.g., "… allows me to choose exercise place"), and (c) procedural autonomy support (e.g., "… offers hints how to do better"). There were five items for each subscale with responses ranging from 1 (*strongly disagree*) to 7 (*strongly*

*agree*). Previous research has supported the reliability and factor structure of the current measure (Tilga et al., 2017; Tilga, Hein, Koka et al., 2020; Montero-Carretero & Cervelló, 2020; Burgueño et al., 2020).

Teachers' controlling behaviour. We measured teachers' controlling behaviour by using students' self-reports on the CCBS (Bartholomew et al., 2010) adapted to PE (Hein et al., 2015). Items were presented by the common stem: "My PE teacher …," followed by the items tapping the three subscales: (a) intimidation (e.g., "… intimidates me into doing the things that he/she wants me to do"), (b) negative conditional regard (e.g., "… pays me less attention if I have displeased him/her"), and (c) controlling use of grades (e.g., "… only uses grades so that I stay focused on tasks during lesson"). There were three items for each subscale with responses ranging from 1 (strongly disagree) to 7 (strongly agree). Previous research has supported the reliability and factor structure of the current measure (Hein et al., 2018; Tilga, Hein, Koka et al., 2019).

*Students' need satisfaction and need frustration.* We measured students' experiences of need satisfaction and need frustration in PE by using the basic psychological need satisfaction and need frustration (BPNSNF; Chen et al., 2015) adapted for PE (Haerens et al., 2015). Items were presented by the common stem: "During the PE lesson …," followed by the items tapping the six subscales: (a) autonomy satisfaction (e.g., "… I felt that the exercises reflect what I really want"), (b) competence satisfaction (e.g., "… I felt I could successfully complete difficult tasks"), (c) relatedness satisfaction (e.g., "… I felt connected with the class members who care for me, and for whom I care"), (d) autonomy frustration (e.g., "… I felt forced to do many exercises I wouldn't choose to do"), (e) competence frustration (e.g., "… I felt like a failure because of the mistakes I made"), and (f) relatedness frustration (e.g., "… I felt the relationships I had with class members were just superficial"). There were four items for each subscale with responses ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Previous research has supported the reliability and factor structure of the current measure (Koka et al., 2019; Tilga, Hein, Koka et al., 2020).

*Students' identified regulation and intrinsic motivation.* We measured students' self-reported identified regulation and intrinsic motivation in PE by using the perceived locus of causality questionnaire (PLOCQ; Goudas et al., 1994). Items were presented by the common stem: "I do PE …", followed by the items tapping the two subscales: intrinsic motivation (e.g., "… because I enjoy PE") and identified regulation (e.g., "… because it's important to me to improve"). There were four items for each subscale with responses ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Previous research has supported the reliability and factor structure of the current measure (Kalajas-Tilga et al., 2020).

*Students' self-reported leisure-time physical activity.* We measured students' self-reported leisure-time physical activity by using the leisure-time exercise questionnaire (LTEQ; Godin & Shepard, 1985). An example item is "In the course of the past five weeks, how often on average, have you participated in moderate to vigorous physical activities during your leisure time for at least 20 minutes at a time?" There were two items with responses ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Previous research has supported the reliability of the current measure (Hagger et al., 2009).

## Data Analysis

The SPSS Version 23.0 statistical package was used to analyse the data. As the online questionnaire forced responses there were no missing data. We calculated descriptive statistics

including means and standard deviations for all the measures. Based on the recommendations by George and Mallery (2010), all the values for skewness and kurtosis were between –2 and +2 and were considered acceptable regarding normal univariate distribution. For the preliminary analysis, firstly we performed randomisation check to examine baseline differences between study groups by using the chi-square tests and independent samples *t*-tests). Secondly, we conducted attrition check to examine differences between those who remained in the study and those who were lost to follow-up. Thirdly, to assess the extent to which experimental group PE teachers had engaged with the autonomy-supportive behaviour, their written descriptions for the short PE lessons were content analysed.

