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A needs-supportive intervention to help PE teachers enhance students' prosocial behavior and diminish antisocial behavior



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ABSTRACT

Objectives: Grounded in self-determination theory's dual-process model, we implemented an autonomy-supportive intervention program (ASIP) to help physical education (PE) teachers become more autonomy-supportive and less controlling toward their students. We tested whether such changes in teachers' classroom motivating styles could promote students' prosocial behaviors and diminish their antisocial behaviors.

Design: We used an experimental research design to manipulate teachers' motivating style and a three-wave longitudinal design to assess the student-reported dependent measures.

Method: We randomly assigned secondary-grade PE teachers (8 women, 25 men) to participate or not in the ASIP. At mid-semester, classroom observers rated teachers' autonomy-supportive and controlling instructional behaviors. At the end of the semester, teachers rated their students' prosocial and antisocial behaviors. At the beginning, middle, and end of the semester, the 1824 students of these teachers completed measures of need satisfaction, need frustration, prosocial behavior, and antisocial behavior.

Results: ASIP participation increased teachers' autonomy support and students' need satisfaction and prosocial behavior, and it decreased teachers' control and students' need frustration, antisocial behavior, and attitude toward cheating. Multilevel structural equation modeling showed that longitudinal increases in prosocial behavior were mostly a function of need satisfaction gains while longitudinally decreases in antisocial behavior and acceptance of cheating were mostly a function of need frustration declines.

Conclusion: ASIP-enabled benefits extend beyond previously-documented student personal functioning gains (e.g., engagement) to include student social functioning gains as well.

Prosocial behavior is an intentional act to benefit another person. Benefitting others is prosocial when it is done volitionally rather than in response to another's directive or by the anticipation of a reward or punishment (Grusec, Hastings, & Almas, 2011). Prosocial behavior occurs as classmates help, share, encourage, comfort, support, cooperate, and show respect for one another. Antisocial behavior is an intentional act to harm another person. Harming others is antisocial when it too is done volitionally, as unintentional harm is not considered to be antisocial (Covne, Nelson, & Underwood, 2011). Antisocial behavior among classmates occurs in ways that are verbal (e.g., verbally abusing), physical (e.g., hitting, injuring) and relational (e.g., intimidating, showing disrespect). Prosocial and antisocial behaviors have profound implications for both the actor's and the recipient's development (empathic vs. callous), emotionality (gratitude vs. hostility), interpersonal relations (social competence vs. social dominance), friendships (peer acceptance vs. rejection), personal functioning (adjustment vs.

maladjustment), and academics (school success vs. school failure) (Ladd, Herald-Brown, & Kochel, 2009; Wentzel, 2003, 2004).

The purpose of the present paper was to investigate how classroom physical education (PE) teachers can alter the nature of their teacherstudent interactions during instruction so to enhance their students' prosocial behaviors and to diminish their students' antisocial behaviors. Teachers' naturally-occurring social support, social goals, and prosocial expectations reliably predict students' high prosocial and low antisocial tendencies (Wentzel, Filisetti, & Looney, 2007), but when school programs try to prescribe or incentivize prosociability, the intended effects rarely materialize and sometimes even backfire to decrease prosocial behavior (Fabes, Fultz, Eisenberg, May-Plumlee, & Christopher, 1989). The essential problem with socially-engineered attempts to promote prosocial behavior is that the offering of incentives, requirements, or obligations to benefit others interferes with students' volition or internal causality (Kunda & Schwartz, 1983) and, therefore, defeats the

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purpose of trying to develop a long-term internally-locused prosocial orientation toward one's classmates (Gagné, 2003; Sobus, 1995; Stukas, Snyder, & Clary, 1999).

Rather than emerging from prescribed or incentivized programs, changes in students' prosocial and antisocial behavior are more responsive to supportive relationships and a caring community. One way educators can do this is through a social approach. When socially structured, teachers and others (e.g., administrators, bus drivers, peers) first model caring and respectful behavior to build students' social skills and connection with the school community (Solomon, Watson, Delucchi, Schaps, & Battistich, 1988) and second communicate clear expectations and special opportunities (e.g., peer mediation) for prosocial behavior (Metzler, Biglan, Rusby, & Sprague, 2001). Another way educators can offer students caring, supportive relationships is through a motivational approach. When motivationally supportive, teachers create the classroom conditions that nurture students' inner motivational resources linked to prosocial behavior (e.g., empathy, need satisfaction) (Delrue et al., 2017). In the present paper, we adopted such a needs-supportive (i.e., motivational) approach, as informed by a selfdetermination theory perspective (Gagné, 2003; Hodge & Gucciardi, 2015; Hodge & Lonsdale, 2011; Ntoumanis & Standage, 2009; Roth, Kanat-Maymon, & Bibi, 2010).

1. Teachers' autonomy support anticipates students' need satisfaction and prosocial behavior

Self-determination theory (SDT) is an approach to motivation and social functioning that highlights students' psychological needs (autonomy, competence, and relatedness) as inherent motivational assets that, when supported, facilitate adaptive personal and social functioning (Ryan & Deci, 2017). In the typical PE classroom, the most salient source of students' need support is the teacher's motivating style (Reeve, 2009). As evidenced by both experimental manipulations (Cheon, Reeve, & Moon, 2012; Tessier, Sarrazin, & Ntoumanis, 2010) and longitudinal surveys (Jang, Kim, & Reeve, 2012; Jang, Kim, & Reeve, 2016), autonomy-supportive teaching enhances students' positive classroom functioning (e.g., engagement, conceptual learning, well-being). It achieves these benefits because autonomy-supportive teaching creates opportunities for students to experience psychological need satisfaction during instruction (Deci et al., 2001; Cheon et al., 2012; Jang et al., 2012, 2016).

Autonomy support is the delivery of instruction through an interpersonal tone of support and understanding that appreciates, supports, and vitalizes students' psychological needs for autonomy, competence, and relatedness (Reeve, 2016). This tone is communicated to students through acts of instruction such as adopting their perspective, creating opportunities for student input and initiative, teaching in students' preferred ways, and acknowledging and accepting expressions of negative affect (Reeve, 2009).

Psychological need satisfaction, once it has been supported by autonomy-supportive teaching, can be expected to enhance prosocial behavior because students who experience need satisfaction show more effective and responsive interactions with social partners, experience and display more positive emotions, experience greater empathy and more mature moral reasoning, display better coping with conflict, cope proactively, tend to accept and internalize prosocial classroom rules and regulations, and see more intrinsic and identified (and less introjected and extrinsic) reasons for their prosocial behavior (Gagné, 2003; Knee, Patrick, Vietor, Nanayakkara, & Neighbors, 2002; Pavey, Greitemeyer, & Sparks, 2011; Ryan & Connell, 1989).

2. Teachers' control anticipates students' need frustration and antisocial behavior

While SDT's emphasis on autonomy support and need satisfaction can explain students' prosocial behavior well, it serves as a less compelling model to explain PE students' antisocial behavior. That is, antisocial behavior flows less out of low autonomy support and low need satisfaction and more out of high interpersonal control and high need frustration (Hein, Koka, & Hagger, 2015; Hodge & Gucciardi, 2015; Rutten et al., 2011). To explain both adaptive (prosocial) and maladaptive (antisocial) social functioning, self-determination theorists now highlight two differentiated, yet complementary, explanatory processes (Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011; Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumanis, 2011; Cheon, Reeve, & Song, 2016; Gunnell, Crocker, Wilson, Mack, & Zumbo, 2013; Haerens, Aelterman, Vansteenkiste, Soenens, & Van Petegem, 2015) such that autonomy-supportive teaching vitalizes the "brighter" side of students' motivation and functioning (Autonomy-support \rightarrow increased need satisfaction \rightarrow increased prosocial behavior) while it has only a mild, supplemental effect on diminishing students' need frustration and maladaptive functioning, while interpersonal control galvanizes the "darker" side of students' motivation and functioning (Teacher control \rightarrow increased need frustration \rightarrow increased antisocial behavior) while it has only a mild, supplemental effect on diminishing students' need satisfaction and adaptive functioning.

Teacher control is the delivery of instruction through an interpersonal tone of coercion that pressures students into thinking, feeling, and behaving in teacher-prescribed ways (Reeve, 2016). This tone frustrates students' psychological needs for autonomy, competence, and relatedness (Bartholomew, Ntoumanis, Ryan, Bosch, et al., 2011), and it is communicated to students through acts of instruction such as adopting only the teacher's perspective, relying on environmental sources of motivation to engage students (e.g., rewards), uttering directives without explanations, and by asserting power and relying on pressuring language to silence students' complaints and to push them into compliance with the teacher's agenda (Reeve, 2009).

Psychological need frustration, once it has been exacerbated by controlling teaching, can be expected to fuel antisocial behavior because students who experience need frustration show more conflictual and ineffective interactions with social partners, experience and display more negative emotions, experience more inner stress and a sense of vulnerability, experience lesser empathy and perspective taking, display poor coping with conflict, cope reactively, and tend to reject and defy prosocial classroom rules and regulations (Gagné, 2003; Knee et al., 2002; Pavey et al., 2011; Ryan & Connell, 1989).

