A classroom-based intervention to help teachers decrease students' amotivation

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ABSTRACT

Student amotivation is a state of motivational apathy in which students harbor little or no reason to engage in classroom learning activities; it is a motivational deficit that is strongly associated with maladaptive functioning. Using a self-determination theory framework, we designed and implemented a teacher-focused intervention to help experienced teachers develop a motivating style that could increase students' psychological need satisfaction and decrease their psychological need frustration, which are the twin causes of level of amotivation. Sixteen secondary school physical education teachers were randomly assigned into either an experimental or a control group, and their 598 students reported their need satisfaction, amotivation, and engagement at the beginning, middle, and end of a semester. Compared to teachers in the control group, teachers in the experimental group were scored by objective raters and perceived by students as more autonomy supportive and as less controlling. The students of the teachers in the experimental group reported greater psychological need satisfaction, greater engagement, and lesser amotivation than did students of teachers in the control group. We conclude that the intervention was successful in helping teachers decrease student amotivation.

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1. Introduction

In some subject matters, students lack the motivation they need to engage in and benefit from the teacher's instruction. This lack of motivation can be traced partly to students' pessimistic domain-specific ability beliefs, partly to their lack of desire to exert effort in the domain, partly to their low value placed on activities in the domain, and partly to their perception that the learning activities being offered are simply unappealing things to do (Cheon & Jang, 2012; Green-Demer, Legault, Pelletier, & Pelletier, 2008; Ntoumanis, Pensgaard, Martin, & Pipe, 2004; Shen, McCaughtry, & Martin, 2008; Shen, Wingert, Li, Sun, & Rukavina, 2010b). These academic beliefs and perceptions are strongly associated with maladaptive classroom functioning and negative student outcomes (e.g., classroom disengagement, superficial learning strategies, poor learning, low performance, and school drop-out; Baker, 2004; Ntoumanis, 2001; Ntoumanis et al., 2004; Pelletier, Dion, Tuson, & Green-Demers, 1999; Pelletier, Fortier, Vallerand, & Briere, 2001; Shen, Wingert, Sun, & Rukavina, 2010a). Recognizing the

maladaptive nature of these beliefs and perceptions, our goal in the present study was to implement an experimentally-designed, classroom-based intervention to help teachers offer a classroom motivating style that could decrease students' class-specific amotivation.

1.1. Amotivation

Amotivation literally means "without motivation" (Legault, Green-Demers, & Pelletier, 2006). It is a state of motivational apathy in which students harbor little or no reason (motive) to invest the energy and effort that is necessary to learn or to accomplish something. During class, the amotivated student tends to sit passively, sleep (or skip class), or just act as if he or she is participating, as the student merely "goes through the motions" of classroom work rather than really engaging himself or herself in learning activities.

Early empirical work on the amotivation construct conceptualized it as a one-dimensional phenomenon that represented the absence of any intentionality toward action (Pelletier et al., 2001; Vallerand, Fortier, & Guay, 1997). Within the self-determination theory tradition, amotivation was contrasted with both autonomous motivation and controlled motivation (Ryan & Deci, 2000). Autonomous motivation, which is characterized by high levels of

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intrinsic motivation and identified regulation, represents behavioral intentions rooted in wanting to act out of interest and enjoyment (intrinsic motivation) or a sense of value and importance (identified regulation). Controlled motivation, which is characterized by high levels of external regulation and introjected regulation, represents behavioral intentions rooted in wanting to act to attain an attractive or to avoid an unattractive incentive (external regulation) or to comply with pressuring internal demands (e.g., perfectionism) and emotions (introjected regulation). With amotivation, the student has no reason to act—not intrinsic motivation, identified regulation, external regulation, or introjected regulation. The student acts without intentions or reasons (e.g., "I go to school, but I don't know why.") or fails to initiate action at all (e.g., "I don't see why I should have to participate in class.").

Pelletier et al. (1999) argued that a one-dimensional conceptualization was insufficient to represent the motivational deficits students experience and display during a state of amotivation. Other researchers subsequently validated the following four-dimensional conceptualization of the construct (Green-Demer et al., 2008; Legault et al., 2006; Shen et al., 2010b): *Amotivation—low ability*, which represents the belief that one lacks sufficient ability or aptitude to perform a particular behavior or task; *amotivation—low effort*, which represents a lack of desire to expend the energy necessary to enact a particular behavior or task; *amotivation—low value*, which represents a lack of perceived importance or usefulness within a particular behavior or task; and *amotivation—unappealing tasks*, which represents the perception that the task at hand is simply a personally unappealing or unattractive thing to do. This multidimensional conceptualization proved to be superior to the former one-dimensional characterization because it could explain how even students with the requisite competence and personal control beliefs could nevertheless still experience amotivation—namely, because of a lack of energy, a lack of valuing, or a perception that the task was not worth doing.

1.2. Self-determination theory

In self-determination theory, students are said to possess the three psychological needs of autonomy, competence, and relatedness (Ryan & Deci, 2000). Collectively, these three needs provide the psychological nutriments necessary for learning, positive classroom functioning, and psychological well-being (Jang, Reeve, Ryan, & Kim, 2009; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004).

The primary reason students experience amotivation is, according to a self-determination theory perspective, because they first experience psychological need frustration (Deci & Ryan, 2000). Having one's psychological needs for autonomy and competence thwarted and frustrated generates immediate negative affect (e.g., anger, anxiety; Assor, Kaplan, Kanat-Maymon, & Roth, 2005) and lingering non-self-determined motivation (i.e., amotivation; Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Gunnell, Crocker, Wilson, Mack, & Zumbo, 2013). Students' need frustration occurs mainly when teachers are highly controlling (Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2010; Reeve, 2009)—when teachers refuse to take their students' perspectives, yell, assert power, use intimidation tactics, intrude into and try to change students' beliefs and behaviors, and otherwise pressure and coerce students into compliance.

Recognizing these interrelations among a teacher's controlling motivating style, students' reactive need frustration, and students' developing multiple manifestations of amotivation in that class (e.g., low ability, low value), we propose that the classroom antidote to amotivation is for teachers to offer a motivating style capable of involving, vitalizing, and satisfying students' psychological needs. Students experience need satisfaction when teachers are highly autonomy supportive—when teachers eagerly embrace the students' perspectives, welcome their thoughts, feelings, and suggestions into the flow of instruction, provide explanatory rationales for their requests, offer interesting and important learning activities, and acknowledge students' complaints and expressions of negative affect as valid and understandable ways of feeling during the learning process. A motivating style that relies on these sorts of autonomy-supportive behaviors is highly capable of involving, vitalizing, and satisfying students' psychological needs and of creating opportunities for students to develop and embrace autonomous forms of classroom motivation (high intrinsic motivation, high identified regulation; Cheon & Reeve, 2013; Cheon, Reeve, & Moon, 2012).

1.3. Student engagement

Motivation is a private student experience, one that is largely invisible to the teacher and is therefore something that needs to be inferred from other more visible student indicators, such as engagement (Lee & Reeve, 2012). Students' psychological need satisfaction is highly positively correlated with students' classroom engagement, whereas students' amotivation is highly negatively correlated with students' classroom engagement (Aelterman et al., 2012). Recognizing this, we included a measure of students' classroom engagement as a secondary outcome to track changes in the quality of students' motivation over the course of the semester.

Engagement refers to a student's active involvement in a learning activity (Christenson, Reschly, & Wylie, 2012). It functions as a student-initiated pathway to highly valued educational outcomes, such as achievement (Jang, Kim, & Reeve, 2012; Ladd & Dinella, 2009). It is a multidimensional construct consisting of four distinct, yet intercorrelated and mutually supportive, pathways to academic progress—namely, its behavioral, emotional, cognitive, and agentic aspects (Christenson et al., 2012; Fredricks, Blumenfeld, & Paris, 2004; Reeve, 2013). Behavioral engagement refers to how involved the student is in the learning activity in terms of attention, effort, and persistence; emotional involvement refers to the presence of positive emotions during task involvement such as interest and to the absence of negative emotions such as anxiety; cognitive engagement refers to how strategically the student attempts to learn in terms of employing sophisticated rather than superficial learning strategies; and agentic engagement refers to how proactively students contribute into the flow of instruction they receive, as by frequently letting the teacher know what they need, want, and are interested in. Individually and collectively, these four aspects of engagement are strong predictors of the academic progress students make (Reeve, 2013; Reeve & Tseng, 2011).

