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## Giving and receiving autonomy support in a high-stakes sport context: A field-based experiment during the 2012 London Paralympic Games<sup>☆</sup>

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## ABSTRACT

**Objective:** Recognizing that high-stakes competitions tend to pressure coaches toward a maladaptive controlling motivating style, we sought to evaluate the capacity of an intervention to help coaches adopt a more autonomy-supportive style as they and their athletes prepared for the 2012 London Paralympic Games.

**Design:** We adopted a coach-focused experimental research design that longitudinally assessed coaches' and athletes' self-report, rater-scored, and objective dependent measures.

**Method:** We randomly assigned 33 coaches and their 64 athletes from 10 sports into either an experimental or control group and assessed their motivation and functioning longitudinally.

**Results:** In the control group, athletes and coaches both showed a significant longitudinal deterioration in all measures of motivation, engagement, and functioning. In the experimental group, none of the measures of motivation, engagement, and functioning deteriorated but, instead, were generally maintained. In terms of performance, athletes of coaches in the experimental group won significantly more Olympic medals than did athletes in the control group.

**Conclusion:** Enacting an autonomy-supportive coaching style within the context of a high-stakes sports competition functioned as an antidote to coaches' otherwise situationally-induced controlling style.

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Research informed by self-determination theory confirms that physical education teachers and exercise instructors can learn how to become more autonomy supportive and, when they do, their students and clients experience numerous benefits (Chatzisarantis & Hagger, 2009; Cheon, Reeve, & Moon, 2012; Edmund, Ntoumanis, & Duda, 2008; Lonsdale et al., 2013; Tessier, Sarrazin, & Ntoumanis, 2010), as do these mentors themselves (Cheon, Reeve, Yu, & Jang, 2014). Benefits from giving and receiving autonomy support are now well established, but a lingering question remains as to whether these benefits continue to accrue when the context changes from teaching novices to engage in leisure activities to coaching life-long elite athletes to prepare for high-stakes, results-oriented, sport competitions. The purpose of the present study was

to test the hypothesis that these benefits would occur even in a high-stakes competitive sport context—namely, the 2012 London Paralympic Games.

In a high-stakes competition participants experience elevated pressure to win; and the higher the stakes become, the more elevated the pressure to win becomes (Fortier, Vallerand, Briere, & Provencher, 1995; Reeve & Deci, 1996). This social process affects competitors, but it also affects coaches, as coaches tend away from supporting autonomy and toward prescribing behaviors and pressuring for outcomes (Pelletier, Séguin-Levesque, & Legault, 2002; Taylor, Ntoumanis, & Smith, 2009). The pressure to win also tends coaches toward controlled motivation of their own (Rocchi, Pelletier, & Couture, 2013) and impaired well-being (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009; Stebbings, Taylor, Spray, & Ntoumanis, 2012). In the language of self-determination theory (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2010; Deci, Spiegel, Ryan, Koestner, & Kauffman, 1982; Mageau & Vallerand, 2003; Soenens, Siens, Vansteenkiste, Goossens, & Dochy, 2012; Stebbings et al., 2012),

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the pressure inherent within a high-stakes competition tends to pull a controlling motivating style out of coaches.

While a controlling style may seem situationally appropriate during a high-stakes competition, self-determination theory argues that such a style is actually counterproductive to the quality of both the coach–athlete relationship and to the athletes' motivation, engagement, and performance (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Blanchard, Amiot, Perreault, Vallerand, & Provencher, 2009; Pelletier, Fortier, Vallerand, & Brière, 2001; Van den Berghe et al., 2013). By controlling, we mean that coaches prioritize tangible extrinsic incentives over experiential intrinsic satisfactions (e.g., win the medal rather than enjoy the activity), display negative conditional regard (e.g., emotionally and physically withdraw after poor performance), use controlling language (e.g., demands), insist on strict compliance paired with constant monitoring, belittle and counter-argue against any athlete resistance to the coach's procedures, impose coach-prescribed values while simultaneously invalidating the athlete's feelings and opinions, display power-assertive intimidation tactics, and show impatience (Bartholomew et al., 2009, 2010; Reeve, 2009).

Because high-stakes competitive contexts pressure coaches toward a maladaptive controlling motivating style, we sought to evaluate the capacity of an intervention to help coaches not default into a situationally-induced controlling style when placed into an extremely results-oriented sporting context (i.e., the 2012 London Paralympic Games). We chose to study this particular population of coaches because the press to win Olympic medals was extremely strong and highly prioritized by the athletic association of the home nation of the authors—namely, Korea. For instance, coaches commonly heard administrator-uttered statements, such as “If you cannot bring home a medal, then we will find a coach who can.”