3. Experimental, longitudinal research design

Many investigations have shown that autonomy support, need satisfaction, and prosocial behavior covary (Gagné, 2003; Hodge & Gucciardi, 2015; Hodge & Lonsdale, 2011; Ntoumanis & Standage, 2009; Roth et al., 2010; Rutten et al., 2011), and a subset of these studies show further that teacher control, need frustration, and antisocial behavior covary (Cheon, Hwang, et al., 2016; Hodge & Gucciardi, 2015; Hodge & Lonsdale, 2011). But all of these studies have relied on a correlational research design. This is a methodological and interpretative concern because autonomy-supportive teaching and need satisfaction may enhance prosocial behavior, but it is also possible that prosocial behavior may enhance autonomy-supportive teaching and need satisfaction, just as antisocial behavior may enhance teacher control and need frustration.

To overcome these methodological limitations and to enhance the capacity of this line of research to offer directional statements, we capitalized on previous investigations that utilized an autonomy-supportive intervention program (ASIP) to help teachers learn how to become significantly more autonomy supportive and significantly less controlling toward their students during instruction (Cheon & Reeve, 2013, 2015; Cheon, Reeve, Yu, & Jang, 2014; Cheon et al., 2012; Cheon, Reeve, et al., 2016). These experiments have been classroom-based and utilized both random assignment to conditions and a multi-wave

longitudinal design.

In the present study, we added three methodological features to this ASIP methodology to strengthen its rigor and scope of application. First, we collected data from multiple informants. To assess teachers' motivating style, we obtained ratings for autonomy-supportive and controlling teaching from both students and trained classroom observers. Similarly, to assess students' prosocial and antisocial behavior, we obtained both student and teacher reports. Second, we collected a supplemental measure of students' antisocial tendency-namely, acceptance of cheating. Acceptance of cheating is an antisocial attitude in the sports context that refers to endorsement of rule violations and unfair play (Lee, Whitehead, & Ntoumanis, 2007), attitudes that are highly associated with antisocial behaviors and poor sportspersonship among adolescents (Ntoumanis, Taylor, & Thøgersen-Ntoumani, 2012). Acceptance of cheating is volitional harm to others because it seeks illegitimate gains at the expense of one's classmates or competitors. Third, we both manipulated teachers' autonomy-supportive and controlling motivating styles (via teacher participation in the ASIP or not) and assessed students' beginning of the semester perceptions of their teachers' autonomy-supportive and controlling motivating styles. By including both measures of teachers' motivating styles, we gained the opportunity to examine if intervention-enabled gains in autonomysupportive teaching might increase students' need satisfaction and prosocial behavior and decrease students' need frustration and antisocial behavior in ways that were above and beyond those effects documented in the correlational and cross-sectional research.

4. Hypotheses and hypothesized model

Hypotheses. We predicted that PE teacher participation in the ASIP (experimental group), relative to non-participation in the ASIP (control group), would significantly increase students' post-intervention T2 and T3 perceived autonomy-supportive teaching, need satisfaction, and prosocial behavior and significantly decrease students' T2 and T3 perceived controlling teaching, need frustration, antisocial behavior, and acceptance of cheating. We further predicted that PE teacher participation in the ASIP would significantly increase raters' post-intervention scoring of teachers' in-class autonomy-supportive instructional behaviors and decrease raters' scoring of teachers' in-class controlling instructional behaviors. And, we predicted that PE teacher participation in ASIP would significantly increase teachers' post-intervention rating of their students' prosocial behavior and decrease teachers' rating of their students' antisocial behavior.

Hypothesized Model. The hypothesized dual-process model appears in Fig. 1. Central to the hypothesized model are the five boldface, sloped lines/paths. As shown in the upper part of Fig. 1, experimental condition was hypothesized to increase T2 need satisfaction, and these mid-semester gains in need satisfaction were then predicted to longitudinally increase T3 prosocial behavior. As shown in the lower part of Fig. 1, experimental condition was further hypothesized to decrease T2 need frustration, and these mid-semester declines in need frustration were then predicted to longitudinally decrease both T3 antisocial behavior and T3 acceptance of cheating. Fig. 1 also includes a dashed upwardly-sloped path from T1 need satisfaction to T3 prosocial behavior and two dashed downwardly-sloped paths from T1 need frustration to T3 antisocial behavior and T3 acceptance of cheating to function as statistical controls that allowed us to test that it was changes in T2 need satisfaction-frustration (and not level of T2 need satisfaction-frustration per se) that explained changes in each T3 prosocial-antisocial outcome.

While our primary focus was on how manipulated motivating style (i.e., experimental condition—ASIP participation or not) would affect changes in students' need satisfaction-frustration, we further assessed for the effects of teachers' naturally-occurring (i.e., beginning-of-semester) motivating styles on longitudinal changes in students' T2 need satisfaction-frustration. Based on prior longitudinal findings (Jang et al., 2012, 2016), we expected that T1 assessed autonomy support

would predict a longitudinal increase in students' T2 need satisfaction and also that T1 assessed teacher control would predict a longitudinal increase in students' T2 need frustration. We were also interested to see if the aforementioned effects of manipulated motivating style on students' need satisfaction-frustration would materialize even after controlling for these T1 differences in teachers' motivating styles.

The dual-process model also predicts mild but significant supplemental cross-over effects that need satisfaction would diminish antisocial behavior and need frustration would diminish prosocial behavior. So, we added two solid (but not boldface—to depict their supplemental nature) downwardly-sloped lines from T2 need satisfaction to (decreased) T3 antisocial behavior and to T3 acceptance of cheating and one upwardly-sloped sold line from T2 need frustration to (decreased) T3 prosocial behavior. And, we again added 3 additional dashed upwardly- and downwardly-sloped lines from each T1 need state to each T3 prosocial-antisocial outcome to function as statistical controls in the test of these cross-over effects.

In addition, on the left side of Fig. 1, we added three supplemental paths depicted by slopped (but not boldfaced) lines: T1 need satisfaction would increase T2 prosocial behavior, and T1 need frustration would increase both T2 antisocial behavior and T2 acceptance of cheating. We added these three paths based on the logic that if we expected these experimentally-induced effects to occur late in the semester (as per the hypothesized model) then they may similarly occur as naturally-occurring effects early in the semester.

Finally, based on prior findings (Jang et al., 2012; Reeve & Lee, 2014), we acknowledged that students' own classroom behaviors sometimes create self-generated changes in their need satisfaction and need frustration, which is one of the primary reasons we relied on an experimental rather than on a correlational research design. Thus, we included six possible reciprocal pathways in which students' prosocial and antisocial attitudes and behaviors predict a longitudinal change in their own subsequent classroom need satisfaction and need frustration, even after controlling for the effects that teachers' manipulated and measured motivating styles might have on students' need satisfaction and need frustration. These six sloped lines appear in Fig. 1 as solid (but not boldface) lines: T1 prosocial behavior \rightarrow T2 need satisfaction; T2 prosocial behavior \rightarrow T3 need frustration; and T2 antisocial behavior and T2 acceptance of cheating \rightarrow T3 need frustration.¹

5. Method

The full procedural timeline for the intervention program and the three waves of data collection appear in Fig. 2. The research protocol was approved by the University Research Ethics Committee of the first author's university. Prior to the data collection, we obtained permission to conduct the study from each school principal and each individual teacher. Prior to completing their respective questionnaires, teacher-participants and student-participants first completed a consent form.

5.1. Participants and procedure

Teacher-participants included 33 ethnic Korean certified PE teachers, 8 women and 25 men. Teachers taught in 33 different secondary schools (15 middle, 18 high) in the Seoul and Kyoungi-Do metropolitan areas. Teachers averaged 36.0 (SD = 4.4) years of age and 6.5 (SD = 2.6) years of PE teaching experience. At the end of the semester,

¹ Fig. 1 also includes 10 thin horizontal lines to represent stability effects of each measured variable on itself at a later time (e.g., T1 Prosocial behavior \rightarrow T2 Prosocial behavior; and T2 Prosocial behavior \rightarrow T3 Prosocial Behavior). These stability effect paths represent statistical controls, rather than hypothesized paths. Lastly, though not shown in Fig. 1 (for purposes of clarity), we included a series of 5 statistical controls from each T1 to each T3 measure (i.e., T1 need satisfaction \rightarrow T3 changes in each outcome.



Fig. 1. Hypothesized model in which bright side variables predict adaptive functioning while dark side variables predict maladaptive functioning. Solid lines represent hypothesized paths; dashed lines represent statistical controls.



Fig. 2. Procedural timeline for the 3-part autonomy-supportive teacher training program and the three waves of data collection.

each participating teacher received the equivalent of \$50 in appreciation of his or her participation. No teacher dropped out over the course of the semester-long study, so the teacher retention rate was 100%.

One month prior to the beginning of the school year, we contacted 40 PE teachers who worked in either the Seoul or Kyoungi-Do metropolitan areas to invite them to participate in our semester-long study and 33 agreed to participate. These 33 teachers were then randomly assigned into either the experimental (n = 15) or control (n = 18) condition. For 29 of the 33 teachers, we administered the student survey to two classes; for the remaining four teachers, we administered the student survey to only one class (for a total of 62 classrooms associated with 33 teachers). For the teachers' data collection, teachers rated their students' class-wide prosocial behavior and their students' class-wide antisocial behavior at the end of the semester (week 19).

