Teachers become more autonomy supportive after they believe it is easy to do[☆]

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ABSTRACT

Objective: Several carefully designed autonomy-supportive intervention programs (ASIPs) have shown that PE teachers can learn how to become significantly more autonomy supportive toward students. The present study investigated why these ASIPs work. We hypothesized that ASIPs work to the extent they help PE teachers conceptually change their beliefs about how effective and how easy-to-implement autonomy-supportive teaching is.
Design: The design was both experimental and longitudinal.
Method: Forty-two full-time PE teachers (30 males, 12 females) from 42 different Korean secondary schools were randomly assigned into either an experimental (intervention) or control group, and we assessed three measures of autonomy-supportive teaching as dependent measures and the two beliefs about autonomy-supportive teaching as predictor variables at the beginning and end of a 17-week semester.
Results: Teachers in the experimental group showed significant end-of-semester increases in all three measures of autonomy support (eta_p^2 ranged from .23 to .34) and in both beliefs about autonomy support (eta_p^2 ranged from .29 to .39). Most importantly, mediation analyses showed that it was intervention-induced changes in the easy-to-implement belief that fully explained the post-intervention increases in autonomy support.
Conclusion: We suggest that ASIPs work by helping teachers revise their belief about autonomy-supportive teaching from "it is hard and difficult" to "it is actually quiet feasible and easy—once one knows how to do it."

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According to self-determination theory (SDT), people possess inherent psychological needs that, when appreciated and supported by the social context, are fully capable of energizing their engagement, positive functioning, and well-being (Deci & Ryan, 1985; Ryan & Deci, 2000). The social context best appreciates and supports people's psychological needs through the provision of autonomy support (Deci, Schwartz, Sheinman, & Ryan, 1981; Reeve, 2009). When autonomy supportive, PE teachers, athletic coaches, and exercise instructors tend to (1) take the perspective of their students, athletes, and clients (e.g., conduct formative assessments to ask what they want, need, think, and prefer); (2) introduce activities that vitalize and support (rather than neglect or frustrate) the psychological needs; (3) provide explanatory rationales for their requests; (4) communicate using informational (rather than pressuring) language; (5) acknowledge and accept expressions of negative affect; and (6) display patience (Assor, Kaplan, & Roth, 2002; Deci, Eghrari, Patrick, & Leone, 1994; Reeve, 2009, 2015a). These six acts of autonomy-supportive behavior are all positively intercorrelated, mutually supportive, and synergistic (Cheon, Reeve, Yu, & Jang, 2014; Deci et al., 1994). Collectively, they convey an interpersonal message of support and understanding (e.g., "I am your ally; I am here to support you and your strivings.") that others generally find to be need supportive (Reeve, 2015b).

In the context of PE instruction, teacher-provided autonomy support benefits both students and teachers. As to student benefits, students taught by autonomy-supportive PE teachers, compared to those taught by non-autonomy-supportive PE teachers, experience higher-quality motivation (i.e., greater need satisfaction and greater autonomous motivation, lesser need frustration and lesser amotivation) and display numerous educational benefits, such as greater

classroom engagement, conceptual learning, skill development, academic achievement, and psychological well-being (Assor et al. 2002; Chatzisarantis & Hagger, 2009; Cheon & Reeve, 2013, 2015; Cheon, Reeve, Lee, & Lee, 2015; Cheon, Reeve, & Moon, 2012; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005). Further, PE students' high-quality (autonomous) motivation has been linked to multiple indicators of their classroom and leisure time physical activity levels (e.g., accelerometers, pedometers, heart rate, self-report, raters' observations; Owen, Smith, Lubans, Ng, & Lonsdale, 2014). As to teacher benefits, PE teachers who participate in ASIP, compared to PE teachers in a no-intervention control group, report greater post-intervention teaching motivation (need satisfaction, autonomous motivation, and intrinsic goals), teaching skill (teaching efficacy), and teaching well-being (vitality, job satisfaction, lesser emotional and physical exhaustion) (Cheon et al., 2014). As SDT researchers became increasingly aware of the benefits of autonomy-supportive teaching, they began to design intervention programs to help PE teachers learn how to become more autonomy supportive during instruction.

1. Autonomy-supportive intervention programs (ASIPs)

An autonomy-supportive intervention program (ASIP) is a step-by-step plan of action to help teachers become more autonomy supportive toward students. When PE teachers participate in carefully-designed, theory-based (self-determination theory) ASIPs, they learn how to become more autonomy supportive (Aelterman, Vansteenkiste, Van den Berghe, De Meyer, & Haerens, 2014; Chatzisarantis & Hagger, 2009; Cheon & Reeve, 2013; Cheon et al., 2012, 2014; Edmunds, Ntoumanis, & Duda, 2008; Fenner, Straker, Davis, & Hagger, 2013; Moustaka, Vlachopoulos, Kabitsis, & Theodorakis, 2012; Reeve, Jang, Carrell, Jeon, & Barch, 2004; Tessier, Sarrazin, & Ntoumanis, 2008). Further, these intervention-enabled changes in teachers' autonomy-supportive motivating style tend to be more than just temporary or situationally-induced changes, because follow-up investigations show that these teachers continue to show a highly autonomy-supportive style one year later (Cheon & Reeve, 2013; Reeve et al., 2004). The conclusion from about a dozen carefully designed and implemented ASIPs is that these teacher-focused interventions produce large and enduring effect sizes (Reeve & Cheon, 2014).

Given the rather large supportive literature on the utility of ASIPs, we investigated the new question of, "Why do these interventions work?" Answering this question is important because doing so will enable a better and more sophisticated understanding of the antecedents of developing a more autonomy-supportive style, and it will also enable educators to design and implement enhanced professional developmental opportunities, including not only formal intervention programs but also teacher-focused workshops, in-service programs, and mentoring programs.

Many factors explain why teachers might (or might not) adopt a more autonomy-supportive style toward students, including the social context in which they teach (Taylor, Ntoumanis, & Smith, 2009), the characteristics of the students they teach (Pelletier, Sequine-Levesque, & Legault, 2002), administrative supports vs. pressures (Pelletier & Sharp, 2009), pre-service and in-service training experiences (Woolfolk & Hoy, 1990), the extent to which their own psychological needs are satisfied vs. thwarted during teaching (Taylor, Ntoumanis, & Standage, 2008), personality dispositions (Van den Berghe et al., 2013), the culture in which they live and teach (Downie, Koestner, ElGeledi, & Cree, 2004), and the beliefs they hold about autonomy-supportive teaching (Roth & Weinstock, 2013). Most of these influences are not very malleable and few can be addressed in an intervention program. The glaring exception is teachers' beliefs about autonomy-supportive teaching.

2. Beliefs about autonomy-supportive teaching

Previous research reveals that three specific beliefs underlie teachers' high vs. low tendency toward autonomy-supportive teaching (Aelterman et al., 2014; Reeve, 1998; Reeve et al., 2014; Roth & Weinstock, 2013). These three beliefs are that autonomy-supportive teaching is (a) an effective way to motivate and engage students ("effectiveness belief"), (b) relatively easy to implement during instruction ("easy-to-implement belief"), and (c) a culturally normative way to teach ("normative belief").

The effectiveness belief reflects the teacher's judgment that students benefit in terms of motivation, engagement, learning, and achievement when teachers offer autonomy-supportive teaching. The easy-to-implement belief reflects the teacher's judgment that autonomy-supportive teaching is easy (vs. difficult) to do during instruction, as teachers see it as a feasible (plausible), time-efficient, and practical (not just idealistic) way to motivate and engage students. The normative belief reflects the teacher's judgment that autonomy-supportive teaching is an accepted, expected, and commonplace way to motivate and engage students among one's peer teachers.