We expected that without an autonomy-supportive intervention (i.e., the control group in our study), the cultural press to win and bring home medals would pull a controlling motivating style out of the coaches of the Korean national Paralympics team during the two months of training that led up to the Games. We also expected, however, that if coaches from this same population were offered a carefully designed, theory-based autonomy-supportive intervention (i.e., the experimental group), then the intervention experience would encourage coaches to rethink the merits and utility of controlling coaching, orient them toward supporting rather than pressuring their athletes, and provide the guidance coaches would need to enact an autonomy-supportive motivating style toward their athletes. So, Hypothesis 1 was that *coaches in the control group would become significantly more controlling during the two months that led up to the Games, while coaches in the experimental group would become significantly more autonomy supportive*. To assess coaches' motivating style, we used both objective (trained raters scored coaching behavior during practice) and subjective (athletes-reported perceptions of their coach's motivating style) measures.

Hypothesis 2 (H2) concerned the athletes and their receiving of autonomy support. H2 was that *the athletes of coaches who participated in ASIP, compared to the athletes of coaches who did not participate in ASIP, would show greater motivation, engagement, and performance*. For motivation, we assessed need satisfaction and need frustration during practice sessions/coach–athlete interactions. For engagement, we assessed both objective engagement (as rated by coaches) and subjective engagement (as self-reported by athletes). For performance, we assessed whether or not each athlete won an Olympic medal. We expected that the athletes of coaches who participated in ASIP (experimental group) would report greater need satisfaction, lower need frustration, greater engagement, and would win more medals than would the athletes of coaches who did not participate in ASIP (control group).

Hypothesis 3 (H3) concerned the coaches and their giving of autonomy support.

H3 was that *the coaches who participated in ASIP, compared to the coaches who did not participate in ASIP, would show greater coaching motivation, coaching efficacy, and coaching well-being*. H3 was based on Deci, La Guardia, Moller, Scheiner, and Ryan's (2006) finding that people experience as much well-being from giving autonomy support as they do from receiving it. To assess coaching motivation, efficacy, and well-being, we measured the same three ASIP-induced benefits observed to occur for physical education teachers (Cheon et al., 2014)—namely, psychological need satisfaction during one's coaching, coaching efficacy, and job satisfaction.

## Method

### Participants, training facilities, and random assignment to conditions

Administrators who managed the Korean national Paralympic team contacted the authors to request a training program to help coaches enhance their athletes' motivation and performance in the Games. To deliver an evidence-based training program, we conducted an experimentally-based, longitudinally-designed research study and asked the administrators to randomly assign the coaches into either the experimental or control condition, using the 10 sports as the unit of random assignment. The Korean national team included one team-based sport (goal ball), but we asked administrators to include only the coaches of the 10 individual sports so that we could test our hypotheses using individually-based data. As shown in Fig. 1, administrators randomly assigned 19 coaches and their 45 athletes from five sports into the experimental condition

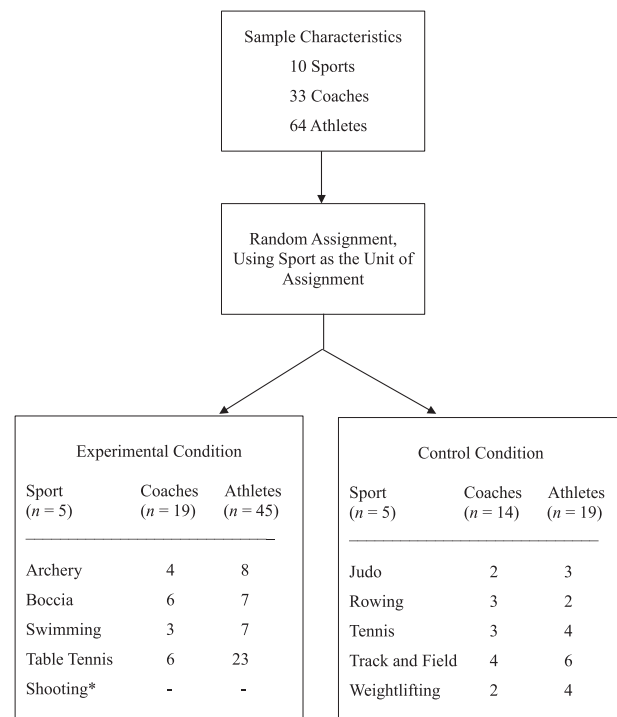


Fig. 1. Number of sports, coaches, and athletes randomly assigned into the experimental and control conditions. \* The Shooting sport was not included in the experimental condition sample for reasons explained in the text.

and 14 coaches and their 19 athletes from five different sports into the control condition.