Student-participants were those students who completed the study questionnaire over all three waves of data collection. At T1, 1951 ethnic Korean students completed the questionnaire. At T2, 1888 students completed the questionnaire for a second time, while 63 did not. The T2 dropout students did not differ from the persisting students on experimental condition, grade level, prosocial behavior, perceived autonomy-supportive teaching, or perceived controlling teaching, but they did include more males, participants who scored lower on T1 need satisfaction, and participants who scored higher on T1 need frustration, antisocial behavior, and acceptance of cheating. At T3, 1824 of the students completed the questionnaire for a third time, while 64 of the T2 persisting students did not. The T3 dropout students did not differ from the persisting students on experimental condition, gender, grade level, or the T1 and T2 measures for perceived autonomy support,

perceived teacher control, need satisfaction, need frustration, prosocial behavior, or acceptance of cheating, but they did score higher on T1 and T2 antisocial behavior. So the final analyzed sample represented an overall retention rate of 93.5% (1824/1951) that was generally biased (because of attrition) by an under-representation of students who reported high levels of antisocial behavior (or by an over-representation of student who reported low levels of antisocial behavior). The final analyzed sample consisted of the following: 1053 (57.7%) females and 771 (42.3%) males; 871 (47.8%) middle school and 953 (52.2%) high school students; and 873 (47.9%) in the experimental group and 951 (52.1%) in the control group.

Students' data were collected in three waves in which students completed the same four-page questionnaire at the beginning (T1; week 1), middle (T2; week 10), and end (T3; week 19) of the spring semester (which is the first semester of Korean school year—early March to late July). The survey was administered at the beginning of the class period, and it began with a consent form. Students completed the questionnaire in reference to that particular teacher and class, and students were assured that their responses would be confidential.

For the classroom observers' data collection, a pair of trained raters visited one of the teacher's classrooms (selected at random) halfway through the semester (during either week 10 or 11) to score objectively that teacher's in-class autonomy-supportive and controlling instructional behaviors.

5.2. Autonomy-supportive intervention program (ASIP)

For teachers in the experimental condition, we delivered the ASIP in three parts. Part 1 was a three hour morning workshop that took place two weeks before the school year began. The workshop began with a pair of reflective warm-up activities to help teachers become aware of their own tendencies toward autonomy-supportive teaching (warm-up activity #1) and controlling teaching (warm-up activity #2). Teacherparticipants then received a media-rich Power-Point presentation that featured information on the nature of student motivation, teachers' autonomy-supportive motivating style, teachers' controlling motivating style, empirical evidence on the benefits of autonomy support and the costs of control, and PE-specific examples of six recommended autonomy-supportive instructional behaviors.

Part 2 was a same-day, two-and-a-half hour afternoon workshop that focused on the "how to" of six recommended autonomy-supportive instructional behaviors, including take the students' perspective, vitalize inner motivational resources, use informational language, provide explanatory rationales, acknowledge and accept negative affect, and display patience. Each autonomy-supportive act of instruction was first described and modeled (via brief, professionally-produced video clips) and then practiced and refined until teachers felt sufficiently skilled to try it out in their own classrooms. The workshop not only helped teachers learn how to enact the six recommended autonomy-supportive instructional behaviors, but it also helped them learn how to replace their existing controlling instructional behaviors (e.g., take only the teacher's perspective, utter directives without rationales, rely on pressuring language) with alternative autonomy-supportive behaviors (e.g., take the students' perspective, offer explanatory rationales for teacher requests, rely on informational language).

Part 3 took place during week 6 of the semester (2 months after Parts 1 and 2), and it featured a peer-to-peer group discussion about teachers' early-semester experiences with autonomy-supportive teaching. Teachers both gave and received instructional help, tips, and strategies on how to become more autonomy supportive and less controlling toward students.

5.3. Measures

We used a previously-validated and successfully used Korean translation for each measure, each of which was originally developed in English (Cheon & Jang, 2012; Cheon, Hwang, et al., 2016; Cheon et al., 2012). We did not, however, have available a previously-translated version of the acceptance of cheating measure, so we used Brislin's (1980) back-translation procedures to create a Korean translated version of this measure (the AMDYSQ).

Raters' Scoring of Teachers' Motivating Styles. Before the data collection, a team of four students with an understanding of self-determination theory, teachers' motivating styles, and Korean PE classrooms received instruction, training, and practice with rating sheets adapted from previous studies (Cheon & Reeve, 2015; Cheon et al., 2012) to score both autonomy-supportive and controlling instructional behaviors. During the data collection (weeks 10 and 11, see Fig. 1). raters worked in pairs, came to the class unannounced 5-10 min before its start, did not know into which group (experimental or control) the observed teacher had been randomly assigned, and made independent ratings. The autonomy-supportive rating sheet utilized an intervalbased 1–7 unipolar scale (1 = not at all, 7 = very much). To supplement this 1-7 interval-based rating, we further utilized a categorical-based rating system in which we converted each rating of 1, 2, or 3 into a "low" category, each rating of 4 into a "medium" category, and each rating of 5, 6, and 7 into a "high" category. Raters scored the rating sheet's five instructional behaviors in a consistent way (as judge by the r statistic for the 1-7 interval ratings and by the kappa statistic for the 1–3 categories): vitalizes inner motivational resources (r = 0.83, $\kappa = 1.00$; provides explanatory rationales (r = 0.81, $\kappa = 0.47$); uses informational language (r = 0.76, $\kappa = 0.49$); acknowledges and accepts negative affect (r = 0.86, $\kappa = 0.69$); and displays patience $(r = 79, \kappa = 0.76)$. We averaged the two ratings into a single score for each behavior and then averaged these five intercorrelated ratings into one overall "rater-scored autonomy-supportive instructional behaviors" score (5-items, $\alpha = 0.95$). The controlling rating sheet, also presented on a 1–7 unipolar scale (1 = not at all, 7 = very much) and converted into 1-3 categories (1, 2, 3 = low, 4 = medium, 5, 6, 7 = high), listed the following five instructional behaviors that raters were able to score reliably: introduces extrinsic motivators (r = 0.80, $\kappa = 0.62$); neglects explanatory rationales (r = 0.77, $\kappa = 0.61$); uses pressuring language (r = 0.79, $\kappa = 0.29$); counters and tries to change negative affect $(r = 0.89, \kappa = 0.73)$; and displays impatience $(r = 0.86, \kappa = 0.44)$. We averaged the two ratings into a single score for each behavior and then averaged the five intercorrelated ratings into one overall "rater-scored controlling instructional behaviors" score (5-items, $\alpha = 0.96$).

Teachers' Rating of their Students' Prosocial and Antisocial Behaviors. Teachers rated their students' prosocial and antisocial behaviors at the class (or group average) level. Teachers completed the 4item prosocial teammate scale to assess prosocial behavior (e.g., "encouraged a classmate"; $\alpha = 0.79$), and teachers completed the 4-item antisocial teammate scale to assess antisocial behavior (e.g., "verbally abused a classmate"; $\alpha = 0.81$) from the Prosocial and Antisocial Behavior in Sport Scale (PABSS; Kavussanu & Boardley, 2009). For our purposes, we modified the word "teammate" from the original PABSS to the word "classmate", and teachers used a 7-point response scale (1 = Strongly disagree, 7 = Strongly agree). The PABSS' antisocial teammate scale is actually a 5-item scale, but we did not include the "swore at a classmate" item because this behavior never occurs in the Korean PE classroom. So, overall, teachers rated eight items (4 prosocial, 4 antisocial) in response to "As a group, the students in my class engaged in the following behaviors during this semester:". These two teacher ratings intercorrelated significantly and negatively, r (62) = -0.58, p < 0.001.

Students' Perceived Autonomy-Supportive and Controlling Teaching. We assessed students' perceived autonomy-supportive teaching with the 6-item version of Learning Climate Questionnaire (LCQ; Williams & Deci, 1996). The LCQ includes items such as, "My PE teacher listens to how I would like to do things", and it has been used successfully in previous studies in the PE context to assess autonomysupportive teaching and to predict need satisfaction (Cheon, Reeve, et al., 2016; Taylor, Ntoumanis, Standage, & Spray, 2010). Students' LCQ scores were internally consistent across the three waves of data collection (α 's at T1, T2, and T3 were 0.90, 0.92, and 0.94, respectively). We assessed students' perceived controlling teaching with the 4-item Controlling Teacher Scale (CTS; Jang, Reeve, Ryan, & Kim, 2009). The CTS includes items such as, "My PE teacher puts a lot of pressure on me", and it has been used successfully in previous studies in the PE context to assess controlling teaching and to predict need frustration (Cheon & Reeve, 2013; Cheon, Reeve, et al., 2016). Students' CTS scores were internally consistent in each assessment period (α 's were 0.83, 0.83, and 0.84). Both measures used the same 7-point response scale (1 = Strongly disagree, 7 = Strongly agree).