For the main analysis, we conducted a series of analyses of covariance (ANCOVA) to investigate ASIP-PE effectiveness. At follow-up, dependent variables were students' experiences of PE teachers' cognitive, organisational and procedural autonomy support, intimidation, controlling use of grades and negative conditional regard, students' experiences of need satisfaction and need frustration for autonomy, competence and relatedness, students' experiences of autonomous and controlled forms of motivation, and students' self-reported leisure-time PA. At follow-up, the independent variable was the experimental or control group (i.e., study group). Baseline variables were added as a covariate in the ANCOVA analysis. To estimate the effect size for ANCOVA we used partial eta squared ($\eta_p^2$). In the present study, we applied significance level $p < .05$.

## Results

### Preliminary Analysis

*Randomization check.* The baseline characteristics of the participants are displayed in Table 1. Based on the results of the independent samples *t*-test, there were no significant differences between the experimental and control group in any of the study variable at baseline (*t*s = -1.62-1.59, *p*s > 0.107). The results of the chi-square test showed that in the proportion of boys and girls across the control and experimental group there was also no significant difference ($\chi^2 = 0.54$, $p = 0.49$).

*Attrition check.* The characteristics of the participants who were lost to follow-up and who remained in the study are displayed in Table 2. Based on the results of the independent samples *t*-test, there were no significant differences in any of the study variables (*t*s = -1.62-1.61, *p*s > 0.106) except students age ($t = -2.12$, $p = 0.036$). The results of the chi-square test showed that in the proportion of boys and girls between the students who were lost to follow-up and who remained in the study there was also no significant differences ($\chi^2 = 1.04$, $p = 0.33$).

*Manipulation check.* The content analysis of the PE teachers written descriptions for the short PE lessons revealed that all the PE teachers reported a specific plan for how they increase their autonomy-supportive behaviour and decrease controlling behaviour.

TABLE I
*Baseline Characteristics Comparisons of the experimental and control group*

| | Experimental group (n = 191) | Control group (n = 224) | | |
|---|---|---|---|---|
| **Variable** | **M (SD)** | **M (SD)** | **t or $\chi^2$ value** | **p** |
| Cognitive autonomy support | 5.37 (1.25) | 5.39 (1.21) | $t$ = -0.19 | 0.853 |
| Organisational autonomy support | 4.89 (1.33) | 4.97 (1.17) | $t$ = -0.65 | 0.519 |
| Procedural autonomy support | 5.35 (1.12) | 5.49 (1.35) | $t$ = -1.18 | 0.239 |
| Intimidation | 2.34 (1.78) | 2.06 (1.73) | $t$ = 1.59 | 0.113 |
| Negative conditional regard | 3.39 (1.76) | 3.23 (1.68) | $t$ = 0.95 | 0.342 |
| Controlling use of grades | 3.38 (1.77) | 3.19 (1.85) | $t$ = 1.03 | 0.304 |
| Autonomy need satisfaction | 4.83 (1.37) | 4.95 (1.52) | $t$ = -0.87 | 0.384 |
| Competence need satisfaction | 5.10 (1.55) | 4.89 (1.60) | $t$ = 1.40 | 0.163 |
| Relatedness need satisfaction | 5.53 (1.38) | 5.38 (1.32) | $t$ = 1.14 | 0.254 |
| Autonomy need frustration | 3.93 (1.60) | 4.01 (1.66) | $t$ = -0.56 | 0.579 |
| Competence need frustration | 3.49 (1.85) | 3.62 (1.77) | $t$ = -0.74 | 0.461 |
| Relatedness need frustration | 2.46 (1.65) | 2.74 (1.76) | $t$ = -1.62 | 0.107 |
| Identified regulation | 5.20 (1.51) | 5.25 (1.09) | $t$ = -0.44 | 0.661 |
| Intrinsic motivation | 4.97 (1.76) | 5.08 (1.31) | $t$ = -0.74 | 0.462 |
| Physical activity | 4.05 (1.51) | 4.07 (1.51) | $t$ = -0.16 | 0.873 |
| Age (year) | 13.18 (0.88) | 13.15 (0.73) | $t$ = 0.45 | 0.650 |
| Gender (male/female) | 98/93 | 123/101 | $\chi^2$ = 0.54 | 0.490 |