1.4. Autonomy-supportive intervention program (ASIP) for teachers

Teachers can learn how to be more autonomy supportive toward students (Reeve, 2009). Theory-based teacher training interventions have been developed and implemented in classroom settings in which researchers provide experienced teachers with the knowledge, modeling, scaffolding, instructional strategies, and how-to skills they need to become more autonomy-supportive and less controlling during instruction (Chatzisarantis & Hagger, 2009; Cheon & Reeve, 2013; Cheon et al., 2012; deCharms, 1976; Reeve, Jang, Carrell, Jeon, & Barch, 2004; Tessier, Sarrazin, & Ntoumanis, 2010). Generally speaking, what these empirical studies show is that these teacher-training programs have been successful and that they have been successful for teachers with pre-existing controlling, neutral, and autonomy-supportive styles. Specifically, students of the participating teachers rate their teachers as significantly more autonomy supportive and less controlling than do students of non-participating teachers. Further, when trained objective raters score participating teachers' classroom

motivating styles, they rate participating teachers as significantly more autonomy supportive and less controlling than they rate non-participating teachers.

Su and Reeve (2011) conducted a meta-analysis of 19 autonomy-supportive intervention studies (10 of which involved classroom teachers) to explain why some autonomy-supportive interventions were more effective than were others. These researchers identified six design features that were common to the most effective autonomy-supportive intervention programs (ASIPs). Benefiting from this knowledge, we designed an intervention program to capitalize on all six of these design characteristics.

First, we offered a teacher intervention that featured the full range (rather than only a subset) of the five previously-validated autonomy-supportive instructional behaviors for teachers to emulate and enact, including vitalizing rather than neglecting students' inner motivational resource (e.g., using instructional strategies to involve a psychological need, to piqué curiosity, or to introduce an intrinsic goal[1]), relying on informational rather than on controlling language (e.g., saying "you may" rather than "you have to"), providing rather than neglecting explanatory rationales for teacher requests and assignments, displaying patience rather than pressuring students to produce the right answer or a prescribed behavior, and acknowledging and accepting students' complaints and expressions of negative affect rather than trying to change it into something more acceptable to the teacher. Second, we delivered the intervention in multiple parts or sessions, rather than offering it in only a single or one-shot intervention experience. Third, we supplemented the training experience with a group discussion component where participants could express their concerns, doubts, and reservations and also share ideas and exchange instructional strategies. Fourth, during the intervention, we emphasized not only content (what to do) but also skill-based training (how to do it). That is, we devoted as much time to helping teachers develop, practice, and refine the skill that is autonomy-supportive instruction as we did to describing what autonomy-supportive instructional behaviors are and explaining why they are important and beneficial. Fifth, we acknowledged and addressed teachers' pre-training beliefs that might otherwise, if unaddressed, conflict with the training message (e.g., autonomy support won't work with my students, it is unrealistic, it is not what most teachers in my school do). Sixth, a member of the research team visited each teacher's classroom once during the semester to observe the classroom dynamics and to initiate a one-on-one post-class discussion to provide supplemental support. In Section 2, we identify how we integrated all six design characteristics into our ASIP.

1.5. Physical education in Korea

We conducted our intervention in the domain of physical education and in the nation of Korea. As to the domain of physical education, we chose this subject matter partly because amotivation is a heavily studied and well understood phenomenon in physical education (PE) classes (Cox, Smith, & Williams, 2008; Lim & Wang, 2009; Londale, Sabiston, Taylor, & Ntoumanis, 2011; Ntoumanis, 2001; Ntoumanis, Barkoukis, & Thøgersen-Ntoumani, 2009; Shen et al., 2010a) and partly because of the unique status of the course within Korean education. The Korean secondary educational system is structured around the major subject areas of

Korean (Language), English, Math, and Science, and students take courses in these subject areas every day. These subject areas are heavily emphasized and prioritized because of their centrality to the university entrance examination, which is a post-graduation, high-stakes, standardized test that determines how prestigious a university each student will be invited to enter. In contrast to these major subject areas, the content of the PE course is not included on the university entrance examination and PE courses are not offered on a daily basis, though PE is a mandatory course. These circumstances explain why many (most) students, parents, teachers, and principals share a network of beliefs that foster relative amotivation toward PE.

As to the nation of Korea, student autonomy is not as valued in the Korean culture as it is in the West (Kim & Park, 2006). In Korean secondary school education, classroom learning environments are almost always heavily teacher-centered, as students are placed into a role in which they receive lectures, study hard to memorize what they are told, and prepare for normatively-graded multiple-choice summative exams. Longer-term, an ever-present cultural pressure to produce a very high score on the university entrance exam is the defining characteristic of Korean adolescents' academic motivation (Bong, Kim, et al., 2008). As a result, Korean secondary school students typically report high levels of controlled motivation and low levels of autonomous motivation, at least in comparison to secondary school students in the West (Jang et al., 2009).

1.6. Hypotheses

We tested two groups of hypotheses. The first concerned hypothesized benefits to the teachers who participated in ASIP. The second concerned hypothesized benefits to students of the teachers who participated in ASIP.

Hypothesis 1 (*Teacher benefits*). We expected that teachers who participated in ASIP would become significantly more autonomy supportive and significantly less controlling toward students during instruction. Specifically, we hypothesized that teachers who participated in ASIP, compared to a group of teachers who were randomly assigned to a control group, would be (1) scored by trained raters as enacting significantly more autonomy-supportive behaviors during instruction, (2) rated by their students as significantly more autonomy supportive, and (3) rated by their students as significantly less controlling.

Hypothesis 2 (*Student benefits*). We expected that students of the teachers who participated in ASIP would report significantly greater psychological need satisfaction, improved classroom functioning, and lower amotivation. Specifically, we hypothesized that students of the teachers who participated in ASIP, compared to students of the teachers in the control group, would report (1) significantly greater autonomy and competence psychological need satisfaction, (2) significantly greater classroom engagement, and, most importantly, (3) significantly lesser amotivation and that this would be true for all four aspects of amotivation (low ability, low effort, low value, unappealing tasks).

1.7. Social validity of ASIP

Social validity addresses the question of whether the intervention program worked as advertised (Page & Thelwell, 2012). To allow teachers to tell us whether ASIP worked as advertised, we asked participating teachers to rate the extent to which they felt that the intervention helped them improve their motivating style, how satisfied they were with the intervention program, and how

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[1] To clarify what we mean by the concept of an instructional strategy that can vitalize students' inner motivational resources, we provide several examples here. Teachers might involve the psychological need for autonomy by offering students an opportunity for self-direction within the learning activity. Teachers might involve the psychological need for competence by offering students an optimal challenge to strive for. Teachers might piqué students' curiosity in a topic by asking a curiosity-inducing question. And, students might promote an intrinsic goal by framing the learning activity as an opportunity for personal growth or skill development. For a discussion of these strategies with specific classroom examples, see Reeve and Cheon (2014).

useful they believed it to be in terms of producing positive changes in them and their students. We also invited participating teachers to complete an open-ended survey to tell us in their own words how they reacted to and did or did not benefit from the intervention experience.

2. Method

2.1. Participants

2.1.1. Teacher participants

The sample of teachers included 16 participants, 5 women and 11 men. All 16 participating teachers were certified as physical education teachers, and they taught in 16 different schools (11 middle schools, 5 high schools) in Kyoungido, South Korea. Each teacher taught between five and eight classes, with class sizes that ranged from 35 to 40 students. For the purposes of our study, we randomly selected one section from each teacher's schedule of classes for inclusion in the study (and did not collect data from the teacher's remaining sections). Teachers averaged 33.5 years of age (range, 30–39) and averaged 5.5 years of teaching experience (range, 2–10). The content of the PE course curriculum was prescribed and standardized by the Korean National and Educational Curriculum (KNEC), and it revolved around a variety of sport-based activities such as volleyball, table tennis, rope jumping, basketball, badminton, softball, and soccer. Classes took place either in a gym or an outside stadium on the school grounds. All 16 teachers who consented to participate were ethnic Korean, received their principal's consent to participate, and received the equivalent of $50 in appreciation of their participation. The monetary award was not announced during the recruitment process but, instead, was given to each teacher at the conclusion of the study as an expression of gratitude. No teacher dropped out over the course of the semester-long study, so the teacher retention rate was 100%.

2.1.2. Student participants

The student participants who consented to complete the study questionnaire during the first week of classes (T1) were 628 ethnic Korean students. During the second wave of data collection, 621 of the original 628 student participants agreed to complete the questionnaire (retention rate = 98.9%). Of the 7 T1 dropouts, 4 were from the experimental group while 3 were from the control group. The 621 persisting students from T1 did not differ significantly from the 7 T2 dropout students on any T1 student-assessed dependent measure, all $ts < 1$, a result that suggests that student drop out occurred for random, rather than for systematic, reasons. During the third wave of data collection, 598 of the 621 students from the first two waves of data collection agreed to complete the questionnaire. Of the 23 T2 dropouts, 15 were from the experimental group while 8 were from the control group. The 598 persisting student participants from T3 did not differ significantly from the 23 T3 dropouts on any of the student-assessed T1 or T2 dependent measures, all $ts < 1.73$. This final sample of 598 student participants represented a retention rate of 95.2% (598/628) and consisted of the following: 321 (54%) females and 277 (46%) males; 411 (69%) middle-school and 187 (31%) high-school students; and 292 (49%) students in the experimental and 306 (51%) in the control group.