Students' Psychological Need Satisfaction and Need Frustration. We assessed students' autonomy, competence, and relatedness satisfaction with three separate scales, each of which used a 7-point response scale (1 = Strongly disagree, 7 = Strongly agree). For autonomy satisfaction, we used the 5-item Perceived Autonomy scale (Standage, Duda, & Ntoumanis, 2006). A sample item is, "I feel that I do PE activities because I want to" (α 's at T1, T2, and T3 = 0.86, 0.89, and 0.92). For competence satisfaction, we used the 4-item Perceived Competence scale from the Intrinsic Motivation Inventory (McAuley, Duncan, & Tammen, 1989). A sample item is, "I think I am pretty good at physical education" (α 's = 0.91, 0.91, and 0.91). For relatedness satisfaction, we used the 5-item Perceived Relatedness scale from the Basic Needs Satisfaction Scale (Ng, Lonsdale, & Hodge, 2011). A sample item is, "I have close relationships with others in my PE class" (α 's = 0.72, 0.76, and 0.82). We assessed students' autonomy, competence, and relatedness frustration with the 12-item Psychological Need Thwarting Scale (PNTS; Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumanis, 2011), which is the most widely-used scale to assess need frustration in empirical tests of the dual-process model (Gunnell et al., 2013; Hein et al., 2015; Mallinson & Hill, 2011). The PNTS uses a 7-point response scale (1 = Strongly disagree, 7 = Stronglyagree), and it includes three 4-item subscales to assess autonomy frustration ("In PE class, I feel pushed to behave in certain ways"; α 's = 0.72, 0.71, and 0.74), competence frustration ("In PE class, there are situations where I am made to feel inadequate"; α 's = 0.81, 0.84, and 0.87), and relatedness frustration ("I feel rejected by my PE teacher"; α 's = 0.89, 0.91, and 0.93).

Students' Prosocial and Antisocial Classroom Behaviors. To assess students' prosocial and antisocial behaviors, we used the aforementioned Prosocial and Antisocial Behavior in Sport Scale (PABSS; Kavussanu & Boardley, 2009). The full 4-scale, 20-item PABSS features two subscales to assess prosocial behavior (toward teammates, toward opponents) and two subscales to assess antisocial behavior (toward teammates, toward opponents), and we used a 7-point response scale (1 = *Strongly disagree*, 7 = *Strongly agree*). To assess prosocial behavior, we used the 4-item prosocial teammate scale (e.g., "encouraged a classmate"; α 's = 0.80, 0.84, and 0.86, which we refer to as prosocial encourage) and the 3-item prosocial opponent scale (e.g., "helped an injured classmate"; α 's = 0.84, 0.87, and 0.89, which we refer to as prosocial help). To assess antisocial behavior, we used the 4-item antisocial teammate scale (e.g., "verbally abused a classmate"; α 's = 0.81, 0.86, and 0.89, which we refer to as antisocial abuse) and the 8-item antisocial opponent scale (e.g., "tried to injure a classmate"; α 's = 0.90, 0.92, and 0.94, which we refer to as antisocial hurt). The PABSS has been successfully used in both the Korean (Cheon, Hwang, et al., 2016) and European (e.g., Kavussanu, Stanger, & Boardley, 2013; Ntoumanis & Standage, 2009) PE and sport contexts.

Acceptance of Cheating. To collect a second antisocial measure, students completed the 7-item Acceptance of Cheating subscale from the Attitude to Moral Decision-making in Youth Sport Questionnaire (AMDYSQ; Lee et al., 2007). While participants completed the full 7-item scale, we followed the recommendations of the AMDYSQ's authors and analyzed the data only from the first three items (Lee et al., 2007; see Study 5), which were as follows: "It is OK to cheat if nobody

knows"; "I would cheat if I thought it would help me win"; and "If other people are cheating, I think I can too." In the present study, we used a 7-point response scale (1 = *Strongly disagree*, 7 = *Strongly agree*), and scores on the 3-item acceptance of cheating scale showed acceptable internal consistency (α 's = 0.86, 0.90, and 0.91).

5.4. Data analyses to test the individual hypotheses

To test each individual hypothesis, we used a t-test when the dependent measure was reported by either the raters or the teachers but a multilevel repeated measures analysis when the dependent measure was reported by the students. In the later analyses, experimental condition served as the between-groups independent variable and time or wave served as the within-groups repeated measure [with teacher gender and grade level serving as a pair of covariates (statistical controls)]. For each of these dependent measures the critical hypothesis test was for a significant condition x time interaction to determine whether the predicted change in students' T3 score depended on experimental condition. To estimate effect sizes, we used the independent-groups pretest-posttest design test (d IGPP-CHANGE) that is appropriate for multilevel, repeated-measures group comparisons to determine the magnitude of the change in the intervention group relative to the change in the control group (Feinglod, 2009). The d_{IGPP} CHANGE statistic may be interpret in the same was as is Cohen's *d*, which is 0.10 for a small effect, 0.35 for a moderate effect, and 0.50 for a large effect (Cohen, 1988).

5.5. Data analyses to test the hypothesized model

The student data had a 3-level cross-classified hierarchical (i.e., multilevel) structure with repeated measures (Level 1, 3-waves) nested within students (Level 2, N = 1824) nested within classrooms (Level 3, k = 62) nested within teachers (a cross-classified Level 3, k = 33). At level 1 (within student), the longitudinal data allowed us to measure students' increase or decrease on each dependent measure over three time points-the beginning, middle, and end of the semester. Accordingly, we scored the "time" independent variable as 0 (T1), 1 (T2), and 2 (T3). At level 2 (between students), we entered the studentlevel variables of gender and grade level as group mean centered covariates to function as statistical controls. At level 3 (between classrooms, nested within teachers), we entered experimental condition as an un-centered independent variable to retain its raw metric form (control group = 0, experimental group = 1). Finally, we entered the condition x time interaction as a cross-level predictor (experimental condition was a level 3 predictor, time was a level 1 predictor) to test the extent to which the changes in students' T3 scores depended on experimental condition.

In the test of the hypothesized model (see Fig. 1), we used multilevel latent variable structural equation modeling (LISREL 8.80; Joreskog & Sorbom, 2006) to evaluate both the measurement and the hypothesized (structural) models. To evaluate model fit, we relied on the chi-square test statistic and multiple indices of fit (as recommended by Kline, 2011), including the root-mean-square error of approximation (*RMSEA*), the standardized root mean square residual (SRMR), the comparative fit index (*CFI*), and the non-normed fit index (NNFI). For *RMSEA* and *SRMR*, values less than 0.08 indicate good fit; for *CFI* and *NNFI*, values greater than 0.95 indicate good fit (Hu & Bentler, 1999; Kline, 2011).

6. Results

6.1. Preliminary analyses

Missing values and normal distribution of scores. Missing data among the student- and rater-reported scores were rare (< 0.1%), so we used the expectation-maximization (EM) algorithm for imputing

missing values. Values for skewness and kurtosis for the 49 assessed variables were all less than |1.7|, indicating little deviation from normality.

Students' demographic characteristics. We tested for possible associations between gender and grade level with the 23 student dependent measures (7 dependent measures x 3 waves, plus T1 autonomy support and T1 teacher control) to check if these demographic characteristics needed to be controlled for in the hypothesis tests. Gender was associated with 13 of the 23 dependent measures, and grade level was associated with 12 of the 23 dependent measures. Given these associations, we included student gender (females = 0; males = 1) and grade level (middle = 0; high = 1) as covariates (i.e., as statistical controls) in the analyses of the student dependent measures.

6.2. Effect of the ASIP manipulation on teachers' motivating styles

We tested the effectiveness of the ASIP manipulation by assessing teachers' autonomy support and control using both observer-scored ratings and student self-reports. Before doing so, we first checked to see whether observers' and students' middle-of-semester ratings corresponded with each other, and they did. Observers' ratings of autonomy-supportive instructional behavior, which were aggregated at the teacher level (n = 33, M = 4.78, SD = 0.97), significantly and rather strongly predicted (i.e., agreed with) students' T2 perceived autonomy-supportive teaching (n = 1,824, M = 5.06, SD = 0.83): *Estimate* = 0.22, *SE* = 0.02, *t*(1822) = 10.78, p < 0.001. Similarly, observers' ratings of controlling instructional behavior, which were also aggregated at the teacher level (n = 33, M = 2.98, SD = 0.96), significantly and rather strongly predicted (i.e., agreed with) students' T2 perceived controlling teaching (n = 1,824, M = 2.45, SD = 0.83): *Estimate* = 0.21, *SE* = 0.02, *t*(1822) = 10.39, p < 0.001.

For observer-scored autonomy supportive and controlling instructional behaviors, observers rated PE teachers in the experimental group as enacting more autonomy-supportive instructional behaviors during classroom instruction than did PE teachers in the control group (*Ms*, 5.51 vs. 4.23), t(31) = 6.30, p < 0.001, d = 2.26. Observers also rated PE teachers in the experimental group as enacting less controlling instructional behaviors than did PE teachers in the control group (*Ms*, 2.67 vs. 3.57), t(31) = 3.53, p = 0.001, d = 1.27.

For students' perceptions of autonomy-supportive teaching, the critical condition x time interaction was significant, t(3,518) = 17.64, p < 0.001 (d _{IGPP-CHANGE} = 0.99).² As illustrated in the upper left panel of Fig. 3, perceived autonomy-supportive teaching increased significantly for students of teachers in the experimental group from T1 to T3 ($\Delta = +0.92$, t = 26.49, p < 0.001), while it decreased significantly for students of teachers in the control group from T1 to T3 ($\Delta = -0.08$, t = 2.59, p = 0.010).