When an ASIP produces positive effects, it does so by helping teachers work through an accommodation process (i.e., conceptual change) about how they think about their motivating style toward students (Reeve, 1998). For instance, many teachers harbor a not-so-positive view of autonomy-supportive teaching (Turner, 2010; Turner, Warzon, & Christensen, 2011). For these teachers, conceptual change is difficult and not at all certain (Weinstein, Madison, & Kuklinski, 1995), largely because these teachers harbor pre-existing beliefs that oppose autonomy-supportive teaching (i.e., namely, that it is a generally ineffective, difficult-to-implement, and culturally non-normative approach to instruction; Reeve, 1998). We focused on teachers' beliefs about autonomy-supportive teaching because findings from the conceptual change literature show that teachers' willingness to adopt practically any new teaching practice is a function of their motivational beliefs (Pintrich, Marx, & Boyle, 1993) and their judgments of how useful and feasible the new teaching practice is believed to be (Posner, Strike, Hewson, & Gertzog, 1982).

To help teachers work through what may sometimes be a difficult conceptual change process, we designed the present ASIP to focus on the two pivotal teacher beliefs of (a) how effective (vs. ineffective) and (b) how easy-to-implement (vs. difficult-to-implement) autonomy-supportive teaching is believed to be (Reeve et al., 2014). That is, we designed the ASIP in the current study to produce a significant main effect to enable positive changes in teachers' beliefs about how effective and how easy-to-implement autonomy-supportive teaching is believed to be (once one knows how to do it).

We assessed both teacher beliefs at the beginning and end of the semester, and we examined the relations of both beliefs to teachers' autonomy-supportive teaching at the beginning of the semester and to changes in autonomy-supportive teaching at the end of the semester. We expected both beliefs to be significantly correlated with teachers' initial endorsement of autonomy-supportive teaching, because this result has been reported in the literature (Aelterman et al., 2014; Reeve et al., 2014). But the focus of the present study was on the contribution of ASIP-induced changes in these beliefs to an end-of-semester change in autonomy-supportive teaching. Specifically, we predicted that a carefully-designed ASIP would produce a large positive main effect to change both the effectiveness and the easy-to-implement beliefs, and also that the ASIP-induced changes in these two beliefs would answer and explain our driving research question, which as "Why do ASIPs work to help teachers become more autonomy supportive?"

3. Hypotheses

3.1. Hypotheses 1 and 2

Hypotheses 1 and 2 predicted that the ASIP would produce its intended effect of increasing autonomy-supportive teaching. Hypothesis 1 (H1) used students' ratings of their teachers: *Students of teachers who participate in ASIP, compared to students of teachers who were randomly assigned not to participate in the intervention, would report significantly greater autonomy-supportive teaching from their teachers.* Hypothesis 2 (H2) used teachers' self-ratings: *Teachers who participate in ASIP, compared to teachers who were randomly assigned not to participate in the intervention, would report significantly greater autonomy-supportive teaching.* H1 and H2 were not new predictions, as the main effect of ASIP on changes in teachers' autonomy support has been replicated repeatedly, as confirmed by the dozen or so prior ASIPs reviewed in the introduction. Still, the tests of H1 and H2 were important to the present study for two reasons: (1) to demonstrate that the version of ASIP implemented in the current study was able to produce a large, positive main (direct) effect on changes in autonomy-supportive teaching; and (2) to introduce the three different ways we measured teacher-reported autonomy support in the present study—namely, self-rated autonomy support, personal endorsement of autonomy-supportive teaching, and future intentions to use autonomy-supportive teaching in one's own classroom.

3.2. Hypothesis 3

Hypothesis 3 (H3) predicted that ASIP would increase teachers' beliefs that autonomy-supportive teaching was both effective and easy to do. H3 was that *teachers who participate in ASIP, compared to teachers who were randomly assigned not to participate in the intervention, would report significantly more positive post-intervention effectiveness and easy-to-implement beliefs.*

3.3. Hypothesis 4

Hypothesis 4 (H4) extended the first three hypotheses by predicting that the ASIP-induced changes in teachers' beliefs would fully mediate and explain the otherwise direct effect ASIP observed on changes in teachers' autonomy support. H4 was that *ASIP-induced changes in teachers' effectiveness and easy-to-implement beliefs would fully mediate the otherwise direct effect that ASIP was predicted to have on changes in autonomy-supportive teaching.*

4. Method

4.1. Participants

Teacher-participants were 42 full-time PE teachers (30 males, 12 females) who taught in one of 42 different public schools (26 middle schools, 16 high schools) around Seoul, South Korea. All teacher-participants were ethnic Korean, and all were certified teachers who daily taught 5 to 7 classes in physical education with class sizes that ranged from 33 to 40 students. Teachers averaged 8.0 years of teaching experience (*range* = 1–35 years) and were, on average, 35.2 years of age (*range* = 25 to 58). Each teacher taught the same national curriculum (designated by the Korean National and Educational Curriculum) that featured weekly activities devoted to sport-based physical activities such as softball, soccer, badminton, basketball, loop jumping, table tennis, and track and field. All 42 teacher-participants completed all aspects of the study, including participating in both waves of data collection and, for the teachers in the experimental group, all three parts of ASIP. Thus, the

teacher retention rate throughout the semester-long study was 100%. In appreciation for their participation, each teacher received a gratuity equivalent to $50.

Student-participants were the 2380 students present in class on the day the student questionnaire was administered. Every student who was in class that day agreed to complete the student questionnaire. All of these students were ethnic Korean. The student sample consisted of the following: 1050 (44%) females and 1330 (56%) males; 1465 (62%) middle school and 915 (38%) high school students; and 1335 (56%) in the experimental group and 1045 (44%) in the control group.

4.2. Procedure

During the summer break, the Korean Ministry of Education (MOE) required all middle and high school PE teachers in the Seoul metropolitan area to participate in a week-long curriculum orientation. During this week, the research team was allowed to administer a brief battery of questionnaires to all 85 attending PE teachers and to invite them to participate in a research study on teachers' classroom instructional strategies. The questionnaire assessed demographic characteristics, the three measures of autonomy support, and three beliefs about autonomy support. As to the research study, teachers were told that their participation would involve, first, random assignment into either an experimental or control condition and, second, two waves of data collection. Most teachers expressed an interest in the study but, in Korea, teachers must first gain the consent and permission of their school principal. In the end, 42 out of the population of 85 PE teachers were willing and able to participate in the study. Importantly, the 42 participating teachers did not differ significantly from the 43 non-participating teachers on any demographic characteristic (i.e., gender, age, grade level taught), on any measure of autonomy support, or on any measure of the beliefs about autonomy support, all t's < 1.29, *ns*.

The timeline for the experimental procedure appears in Fig. 1. The population of 85 PE teachers attended the MOE's curriculum orientation in early August. In the month between the curriculum orientation and the start of the academic semester, the sample of 42 participating teachers were identified and then randomly assigned into either the experimental ($n = 23$, 55%) or control ($n = 19$, 45%) group. Two weeks prior to the beginning of the semester, teachers in the experimental group participated in a two-part (morning and afternoon) 6-h ASIP. Part 3 of the ASIP was conducted in one of the three weeks after the midterm exam, which was either week 9 or 10 or 11 of the 17-week semester. Based on teachers' schedules and geographies, we arranged to have each teacher complete Part 3 by participating in one of four group discussions. Again, all 23 teachers in the experimental group (100%) were able to participate in Part 3. It was in week 9 that the students of all 42 participating teachers completed the student questionnaire during the first 5 min of one class.[1] Finally, in the last week of the semester (week 17), all 42 teacher-participants completed the same questionnaire assessing autonomy support and beliefs about autonomy support that they completed four months earlier during the curriculum orientation.