All coaches and athletes lived on-site on a full-time basis in the Athletic Complex for Athletes with Disabilities to train and practice together five days a week for eight hours a day. The training facility is its own campus with a main administration building, living quarters, meeting rooms, and a cafeteria that is surrounded by training facilities for each individual sport (e.g., swimming pool, indoor tennis courts, outdoor archery range). Safety concerns prevented the members of the shooting sport from residing in the Athletic Complex. Instead, these coaches and athletes stayed and practiced at a nearby military complex that provided a well-equipped shooting range. Because the research team did not have access to the military complex, we had to drop the shooting sport from the experimental condition. The shooting coaches did not participate in the ASIP.

#### Coaches

Coach-participants were 33 ethnic Koreans (25 male, 8 female) who served as either head coach or assistant coach to one of the nine sports listed in Fig. 1. On average, coaches had 7.8 years of coaching experience in the disabled sport context (range, 1–30), and their average age was 40.6 years old (range, 28–53). Nine coaches had a disability, while 24 did not.

#### Athletes

Athlete-participants were 64 ethnic Koreans with disability (41 males, 23 females) who were a member of one of the nine sport groups listed in Fig. 1. On average, athletes were 36.6 years old (range, 18–54). All the athletes had a disability (e.g., physical, hearing, visual), and 15 were born with the disability while 49 were disabled by an accident.

#### Procedure

Administrators at the Athletic Complex managed the schedules of the coaches and athletes (e.g., practice hours, meal times, meeting hours). Because of this arrangement, staff members—not the research team—administered all questionnaires used in the study. The administrators granted permission to the research team to observe and score coaches' behaviors during regularly scheduled practices. All the coaches also granted permission to the research team to make these observations. All coaches and athletes completed an informed consent form prior to the Time 1 (T1) questionnaires, and the study was approved by the Athletic Complex administrators and by the Human Subjects Committee of the third author's university.

The timeline for the experimental procedures appears in Fig. 2. Coaches were first randomly assigned (based on the sport they coached) into either the experimental or control condition in early June. In mid-June, 31 of 33 coaches completed the T1 coach questionnaire and all 64 athletes completed the T1 athlete questionnaire. The two judo coaches (from the control group) declined the invitation to participate in the questionnaire part of the study, though they did allow raters to score their coaching behavior during practice and they did rate their athletes' practice engagement. When completing the questionnaires, 11 athletes required the assistance of a staff member to read the questions aloud and to mark the athletes' voiced responses on the questionnaire. Starting at the end of June, all 19 coaches in the experimental condition participated in the autonomy-supportive intervention program (ASIP). During one week in late July, the team of raters scored coaches' autonomy-supportive vs. controlling coaching behaviors during a regularly-scheduled practice session. In the first week of August, 31 of 33 coaches completed the T2 coach questionnaire (all

but the two judo coaches) and all 64 athletes completed the T2 athlete questionnaire. It was also at this time that coaches rated their athletes' practice engagement. For the coaches, the participation rate was 94% (31/33), while the attrition rate was 0%. For the athletes, the participation rate was 100%, while the attrition rate was 0%. Coaches and athletes departed for London on August 24th (administrators and staff departed on August 20th), and the Paralympic Games took place from August 29th to September 8th. After the Games, the administrators provided the research team with the medals won broken down by individual athlete.

We assessed most dependent measures longitudinally [all except (a) coaches' autonomy-supportive vs. controlling motivating style during practice, (b) coaches' rating of athletes' engagement, and (c) medals won]. We collected both pre- and post-intervention dependent measures because we expected the motivation, engagement, efficacy, and well-being of coaches and athletes in the experimental group to improve over the two months of practice that led up to the Games while we expected these same dependent measures to deteriorate longitudinally for the coaches and athletes in the control group.

#### Autonomy-supportive intervention program (ASIP)

The 3-part ASIP provided to coaches in the experimental condition was based on our previously-utilized 3-part ASIP with physical education (PE) teachers (Cheon & Reeve, 2013, 2015; Cheon et al., 2012, 2014). The present ASIP was based on self-determination theory principles (Ryan & Deci, 2000), the guidelines for effective ASIPs outlined by Su and Reeve (2011), and the research team's frequent pre-intervention visits to observe practice sessions and to interview coaches, athletes, and administrators.

Part 1 was a 2-hr workshop that began with a media-rich PowerPoint presentation that emphasized the nature of athlete motivation (what it is, where it comes from), types of motivating styles (autonomy supportive, controlling), and empirical evidence on the benefits of autonomy support and the costs of control. The presentation then transitioned to a "how to" workshop with numerous examples of autonomy-supportive coaching by presenting both verbal descriptions and videotaped models to observe and emulate. Specifically, we showed the following five categories of autonomy-supportive coaching behaviors: Vitalize athletes' inner motivational resources (autonomy, competence, relatedness) during training and practice sessions; provide explanatory rationales for each rule, request, or procedure; acknowledge and accept expressions of negative affect; rely on non-pressuring language when addressing problems and providing feedback; and display patience. As one example of a recommended autonomy-supportive behavior (acknowledge and accept negative affect), we suggested that when coaches observe an athlete display an engagement or performance problem that, instead of criticizing and pressuring the athlete to change, the coach could acknowledge the problem (e.g., "I've noticed that you don't seem to have your normal energy level today; is that right?"), accept the problem as valid (e.g., "Yes, we have been practicing for several hours now, haven't we?"), and invite the athlete to diagnose the problem (e.g., "Okay, so how can we get your energy back? Any suggestions?"). Part 1 concluded with a group discussion about the feasibility of autonomy-supportive coaching in the disabled sport context and its potential obstacles, such as how non-disabled coaches can truly take the perspective of their disabled athletes.