2.2. Procedure

Two months prior to the beginning of the study, we contacted all 24 PE teachers located in the Kyoungido area (which surrounds Seoul) and invited them to participate in the study. Sixteen teachers agreed to participate, while eight declined the invitation, usually because they cited competing and highly time-consuming school-related duties that would not allow them sufficient time to participate. The 16 PE teachers were then randomly assigned into either the experimental ($n = 8$) or control ($n = 8$) condition. The full procedural timeline for the intervention program and data collection over the course of the spring semester appears in Fig. 1. It is worth noting that, in the Korean education system, spring is the first semester of the academic year and it runs from the beginning of March to the middle of July.

As seen in Fig. 1, the teachers in the experimental group were invited to participate in a three-part intervention (described in the next section), while teachers in the control group were placed on a waiting list to receive the same teacher-training intervention after the study concluded. Parts 1 and 2 took place on the same day in mid-February, 2-weeks before the start of the semester. Part 3 took place during the ninth week of classes, the week after the midterm exam. During the first week of classes, the students of the 16 participating teachers completed the experimental questionnaire to establish T1 baseline scores for the study's dependent measures. Students completed the study questionnaire for a second time during week 9 (May) and for a third and final time during week 17 (July). Trained raters twice observed and scored each teachers' autonomy-supportive vs. controlling instructional behaviors during a class period. The first visit occurred at week 6 (April) and the second visit occurred at week 14 (June). Three weeks after the semester ended (August), teachers in the experimental group were asked to complete the questionnaire assessing the social validity of the intervention program.

2.3. Autonomy-supportive intervention program (ASIP) for PE teachers

The autonomy-supportive intervention program (ASIP) was delivered in three parts. Collectively, the 3-part ASIP was designed to help teachers become more autonomy supportive toward students by adjusting the delivery of classroom instruction so that teachers relied more on autonomy-supportive instructional strategies and less on controlling strategies.

Part 1 was a 2-h morning workshop that took place in February, 2 weeks before the start of the semester and during the winter break. It began with a pair of personalized warm-up activities designed to encourage teachers to reflect on their own motivating style toward students. For the first activity, teachers read both a highly autonomy-supportive and a highly controlling teaching scenario and then rated how much each scenario did or did not describe their own teaching style (from Reeve et al., 2014, Table 1, p. 96). For the second activity, teachers indicated the extent to which they currently relied on four-specific controlling teaching strategies—including negative conditional regard, controlling rewards, intimidation, and excessive personal control (from Bartholomew et al., 2010). A media-rich PowerPoint presentation was then delivered by the authors, and it featured information on the nature of student motivation, teachers' motivating styles, empirical evidence on the benefits of teacher-provided autonomy support and the costs of teacher control, and PE-specific classroom examples of teacher-provided autonomy support. The presentation included a series of brief videotapes showing PE teachers delivering instruction in an autonomy-supportive way. At the end of Part 1, a PE teacher who had participated in a previous autonomy-supportive intervention program addressed teachers as a guest speaker. He passed along his experiences in trying to expand his motivating style to include a greater reliance on autonomy-supportive strategies, described what he now did differently in the classroom, and launched a group-based discussion about participating teachers' concerns, doubts, and reservations. After the group discussion, Part 1 ended and participants took a 15-min coffee and snack break.
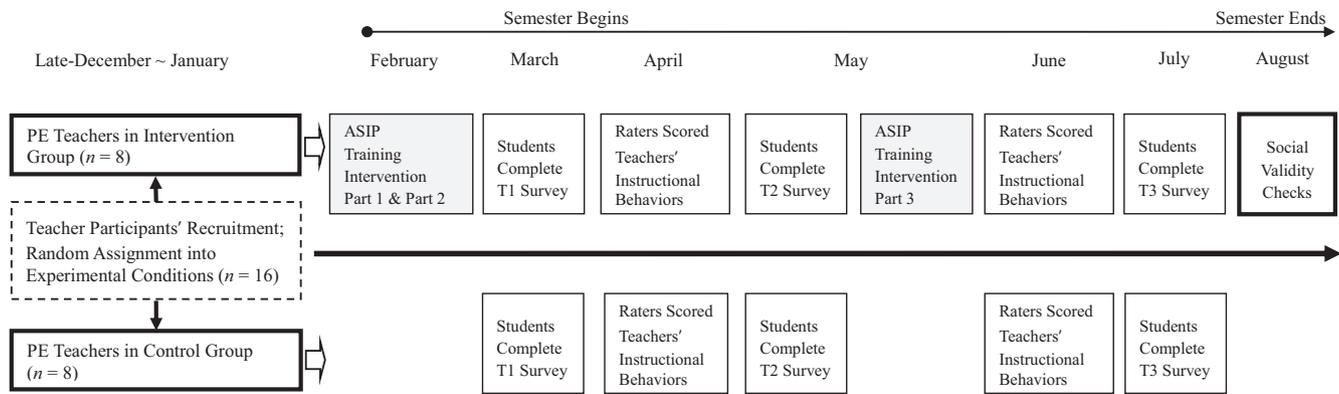
Fig. 1. Procedural time line for the events included in the delivery of the intervention and in the data collection.

Part 2 was a 2-h afternoon group discussion. It too began with a reflective warm-up activity in which teachers read four brief case studies that depicted prototypical examples of amotivated PE students (from Shen et al., 2010b). A group discussion followed, and it was stimulated by three prepared questions, such as "How can PE teachers motivate and engage amotivated students in an autonomy-supportive way?" The group discussion was designed as an opportunity for teachers to voice their concerns, identify potential obstacles to enacting autonomy-supportive instruction, and critique and improve upon the specific autonomy-supportive instructional strategies they heard from the experimenters, guest speaker, and peers. All eight teachers participated for the entirety of both Parts 1 and 2.

After Part 2 ended and before Part 3 began, teachers returned to their classrooms to initiate autonomy-supportive teaching and to refine their autonomy-supportive instructional strategies. During this time, we did not provide teachers with specific "do this" advice. Instead, we introduced, modeled, and provided examples of the five previously-validated autonomy-supportive instructional behaviors and then suggested that teachers adapt the five acts of instruction to their own instructional situation. For instance, we did not provide teachers with scripted explanatory rationales but, instead, recommended that they make a specific effort to communicate the reason behind each teacher request.

Part 3 took place the week after the mid-term examination, a time that we knew in advance would be amenable to teachers' schedules. All eight teachers were again able to participate (100% attendance rate). Part 3 began with a brief PowerPoint presentation of autonomy-supportive teaching that reviewed and extended the presentation from Part 1. The central activity was a teacher-centered group discussion that focused on the practicality and effectiveness of teachers' actual efforts to increase their usage of autonomy-supportive instructional strategies and to decrease their usage of controlling instructional strategies. Teachers described their autonomy-supportive instructional behaviors, reported on their students' reactions to autonomy-supportive teaching, and shared and exchanged what worked best, especially those that were specific to a particular sport (e.g., "To start the badminton class, I...") or to a particular student behavior (e.g., "When students were just sitting passively on the sidelines, I...").

The first author also visited and observed one class for each teacher in the experimental group so that he could offer an individualized commentary based on what he observed. The purpose of this visitation and observation was not to rate or evaluate the teacher's instructional behaviors but, rather, to support the teacher's effort to make the professional transition from being a mostly controlling teacher to becoming a significantly more autonomy-supportive teacher.

Overall, the design and implementation of each aspect of the intervention was autonomy supportive, and we closely monitored teachers' need satisfaction, engagement, and well-being throughout the semester. In the current investigation we did not measure these potential teacher benefits, but in another large-scale intervention we did. In Cheon, Reeve, Yu, and Jang (2014), we designed and implemented a semester-long, experimentally-designed autonomy supportive intervention program to assess and analyze hypothesized teacher benefits. These data showed that teachers themselves showed large and consistent benefits from participating in ASIP and from giving autonomy support. These observed benefits included greater teaching motivation (psychological need satisfaction, autonomous motivation, intrinsic teaching goals, and harmonious passion), greater teaching skill (teaching efficacy, capacity to increase student engagement, autonomy-supportive teaching), and greater teaching well-being (vitality, job satisfaction, and lesser emotional and physical exhaustion). These data are important because they confirm that we probably did deliver the current ASIP in a way that teachers found to be need satisfying and engaging.