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[1] The week 9 assessment of students' perceptions of their teachers' autonomy-supportive style was the only student data collected during the study. We did not collect a baseline measure of students' perceptions. This was because we assumed that random assignment to conditions would yield no significant differences in a beginning of the semester (i.e., baseline) assessment. We assessed the student ratings during week 9 because it takes about one month for students' perceptions of their teacher's motivating style to clarify and stabilize (Deci et al., 1981). The student response rate during this week 9 assessment was 100% (i.e., all students present in class that day volunteered to complete the brief questionnaire).
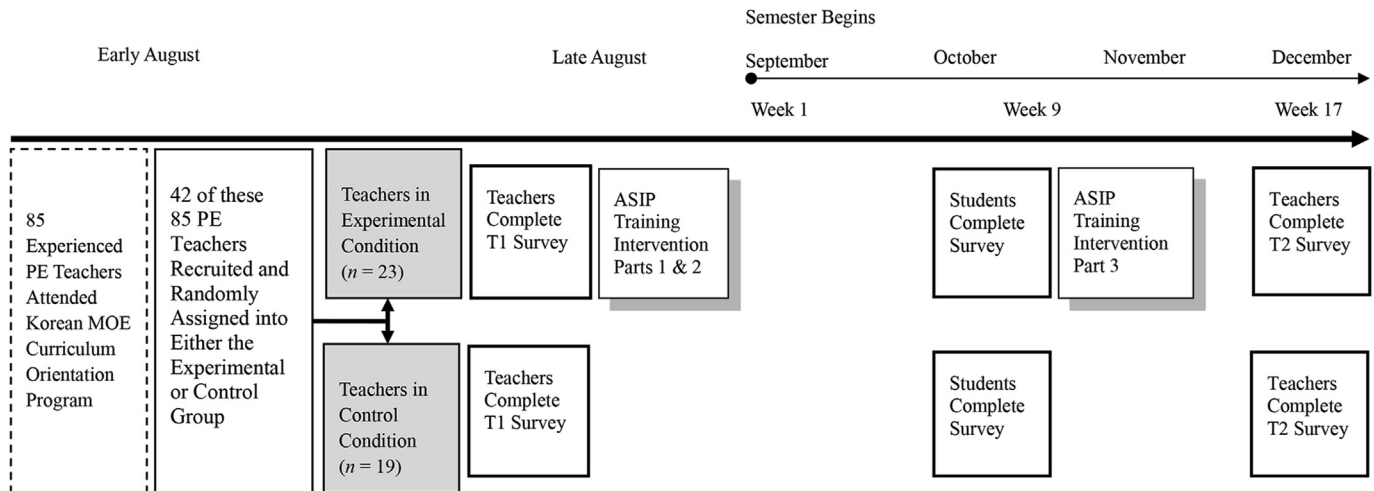
Fig. 1. Procedural timeline for the 2-part autonomy-supportive teacher training intervention and 2 waves of data collection.

All data collected and reported in this investigation are original. That is, while our research team has used a teacher-focused, experimentally-based, longitudinal research design in past publications (e.g., Cheon & Reeve, 2013), the present data are all unique to this particular investigation.

4.3. Autonomy-supportive intervention program (ASIP)

Participation in the autonomy-supportive intervention program (ASIP) constituted the study's independent variable. Part 1 of the ASIP was a 3-h workshop experience. It began with a media-rich PowerPoint presentation to discuss the nature of student motivation (what it is, where it comes from), the autonomy-supportive motivating style, and empirical evidence on the benefits of autonomy-supportive teaching. The two-fold goal was to introduce autonomy-supportive teaching and to support the teacher belief that it was an effective way to motivate and engage students during instruction.

Part 2 of the ASIP was a two-and-a-half-hour workshop experience. It began by introducing six specific acts of autonomy-supportive teaching (summarized later in Table 3) and then modeled their classroom enactment through "how to" examples offered in text, photographs, and video clips of previously-recorded Korean PE teachers skillfully displaying each autonomy-supportive act of instruction. Part 2 concluded with a group discussion to clarify how and when to enact autonomy-supportive instructional behaviors, to provide opportunities for practice and scaffolding, and to provide opportunities for peer-to-peer interpretations, tips, and suggestions. The two-fold goal was to introduce the six specific autonomy-supportive instructional behaviors and to support the teacher belief that each was easy-to-implement—once one knows how to do it.

Part 3 of the ASIP lasted for 2 h. It featured a peer-to-peer group discussion about teachers' early-semester classroom experiences with autonomy-supportive teaching. Teachers reported on what they said and did during instruction, and also on how their students' reacted to autonomy-supportive teaching. The discussion led to peer-to-peer tips, suggestions, and clarifications.

4.4. Measures

4.4.1. Student measure

To report perceptions of their teacher's autonomy-supportive motivating style, students completed the Korean-translation (Cheon et al., 2012) of the 6-item short-version of the Learning Climate Questionnaire (LCQ; Williams & Deci, 1996). The LCQ has been used successfully to assess autonomy-supportive teaching in previous studies (Cheon et al., 2012; Jang, Reeve, Ryan, & Kim, 2009), and it utilized a 7-point response scale (1 = *strongly disagree*, 7 = *strongly agree*). Sample items include, "I feel understood by my teacher" and "My teacher tries to understand how I see things before suggesting a new way to do things." Scores on the LCQ were internally consistent in the present study ($\alpha = .92$).

4.4.2. Teacher measures

At both T1 (prior to the beginning of the semester) and T2 (at week 17, or the end of the semester), teachers reported their extent of autonomy support using three different measures—namely, self-rated autonomy support, personal endorsement of autonomy-supportive teaching, and future intentions to use autonomy-supportive teaching in one's own classroom. In past research, teachers' autonomy-supportive motivating style has been assessed in three different ways (Aelterman et al., 2014; Su & Reeve, 2011): (1) trained raters score teachers' actual autonomy-supportive behavior during classroom instruction; (2) students report their perceptions of autonomy-supportive teaching (as in the paragraph above), and teachers' self-report. While raters' scoring of teachers' autonomy-supportive instructional behavior represents an objective way to assess autonomy support (Aelterman et al., 2014; Cheon & Reeve, 2013; Cheon et al., 2012), the collection of such a measure in the current study was, unfortunately, impractical because the 42 teacher-participants taught in 42 geographically diverse schools that would have required both pre- and a post-intervention ratings to accommodate the pre-intervention/post-intervention research design. For this logistical reason, we elected to utilize only the two remaining previously-validated ways of assessing autonomy support—namely, students' ratings and teacher's self-ratings.

To assess self-rated autonomy support, teachers completed the same Korean-translated version of the 6-item LCQ that their students completed. For the teachers, each item was adapted to be self-referenced, such that the student item "My teacher tries to understand how I see things before suggesting a new way to do things" was adapted to "I try to understand how students see things before I suggest a new way they might do things." The teacher version of the LCQ was internally consistent in the present study ($\alpha = .74$ at T1; $\alpha = .81$ at T2). Teachers' self-ratings correlated significantly with the classroom average of their students' ratings of them on the LCQ, $r(42) = .40$, $p = .008$. Incidentally, students' LCQ scores also correlated significantly with the other two T2 teacher

measures of autonomy support—namely, personal endorsement of autonomy-supportive teaching, $r(42) = .47$, $p = .002$, and future intentions to use autonomy-supportive teaching, $r(42) = .46$, $p = .002$.

To assess personal endorsement of autonomy-supportive teaching, future intentions to use autonomy-supportive teaching in one's own classroom, and the three beliefs about autonomy-supportive teaching, teachers completed the Teaching Scenarios measure (see Reeve et al., 2014, Table 1, page 96). The measure first presents a 263-word description of highly autonomy-supportive teaching that is then followed by 20 questions that referenced that teaching scenario. All 20 items utilized the same 7-point response scale (1 = *strongly disagree*, 7 = *strongly agree*), and the measure has been validated in six different languages, including Korean (Reeve et al., 2014). Four questions assessed personal endorsement of autonomy-supportive teaching in an internally consistent way ($\alpha = .89$ at T1; $\alpha = .94$ at T2): "This approach to teaching describes how I teach my students on a daily basis"; "This approach to teaching nicely describes what I do during class"; "This is an accurate and true description of what I do during my teaching"; and "I do *not* teach this way" (reverse scored). Four questions assessed future intentions to use autonomy-supportive teaching in one's own classroom in an internally consistent way ($\alpha = .86$ at T1; $\alpha = .89$ at T2): "I plan to teach my students this way in the future"; "In the future, I intend to motivate my students this way"; "This approach to teaching nicely describes the way I intend to motivate my students in the future"; and "I do *not* intend to motivate my future students in this way."