For students perceptions of controlling teaching, the critical condition x time interaction was significant, t(3,518) = 9.46, p < 0.001 ($d_{\text{IGPP.}}_{\text{CHANGE}} = 0.64$). As illustrated in the upper right panel of Fig. 3, perceived controlling teaching decreased significantly for students of teachers in the experimental group from T1 to T3 ($\Delta = -0.71$, t = 19.64, p < 0.001), while it also decreased significantly (but more modestly so) for students of teachers in the control group from T1 to T3 ($\Delta = -0.10$, t = 2.81, p = 0.005).

6.3. Effects of ASIP on students' need states

For students' need satisfaction, the critical condition x time interaction was significant, t(3,518) = 12.52, p < 0.001 ($d_{\text{IGPP.}}$ _{CHANGE} = 0.56). As illustrated in the lower left panel of Fig. 3, need satisfaction increased significantly for students of teachers in the experimental group from T1 to T3 ($\Delta = +0.71$, t = 21.28, p < 0.001), while it also increased significantly (but more modestly so) for students of teachers in the control group from T1 to T3 ($\Delta = +0.11$, t = 3.43, p < 0.001).

For *students' need frustration*, the critical condition *x* time interaction was significant, t(3,518) = 11.19, p < 0.001 ($d_{IGPP-CHANGE} = 0.63$). As illustrated in the lower right panel of Fig. 3, need frustration decreased significantly for students of teachers in the experimental group from T1 to T3 ($\Delta = -0.40$, t = 13.17, p < 0.001), while it increased significantly for students of teachers in the control group from T1 to T3 ($\Delta = +0.16$, t = 5.52, p < 0.001).

6.4. Effects of ASIP on students' prosocial and antisocial behavior

We assessed students' prosocial and antisocial behavior by using both teacher ratings and student self-reports. As before (with the raters' and students' scores), we first checked to see whether teachers' and students' end-of-semester ratings corresponded with each other, and they did. Teachers' ratings of their students' prosocial behavior, which were aggregated at the classroom level (n = 62, M = 5.15, SD = 0.48), predicted (i.e., agreed with) students' T3 self-reported prosocial behavior (n = 1,824, M = 4.92, SD = 0.90): *Estimate* = 0.10, SE = 0.04, t(1822) = 2.33, p = 0.020. Similarly, teachers' ratings of their students' antisocial behavior, which were also aggregated at the classroom level (n = 62, M = 2.38, SD = 0.53), significantly predicted (i.e., agreed with) students' T3 self-reported antisocial behavior (n = 1,824, M = 2.00, SD = 0.71): *Estimate* = 0.10, SE = 0.03, t(1822) = 3.16, p = 0.002.

For *teacher-rated prosocial and antisocial behavior*, teachers in the experimental group rated their students as displaying significantly more prosocial behavior than did teachers in the control group (*Ms*, 5.49 *vs*. 4.85), t(31) = 7.34, p < 0.001, d = 2.64. Teachers in the experimental group also rated their students as displaying significantly less antisocial behavior than did teachers in the control group (*Ms*, 2.00 *vs*. 2.68), t(35) = 6.98, p < 0.001, d = 2.51.

For students' self-reported prosocial behavior, the critical condition x time interaction was significant, t(3,518) = 11.64, p < 0.001 ($d_{\text{IGPP.}}_{\text{CHANGE}} = 0.55$). As illustrated in the left panel of Fig. 4, prosocial behavior increased significantly for students of teachers in the experimental group from T1 to T3 ($\Delta = +0.53$, t = 15.11, p < 0.001), while it decreased significantly for students of teachers in the control group from T1 to T3 ($\Delta = -0.09$, t = 2.56, p = 0.010).

For students' self-reported antisocial behavior, the critical condition x time interaction was significant, t(3,518) = 12.96, p < 0.001 ($d_{\text{IGPP.}}_{\text{CHANGE}} = 0.72$). As illustrated in the middle panel of Fig. 4, antisocial behavior decreased significantly for students of teachers in the experimental group from T1 to T3 ($\Delta = -0.25$, t = 8.48, p < 0.001), while it increased significantly for students of teachers in the control group from T1 to T3 ($\Delta = +0.37$, t = 13.29, p < 0.001).

For students' acceptance of cheating, the critical condition x time interaction was significant, t(3,518) = 8.20, p < 0.001 (d_{IGPP} . _{CHANGE} = 0.44) As illustrated in the right panel of Fig. 4, acceptance of cheating decreased significantly for students of teachers in the experimental group from T1 to T3 ($\Delta = -0.31$, t = 7.51, p < 0.001), while it increased significantly for students of teachers in the control group from T1 to T3 ($\Delta = +0.22$, t = 5.69, p < 0.001).

6.5. Test of the hypothesized model

We first tested the measurement model, which featured 17 latent

 $^{^2}$ In the 7 multilevel modeling analyses, we report only the results for the hypothesized test, which was the condition *x* time interaction effect. In all 7 analyses [need satisfaction, need frustration, prosocial behavior (teacher rating, student-reported), antisocial behavior (teacher rating, student-reported), and acceptance of cheating], the 7 unreported condition main effects were all non-significant, the 7 time main effects were all statistically significant (p < 0.001), and the 7 random effects test for meaningful classroom-level variance were all statistically significant (p < 0.001).



Fig. 3. Means and standard errors for studentautonomy-supportive teaching (upper left panel), perceived controlling teaching (upper right panel), need satisfaction (lower left panel), and need frustration (lower right panel) broken down by experimental con-

variables (7 latent variables assessed at T1, 5 latent variables assessed at T2 and T3), including two indicators for perceived autonomy support (parcel 1, parcel 2), two indicators for perceived teacher control (parcel 1, parcel 2), three indicators for need satisfaction (autonomy,

competence, and relatedness), three indicators for need frustration (autonomy, competence, and relatedness), two indicators for prosocial behavior (encourage, help), two indicators for antisocial behavior (abuse, hurt), and three indicators for acceptance of cheating (3 items

Fig. 4. Means and standard errors for student-reported prosocial behavior (left panel), antisocial behavior (center panel), and acceptance of cheating (right panel) broken down by experimental condition and time of assessment.

Table 1

Descriptive statistics, unstandardized, and standardized factor loadings associated with the student-based dependent measures in the measurement model.

Dependent Measure	Time 1					Time 2					Time 3				
	М	(SD)	В	SE	β	М	(SD)	В	SE	β	М	(SD)	В	SE	β
Perceived Autonomy Supp	oort Indica	itors													
1. Parcel 1	4.74	(0.98)	1.00	-	0.93										
2. Parcel 2	4.82	(1.02)	0.98	0.02	0.91										
Perceived Teacher Contro	l Indicator	rs													
1. Parcel 1	2.52	(1.17)	1.00	-	0.92										
2. Parcel 2	2.91	(1.21)	0.88	0.02	0.81										
Need Satisfaction Indicate	ors														
1. Autonomy	4.78	(1.01)	1.00	-	0.91	5.22	(1.05)	1.00	-	0.91	5.17	(1.13)	1.00	-	0.92
2. Competence	4.05	(1.30)	0.77	0.02	0.73	4.48	(1.30)	0.79	0.02	0.74	4.56	(1.31)	0.85	0.02	0.79
3. Relatedness	4.77	(1.09)	0.69	0.02	0.63	5.09	(1.18)	0.80	0.02	0.74	5.07	(1.23)	0.83	0.02	0.77
Need Frustration Indicato	rs														
1. Autonomy	3.17	(1.00)	0.75	0.03	0.60	2.94	(1.02)	0.77	0.02	0.67	2.91	(1.04)	0.76	0.02	0.68
2. Competence	2.53	(1.12)	0.90	0.03	0.81	2.37	(1.16)	0.95	0.02	0.82	2.39	(1.17)	0.95	0.02	0.84
3. Relatedness	1.94	(0.95)	1.00	-	0.82	1.90	(1.00)	1.00	-	0.85	2.01	(1.06)	1.00	-	0.88
Prosocial Behavior Indica	tors														
1. Encourage	4.81	(1.05)	0.97	0.03	0.85	5.02	(1.15)	0.96	0.02	0.86	4.95	(1.22)	0.95	0.02	0.85
2. Help	4.73	(1.07)	1.00	-	0.88	5.01	(1.17)	1.00	-	0.90	5.01	(1.22)	1.00	-	0.90
Antisocial Behavior Indic	ators														
1. Verbally Abuse	2.00	(0.89)	0.94	0.02	0.84	1.96	(0.96)	0.95	0.02	0.87	2.04	(1.01)	0.97	0.02	0.88
2. Hurt	1.97	(0.85)	1.00	-	0.88	1.97	(0.95)	1.00	-	0.91	2.09	(1.03)	1.00	-	0.91
Acceptance of Cheating I	ndicators														
1. Item 1	2.15	(1.29)	0.94	0.02	0.84	2.12	(1.33)	0.91	0.02	0.83	2.18	(1.32)	0.94	0.02	0.88
2. Item 2	2.08	(1.25)	1.00	-	0.89	2.04	(1.27)	1.00	-	0.92	2.12	(1.27)	1.00	-	0.94
3. Item 3	2.54	(1.48)	0.81	0.02	0.73	2.34	(1.44)	0.88	0.02	0.81	2.38	(1.42)	0.86	0.02	0.81

Possible range for each variable, 1–7. Note. All Bs are statistically significant (p < 0.001). On the Acceptance of Cheating scale, item 1 is "It is OK to cheat if nobody knows."; item 2 is "I would cheat if I thought it would help me win."; and item 3 is "If other people are cheating, I think I can too."

from the AMDYSQ). To represent the longitudinal character of the data set, we allowed the between-wave error terms of each repeated-measures indicator to correlate with itself from T1 to T2, T2 to T3, and T1 to T3. The measurement model fit the data reasonable well, X^2 (2644) = 6138.95, p < 0.001, *RMSEA* = 0.069 (0.068–0.070), *SRMR* = 0.040, *CFI* = 0.98, *NNFI* = 0.98. Table 1 shows the descriptive statistics and factor loadings for all 43 individual indicators included in the measurement model, while Table 2 shows the intercorrelations among experimental condition and the 17 latent variables.