2.4. Raters and observations

Before the beginning of the study, a team of six students (4 undergraduates, 2 graduate students) with a sophisticated understanding of both self-determination theory and PE instruction in Korean secondary schools received extensive instruction on autonomy-supportive and controlling PE instructional behaviors. In their training, these students received conceptual definitions of autonomy-supportive and controlling teaching, became familiar with a previously-validated rating sheet to operationally define autonomy-supportive and controlling acts of instruction (see Cheon et al., 2012, p. 372), received modeling and guidance on how to use the rating sheet, practiced with the rating sheet for 2 weeks by observing and scoring PE teachers first through videotaped instruction and then through live classroom instruction, and engaged in a steady-stream of in-rating and post-rating discussions with the authors to explain, defend, and refine their ratings.

During the actual study (during weeks 6 and 14, as per Fig. 1), raters worked in pairs, came to the class unannounced 5–10 min before the start of class, and did not know into which group (experimental or control) the observed teacher had been randomly assigned. The two raters made independent ratings as they nonintrusively observed the classroom dynamics. The rating sheet itself listed the following five instructional behaviors with the controlling behavior listed on the left side of the rating sheet and the autonomy-supportive behavior listed on the right side: relies on extrinsic incentives vs. nurtures inner motivational resources; uses

pressuring language vs. uses noncontrolling language; neglects to provide explanatory rationales vs. provides explanatory rationales; displays impatience vs. displays patience; and counters and tries to change negative affect vs. acknowledges and accepts negative affect. Each instructional behavior was scored using a bipolar format in which the controlling behavior was scored as a 1 while the autonomy-supportive behavior was scored as a 7. Illustrative descriptors accompanied (and operationally defined) each of the five controlling and each of the five autonomy-supportive instructional behaviors.

The ratings from the two observers were positively correlated on each of the five instructional behaviors, as interrater reliabilities ranged from .80 to .87 at Time 1 (April) and from .65 to .82 at T2 (June). Given these acceptable reliabilities, the two ratings were averaged to produce a single score for each of the five instructional behaviors for both the first and second classroom visit.

2.5. Measures

Students completed the same four-page questionnaire three times (T1, T2, T3) that assessed 9 dependent measures, 2 of which served as manipulation checks (perceived autonomy-supportive teaching, perceived controlling teaching) and 7 of which served as student outcomes. Each measure used the same 1–7 Likert response scale that ranged from strongly disagree (1) to strongly agree (7). Though the measures were originally developed in English, the questionnaire as a whole had previously been back-translated into Korean and successfully used on a couple of occasions (Cheon & Reeve, 2013; Cheon et al., 2012).

2.5.1. Autonomy supportive and controlling teaching

To assess students' perception of their teachers' autonomy support, we used the six-item short version of Learning Climate Questionnaire (LCQ; Williams & Deci, 1996). This measure has been used successfully in previous studies to assess autonomy-supportive teaching (Black & Deci, 2000; Jang et al., 2009). A sample item is, "My PE teacher provides us with choices and options". Scores on the LCQ were internally consistent throughout each assessment period (α = .87 at T1; α = .91 at T2; α = .93 at T3). To assess students' perceptions of their teachers' controlling style, we used the four-item Controlling Teacher Scale (CTS; Jang et al., 2009). This measure has also been used successfully in previous studies to assess controlling teaching (Cheon & Reeve, 2013; Jang et al., 2009). A sample example item is, "My PE teacher puts a lot of pressure on me". Scores on the CTS were internally consistent throughout each assessment period (α = .82 at T1; α = .87 at T2; α = .87 at T3).

2.5.2. Psychological need satisfaction

To assess autonomy need satisfaction, students completed the five-item Perceived Autonomy scale (Standage, Duda, & Ntoumanis, 2006). A sample item is, "In this PE class, I feel that I do PE activities because I want to." This measure has been successfully used in the PE classroom setting (Cheon et al., 2012), and scores on the Perceived Autonomy scale showed acceptable internal consistency (α = .85 at T1; α = .88 at T2; α = .91 at T3). To assess competence need satisfaction, students completed the four-item Perceived Competence subscale from the Intrinsic Motivation Inventory (McAuley, Duncan, & Tammen, 1989). A sample item is, "I think I am pretty good at physical education." This measure has been used successfully in the PE classroom setting (Ntoumanis, 2001; Taylor, Ntoumanis, Standage, & Spray, 2010), and scores on the Perceived Competence scale showed acceptable internal consistency (α = .91 at T1; α = .91 at T2; α = .90 at T3).

2.5.3. Multidimensional PE amotivation

To assess students' amotivation as multidimensional construct, we used the Amotivation Inventory-Physical Education (AI-PE; Shen et al., 2010a), which was developed from Legault et al.'s (2006) work on amotivation in the general education setting. This scale has been used successfully in the PE context with secondary students (Shen et al., 2010a, 2010b). The AI-PE consists of 16 items. Four items assess amotivation—low ability (e.g., "I don't have what it takes to do well in PE", "I don't have the knowledge/skill required to succeed in PE"), four items assess amotivation—low effort (e.g., "I'm not energetic enough for PE", "I don't like to invest the effort that is required for PE"), four items assess amotivation—low value ("Participating in PE is not valuable to me", "I have no good reason to participate in PE"), and four items assess amotivation—unappealing tasks (e.g., "I find the sport/activity being played is boring", "The sport/activity in PE is not stimulating"). Scores on all four subscales were highly internally consistent: amotivation—low ability (α = .94 at T1; α = .95 at T2; α = .94 at T3); amotivation—low effort (α = .90 at T1; α = .89 at T2; α = .90 at T3); amotivation—low value (α = .92 at T1; α = .92 at T2; α = .92 at T3); and amotivation—unappealing tasks (α = .93 at T1; α = .93 at T2; α = .93 at T3).

2.5.4. Classroom engagement

Because we conceptualized students' classroom engagement as a multidimensional construct (Reeve, 2013; Reeve & Tseng, 2011), we assessed students' behavioral, emotional, cognitive, and agentic engagement in the context of PE. To assess behavioral and emotional engagement, we used the behavioral engagement and emotional engagement scales from the engagement vs. disaffection with learning measure (Skinner, Kindermann, & Furrer, 2009). The behavioral engagement scale includes five items (e.g., "In this class, I work as hard as I can."), and it showed high internal consistency (α = .89 at T1; α = .89 at T2; α = .90 at T3). The emotional engagement scale includes five items (e.g., "When I'm in this class, I feel good."), and it showed high internal consistency (α = .89 at T1; α = .86 at T2; α = .87 at T3). To assess cognitive engagement, we used the learning strategy items from the Metacognitive Strategies Questionnaire (Wolters, 2004). The cognitive engagement scale includes four items (e.g., When doing work for this class, I try to relate what I'm learning to what I already know."), and it showed high internal consistency (α = .78 at T1; α = .78 at T2; α = .80 at T3). To assess agentic engagement, we used the agentic engagement scale (Reeve, 2013). The agentic engagement scale includes five items (e.g., "I let my teacher know what I need and want."), and it showed high internal consistency (α = .82 at T1; α = .83 at T2; α = .88 at T3).

Scores from these four engagement scales were highly positively intercorrelated across each of the three assessment periods, so we followed the tradition in this literature (Cheon & Reeve, 2013; Reeve & Lee, 2014) and created a single engagement index by averaging participants' scores for behavioral, emotional, cognitive, and agentic engagement into a single dependent measure at each time or wave of assessment (4-item α's were .91 at T1, .94 at T2, and .95 at T3). To justify treating the four aspects of engagement as a single score, we calculated an exploratory factor analysis on the four aspects of engagement at each time point. Entering students' mean scores on the behavioral, emotional, cognitive, and agentic engagement scales as the four individual data points, a 1-factor solution emerged from a 4-item principal components analysis at T1 (eigenvalue = 3.16; 79.1% of the total variance; factor loadings of .93 for behavioral engagement, .89 for emotional engagement, .91 for cognitive engagement, and .83 for agentic engagement), at T2 (eigenvalue = 3.39; 84.7% of the total variance; factor loadings of .94, .94, .94, and .86, respectively), and at T3

(eigenvalue = 3.47; 86.9% of the total variance; factor loadings of .94, .95, .94, and .90, respectively).

2.6. Assessment of social validity

To examine social validity, we chose two methodological approaches that have been successfully adopted in previous education-based intervention studies (Mellalieu, Hanton, & Thomas, 2009; Thelwell & Maynard, 2003). First, we asked the eight teachers who completed the ASIP to complete the following four-item questionnaire: (1) Did your participation in ASIP help produce a positive significant change in your classroom motivating style? (1 = *not at all significant*; 7 = *extremely significant*); (2) Was your participation in ASIP important to you? (1 = *not at all important*; 7 = *extremely important*); (3) How satisfied with the ASIP were you? (1 = *not at all satisfied*; 7 = *extremely satisfied*); and (4) Was ASIP useful to you? (1 = *not at all useful*; 7 = *extremely useful*)?. Second, we asked these same teachers to generate their own open-ended answer to the following question: "Were you satisfied with the ASIP overall? If so, why? If not, why not?"