Twelve questions assessed the three teacher beliefs about autonomy support. Four items assessed the effectiveness belief in an internally consistent way ($\alpha = .75$ at T1; $\alpha = .93$ at T2): "This approach to teaching is effective in terms of motivating and engaging students"; "In terms of performance and achievement, students benefit from this approach to teaching"; "I like and think positively of this approach to teaching"; and "This approach to teaching produces good and desirable results—it works!". Four items assessed the easy-to-implement belief in an internally consistent way ($\alpha = .90$ at T1; $\alpha = .94$ at T2): "This approach to teaching is easy to do"; "Most teachers can do this; it is not asking too much from teachers"; "This approach to teaching is easy and simple (not hard and difficult) to do"; and "This approach to teaching is effortless and easily manageable." Four items assessed the normative belief in an internally consistent way ($\alpha = .92$ at T1; $\alpha = .91$ at T2): "This approach to teaching describes what most teachers do"; "This approach to teaching is the norm—most of the

teachers I know teach this way"; "This approach to teaching is very typical—most of the teachers I know teach this way"; and "This approach to teaching is common for the teachers I know and work with."

4.5. Statistical analyses and power analysis

In the test of H1, the dependent measure was students' perceptions of their teachers' autonomy-supportive teaching. Because the unit of analysis was the teacher, rather than the student, and because students' data (Level 1, $n = 2380$) were nested within teachers (Level 2, $n = 42$), we tested H1 by performing a multilevel analysis using hierarchical linear modeling (HLM, version 7; Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011). Approximately one-fifth of the variance in students' ratings was attributable to between-teacher differences (Level 2 ICC = 22%), though the majority of the variance in students' ratings was attributable to between-student differences (Level 1 ICC = 78%).

In the test of H2, the three dependent measures were the three different teacher-ratings of their own autonomy-supportive teaching. To determine the effect of the ASIP on each dependent measure, we used a series of three regression-based repeated measures analyses (one regression for each measure) with experimental condition serving as the between-groups independent variable (0 = control, 1 = experimental) and time or wave serving as the within-groups repeated measure (a second independent variable). By using this analytic strategy, we were able to treat teachers' T1 scores as a baseline measure so that we could interpret teachers' T2 scores as a change from that baseline score. The hypothesis test was for a significant condition × time interaction to assess whether any observed changes in teachers' T2 scores depended on experimental condition.

In the test of H3, the three dependent measures were the three different teacher-ratings of their own beliefs about autonomy-supportive teaching. We used the same regression-based repeated measures analyses for the test of H3 as we used in the test of H2, and the hypothesis test was again for a significant condition × time interaction.

In the test of H4, we examined whether the ASIP direct effect on changes in teachers' T2 autonomy support was mediated by ASIP-induced changes in the T2 effectiveness and easy-to-implement beliefs. Because this was a mediation analysis, we used the INDIRECT macro in SPSS to conduct bootstrapping analyses based on 1000 bootstrapping resamples (Preacher & Hayes, 2008). In all three analyses (one for each T2 measure of autonomy-supportive

Table 1
Descriptive statistics and correlation matrix for experimental condition and all 12 teacher measures.

Variable	M	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Experimental condition	.55	.50													
Time 1		—													
2. Self-Rated Autonomy Support	5.04	.67	.00	—											
3. Personal Endorsement of AST	4.42	.96	.28	.45**	—										
4. Future Intentions to Use AST	5.02	.80	−.11	.32*	.47**	—									
5. Effectiveness Belief	4.15	.90	.23	.31*	.38*	.12	—								
6. Easy-to-Implement Belief	5.12	.88	−.10	.39*	.38*	.67**	.27	—							
7. Normative Belief	3.71	1.15	−.04	.31*	.23	.07	.46**	.40**	—						
Time 2															
8. Self-Rated Autonomy Support	5.36	.78	.47**	.44**	.60**	.23	.35*	.22	.12	—					
9. Personal Endorsement of AST	4.60	1.15	.67**	.14	.68**	.07	.32*	.08	.02	.64**	—				
10. Future Intentions to Use AST	5.14	1.12	.55**	.02	.44**	.12	.13	.07	−.08	.44**	.83**	—			
11. Effectiveness Belief	4.48	1.25	.77**	.11	.31*	−.12	.41**	−.07	.09	.42**	.64**	.52**	—		
12. Easy-to-Implement Belief	5.35	1.10	.57**	−.07	.40**	.05	.22	.11	−.04	.47**	.81**	.88**	.50**	—	
13. Normative Belief	3.42	1.05	−.33*	.21	.23	.06	.08	.12	.49**	.04	.05	.05	−.09	.08	—

*$p < .05$. **$p < .01$. N = 42.
Note. Experimental condition: 0, control; 1, experimental. AST = Autonomy-Supportive Teaching.

teaching), we used the six independent (predictor) variables of experimental condition, the corresponding T1 measure of autonomy-supportive teaching, the T1 and T2 effectiveness beliefs, and the T1 and T2 easy-to-implement beliefs. We did not include the T1 and T2 normative beliefs in these analyses because experimental condition did not predict changes in the normality belief (as reported below in the analyses for H3). Prior to these mediation analyses, we transformed all variables into standardized scores so that we could report and interpret the standardized statistics.

Before our hypothesis tests, we computed a power analysis for a 2-group repeated measures analysis (G*Power 3; Faul, Erdfelder, Lang, & Buchner, 2007). Using $p = .05$ and an expected effect size of $d = .70$, we calculated what sample size was needed to obtain a power $= .95$. The needed sample size was 29. Because the sample size for each analysis was 42, we determined that we had sufficient statistical power for each hypothesis test.

5. Results

5.1. Preliminary analyses

Missing data were rare (<.1%), so we used the expectation-maximization (EM) algorithm for imputing missing values. We checked whether any of the assessed variables deviated from normality; all values for skewness and kurtosis were less than |.9|, indicating little deviation from normality. We also tested for possible associations among the demographic characteristics of gender, age, years of teaching experience, and grade level taught (middle *vs.* high school) and the baseline measures of teachers' autonomy support and beliefs about autonomy support. No demographic characteristic was significantly associated with any baseline measure.

5.2. Effect of ASIP on student-rated autonomy support (Hypothesis 1)

We first assessed the capacity of the ASIP to increase autonomy-supportive teaching by asking students to report their perceptions of autonomy-supportive teaching. Students of teachers who participated in ASIP rated the teacher higher on autonomy-supportive teaching than did students of teachers who did not participate in ASIP, $t(40) = 4.78$, $p < .001$, $d = 1.52$ (Ms, 5.18 *vs.* 4.52).

5.3. Effect of ASIP on teacher-rated autonomy support (Hypothesis 2)

At both T1 and T2, teachers reported their autonomy support in three ways—self-rated autonomy support, personal endorsement of autonomy-supportive teaching, and future intentions to use autonomy-supportive teaching in one's own classroom.

For *self-rated autonomy support*, the condition main effect was not significant, $F(1, 40) = 3.98$, $p = .053$, the time main effect was significant, $F(1, 40) = 7.17$, $p = .011$, and, most importantly, the condition × time interaction was significant, $F(1, 40) = 11.67$, $p < .001$, $eta_p^2 = .23$. As illustrated in the left panel of Fig. 2, autonomy support increased significantly for teachers in the experimental group from T1 to T2 ($\Delta = +.66$, $t = 3.40$, $p = .001$), while it remained unchanged from T1 to T2 for teachers in the control group ($\Delta = -.07$, $t = .33$, $p = .740$).

For *personal endorsement of autonomy-supportive teaching*, the condition main effect was significant, $F(1, 40) = 16.29$, $p < .001$, the time main effect was not significant, $F(1, 40) = 1.40$, $p = .244$, and the condition × time interaction was significant, $F(1, 40) = 20.35$, $p < .001$, $eta_p^2 = .34$. As illustrated in the center panel of Fig. 2, autonomy support increased significantly for teachers in the

experimental group from T1 to T2 ($\Delta = +.63$, $t = 2.38$, $p = .021$), while it remained unchanged from T1 to T2 for teachers in the control group ($\Delta = -.37$, $t = 1.27$, $p = .213$).