We next tested the hypothesized (structural) model. Before doing so, we added student gender and grade level as T1 predictors (statistical controls). Within T1, the eight predictor variables and the two statistical controls (gender, grade level) were allowed to correlate freely. Within T2 and T3, the errors of the five within-wave variables were allowed to correlate. Overall, the hypothesized model fit the data reasonably well, X^2 (2895) = 7364.68, p < 0.001, RMSEA = 0.074 (0.072-0.075), SRMR = 0.065, CFI = 0.97, NNFI = 0.97. The path diagram showing the standardized estimates for each of the five hypothesized paths (all of which were significant), for the T1 perceived autonomy support and T1 perceived teacher control paths (both of which were significant), each of the three possible dual-process T2 \rightarrow T3 cross-over paths (all of which were significant), the three early-semester supplemental paths from T1 need satisfaction and need frustration (none of which were significant), and the six reciprocal paths from the early-semester and mid-semester indicators of prosocial and antisocial behavior (three of which were significant) appear in Fig. 5. For clarity, we do not show the T1 statistical controls in the figure, but we do report each of these paths in the full statistical results below.

As shown on the upper half of Fig. 5, both experimental condition (ASIP) (B = 0.16, SEB = 0.02, $\beta = 0.19$, t = 10.28, p < 0.001) and T1 perceived teacher autonomy support (B = 0.07, SEB = 0.02, $\beta = 0.07$, t = 2.72, p = 0.007) increased T2 need satisfaction, as did students' own T1 prosocial behavior (B = 0.10, SEB = 0.03, $\beta = 0.10$, t = 3.93, p < 0.001), even after controlling for T1 need satisfaction

(*B* = 0.41, *SE B* = 0.03, β = 0.43, *t* = 13.56, *p* < 0.001), gender (*B* = -0.04, *SE B* = 0.02, β = -0.04, *t* = 2.05, *p* = 0.040), and grade level (*B* = -0.04, *SE B* = 0.02, β = -0.04, *t* = 2.03, *p* = 0.043). The increased T2 need satisfaction in turn longitudinally increased T3 prosocial behavior (*B* = 0.20, *SE B* = 0.03, β = 0.21, *t* = 6.24, *p* < 0.001), as did the cross-over decrease in need frustration (*B* = -0.08, *SE B* = 0.03, β = -0.07, *t* = 2.92, *p* = 0.003), even after controlling for T1 prosocial behavior (*B* = 0.22, *SE B* = 0.04, β = 0.23, *t* = 6.41, *p* < 0.001), T2 prosocial behavior (*B* = 0.41, *SE B* = 0.04, β = 0.42, *t* = 11.14, *p* < 0.001), T1 need satisfaction (*B* = -0.07, *SE B* = 0.03, β = -0.07, *t* = 2.24, *p* = 0.025), T1 need frustration (*B* = 0.07, *SE B* = 0.03, β = 0.01, *t* = 0.24, *p* = 0.810), and grade level (*B* = 0.03, *SE B* = 0.02, β = 0.03, *t* = 1.74, *p* = 0.082).

As shown on the lower half of Fig. 5, experimental condition (ASIP) decreased (B = -0.04, SE B = 0.02, $\beta = -0.05$, t = 2.78, p = 0.005) while T1 perceived teacher control increased (B = 0.04, SE B = 0.02, β = 0.05, t = 2.13, p = 0.043) T2 need frustration, as did students' own T1 antisocial behavior (B = 0.13, SEB = 0.04, $\beta = 0.14$, t = 3.36, p < 0.001) while students' own T1 acceptance of cheating did not $(B = 0.03, SE B = 0.03, \beta = 0.03, t = 0.95, p = 0.342)$, even after controlling for T1 need frustration (B = 0.28, SE B = 0.04, $\beta = 0.27$, t = 7.37, p < 0.001, gender ($B = -0.06, SEB = 0.02, \beta = -0.07$, t = 2.88, p = 0.004, and grade level (B = 0.03, SE B = 0.02, $\beta = 0.03, t = 1.41, p = 0.159$). The increased T2 need frustration in turn longitudinally increased both (a) T3 antisocial behavior (B = 0.17, SE B = 0.04, β = 0.16, t = 4.27, p < 0.001), as did the cross-over decrease in need satisfaction (B = -0.08, SE B = 0.03, $\beta = -0.08$, t = 3.04, p = 0.003), even after controlling for T1 antisocial behavior $(B = 0.24, SEB = 0.03, \beta = 0.24, t = 7.25, p < 0.001)$, T2 antisocial behavior (B = 0.36, SE B = 0.03, $\beta = 0.36$, t = 10.92, p < 0.001), T1 need frustration (B = -0.12, SE B = 0.04, $\beta = -0.11$, t = 2.88, p = 0.004), T1 need satisfaction (B = 0.04, SE B = 0.03, $\beta = 0.04$, t = 1.43, p = 0.153, gender ($B = -0.05, SE B = 0.02, \beta = -0.06$,

Table 2 Intercorrelation matrix among e:	xperimental	condition a	nd the 17 d	ependent me	asures inclue	led in the te	st of the stru	ıctural mode	_:									
Variable	1.	2.	з.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
1. Experimental Condition <i>Time 1</i>	I																	
2. P. Autonomy Support	90.0	I																
3. P. Teacher Control	cn.n_		I															
· · · ·	0.00	-0.45																
4. Need Satisfaction	-0.01	0.63	- 0.33	I														
5. Need Frustration					I													
6. Prosocial Behavior	0.08	-0.41	0.46	- 0.57		I												
7 Antionaid Daharian	-0.06	0.43	-0.18	0.55	-0.38													
/. Allusocial Dellavior	0.12	-0.33	0.38	-0.29	0.66	-0.41	I											
8. Acceptance of Cheating	10.0	-017	0.18	-0.26	0.44	-0.27	0.65	I										
Time 2	10.0	/1.0-	01.0	07.0 -	++-0	17.0 -	C0.0											
9. Need Satisfaction	0.25	0.37	86 U -	0 55	-0.37	0.37	0.10	0.00	I									
10. Need Frustration	24.0	10:0	07.0	0000	0.00	0.0	010	01.0		I								
	-0.13	-0.23	0.27	-0.32	0.42	- 0.26	0.37	0.30	-0.60									
11. FT0S0CIAI DEIIAVIOI	0.13	0.29	-0.15	0.41	-0.29	0.66	-0.30	-0.24	0.64	-0.46	I							
12. Antisocial Behavior	-0.13	-0.16	0.18	-0.14	0.29	- 0.23	0.45	0.35	-0.36	0.73	-0.43	I						
13. Acceptance of Cheating	6 F 6		01.0	010	96.0	сс о		L C	10.0	L L	L C C	0.9.0	I					
Time 3	01.0	110	61.0	01.0	07.0	77.0	000	1		5		60.0						
14. Need Sausiacuon	0.33	0.31	-0.17	0.45	-0.29	0.33	-0.13	-0.16	0.70	-0.44	0.50	-0.25	-0.29	I				
15. Need Frustration	-0.28	-0.17	0.21	-0.27	0.31	-0.22	0.26	0.23	- 0.53	0.54	-0.37	0.47	0.39	-0.62	I			
16. Prosocial Behavior	0.25	0.24	-0.11	0.33	-0.21	0.54	-0.19	-0.15	0.56	-0.41	0.70	-0.34	-0.30	0.72	-0.51	I		
17. Antisocial Behavior	-0.27	-0.15	0.19	-0.13	0.22	- 0.22	0.40	0.30	-0.38	0.49	- 0.36	0.60	0.43	- 0.42	0.79	- 0.48	I	
18. Acceptance of Cheating	-0.21	-0.14	0.15	-0.14	0.20	-0.17	0.28	0.42	- 0.34	0.39	-0.29	0.47	0.60	-0.38	0.59	- 0.35	0.73	I
$N = 1824. r'_{\rm S} \ge 0.05, p < 0.0$	15; <i>r</i> 's ≥ 0.0(6, p < 0.01	 															

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Fig. 5. Hypothesized model in which bright side variables predict adaptive functioning while dark side variables predict maladaptive functioning. Solid lines represent significant paths; dashed lines represent non-significant paths.

t = 2.70, *p* = 0.007), and grade level (*B* = -0.03, *SE B* = 0.02, $\beta = -0.03$, *t* = 1.45, *p* = 0.147) and (b) T3 acceptance of cheating (*B* = 0.12, *SE B* = 0.03, $\beta = 0.11$, *t* = 3.54, *p* < 0.001), as did the cross-over decrease in need satisfaction (*B* = -0.08, *SE B* = 0.03, $\beta = -0.08$, *t* = 2.83, *p* = 0.005), even after controlling for T1 acceptance of cheating (*B* = 0.16, *SE B* = 0.03, $\beta = 0.16$, *t* = 6.16, *p* < 0.001), T2 acceptance of cheating (*B* = 0.41, *SE B* = 0.03, $\beta = 0.41$, *t* = 15.27, *p* < 0.001), T1 need frustration (*B* = -0.01, *SE B* = 0.03, $\beta = -0.01$, *t* = 0.40, *p* = 0.689), T1 need satisfaction (*B* = 0.04, *SE B* = 0.03, $\beta = 0.04$, *t* = 1.39, *p* = 0.165), gender (*B* = -0.05, *SE B* = 0.02, $\beta = -0.06$, *t* = 2.80, *p* = 0.005), and grade level (*B* = -0.02, *SE B* = 0.02, $\beta = -0.02$, *t* = 0.97, *p* = 0.332).