3. Results

3.1. Preliminary analysis

3.1.1. Missing values

Missing data were rare (only 11 of the 96,876 possible responses, or <0.1%, were missing), and Little's MCAR test showed that the data were missing at random, X^2 (1, 580) = 1621.11, *ns*. Based on these results, we used the Expectation–Maximization (EM) algorithm for imputing missing values (Schafer & Graham, 2002). We further explored whether the distribution of scores for each of the 36 student-assessed and 10 rater-scored variables deviated from normality and found that all values for skewness and kurtosis were less than |1.0|, indicating little deviation from normality.

3.1.2. Student demographics

Prior to the main analyses, we tested for possible associations between gender and grade level with the student-assessed dependent measures. Gender was associated with 23 of the 27 dependent measures, as males, compared to females, scored higher on T1 and T3 perceived autonomy support, all three waves of autonomy and competence need satisfaction, all three waves of classroom engagement, and lower on all three waves of all four measures of amotivation. Grade level also was associated with 5 of the 27 dependent measures, as high school students, compared to middle school students, scored higher on T1 perceived autonomy support, lower on all three waves of perceived controlling teaching, and higher on T1 autonomy need satisfaction.[2] Given these associations, we included gender (females = 0; males = 1) and grade level (middle school = 0; high school = 1) as covariates (i.e., as statistical controls) in all subsequent analyses.

3.1.3. Multilevel analyses

Before testing the hypotheses, we first conducted multilevel analyses using hierarchical linear modeling (HLM, version 7; Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011) to determine whether meaningful between-teacher differences might have affected the student-reported dependent measures. The intra-class correlation coefficients (*ICC*s) associated with the nine T1 student-assessed dependent measures calculated from unconditional models were as follows: perceived autonomy support, 9.9%; perceived

controlling, 7.8%; autonomy need satisfaction, 7.2%; competence need satisfaction, 6.0%; classroom engagement, 9.0%; amotivation—low ability, 6.3%; amotivation—low effort, 4.3%; amotivation—low value, 9.7%; and amotivation—unappealing tasks, 10.7%. Given these meaningful between-teacher effects, we used multilevel modeling to represent the nested nature of the data. By doing so, we sought to partial out the baseline "between-teacher" effects within the students' data (as represented by the *ICC*s that averaged 7.9% across the 9 dependent measures) such that the analyses tested the hypotheses in a way that students' scores on each dependent measure were statistically independent of these "controlled for" T1 teacher-level effects.

The longitudinal design had a three-level hierarchical structure with repeated measures (Level 1) nested within students (Level 2) nested within teachers (Level 3). At level 1 (within student), the longitudinal data allowed us to study students' increase or decrease on each dependent measure over three time points—the beginning, middle, and end of the semester. We entered "time" as an un-centered independent variable so that we could use participants' T1 beginning-of-semester score as an initial status measurement on each dependent measure so that the T2 and T3 scores could then function as change scores from that initial status score. At level 2 (between students), we entered the student-level individual differences of gender and grade level as group mean centered covariates to function as a pair of statistical controls in each analysis. At level 3 (between teachers), we entered experimental condition as an un-centered independent variable so that we could retain its raw metric form of control group = −1 and experimental group = 1. Finally, we entered the condition x time interaction as a cross-level predictor (condition was a level 3 predictor, time was a level 1 predictor) to test the extent to which the changes in the T2 and T3 scores on each dependent measure depended on experimental condition.

3.1.4. Four distinct aspects of amotivation

To represent the amotivation outcome measure, we tested the extent to which the data fit two different models: (a) a single-factor model in which all 16 individual items from the four subscales loaded onto a single latent factor (i.e., amotivation consists of one unitary factor), and (b) a four-factor model consisting of four separate latent factors (low effort, low ability, low value, unappealing tasks). The 16-item one-factor model did not fit the data well, X^2 (240) = 2134.76, *p* < .01, *RMSEA* = .182 (90% *CI* = .176–.188), *SRMR* = .063, *CFI* = .94; *NNFI* = .94. On the other hand, the 16-item four-factor model fit the data reasonably well, X^2 (234) = 823.38, *p* < .01, *RMSEA* = .070 (90% *CI* = .063–.077), *SRMR* = .036, *CFI* = .98; *NNFI* = .98, and it fit significantly better than did the one-factor model, ΔX^2 (Δ 6 *df*) = 1314.38, *p* < .01. Each individual indicator loaded positively and significantly on its hypothesized latent factor (*p* < .001). Given these results, we tested our hypotheses by conceptualizing amotivation as four distinct, yet intercorrelated, aspects of student amotivation.

3.2. Manipulation checks

We assessed the extent to which the two groups of teachers differed in their provision of autonomy-supportive instruction in two ways. First, trained raters scored teachers' objective classroom instructional behaviors at two times during the semester (first half, second half). Second, students reported on their teachers' perceived autonomy-supportive and perceived controlling teaching at three times during the semester (T1, T2, and T3).

3.2.1. Raters' objective scoring of motivating style

For the raters' scoring of motivating style, we conducted a series of five repeated measures analyses—one analysis for each of the five

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[2] For the descriptive statistics and *t*-ratios associated with these gender and grade level differences, please send an email request to the corresponding author.

autonomy-supportive vs. controlling instructional behaviors—in which time of assessment (H1, H2) was the within-subjects repeated measure and experimental condition was the between-subjects hypothesized predictor. For post hoc mean comparisons, we used the Bonferroni test and an alpha of $p < .01$ (family-wise $\alpha = .05/5 = .01$).

For nurtures inner motivational resources vs. relies on extrinsic incentives, the condition main effect was significant, $F(1, 14) = 23.97$, $p < .01$, $\eta_p^2 = .63$, as raters scored teachers in the experimental group as nurturing inner motivational resources more than teachers in the control group at T1 [Ms, 6.00 vs. 4.41, $p < .01$, $d = 2.11$] and T2 [Ms, 5.81 vs. 4.53, $p < .01$, $d = 2.49$]. The condition x time interaction was not significant, $F(1, 14) = 1.16$, ns.

For relies on informational vs. pressuring language, the condition main effect was significant, $F(1, 14) = 34.89$, $p < .01$, $\eta_p^2 = .71$, as raters scored teachers in the experimental group as relying more on informational language than teachers in the control group at T1 [Ms, 6.47 vs. 4.56, $p < .01$, $d = 2.61$] and T2 [Ms, 6.28 vs. 4.75, $p < .01$, $d = 2.94$]. The condition x time interaction was not significant, $F(1, 14) < 1$.

For provides vs. neglects explanatory rationales, the condition main effect was significant, $F(1, 14) = 45.34$, $p < .01$, $\eta_p^2 = .76$, as raters scored teachers in the experimental group as providing explanatory rationales more than teachers in the control group at T1 [Ms, 6.34 vs. 4.34, $p < .01$, $d = 2.78$] and T2 [Ms, 6.31 vs. 4.44, $p < .01$, $d = 3.02$]. The condition x time interaction was not significant, $F(1, 14) < 1$.

For displays patience vs. displays impatience, the condition main effect was significant, $F(1, 14) = 60.88$, $p < .01$, $\eta_p^2 = .81$, as raters scored teachers in the experimental group as displaying patience more than teachers in the control group at T1 [Ms, 6.34 vs. 4.56, $p < .01$, $d = 3.58$] and T2 [Ms, 6.22 vs. 4.69, $p < .01$, $d = 2.87$]. The condition x time interaction was not significant, $F(1, 14) < 1$.

For accepts and acknowledges vs. counters and tries to change negative affect, the condition main effect was significant, $F(1, 14) = 33.13$, $p < .01$, $\eta_p^2 = .70$, as raters scored teachers in the experimental group as accepting negative affect more than teachers in the control group at T1 [Ms, 5.97 vs. 4.38, $p < .01$, $d = 1.79$] and T2 [Ms, 6.06 vs. 4.47, $p < .01$, $d = 3.71$]. The condition x time interaction was not significant, $F(1, 14) < 1$.

These findings show that teachers in the experimental group enacted significantly more autonomy-supportive behaviors during instruction than did teachers in the control group (the average effect size across the 10 mean comparisons was $d = 2.79$), though

teachers in the experimental group did not enact more autonomy-supportive instructional behaviors at T2 relative to T1 (all five interactions effects were non-significant), probably because of a ceiling effect in which teachers in the experimental group were so highly autonomy-supportive at T1 (their average T1 rating was 6.23 on a 1–7 scale).