For *future intentions to use autonomy-supportive teaching in one's own classroom*, the condition main effect was significant, $F(1, 40) = 6.09$, $p = .018$, the time main effect was not significant, $F(1, 40) = .10$, $p = .761$, and the condition × time interaction was significant, $F(1, 40) = 16.25$, $p < .001$, $eta_p^2 = .29$. As illustrated in the right panel of Fig. 2, autonomy support increased significantly for teachers in the experimental group from T1 to T2 ($\Delta = +.75$, $t = 2.93$, $p = .005$), while it decreased significantly from T1 to T2 for teachers in the control group ($\Delta = -.65$, $t = 2.21$, $p = .034$).

5.4. Effect of ASIP on beliefs about autonomy support (Hypothesis 3)

At both T1 and T2, teachers reported their three beliefs about autonomy support—the effectiveness belief, the easy-to-implement belief, and the normative belief.

For the *effectiveness belief*, the condition main effect was significant, $F(1, 40) = 28.79$, $p < .001$, the time main effect was not significant, $F(1, 40) = 3.10$, $p = .086$, and the important condition × time interaction was significant, $F(1, 40) = 25.32$, $p < .001$, $eta_p^2 = .39$. As illustrated in the left panel of Fig. 3, the effectiveness belief increased significantly for teachers in the experimental group from T1 to T2 ($\Delta = +1.01$, $t = 3.74$, $p = .001$), while it remained unchanged from T1 to T2 for teachers in the control group ($\Delta = -.50$, $t = 1.98$, $p = .056$).

For the *easy-to-implement belief*, the condition main effect was significant, $F(1, 40) = 6.00$, $p = .019$, the time main effect was not significant, $F(1, 40) = .82$, $p = .372$, and the condition × time interaction was significant, $F(1, 40) = 16.41$, $p < .001$, $eta_p^2 = .29$. As illustrated in the right panel of Fig. 3, the easy-to-implement belief increased significantly for teachers in the experimental group from T1 to T2 ($\Delta = +.87$, $t = 3.49$, $p = .001$), while it remained unchanged from T1 to T2 for teachers in the control group ($\Delta = -.55$, $t = 1.78$, $p = .084$).

For the *normative belief*, the condition main effect was not significant, $F(1, 40) = 1.75$, $p = .194$, the time main effect was not significant, $F(1, 40) = 2.37$, $p = .132$, and the condition × time interaction was not significant, $F(1, 40) = 2.87$, $p = .098$, $eta_p^2 = .07$.

5.5. Mediation analyses (Hypothesis 4)

The descriptive statistics and intercorrelations among experimental condition and the 12 teacher-reported dependent measures appear in Table 1. The mediation hypothesis was that both the T2 effectiveness belief and the T2 easy-to-implement belief, controlling for the T1 effectiveness belief, the T1 easy-to-implement belief, experimental condition, and the corresponding T1 measure of autonomy support, would both uniquely predict each T2 measure of autonomy support.

For *self-rated autonomy support*, the overall 6-term model significantly predicted T2 autonomy support, $F(6, 35) = 5.91$, $p < .001$ ($R^2 = .50$). The T2 easy-to-implement belief significantly predicted T2 autonomy support, $\beta = .334$, $t = 2.18$, $p = .036$, while the T2 effectiveness belief did not, $\beta = -.086$, $t = .42$, $p = .675$. Without these two beliefs in the model the direct effect of ASIP on T2 autonomy support was significant, $\beta = .907$, $t = 3.54$, $p = .001$, but with these two beliefs in the model this same direct effect was no longer significant, $\beta = .326$, $t = 1.62$, $p = .114$, suggesting mediation. The bias-corrected confidence interval for the indirect path from the T2 easy-to-implement belief to T2 autonomy support did not include zero [.023, .851], confirming the presence of mediation, while the bias-corrected confidence interval for the
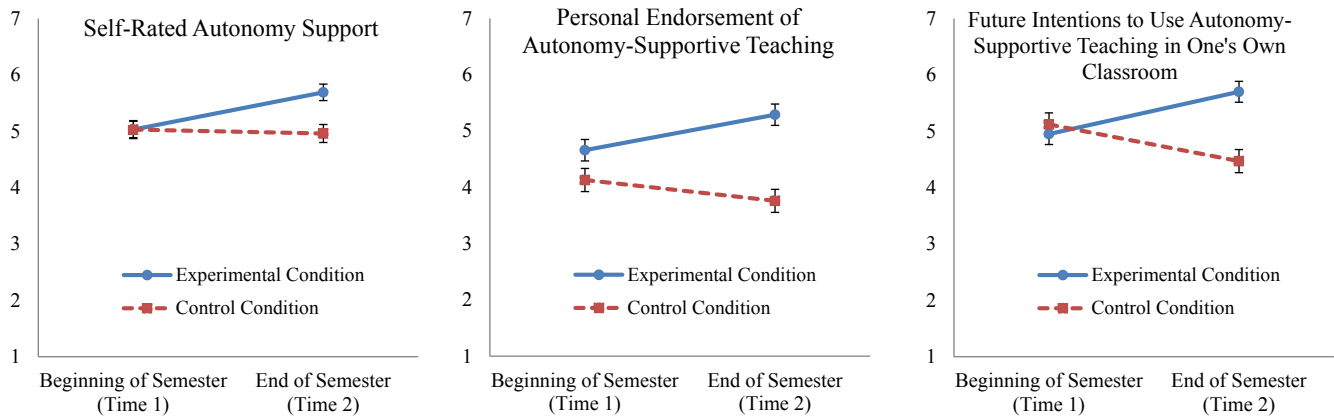
Fig. 2. Means and standard errors (vertical bars) of the three teacher-reported measures of autonomy-supportive teaching broken down by experimental condition and time of assessment.
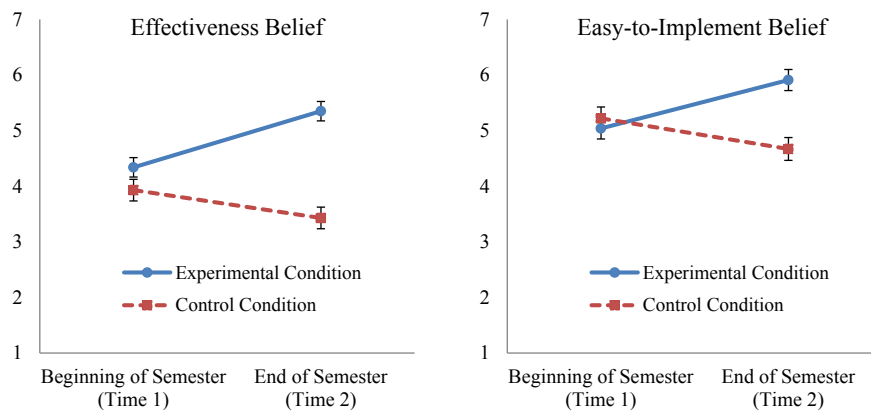

Fig. 3. Means and standard errors (vertical bars) of the teacher-reported effectiveness and easy-to-implement beliefs broken down by experimental condition and time of assessment.

indirect path from the T2 effectiveness belief to T2 autonomy support did include zero [−.734, .564], confirming the absence of mediation. The overall results from the bootstrapping analysis to predict T2 changes in self-rated autonomy support appear in the left column of Table 2, while the corresponding path model appears in Fig. 4.[2]

For *personal endorsement of autonomy-supportive teaching*, the overall 6-term model significantly predicted T2 autonomy support, $F(6, 35) = 41.88$, $p < .001$ ($R^2 = .88$). The T2 easy-to-implement belief significantly predicted T2 autonomy support, $\beta = .497$, $t = 6.52$, $p = .001$, while the T2 effectiveness belief did not, $\beta = .127$,

$t = 1.27$, $p = .212$. Without these two beliefs in the model the direct effect of ASIP on T2 autonomy support was significant, $\beta = .993$, $t = 5.26$, $p = .001$, but with these two beliefs in the model this same direct effect was no longer significant, $\beta = .157$, $t = 1.57$, $p = .125$, suggesting mediation. The bias-corrected confidence interval for the indirect path from the T2 easy-to-implement belief to T2 autonomy support did not include zero [.245, .888], confirming mediation, while the bias-corrected confidence interval for the indirect path from the T2 effectiveness belief to T2 autonomy support did include zero [−.083, .531], confirming non-mediation. The overall results from the bootstrapping analysis to predict T2 changes in personal endorsement of autonomy-supportive teaching appear in the center column of Table 2, while the corresponding path model appears in Fig. 5.