None of the three early-semester supplemental paths were individually significant. T1 need satisfaction did not longitudinally increase T2 prosocial behavior (B = 0.05, SE B = 0.02, $\beta = 0.05$, t = 1.93, p = 0.054), at least not after controlling for T1 prosocial behavior (B = 0.61, SE B = 0.03, $\beta = 0.60$, t = 20.82, p < 0.001), gender (B = 0.01, SE B = 0.02, $\beta = 0.01$, t = 0.39, p = 0.700), and grade level (B = 0.05, SE B = 0.02, $\beta = 0.05$, t = 2.46, p = 0.014). Similarly, T1 need frustration did longitudinally increase either (a) T2 antisocial behavior (B = 0.00, SE B = 0.04, $\beta = 0.00$, t = 0.01, p = 0.992), after controlling for T1 antisocial behavior (B = 0.43, SE $B = 0.03, \beta = 0.42, t = 12.79, p < 0.001$, gender (B = -0.14, SE $B = 0.02, \beta = -0.15, t = 6.83, p < 0.001$, and grade level $(B = 0.00, SE B = 0.02, \beta = 0.00, t = 0.06, p = 0.952)$, or (b) T2 acceptance of cheating (B = 0.05, SE B = 0.03, $\beta = 0.04$, t = 1.59, p = 0.112), after controlling for T1 acceptance of cheating (B = 0.49, SE B = 0.03, β = 0.49, t = 19.63, p < 0.001), gender (B = -0.05, SE $B = 0.02, \beta = -0.05, t = 2.38, p = 0.017$), and grade level (B = 0.04, SE B = 0.02, $\beta = 0.05$, t = 2.26, p = 0.024).

Three (of the six) reciprocal paths were individually significant. The

analyses above showed the early-semester significant effects of T1 prosocial behavior \rightarrow T2 need satisfaction ($\beta = 0.10, p < 0.001$) and T1 antisocial behavior \rightarrow T2 need frustration ($\beta = 0.14, p < 0.001$) and the non-significant effect of T1 acceptance of cheating \rightarrow T2 need frustration ($\beta = 0.03, p = 0.342$). Here we report the same three latesemester reciprocal effects. Increases in T2 prosocial behavior did not longitudinally increase students' own T3 need satisfaction (B = 0.06, SE $B = 0.03, \beta = 0.06, t = 1.75, p = 0.080$, at least not after controlling for T1 need satisfaction (B = 0.07, SE B = 0.03, $\beta = 0.08$, t = 2.80, p = 0.005), T2 need satisfaction (B = 0.57, SE B = 0.03, $\beta = 0.57$, t = 18.65, p < 0.001, T1 prosocial behavior (B = 0.03, SEB = 0.03, $\beta = 0.03, t = 1.05, p = 0.293$), gender (B = 0.00, SE B = 0.02, $\beta = 0.00, t = 0.20, p = 0.841$, and grade level (B = 0.00, SE $B = 0.02, \beta = -0.01, t = 0.26, p = 0.795$). Increases in T2 antisocial behavior did longitudinally increase students' own T3 need frustration $(B = 0.12, SE B = 0.04, \beta = 0.12, t = 2.87, p = 0.004)$, while increases in T2 acceptance of cheating did not (B = 0.00, SE B = 0.03, $\beta = 0.00, t = 0.06, p = 0.952$), after controlling for T1 need frustration $(B = 0.13, SE B = 0.04, \beta = 0.12, t = 3.48, p < 0.001)$, T2 need frustration (B = 0.45, SE B = 0.04, $\beta = 0.42$, t = 11.83, p < 0.001), T1 antisocial behavior (B = -0.04, SE B = 0.04, $\beta = -0.04$, t = 0.89, p = 0.374), T1 acceptance of cheating (B = 0.03, SE B = 0.03, $\beta = 0.03, t = 0.95, p = 0.342$, gender (B = -0.01, SE B = 0.02, $\beta = -0.01, t = 0.32, p = 0.749$, and grade level (B = -0.02, SE $B = 0.02, \beta = -0.02, t = 1.03, p = 0.303$).

6.6. Supplemental analyses

The hypothesized model was a needs-based model in which intervention-enabled changes in students' psychological needs (satisfaction, frustration) explained changes in students' late-semester adaptive and



Fig. 6. Revised hypothesized model that adds six direct effect paths from Experimental Condition, T1 Autonomy Support, and T1 Teacher Control (see β s on the right side of the figure) to the hypothesized model (Fig. 5). Solid lines represent significant paths; dashed lines represent non-significant paths.

maladaptive social functioning. Such a model does not include a direct effect of teachers' motivating styles on students' social functioning outcomes. So, in a supplemental analyses, we added the following six direct effects to the hypothesized model (Fig. 1) and re-ran the multilevel structural equation model analyses: both experimental condition and T1 teacher autonomy support \rightarrow T3 prosocial behavior; both experimental condition and T1 teacher control \rightarrow T3 antisocial behavior; and both experimental condition and T1 teacher control \rightarrow T3 acceptance of cheating. Overall, this revised model fit the data reasonably well, X^2 (2883) = 7313.79, p < 0.001, RMSEA = 0.073 (0.072–0.075), SRMR = 0.065, CFI = 0.98, NNFI = 0.97, and it fit the data significantly better than did the hypothesized model, $\Delta \chi^2$ (Δ df = 12 = 50.89, p < 0.001. The path diagram showing the standardized estimates for each of the six newly-added direct effect paths (as well as all the former paths included in the hypothesized model) appear in Fig. 6.

All three direct effect paths from experimental condition to the indicators of social functioning were individually significant. That is, after controlling for all the same effects included in the test of the hypothesized model, experimental condition additionally predicted T3 prosocial behavior (B = 0.06, SE B = 0.02, $\beta = 0.07$, t = 4.08, p < 0.001), T3 antisocial behavior (B = -0.09, SE B = 0.01, $\beta = -0.10$, t = 6.24, p < 0.001), and T3 acceptance of cheating $(B = -0.05, SEB = 0.02, \beta = -0.06, t = 2.97, p = 0.003)$. However, none of the three direct effect paths from the T1 perceived motivating styles to the indicators of social functioning were individually significant. That is, T1 autonomy support did not predict T3 prosocial behavior (B = -0.01, SE B = 0.02, $\beta = -0.01$, t = 0.35, p = 0.726), T1 teacher control did not predict T3 antisocial behavior (B = 0.03, SE $B = 0.02, \beta = 0.03, t = 1.38, p = 0.167$), and T1 teacher control did not predict T3 acceptance of cheating (B = 0.02, SE B = 0.02, $\beta = 0.02$, t = 0.80, p = 0.422). Of the original 23 paths reported as significant in Fig. 5, 22 remained statistically significant in the test of

the revised model. The single path that flipped from significant to nonsignificant was the cross-over effect from low T2 need satisfaction to high T3 antisocial behavior, as it dropped from significant in the original model (B = -0.08, p = 0.003) to non-significant in the revised direct effects model (B = -0.04, SE B = 0.03, $\beta = -0.04$, t = 1.39, p = 0.165). In addition, the R^2 value for each social functioning outcome increased slightly after the addition of the six direct effects: T3 prosocial behavior (R^2 increased from 0.50 to 0.51); T3 antisocial behavior (R^2 increased from 0.39 to 0.40); and T3 acceptance of cheating (R^2 increased from 0.35 to 0.36).

7. Discussion

We designed and carried out the present investigation to help PE teachers address the very practical problem of enhancing their students' prosocial behavior and diminishing their students' antisocial behavior. We adopted a needs-based motivational approach to explain the conditions under which students' prosocial increases and their antisocial behaviors decreases over the course of an academic semester. We first replicated previous investigations showing that a teacher-focused ASIP (experimental condition) could increase autonomy-supportive teaching and decrease controlling teaching. Given that starting point, we tested whether such intervention-enabled changes in their motivating styles could help teachers (a) facilitate students' psychological need satisfaction and hence promote prosocial behavior and (b) alleviate students' psychological need frustration and hence diminish antisocial behavior.