## MAIN ANALYSIS

*Between-group change comparisons*. The results of the ANCOVA are displayed in Table 3. The results showed that students in the experimental group reported significantly higher experiences of cognitive, $F(1, 328) = 10.36$, $p < 0.001$, $\eta_p^2 = 0.894$, and procedural, $F(1, 328) = 4.43$, $p = 0.036$, $\eta_p^2 = 0.555$, autonomy support at one-month follow-up compared to control group students. Also, need satisfaction for autonomy, $F(1, 328) = 6.21$, $p = 0.013$, $\eta_p^2 = 0.700$, and competence, $F(1, 328) = 4.39$, $p = 0.037$, $\eta_p^2 = 0.551$, were reported significantly higher by experimental group students at one-month follow-up compared to the control group students. Experimental group students perceived significantly lower intimidation, $F(1, 328) = 5.34$, $p = 0.021$, $\eta_p^2 = 0.635$, negative conditional regard, $F(1, 328) = 4.31$, $p = 0.039$,

TABLE II
*Characteristics Between The Participants Who Remained In The Study And Those Who Were Lost To Follow-Up*

| | **Remained in the study ($n$ = 329)** | **Lost in follow-up ($n$ = 86)** | | |
|---|---|---|---|---|
| **Variable** | **M (SD)** | **M (SD)** | **t or $\chi^2$ value** | **p** |
| Cognitive autonomy support | 5.38 (1.24) | 5.39 (1.19) | $t$ = -0.07 | 0.948 |
| Organisational autonomy support | 4.95 (1.28) | 4.85 (1.08) | $t$ = 0.71 | 0.481 |
| Procedural autonomy support | 5.41 (1.27) | 5.48 (1.20) | $t$ = -0.41 | 0.679 |
| Intimidation | 2.15 (1.71) | 2.34 (1.93) | $t$ = -0.87 | 0.385 |
| Negative conditional regard | 3.24 (1.72) | 3.55 (1.70) | $t$ = -1.47 | 0.141 |
| Controlling use of grades | 3.23 (1.82) | 3.47 (1.77) | $t$ = -1.10 | 0.272 |
| Autonomy need satisfaction | 4.84 (1.46) | 5.12 (1.39) | $t$ = -1.62 | 0.106 |
| Competence need satisfaction | 5.05 (1.43) | 4.74 (2.04) | $t$ = 1.61 | 0.107 |
| Relatedness need satisfaction | 5.40 (1.18) | 5.63 (1.18) | $t$ = -1.37 | 0.172 |
| Autonomy need frustration | 3.96 (1.67) | 4.03 (1.46) | $t$ = -0.36 | 0.723 |
| Competence need frustration | 3.55 (1.84) | 3.61 (1.66) | $t$ = -0.27 | 0.785 |
| Relatedness need frustration | 2.60 (1.75) | 2.65 (1.59) | $t$ = -0.23 | 0.818 |
| Identified regulation | 5.25 (1.28) | 5.13 (1.35) | $t$ = 0.74 | 0.463 |
| Intrinsic motivation | 4.99 (1.57) | 5.18 (1.38) | $t$ = -1.02 | 0.310 |
| Physical activity | 4.00 (1.54) | 4.28 (1.40) | $t$ = -1.53 | 0.126 |
| Age (year) | 13.12 (0.78) | 13.33 (0.87) | $t$ = -2.12 | 0.036 |
| Gender (male/female) | 171/158 | 50/36 | $\chi^2$ = 1.04 | 0.333 |

$\eta_p^2$ = 0.544, and autonomy need frustration $F(1, 328) = 4.18$, $p = 0.042$, $\eta_p^2$ = 0.531, at one-month follow-up compared to control group students. There were no significant group effects on students' perceived PE teachers' organisational autonomy support, controlling use of grades, students' relatedness need satisfaction, students' competence and relatedness need frustration, students' identified regulation and intrinsic motivation, and on students' self-reported PA at a one-month follow-up.