For *future intentions to use autonomy-supportive teaching in one's own classroom*, the overall 6-term model significantly predicted T2 autonomy support, $F(6, 35) = 26.54$, $p < .001$ ($R^2 = .82$). The T2 easy-to-implement belief significantly predicted T2 autonomy support, $\beta = .849$, $t = 9.38$, $p = .001$, while the T2 effectiveness belief did not, $\beta = .197$, $t = 1.62$, $p = .115$. Without these two beliefs in the model the direct effect of ASIP on T2 autonomy support was significant, $\beta = 1.147$, $t = 4.10$, $p = .001$, but with these two beliefs in the model this same direct effect was no longer significant, $\beta = −.096$, $t = .40$, $p = .693$, suggesting mediation. The bias-corrected confidence interval for the indirect path from the T2 easy-to-implement belief to T2 autonomy support did not include zero [.545, 1.670], confirming mediation, while the bias-corrected

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[2] For purposes of clarity, we do not report in Figs. 4–6 the paths from the T1 easy-to-implement and effectiveness beliefs to the T2 measure of autonomy support, so we report those statistics here and in Table 2. For Fig. 4, the path from the T1 ease-of-implementation belief to T2 self-rated autonomy support was not significant ($\beta = .017$, $t = .13$, $p = .899$), but it is important to include this path in the interpretation of the model because it confirms that it was *changes* in the easy-to-implement belief (not the T2 easy-to-implement belief per se) that predicted changes in self-rated autonomy support. The path from the T1 effectiveness belief was also not significant ($\beta = .104$, $t = .73$, $p = .468$). For Fig. 5, the path from the T1 easy-to-implement belief to T2 changes in personal endorsement of autonomy-supportive teaching was not significant ($\beta = −.119$, $t = 1.76$, $p = .089$). The path from T1 effectiveness belief was also not significant ($\beta = −.009$, $t = .13$, $p = .895$). For Fig. 6, the path from the T1 easy-to-implement belief to T2 changes in future intentions to use autonomy-supportive teaching was not significant ($\beta = −.096$, $t = .95$, $p = .350$). The path from T1 effectiveness belief was also not significant ($\beta = −.120$, $t = 1.43$, $p = .162$).

Table 2
Results from the bootstrapping analyses for each of the three measures of autonomy support.

Predictor Variable	Self-rated autonomy support					Personal endorsement of autonomy-supportive teaching					Future intentions to use autonomy-supportive teaching in one's own classroom				
	B	SE B	β	t	p	B	SE B	β	t	p	B	SE B	β	t	p
Experimental condition	.505	.311	.326	1.62	.114	.358	.228	.157	1.57	.125	−.108	.270	−.096	.40	.693
Motivation style measure[1], T1	.498	.159	.427	3.13	.003	.527	.086	.442	6.09	.000	.242	.136	.172	1.78	.084
Effectiveness belief, T1	.090	.123	.104	.73	.468	−.012	.090	−.009	.13	.895	−.150	.105	−.120	1.43	.162
Effectiveness belief, T2	−.054	.127	−.086	.42	.675	.117	.092	.128	1.27	.212	.177	.109	.197	1.62	.115
Easy-to-implement belief, T1	.016	.123	.017	.13	.899	−.156	.089	−.119	1.76	.089	−.122	.129	−.096	.95	.350
Easy-to-implement belief, T2	.237	.109	.333	2.18	.036	.520	.080	.497	6.52	.000	.865	.092	.849	9.38	.000
$F_{(6, 35)}$	5.91, $p < .001$.					41.88, $p < .001$.					26.54, $p < .001$.				
R^2	.50					.88					.82				

confidence interval for the indirect path from the T2 effectiveness belief to T2 autonomy support did include zero [−.107, .783], confirming non-mediation. The overall results from the bootstrapping analysis to predict T2 changes in future intentions appear in the right column of Table 2, while the corresponding path model appears in Fig. 6.

6. Discussion

The plan behind the present investigation was to conduct a theory-based, carefully-designed, and previously-validated ASIP to observe intervention-induced changes in teachers' autonomy support and in their beliefs about autonomy support and then use these data to explain why teachers were or were not willing or able to capitalize on the professional developmental opportunity to meaningfully upgrade the quality of their classroom motivating style. As expected, participation in ASIP did help teachers become more autonomy supportive, as confirmed both by students' ratings (H1) and by teachers' self-reports (H2). Also as expected, participation in ASIP did help teachers accept and internalize that autonomy-supportive teaching was more effective and easier-to-

implement than these teachers believed prior to the ASIP experience (H3).

While ASIP increased teachers' beliefs that autonomy support was both effective and easy-to-implement (Fig. 3), it was only changes in the easy-to-implement belief that explained changes in teachers' autonomy support (Figs. 4–6). From this finding (H4), we conclude that when it comes to designing and implementing interventions that have the capacity to help teachers meaningfully upgrade the quality of their classroom motivating style, changing teachers' easy-to-implement belief (e.g., "Oh, this is easier than I thought it would be.") is a functional necessity while changing teachers' effectiveness belief (e.g., "Oh, this is more effective than I thought it would be.") is either a prerequisite (to changes in the easy-to-implement belief) or a mere luxury.

Because changes in the easy-to-implement belief were a functional necessity during the ASIP experience, we provide in Table 3 a sample instructional script from our ASIP for each of the six recommended autonomy-supportive instructional behaviors. In the ASIP, each of these six instructional behaviors was introduced, explained, modeled, practiced, and discussed. We encouraged teachers to try each sample script in their own classroom and
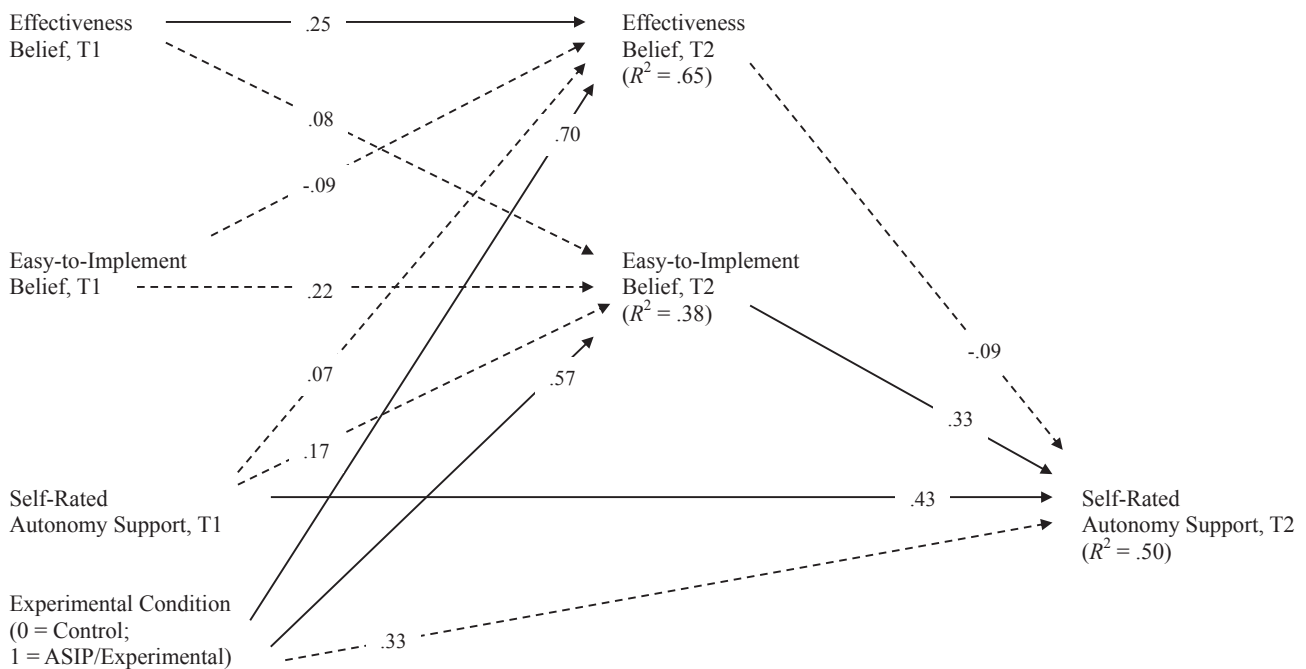