3.2.2. Students' perceptions of motivating style

To assess the effect of experimental condition on students' perceptions of their teachers' motivating style, we conducted HLM-based regression analyses in which the test of each hypothesis was for a significant condition x time/wave cross-level interaction. Mean scores for autonomy-supportive and controlling teaching, adjusted for the gender and grade level covariates, appear in Fig. 2 broken down by experimental condition and time of assessment. In conducing pair-wise post hoc mean comparisons, we used the Bonferroni corrected t–test procedure (family-wise $\alpha = .05/6 = .008$). As expected, students' perceptions of autonomy-supportive teaching and controlling teaching were consistently negatively correlated: T1, $r(598) = -.41$, $p < .01$; T2, $r(598) = -.40$, $p < .01$; and T3, $r(598) = -.46$, $p < .01$.

For *perceived autonomy-supportive teaching*, the condition main effect was not significant, $t(14) = 0.91$, ns, the time main effect was significant, $t(1176) = 7.78$, $p < .01$, and the crucial condition x time interaction was significant, $t(1176) = 8.51$, $p < .01$. As illustrated in the left panel of Fig. 2, perceived autonomy support increased significantly for students of the teachers in the experimental group from T1 to T2 ($\Delta = +0.42$, $p < .008$) and again from T2 to T3 ($\Delta = +0.24$, $p < .008$), while it decreased significantly for students of the teachers in the control group from T1 to T2 ($\Delta = -0.15$, $p < .008$) but was then unchanged from T2 to T3 ($\Delta = +0.09$, ns). While the two conditions did not differ at the T1 baseline ($\Delta = 0.04$, ns), perceived autonomy support was greater for students of the teachers in the experimental group than it was for students of teachers in the control group at both T2 ($\Delta = +0.61$, $p < .008$) and T3 ($\Delta = +0.76$, $p < .008$).

For *perceived controlling teaching*, the condition main effect was not significant, $t(14) = 0.11$, ns, the time main effect was not significant, $t(1176) = 1.59$, ns, while the condition x time interaction was significant, $t(1176) = 4.01$, $p < .01$. As illustrated in the right panel of Fig. 2, perceived controlling teaching decreased significantly for students of the teachers in the experimental group from T1 to T2 ($\Delta = -0.29$, $p < .008$) but was then unchanged from T2 to T3 ($\Delta = -0.01$, ns), while it was unchanged for students of the teachers
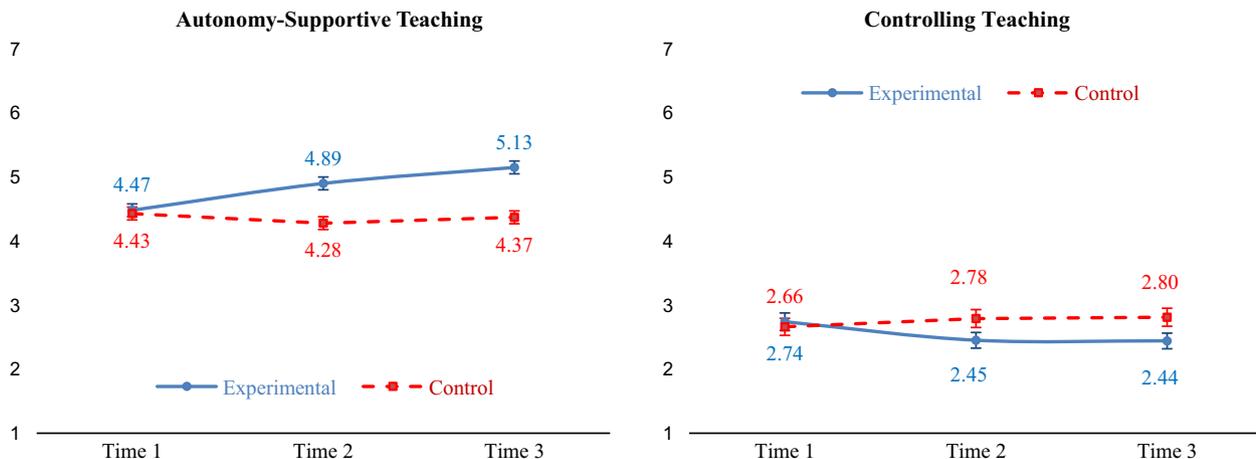
Fig. 2. Students' perceived teacher-provided autonomy support (left panel) and teacher control (right panel) broken down by experimental condition and time of assessment. *Note.* Number are mean scores, while the vertical bars represent the standard errors of those means. Blue solid lines with circles represent the experimental group, while red dashed lines with squares represent the control group. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

in the control group from T1 to T2 (Δ = +0.12, *ns*) and from T2 to T3 (Δ = +0.02, *ns*). While the two conditions did not differ at baseline (Δ = 0.08, *ns*), perceived controlling was lower for students of the teachers in the experimental group than it was for students of teachers in the control group at both T2 (Δ = −0.33, *p* < .008) and T3 (Δ = −0.36, *p* < .008).

3.3. Students' need satisfaction and classroom engagement

For *autonomy need satisfaction*, the condition main effect was not significant, *t*(14) = 0.90, *ns*, the time main effect was significant, *t*(1176) = 9.69, *p* < .01, and the condition *x* time interaction was significant, *t*(1176) = 6.40, *p* < .01. As illustrated in the left panel of Fig. 3, autonomy need satisfaction increased significantly for students of the teachers in the experimental group from T1 to T2 (Δ = +0.37, *p* < .008) and again from T2 to T3 (Δ = +0.28, *p* < .008), while it was unchanged for students of the teachers in the control group from T1 to T2 (Δ = +0.06, *ns*) and from T2 to T3 (Δ = +0.06, *ns*). While the two conditions did not differ at baseline (Δ = 0.09, *ns*), autonomy need satisfaction was greater for students of the teachers in the experimental group than it was for students of teachers in the control group at both T2 (Δ = +0.40, *p* < .008) and T3 (Δ = +0.62, *p* < .008).

For *competence need satisfaction*, the condition main effect was not significant, *t*(14) = 0.18, *ns*, the time main effect was significant, *t*(1176) = 9.12, *p* < .01, and the condition *x* time interaction was significant, *t*(1176) = 6.01, *p* < .01. As illustrated in the center panel of Fig. 3, competence need satisfaction increased significantly for students of the teachers in the experimental group from T1 to T2 (Δ = +0.35, *p* < .008) and again from T2 to T3 (Δ = +0.38, *p* < .008), while it was unchanged for students of the teachers in the control group from T1 to T2 (Δ = +0.08, *ns*) and from T2 to T3 (Δ = +0.07, *ns*). While the two conditions did not differ at either T1 (Δ = −0.05, *ns*) or T2 (Δ = +0.11, *ns*), competence need satisfaction was greater for students of the teachers in the experimental group than it was for students of teachers in the control group at T3 (Δ = +0.42, *p* < .008).

For *classroom engagement*, the condition main effect was not significant, *t*(14) = 1.38, *ns*, the time main effect was significant, *t*(1176) = 10.16, *p* < .01, and the condition *x* time interaction was significant, *t*(1176) = 5.38, *p* < .01. As illustrated in the right panel of Fig. 3, classroom engagement increased significantly for students of the teachers in the experimental group from T1 to T2 (Δ = +0.30, *p* < .008) and again from T2 to T3 (Δ = +0.22, *p* < .008), while it was unchanged for students of the teachers in the control group from T1 to T2 (Δ = +0.05, *ns*) and from T2 to T3 (Δ = +0.09, *ns*). Though the two conditions did unexpectedly differ at baseline

(Δ = 0.14, *p* < .008), classroom engagement was greater for students of the teachers in the experimental group than it was for students of teachers in the control group at both T2 (Δ = +0.39, *p* < .008) and T3 (Δ = +0.52, *p* < .008).

3.4. Students' amotivation

For *amotivation—low ability*, the condition main effect was not significant, *t*(14) = 0.37, *ns*, the time main effect was significant, *t*(1176) = 4.37, *p* < .01, while the condition *x* time interaction was significant, *t*(1176) = 4.02, *p* < .01. As illustrated in the upper left panel of Fig. 4, amotivation—low ability decreased significantly for students of the teachers in the experimental group from T1 to T2 (Δ = −0.14, *p* < .008) and again from T2 to T3 (Δ = −0.32, *p* < .008), while it was unchanged for students of the teachers in the control group from T1 to T2 (Δ = +0.01, *ns*) and from T2 to T3 (Δ = −0.04, *ns*). While the two conditions did not differ at baseline (Δ = −0.07, *ns*), amotivation—low ability was lower for students of the teachers in the experimental group than it was for students of teachers in the control group at both T2 (Δ = −0.22, *p* < .008) and T3 (Δ = −0.50, *p* < .008).