## Discussion

The current study aimed to examine whether one-day ASIP-PE workshop for PE teachers changed students' perceptions of their PE teachers'

TABLE III
*Comparisons Of The Variables Between The Experimental and control group at follow-up*

| | Experimental Group (*N* = 145) | Control Group (*N* = 184) | | | |
|---|---|---|---|---|---|
| **Variable** | **M (SD)** | **M (SD)** | **F(1, 328)** | **p** | $\eta_p^2$ |
| Cognitive autonomy support | 5.36 (0.64) | 5.13 (0.63) | 10.36 | 0.001 | 0.894 |
| Organisational autonomy support | 5.00 (1.08) | 4.83 (1.09) | 1.94 | 0.164 | 0.285 |
| Procedural autonomy support | 5.42 (0.46) | 5.31 (0.45) | 4.43 | 0.036 | 0.555 |
| Intimidation | 2.17 (0.79) | 2.37 (0.78) | 5.34 | 0.021 | 0.635 |
| Negative conditional regard | 2.81 (1.06) | 3.06 (1.05) | 4.31 | 0.039 | 0.544 |
| Controlling use of grades | 3.12 (1.02) | 3.26 (1.01) | 1.47 | 0.227 | 0.226 |
| Autonomy need satisfaction | 4.93 (0.62) | 4.75 (0.61) | 6.21 | 0.013 | 0.700 |
| Competence need satisfaction | 5.15 (0.67) | 4.99 (0.68) | 4.39 | 0.037 | 0.551 |
| Relatedness need satisfaction | 5.37 (0.69) | 5.29 (0.71) | 1.13 | 0.289 | 0.185 |
| Autonomy need frustration | 3.74 (0.75) | 3.92 (0.74) | 4.18 | 0.042 | 0.531 |
| Competence need frustration | 3.48 (0.63) | 3.55 (0.62) | 0.82 | 0.367 | 0.147 |
| Relatedness need frustration | 2.66 (0.70) | 2.73 (0.71) | 0.87 | 0.350 | 0.154 |
| Identified regulation | 5.32 (0.69) | 5.23 (0.68) | 1.31 | 0.254 | 0.207 |
| Intrinsic motivation | 5.16 (0.75) | 5.06 (0.74) | 1.66 | 0.198 | 0.251 |
| Physical activity | 4.04 (0.89) | 3.92 (0.65) | 1.24 | 0.266 | 0.199 |

multidimensional autonomy-supportive and controlling behaviour, students' experiences of need satisfaction and need frustration, students' self-reported identified regulation and intrinsic motivation, and students' self-reported PA. ASIP-PE for PE teachers was found to be partially effective to change students' perceptions at a one-month follow-up.

First, it was found that the experimental group students perceived significantly higher cognitive and procedural autonomy support from their PE teachers compared to the students in the control group. In other words, experimental group students reported after the intervention that their PE teachers focus more on understanding their needs (i.e., cognitive autonomy support) and explaining why they learn certain exercises (i.e., procedural autonomy support). This is similar to the results of an online intervention program WB-ASIP (Tilga, Hein, & Koka, 2019) that autonomy-supportive intervention for PE teachers is effective in enhancing their cognitive and procedural autonomy-supportive behaviour. ASIP-PE did not significantly change PE teachers' organisational autonomy support based on their stu-

dents' perceptions. In a study by Tilga, Hein and Koka (2019), WB-ASIP resulted in significant gains in students' perceptions of their PE teachers' organisational autonomy support at one-month follow-up (Tilga, Hein, & Koka, 2019) and at 15-month follow-up (Tilga et al., 2020). This indicates that there are advantages of using a web-based intervention program for PE teachers to learn organisational autonomy-supportive behaviour. The possible reason for this might be that WB-ASIP lasted for four weeks and study materials were all the time available online for the PE teachers. Also, the change in organisational autonomy support in the WB-ASIP (Tilga, Hein and Koka, 2019) was smallest compared to the change in cognitive and procedural autonomy support.