Fig. 4. Test of the hypothesized beliefs mediation model to predict teachers' self-rated autonomy support. *Note.* Solid lines represent statistically significant paths, $p < .05$, while dashed lines represent non-significant paths. Numbers with each path are standardized beta coefficients. All variables are observed variables. Correlations among the T1 and T2 variables are reported in Table 1.
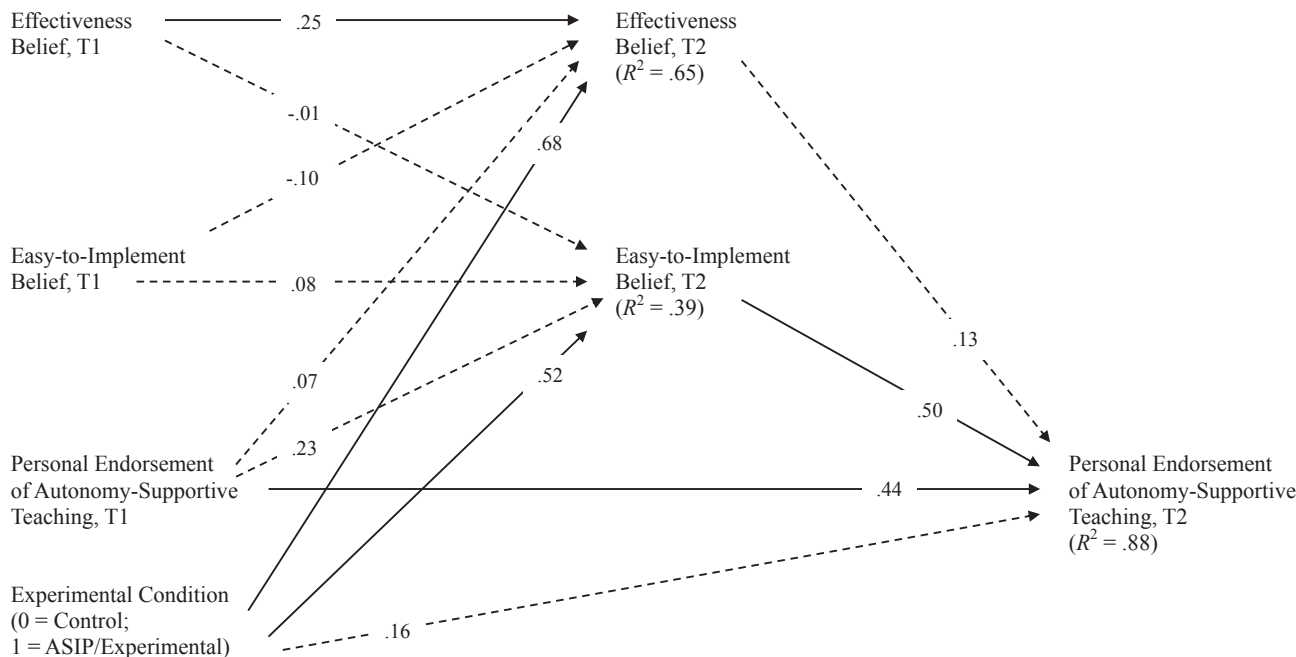
Fig. 5. Test of the hypothesized beliefs mediation model to predict teachers' personal endorsement of autonomy-supportive teaching. *Note.* Solid lines represent statistically significant paths, $p < .05$, while dashed lines represent non-significant paths. Numbers with each path are standardized beta coefficients. All variables are observed variables. Correlations among the T1 and T2 variables are reported in Table 1.
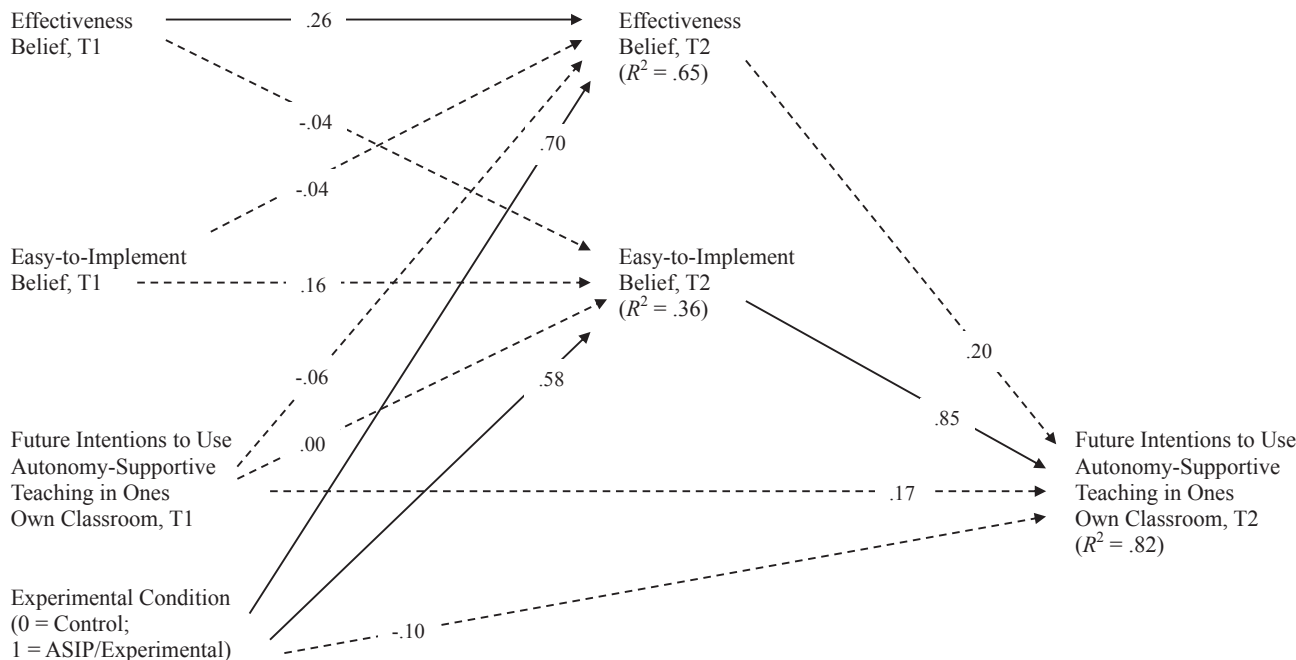

Fig. 6. Test of the hypothesized beliefs mediation model to predict teachers' future intentions to use autonomy-supportive teaching in their own classrooms. *Note.* Solid lines represent statistically significant paths, $p < .05$, while dashed lines represent non-significant paths. Numbers with each path are standardized beta coefficients. All variables are observed variables. Correlations among the T1 and T2 variables are reported in Table 1.

gradually, over the course of the semester, seek to refine them into more personalized ways of motivating and engaging their particular students in the context of their particular teaching situation.