7.1. Increasing students' prosocial behavior

When PE teachers participated in the ASIP, their students showed an increase in prosocial behavior. This ASIP-induced boost in prosocial behavior can be seen in both the teacher ratings and in students' own self-reports (see Fig. 4). When teachers learned how to be more

autonomy-supportive, their students showed a longitudinal increase in their in-class need satisfaction as well as a longitudinal decrease in their in-class need frustration. Both of these ASIP-enabled changes in students' need status were important, as increased mid-semester need satisfaction and decreased mid-semester need frustration both predicted increases in students' end-of-semester prosocial behavior.

Students who have their needs for autonomy, competence, and relatedness satisfied by the people and activities around them are well positioned to engage themselves prosocially. Psychological need satisfaction energizes people toward growth, positive emotions, intrinsic motivation, and well-being (while psychological need frustration pushes people toward defensiveness, negative emotions, amotivation, and ill-being). Need satisfaction also increases people's beneficence (feeling that they want to help others) and their actual helping (Martela & Ryan, 2015). Given these known relations, our primary focus was on creating the conditions under which need satisfaction might increase while need frustration might decrease, and teachers' intervention-enabled gains in autonomy-supportive teaching and teachers' naturally-occurring autonomy-supportive teaching were significant antecedents to both of these desired effects (i.e., gains in need satisfaction, declines in need frustration). In addition, students' own naturally-occurring (T1) prosocial behavior was a third significant antecedent to gains in need satisfaction. So, it was not only teachers who created the need-satisfying conditions but, by engaging in prosocial classroom behavior, students too were creating their own conditions to promote their own need satisfaction.

The test of the revised model (that added the direct effect from experimental condition to T3 prosocial behavior) suggested that the ASIP boosted prosocial behavior in another beyond need satisfaction. We suspect that the ASIP produced both motivational (i.e., needsbased) and emotional effects. Because teachers learned how to better understand and support their students during the ASIP, students' of teachers in the experimental condition likely experienced more classroom positive emotion than did students in the control group. Gratitude (Bartlett & DeSteno, 2006) and empathy (Benita, Levkovitz, & Roth, 2010) are both reliable facilitating effects on prosocial behavior. Thus, overall, changes in students' T3 prosocial behavior were mostly a function of changes in students' T2 need satisfaction, but this primary effect was further supplemented by a diminished T2 need frustration effect and also by a positive classroom emotions (i.e., gratitude, empathy) effect.

7.2. Decreasing students' antisocial behavior and acceptance of cheating

When PE teachers participated in the ASIP, their students showed a decrease in both antisocial behavior and an attitude toward cheating (see Fig. 4). When teachers learned how to be less controlling and when students perceived their teachers as low in T1 control, their students showed a longitudinal decrease in their mid-semester need frustration. Somewhat surprisingly, the largest predictor of students' mid-semester need frustration was their own naturally-occurring (T1) antisocial behavior. This same effect occurred late in the semester as well (T2 antisocial behavior \rightarrow T3 need frustration). So, it was not only teachers who were creating the conditions to frustrate their students' psychological needs, but students themselves were creating their own conditions to promote their own need frustration (by engaging in antisocial classroom behavior). These mid-semester changes in students' need frustration were important because they most fully explained students' T3 antisocial behavior and T3 acceptance of cheating, though low midsemester need satisfaction further predict T3 acceptance of cheating.

We initiated the current investigation not only to document the relation between need frustration and students' maladaptive social functioning, but also to discover the classroom conditions under which need frustration arises. Those three conditions were teacher non-participation in the ASIP, teachers' beginning-of-semester controlling motivating style, and students' own antisocial classroom behavior.

The test of the revised model (Fig. 6) suggested that teachers' nonparticipation in the ASIP boosted students' antisocial behavior in way that went beyond affecting students' psychological needs. As discussed above, we suspect that the ASIP produced both motivational (needsbased) and emotional effects. We suggest that controlling teaching, especially when intense (e.g., yelling, intimidating, shaming), may do more than just frustrate students' psychological needs. When teachers do not allow students to voice their opinions, when teachers constantly dole out unexplained directives, and when teachers regularly counter and oppose students' thinking, feeling and behaving, then students become more likely to experience negative emotions such as anger, resentment, anxiety, and shame (Assor, Kaplan, Kanat-Maymon, & Roth, 2005). Anger in response to controlling teaching has been shown to predict students' antisocial classroom behavior (Hein et al., 2015). Thus, overall, changes in students' T3 antisocial behavior and T3 acceptance of cheating were mostly a function of changes in students' T2 need frustration, but this primary effect was further supplemented by a diminished T2 need satisfaction effect (but only for T3 acceptance of cheating) and also by a negative classroom emotions (i.e., anger) effect.

7.3. Autonomy support or needs support?

For both manipulated motivating style (experimental condition) and beginning-of-semester motivating style, we conceptualized teacher support as *autonomy* support. We hypothesized and found that autonomy support satisfied the full range of students' psychological needs—autonomy, competence, and relatedness (and also lessened the frustration of all three needs). This same multiple-needs effect has been observed previously in both intervention-based experimental studies (Cheon, Reeve, et al., 2016) and classroom-based longitudinal correlational studies (Haerens et al., 2015; Jang et al., 2016). This raises the question as to why we refer specifically to "autonomy support" rather more generally to "needs support", especially given that one of the key autonomy-supportive instructional behaviors included in the ASIP was "vitalize students' psychological needs".

We acknowledge that the general "needs support" motivating style is an accurate representation of what teachers learned during the ASIP. That said, we still prefer the specific "autonomy support" nomenclature because the ASIP was designed specifically around helping teachers learn how to support their students' autonomy and to replace autonomy-suppressive instructional behaviors with autonomy-supportive ones. By using the specific "autonomy supportive" terminology, we leave it open to future interventions to be designed and implemented to feature an explicit focus on both competence support and relatedness support (for one example, see Tessier et al., 2010).

For instance, a need-supportive intervention to help teachers increase promote prosocial behavior and diminish antisocial behavior could be built around not only fostering autonomy satisfaction and diminishing autonomy frustration, but also around helping teachers learn how foster students' competence satisfaction and diminish students' competence frustration. While an autonomy-supportive intervention emphasizes the aforementioned six autonomy-supportive instructional behaviors, a competence-supportive intervention would further emphasize helping teachers learn how to set expectations and goals, provide skill-building guidance and mentoring, and offer progress-enabling feedback (Jang, Reeve, & Deci, 2010). Similarly, a relatedness-supportive intervention would emphasize helping teachers show care, rely on friendly communications, and promote cooperation and teamwork (Sparks, Dimmock, Whipp, Lonsdale, & Jackson, 2016). We suspect that a future program that helped teachers support not only autonomy satisfaction but also competence and relatedness satisfaction would strengthen teachers' capacity to promote student-initiated prosocial classroom behavior and to diminish student-initiated antisocial classroom behavior.

7.4. Implications, limitations, and future research

These findings are important to understanding why students are (and are not) prosocial and antisocial in the classroom, but they are further important with respect to the breadth of student benefits that accrue from teacher participation in ASIPs. Past interventions have shown that teacher participation in ASIP facilitates students' personal benefits, including gains in motivation (intrinsic motivation, need satisfaction, autonomous motivation, lesser amotivation), engagement (effort, agency, lesser dropout), development (self-worth, preference for optimal challenge), learning (conceptual understanding, deep processing), performance (task performance, grades), and well-being (vitality, school satisfaction, lesser cortisol) (Chatzisarantis & Hagger, 2009; Cheon & Reeve, 2015; Cheon, Reeve, et al., 2016; Tessier et al., 2010). However, the current study was the first to investigate possible ASIPenabled gains in social-relationship benefits, including students' capacity to engage in more adaptive, prosocial, and high-quality interactions and relationships. These findings therefore extend previously-known ASIP-enabled student benefits beyond gain in personal functioning (e.g., engagement, learning) to further include gains in social functioning.

We note three limitations to the present research. First, we focused our experimental manipulation and data collection efforts only on the role of the teacher-student relationship. We did not include a similar focus on the peer climate and on student-student relationships, though the potential importance of peers' controlling interpersonal behaviors on students' need states has been suggested by correlational research (Hodge & Gucciardi, 2015, Study 2). So, we recommend that future investigations on students' prosocial and antisocial behaviors assess both teacher-provided and peer-provided autonomy support and interpersonal control.

Second, though participant retention over the course of the semester was very high (retention rate = 93.5%), those student-participants who dropped out of the study (through attrition) scored relatively high on T1 need frustration and T1 and T2 antisocial behavior. Practically speaking, this was very unfortunate, because these were the students who would have benefited the most from the intervention. This leaves teachers (and researchers who implement interventions) with the extra practical challenge of reaching their key target population—students who are especially prone to need frustration and antisocial behavior—to offer them teaching relationships and classroom experiences that are unusually high in autonomy support and need satisfaction and unusually low in control and need frustration.

Third, the outcome measures in the present study were general categories of prosocial behavior and antisocial attitudes and behaviors (i.e., encourage and help, verbally abuse and hurt). Some researchers might be additionally interested in more specific prosocial or antisocial classroom behaviors. For instance, it would be interesting if future research investigated a similar needs-based approach to predicting and understanding bullying.

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