For *amotivation—low effort*, the condition main effect was not significant, *t*(14) = 1.10, *ns*, the time main effect was not significant, *t*(1176) = 1.22, *ns*, while the condition *x* time interaction was significant, *t*(1176) = 3.82, *p* < .01. As illustrated in the upper right panel of Fig. 4, amotivation—low effort was unchanged for students of the teachers in the experimental group from T1 to T2 (Δ = −0.01, *ns*) but then decreased significantly from T2 to T3 (Δ = −0.25, *p* < .008), while it increased significantly for students of the teachers in the control group from T1 to T2 (Δ = +0.12, *p* < .008) but was then unchanged from T2 to T3 (Δ = −0.01, *ns*). While the two conditions did unexpectedly differ at baseline (Δ = −0.17, *p* < .008), amotivation—low effort was lower for students of the teachers in the experimental group than it was for students of teachers in the control group at both T2 (Δ = −0.30, *p* < .008) and T3 (Δ = −0.54, *p* < .008).

For *amotivation—low value*, the condition main effect was not significant, *t*(14) = 0.72, *ns*, the time main effect was significant, *t*(1176) = 2.21, *p* < .05, while the condition *x* time interaction was significant, *t*(1176) = 3.69, *p* < .01. As illustrated in the lower left panel of Fig. 4, amotivation—low value was unchanged for students of the teachers in the experimental group from T1 to T2 (Δ = −0.06, *ns*) and then decreased significantly from T2 to T3 (Δ = −0.15, *p* < .008), while it was unchanged for students of the teachers in the control group from T1 to T2 (Δ = +0.12, *ns*) and from T2 to T3 (Δ = +0.01, *ns*). While the two conditions did not differ at baseline (Δ = −0.12, *ns*), amotivation—low value was lower for students of the teachers in the experimental group than it was for students
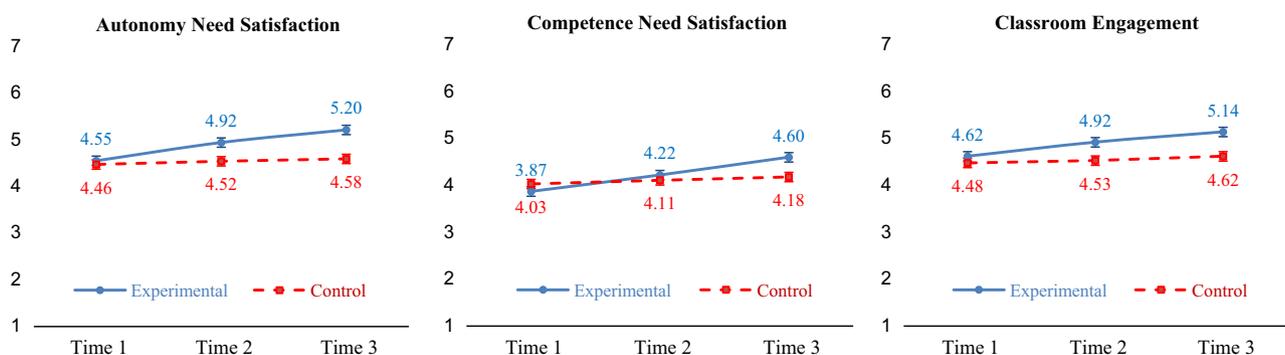
Fig. 3. Students' autonomy need satisfaction (left panel), competence need satisfaction (center panel), and classroom engagement (right panel) broken down by experimental condition and time of assessment. *Note.* Number are mean scores, while the vertical bars represent the standard errors of those means. Blue solid lines with circles represent the experimental group, while red dashed lines with squares represent the control group. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)
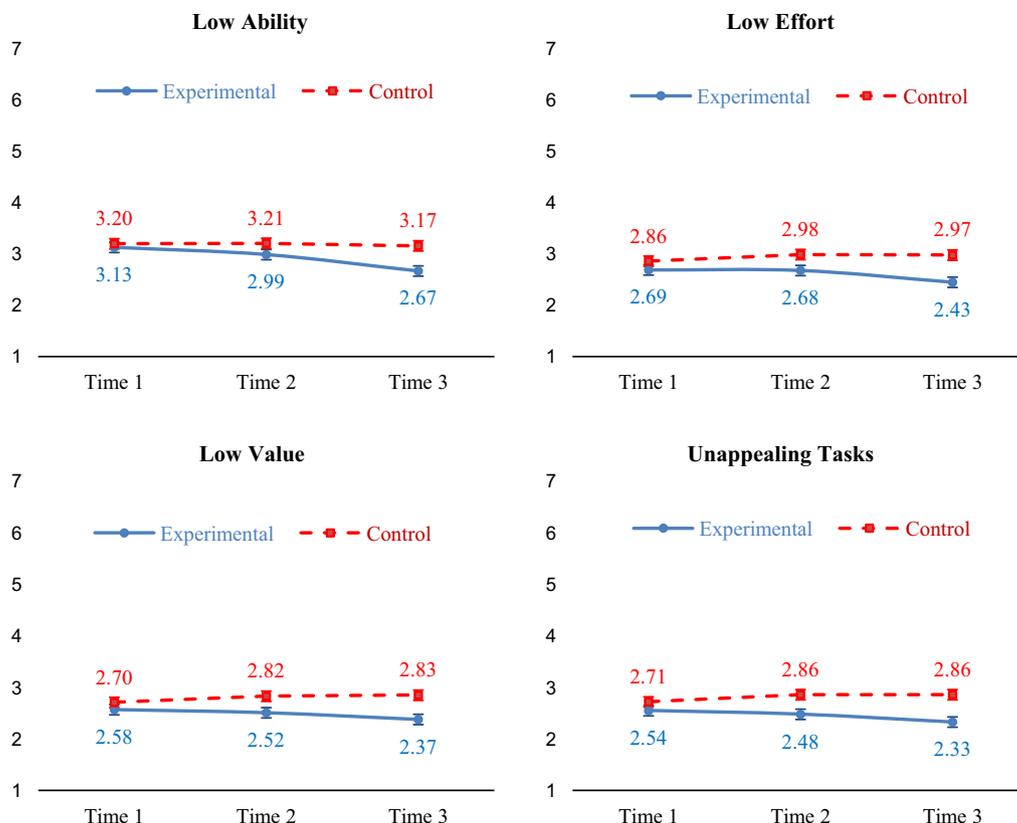
Fig. 4. Students' amotivation scores broken down by experimental condition, time of assessment, and each aspect of amotivation, including low ability beliefs (top left panel), low effort (top right panel), low value (bottom left panel), and unappealing tasks (bottom right panel). *Note*. Number are mean scores, while the vertical bars represent the standard errors of those means. Blue solid lines with circles represent the experimental group, while red dashed lines with squares represent the control group. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

of teachers in the control group at both T2 ($\Delta = -0.30$, $p < .008$) and T3 ($\Delta = -0.46$, $p < .008$).

For *amotivation—unappealing tasks*, the condition main effect was not significant, $t(14) = 0.96$, *ns*, the time main effect was significant, $t(1176) = 2.09$, $p < .05$, while the condition x time interaction was significant, $t(1176) = 2.58$, $p < .01$. As illustrated in the lower right panel of Fig. 4, amotivation—unappealing tasks was unchanged for students of the teachers in the experimental group from T1 to T2 ($\Delta = -0.06$, *ns*) but then decreased significantly from T2 to T3 ($\Delta = -0.15$, $p < .008$), while it increased significantly for students of the teachers in the control group from T1 to T2 ($\Delta = +0.15$, $p < .008$) but was then unchanged from T2 to T3 ($\Delta = 0.00$, *ns*). While the two conditions did unexpectedly differ at baseline ($\Delta = -0.17$, $p < .008$), amotivation—low unappealing tasks was lower for students of the teachers in the experimental group than it was for students of teachers in the control group at both T2 ($\Delta = -0.38$, $p < .008$) and T3 ($\Delta = -0.63$, $p < .008$).

3.5. Social validity assessment

We assessed the social validity of the ASIP in two ways—first, by asking teachers in the experimental group to use a rating scale to rate four aspects of their satisfaction with the intervention program and, second, to provide an open-ended essay to evaluate the ASIP. Teachers who participated in the intervention reported (on a 1–7 scale) a positive significant change in their motivating style ($Ms = 6.13$; $SD = 0.64$), high perceived importance ($Ms = 6.38$; $SD = 0.74$), high perceived satisfaction ($Ms = 6.38$; $SD = 0.74$), and high perceived usefulness ($Ms = 6.38$; $SD = 0.52$). On the open-ended survey, all teachers expressed very positive commentaries. One teacher wrote the following (translated):

"Throughout the ASIP, I learned how to be autonomy-supportive toward students in PE and it is not complicated or difficult at all but simple and easy because it does not require any external resources such as money, equipment, gym-like space, or anything like external things. Autonomy support is somewhat challenging for a PE teacher who is highly, extremely controlling toward their students but it is the most desirable way to teach and motivate students because it asks us to care about and develop students' inner motivational resources rather than use test scores, teacher evaluation, and intra-class competition to earn specific rewards..."