While the findings clearly highlight the importance of changes in the easy-to-implement belief, changes in the effectiveness belief might still be important to the professional development effort to improve one's motivating style. It is worth noting that changes in

teachers' effectiveness belief would have explained substantial variance in changes in teachers' T2 autonomy support across all three measures had it been the only teacher belief under consideration (the only mediator entered into the mediation analyses). But when both the easy-to-implement and effectiveness beliefs were entered together, changes in the effectiveness belief were overwhelmed by the predictive power of changes in the easy-to-

Table 3
Illustrative scripts for each of the six recommended instructional behaviors to help PE teachers learn the "how to" of autonomy-supportive teaching.

Autonomy-supportive instructional behavior	Sample instructional script
Take the students' perspective	Conduct various formative assessments, such as starting a class (or activity) by soliciting students' input into the forthcoming lesson and then integrating those suggestions into the lesson plan, and also by ending a class by asking students to complete an anonymous "Any suggestions?" comment card.
Offer activities to vitalize the psychological needs	For autonomy, give students some say in what they will do and how they will do it, asking "What would you like to do?"
	For competence, offer students a "Can you do this?" optimal challenge to strive for, such as a difficult goal, a model to emulate, or a standard of excellence to pursue.
	For relatedness, offer students an opportunity to engage in peer-to-peer interaction, such as a cooperative learning activity.
Provide explanatory rationales	Introduce engagement requests, procedures, rules, and limits as follows: (1) Request, (2) Rationale, such as "Let's work today to change our disrespectful language into more respectful language, because we want a classroom that is welcoming, safe, and supportive for everyone."
Communicate using informational language	When a student misbehaves or performs poorly, ask if he or she agrees with your perception (e.g., "It seem that you are having trouble with this activity; am I right about that?"), ask him or her to diagnose the cause of the misbehavior or poor performance (e.g., "Do you know why that might be?"), and ask if he or she would like your help in generating new-and-improved prosocial or performance-enhancing coping behaviors.
Acknowledge and accept expressions of negative affect	Acknowledge the negative affect: "I see that everyone looks bored and unenthusiastic about today's stretching exercises."
	Accept the negative affect as valid: "Yes, we have practiced this same routine many times before, haven't we?"
	Welcome suggestions to eliminate the cause of the negative affect: "Okay, so what might we do differently; any suggestions?"
Display patience	Watch, listen, be responsive to students' initiatives, communicate your willingness to help, and do so after being asked, signaled, or invited. Avoid rushing in to intervene or fix the problem, as in "Here, do it this way—like I showed you."

implement belief. Thus, it seems that changes in the effectiveness belief are potentially important and predictive but that changes in the easy-to-implement belief are more important and more explanatory.

We did not design the ASIP to produce a significant main effect on the normative belief, as the normative belief more reflects the cultural context in which one teaches, which is something that we considered to be outside the purview of an ASIP, at least in its present form. Accordingly, teachers' participation in ASIP did not produce a significant increase in the belief that autonomy-supportive teaching was culturally normative. This is because a normative belief arises out of and reflects the descriptive norm that guides people's (i.e., teachers') thinking and acting, and normative beliefs are particularly difficult to change (Cialdini, 2007; Cialdini, Kallgren, & Reno, 1991). What drives a change in normative beliefs tends to be social approval versus social disapproval (Cialdini, 2003; Goldstein, Cialdini, & Griskevicius, 2008).

6.1. Implications for future ASIPs

While research on the motivational climate provided by PE teachers has a long and broad representation in the literature (e.g., TARGET studies; Braithwaite, Spray, & Warburton, 2011), ASIP-specific studies are relatively new. The pioneering ASIPs were either experience-based or theory- and evidence-based. As to an experienced-based intervention, Richard deCharms (1976) guided a group of elementary-school teachers toward a more autonomy-supportive motivating style by offering them a series of 21 experience-based activities, such as "The Origin-Pawn Game" and "The Blindfold Game" that afforded teachers with first-hand, role-reversal experiences of feeling high (origin) or low (pawn) autonomy support during a learning activity (e.g., assembling tinker toys, being led by a sighted guide). Later, Reeve (1998) guided a group of preservice teachers toward a more autonomy-supportive style by offering informational booklets that provided conceptual definitions and a theoretical framework (theory-based) as well as an overview of published research findings on the benefits of autonomy-supportive teaching (evidence-based). In retrospect, these early ASIPs yielded relatively modest effect sizes (d's < 1). Contemporary ASIPs have trended more toward emphasizing

"how-to" skills and offering concrete take-it-to-the-classroom recommendations (as per Table 3), and they utilized the input and collaboration of the participating teachers in the development and design of the intervention (Aelterman et al., 2013). These more skill-based interventions have yielded relatively large effect sizes (d's > 1) and sometimes they have yielded very large effect sizes (d > 2; Cheon & Reeve, 2015).

Teachers' beliefs about autonomy support were not assessed in these past ASIP intervention studies, but it seems reasonable in hindsight to infer that the early ASIPs largely strengthened teachers' effectiveness beliefs while contemporary ASIPs largely strengthened both the effectiveness and easy-to-implement beliefs. This trend toward a more skill-based, how-to intervention design helps teachers experience conceptual change away from believing that "autonomy-supportive teaching sounds nice and probably works in theory, but it also sounds naïve and unrealistically difficult, impractical and time-consuming, given my students and my classroom demands" toward believing that "autonomy-supportive teaching sounds feasible and easy to do, practical, and time-saving, even with my students and my classroom demands."

6.2. Limitations

We identify two key methodological limitations. The first limitation was that data were subjective self-reports, rather than objective behaviors. This concern applies to both the students' and the teachers' data. As to the students' data, we assessed only perceptions of autonomy-supportive teaching, tough these data did nevertheless show that students perceived a real change in their teachers' classroom autonomy support. We also did not assess ASIP-induced student outcomes or benefits. Past studies have collected student outcome data such as objectively-scored classroom engagement (Reeve et al., 2004), classroom grades (Cheon et al., 2012), and performance achievements (e.g., medals won in a sports competition; Cheon et al., 2015). These objectively-scored dependent measures enhance the methodological strength of any ASIP investigation, but they address the question of whether the ASIP works, rather than why it works. In the present study, we borrowed heavily from the ASIP literature to assume that our ASIP would work (i.e., increase autonomy-supportive teaching), an

assumption that allowed us to focus on answering the new question of why ASIP worked. As to the teachers' data, our study was limited by a mono-method of assessing only self-reported mediators and outcomes. So, future research will need to confirm that changes in teachers' beliefs about autonomy support predict changes in their actual day-to-day classroom instruction.

The second limitation is that our research design might have created a self-fulfilling expectancy effect in the minds of our teacher-participants. That is, perhaps changes in the two teacher beliefs occurred simply because we told teachers that autonomy-supportive teaching was effective and easy-to-do. This alternative interpretation may apply to the effectiveness belief, because we did tell teachers explicitly in Part 1 of ASIP that autonomy-supportive teaching was effective. But this alternative interpretation does not seem to apply to the ease-of-implementation belief, because we did not tell teachers during ASIP that autonomy-supportive teaching was easy to do. Instead, how easy *vs.* difficult autonomy-supportive teaching is to do is something that needs to be discovered and realized by the teacher himself or herself over weeks and perhaps months of actual classroom experience. Just as a swimming instructor cannot tell a student that the backstroke is easy to do, we do not think we can tell teachers that autonomy-supportive teaching is easy to do. Instead, we can show teachers how to implement autonomy-supportive instruction, and teachers will then learn through experience and feedback that these acts of instruction really are easy, practical, time-efficient, and situationally-appropriate things to do. Hence, the fruits of our 8-h ASIP experience are not likely explained by mere expectancy effects, at least not in regard to the critical ease-of-implementation belief.

7. Conclusion

Teachers used our ASIP as a professional developmental opportunity to learn how to become more autonomy supportive toward their students. The ASIP helped teachers conceptually change their belief that autonomy-supportive teaching was too difficult to a revised belief that it was actually easy and quite feasible—once you knew how to do it. Perhaps future interventions might be structured in ways to better support constructive changes in PE teachers' easy-to-implement belief and, in doing so, catalyze their professional development.

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