Second, it was found that experimental group students perceived significantly lower intimidation and negative conditional regard from their PE teachers compared to the control group students. In other words, experimental group students reported that their PE teachers were less shouting at them (i.e., intimidation) and were more supportive of students when they did not exercise or perform well (i.e., negative conditional regard). This finding is similar to a study by Tilga, Hein and Koka (2019), in which WB-ASIP led to changes in students' perceptions of their PE teachers intimidating behaviour. However, WB-ASIP did not significantly decrease students' perceptions of their PE teachers negative conditional regard (Tilga, Hein, & Koka, 2019). The reason why ASIP-PE changed PE teachers' negative conditional regard might be that PE teachers used ASIP-PE in learning how to avoid unfriendly behaviour with students if they do something different as their PE teachers expect them to do. It has been argued by Bartholomew et al. (2018) that teachers should pay attention to their body language and to non-verbal behaviours which underpin the negative conditional regard (e.g., a glimpse of disappointment or rejecting a student when he or she has not acted as the teacher said; Pianta et al., 2002). A face-to-face intervention might be more informative about the negative consequences of the negative conditional regard which the online intervention WB-ASIP could not provide as indicated by students' self-reports. Finally, based on students' self-reports, ASIP-PE and WB-ASIP did not significantly change PE teachers' controlling use of grades. One possible reason for this might be that PE teachers still had to give grades to their students. Previously it has been found that students' can be quite sensitive to the teachers' controlling behaviours, even if the incidence of the controlling behaviours rated by the observers is low (De Meyer et al., 2014). However, PE teachers do not have to use controlling behaviour to evaluate their students', but under pressure, PE teacher might resort back to controlling techniques in delivering messages about the grades to their

students (e.g., PE teacher uses grades to make students stay focused on tasks during the lesson). Still, the results of the ASIP and WB-ASIP demonstrated a small trend for a decrease in students' self-reported controlling use of grades, however, not statistically significant. Thus, future autonomy-supportive intervention programs for PE teachers should use a combined intervention program of ASIP and WB-ASIP to test whether there would be an intervention effect on students' controlling use of grades.

Third, it was found that the experimental group students reported significantly higher need satisfaction for autonomy and competence compared to the control group students. The reason for this might be that the experimental group PE teachers effectively learned how to provide cognitive and procedural autonomy support to their students. This is in line with previous research demonstrating that cognitive autonomy support is a significant predictor of autonomy and competence need satisfaction (Tilga et al., 2017). However, in this study, we did not find significant group effects for the experimental group students' need satisfaction for relatedness. This is in line with Lonsdale et al. (2013), possibly because the aim during this intervention was rather on providing autonomy support and decreasing controlling behaviour than on initiating cooperation. However, WB-ASIP demonstrated significant gains in experimental group students' need satisfaction for relatedness (Tilga, Hein, & Koka, 2019). This indicates that a web-based intervention program might have some advantages for PE teachers in supporting their students' need for relatedness compared to the face-to-face intervention program. The possible reason for this might be that the online intervention program participants had to watch more video examples, having a third-person view, and by this, they might have a better overview how each person might experience different situations.

Fourth, it was found that the experimental group students reported significantly lower need frustration for autonomy compared to the control group students. After the intervention, experimental group students reported that their PE teacher says less that they simply must do exercises in their PE class. The reason for this might be that the experimental group PE teachers effectively learned how to avoid negative conditional regard and intimidation toward their students. For example, experimental group teachers were told to less intimidate students into doing the things they want them to do (i.e., intimating behaviour). This finding is similar to the previous work by Cheon and colleagues (2018) that autonomy-supportive intervention program decreased students' need frustration. However, in this study, a change in psychological need frustration for autonomy, competence and relatedness was measured. The current finding is also in line with a previous interven-

tion study by Tilga, Hein and Koka (2019) that students in the experimental group reported significantly lower need frustration for autonomy at one-month follow-up compared to the control group. However, ASIP-PE did not demonstrate significant changes in students' experiences of competence and relatedness need frustration. One possible reason for this might be that there were no significant changes in students' perceptions of their PE teachers' controlling use of grades. For example, if PE teachers are controlling their students with grades, then it might be that the students still feel that their need for competence is frustrated.