Brief excerpts from four additional teachers were as follows:

"During the ASIP, I felt I improved my teaching capabilities in terms of helping students be highly engaged in PE activities. Overall, I was satisfied with it and I will recommend other teachers who I know in the future."
"I was satisfied and felt confident to teach students because it was good for me to learn how to support students' autonomy."
"The content of ASIP was rich and I learned a lot from it."
"I felt satisfied with it, especially when I learned from others (PE teachers) who already adopted strategies in an autonomy-supportive way and also when I gave them examples of what I had used in my PE class."

4. Discussion

The autonomy-supportive intervention program (ASIP) was successful. It was judged as successful by trained raters who observed what teachers said and did in the classroom, by students who reported their perceptions of their teachers' motivating styles,

and by the teachers themselves as they reported on the social validity assessment.

According to the raters, the teachers who did not receive the ASIP displayed a neutral motivating style—not strongly autonomy supportive but not strongly controlling either. The raters scored teachers who received the ASIP as highly autonomy supportive, and this was true across all five instructional behaviors and during both the first- and second-half semester ratings. From these data, we conclude that teachers were able to learn how to implement (1) the full range of autonomy supportive instructional behaviors during their PE instruction and (2) autonomy-supportive teaching rather early in the semester (by week 6). This latter observation suggests that perhaps the Part 3 session in ASIP might not be necessary. This may be the case, but we still recommend future ASIPs include this mid-semester part of ASIP for two reasons. First, the group discussion provides teachers with a unique and timely opportunity to engage in a peer-based group discussion that is informed and enriched by their own (and by their peers) actual classroom experiences with autonomy-supportive teaching. Second, much of the decrease in students' amotivation occurred during the second half of the semester, so on-going teacher support from ASIP seems warranted.

According to the students, teachers in general were more autonomy supportive than they were controlling. For students of the teachers who did not participate in ASIP, they generally perceived that their teachers maintained their baseline motivating style throughout the semester, though they did perceive an early-semester decline in perceived autonomy-supportive teaching. For students of the teachers who did participate in ASIP, they generally perceived that their teachers became increasingly autonomy supportive and decreasingly controlling as the semester progressed.

According to the teachers themselves, they reported that the ASIP helped them improve their classroom motivating style, and it did so in a way that produced a strong sense of importance, usefulness, and satisfaction (all scores were above a 6 on a 7-point scale). In their open-ended responses, all eight participating teachers voiced strong satisfaction with ASIP. This means that the ASIP afforded teachers with a professional developmental opportunity that provided them with something that they did not have or did not currently know how to do effectively on their own.

The ASIP not only produced a positive change in teachers' motivating styles, it also produced motivational and engagement benefits for students. At its core, a change in a teacher's motivating style to become more autonomy supportive and less controlling is designed to increase classroom opportunities for students to experience psychological need satisfaction and to decrease opportunities for need frustration. For students of teachers in the control group, they experienced little change in need satisfaction from the beginning of the course to its end (see Fig. 3). For students of teachers in the experimental group, they experienced an ever-increasing (from T1 to T2 to T3) increase in need satisfaction, and this was true for both autonomy and competence. It is important to note that students in both conditions engaged in the same sport and exercise activities from week-to-week, and it was only the students of teachers in the experimental group who engaged in these activities in ways that were increasingly psychologically need satisfying.

We included a measure of students' classroom engagement to confirm that increased psychological need satisfaction had positive benefits for students' classroom functioning. While the present study did not include a mediation analysis to confirm that it was changes in students' need satisfaction that produced the corresponding changes in classroom engagement (because we wanted to focus on the intervention), previous work had already shown that the reason why teacher-focused autonomy-supportive interventions programs produce increased classroom engagement was

because the intervention first produced increase psychological need satisfaction (for this longitudinal mediation analysis, see Fig. 8, p. 387, in Cheon et al., 2012).

We initiated the study with the belief that psychological need satisfaction was the antidote to amotivation. Student amotivation is both a difficult motivational deficit to address and also one that is strongly associated with a wide range of important maladaptive outcomes. For the students in the control group, level of amotivation remained fairly constant throughout the semester, though amotivation—low effort and amotivation—unappealing tasks both showed a significant rise from T1 to T2. This suggests that if rises in class-specific amotivation occur, they tend occur early in the semester. For the students in the experimental group, level of amotivation decreased significantly over the course of the semester, and this was true across all four measures of amotivation. Interestingly, all four measures showed that amotivation lessened from T2 to T3, while only amotivation—low ability also showed an early-semester (T1 to T2) decline. This suggests that decreases in amotivation tend to occur late in the semester. This also suggests that amotivation may only decline in a contingent way, as students first need to perceive and benefit from a steady and reliable stream of classroom need satisfaction experiences before they begin to experience a decrease in amotivation.

4.1. Opportunities, constraints, and limitations in the implementation of the ASIP

Classroom-based interventions are difficult to implement with high fidelity because of a wide range of complexities, constraints, and limitations. In this section, we identify the key constraints to our effort to deliver an effective intervention and discuss how we responded to these conditions and constraints. We also identify the limitations that need to be acknowledged in interpreting the findings from the present study.

Because our intervention was delivered to teachers, our key research limitation was to recruit teachers to participate in the study. We identified a population of 24 PE teachers in a school district, but only 16 of the eligible teachers accepted our invitation to participate. The non-participating teachers had very good reasons to decline the invitation (usually because of a very demanding and busy schedule), but our utilization of only a subsample of the teacher population raises an issue of the generalizability of our findings. It is possible, for instance, that highly controlling teachers might have been especially likely to decline the invitation. The effort to involve all teachers in an intervention program, rather than just volunteer and motivated teachers, is always a challenge for school-based intervention programs. Our approach is simply to accept this possible limitation, as it actually seems more problematic to us to require disinterested teachers to participate. Long term, we believe that teachers' positive word-of-mouth about the intervention is necessary to build a positive inclination in all—not just in some—teachers to participate in and benefit from the intervention.

A second key problem with longitudinally-based intervention research is participant attrition. We were very fortunate in this regard in that the Korean educational system and the Korean culture more generally has an extremely high regard for education and for research that is designed to improve classroom practice. This means that teachers and students both routinely show an extremely high attendance rate (often 100% of students are in class each day). For the students, we nevertheless kept the length of the questionnaire to a single page (two columns of questions on both sides of a single page), because we worried that students might not provide sincere responses or might outright protest against a laborious-looking questionnaire that was thrice repeated. This limited the number of dependent measures we could assess and hence

explains why we did not include a measure of relatedness need satisfaction. For the teachers, we provided on-going support during the intervention (e.g., the research team member's class visit) and a state of the art intervention that addressed a classroom problem that was of key concern to them. During the intervention, we made a special effort to offer information and activities that were interesting and highly relevant to their teaching (e.g., the personalized warm-up activity, videotapes of autonomy-supportive teachers in a PE context, a guest speaker, interactive group discussions). What we explicitly did not do was try to alter what teachers taught (i.e., the day's lesson plan); instead we only addressed *how* teachers delivered the curriculum. In the end, this combination of features worked to produce a very high teacher retention rate (100%) and, hence, solved the potential teacher attrition problem.

Several methodological features limit the strength of the conclusions that can be drawn from our findings. The number of participating teachers (*N* = 16) might be considered on the low side. A small sample size works against the generalizability of the study and also against the statistical capacity to analyze the data at the teacher, rather than only at the student, level, as in multilevel modeling analyses. Our sample was also focused rather narrowly on Korean secondary school PE classes. This sample potentially limits the study's generalizability in terms of nation, grade level, and subject matter taught. A couple of baseline differences emerged between the experimental and control groups, and these differences make the interpretation of the findings more difficult than they otherwise would be, though the emergence of these baseline differences also reaffirms researchers' future need to collect baseline measures so to be able to cope with any differences that emerge as statistical controls. In retrospect, it was also an oversight to assess only psychological need satisfaction. Recent research shows that need satisfaction and need frustration are best conceptualized as two distinct processes (Sheldon & Hilpert, 2012). Thus, we encourage future research on this topic to assess both need satisfaction and need frustration. Finally, the intervention study as a whole would be stronger had we been able to include an objective measure of students' achievement (e.g., course grade). We presume that engagement was a valid indicator of students' adaptive functioning and that amotivation was a valid indicator of students' maladaptive functioning, but the inclusion of an objective achievement measure would have placed these assumptions on firmer ground.

Acknowledgments

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