Fifth, no significant changes were found in the experimental group students' identified regulation and intrinsic motivation compared to the control group students at a one-month follow-up. The possible reason for this might be that the time was too short to see changes in students' motivation. This is also in line with previous studies that there were no significant changes in students' perception of intrinsic motivation (Tilga, Hein, & Koka, 2019) and autonomous motivation (Lonsdale et al., 2013) at follow-up compared to the control group students. However, in a recent study by Tilga and colleagues (2020), it was found that at 15-month follow-up experimental group students did report significantly higher intrinsic motivation compared to the control group students. Thus, follow-up studies with a longer period are suggested to examine whether ASIP-PE has long term effects on students' perceptions of their identified regulation and intrinsic motivation. However, in a recent study by González-Cutre and colleagues (2018) significant intervention effects were found on students' intrinsic regulation and identified regulation. The reason for this might be that in addition to PE teachers also parents were involved in the intervention program.

Sixth, no significant changes were found in the experimental group students' PA compared to the control group students at a one-month follow-up. It might be the case that the development of students' PA requires a significant increase in students' intrinsic motivation and identified regulation. In a previous study by Kalajas-Tilga and colleagues (2020), it was found that intrinsic motivation is a significant predictor of MVPA among adolescents. In the current study, there were also no significant changes in the students' perceptions of their identified regulation and intrinsic motivation. A recent school-based motivational intervention was effective in changing students' leisure-time PA (González-Cutre et al., 2018). However, González-Cutre and colleagues (2018) recruited not only PE teachers but also the students' parents to change students' behaviour. Based on this, future research should aim to recruit PE teachers and students' parents to autonomy-supportive intervention programs to gain significant effects on students' behaviour.

*Limitations and future directions*

Although the current study was effective to demonstrate several changes in students' perceptions, some limitations need to be acknowledged. To evaluate intervention effects, we used only students' self-reports and not objective observations by trained evaluators as in some previous studies (e.g., Cheon et al., 2012). However, the objective observations may lead to the Hawthorne observational effect (McCambridge, Witton, & Elbourne, 2014). Future studies could consider videotaping PE lessons to provide objective observation. One important limitation of the current study is that we used a self-reported questionnaire to measure PA that might not reflect the actual PA. Previous research has demonstrated that PA measured by self-reports versus accelerometers can result in substantially different results regarding the relationships between PA and psychosocial variables (Kavanaugh et al., 2015). Future research could use accelerometers to measure objective changes in students' PA. Another limitation is that students who remained in the study were significantly younger than those who were lost to follow up. Therefore, our results might better describe younger students (i.e., 6$^{th}$-grade students) and are less generalizable to older students (i.e., 8$^{th}$-grade students). Finally, our study was pitched toward the affective domain by not measuring students' learning behaviour that future studies might do. For example, measuring students' time on task and intensity of PA during PE might be informative about intervention effects.

## Conclusions

Based on students' self-reports, PE teachers used ASIP-PE intervention to gain knowledge of how to provide more cognitive and procedural autonomy support and avoid negative conditional regard and intimidation toward their students' in PE class. The current research demonstrates that ASIP-PE is effective to increase students' perceptions of their PE teachers cognitive and procedural autonomy-supportive behaviour, decrease negative conditional regard and intimidation, increase experiences of students' need satisfaction for autonomy and competence, and decrease experiences of need frustration for autonomy. This study provides initial evidence that ASIP-PE might be able to change PE teachers' behaviour toward their students and therefore this will result in students' perceptions of psychological needs and motivation in PE.

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