Part 2 lasted 2 h with the first hour featuring a PowerPoint presentation, and the second hour featuring a group discussion. The presentation reinforced the message from Part 1, but it presented the new idea of offering athletes a structured practice session in an autonomy-supportive way. From our pre-intervention

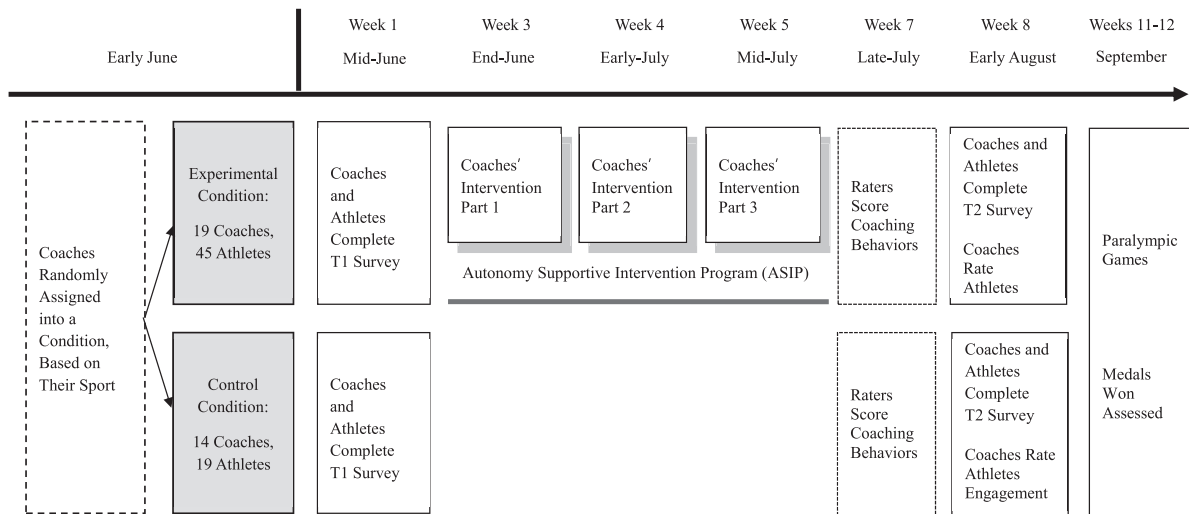


Fig. 2. Procedural timeline for the autonomy-supportive intervention program and data collection from coaches, athletes, and raters during the Summer of 2012.

observations, it was clear that coaches rather uniformly offered highly structured practice sessions (e.g., rules, procedures, expectations, feedback), but also that they offered these elements of structure in a controlling, rather than in an autonomy-supportive, way. Recognizing this, the presentation communicated how coaches could offer their existing elements of structure in an autonomy-supportive way. The group discussion revolved around coaches' efforts at autonomy-supportive coaching from the prior week, the obstacles they faced (e.g., extreme results-oriented pressure from administrators), and a sharing of peer-to-peer strategies and insights.

Part 3 involved a 1-h one-on-one meeting between each coach and the senior author, who was ethnic Korean and highly knowledgeable about each sport and what it takes to support elite athletes. The purpose of the meeting was to address each individual coach's questions, problems, counter-arguments, and practical concerns related to enacting an autonomy-supportive coaching style. All 19 coaches in the experimental condition completed all three parts of ASIP.

#### Trained raters and the observation sheet

Four graduate students in the School of Adaptive Physical Education and Sport at the third author's university constituted the team of trained raters. Raters received, first, a 3-h lecture on the principles of self-determination theory and, second, a 3-h workshop on how to use the rating sheet in the context of coaches motivating elite athletes with disabilities. The rating sheet was the same as that used by Cheon and Reeve (2013), and it listed the following five instructional behaviors scored on a bi-polar 1–7 response scale with the autonomy supportive behavior accompanied by illustrative descriptors listed on the right side (scored as 7) and the controlling behavior accompanied by illustrative descriptors listed on the left side (scored as 1): nurtures inner motivational resources vs. introduces extrinsic motivators; relies on informational language vs. relies on pressuring language; provides explanatory rationales vs. neglects explanatory rationales; displays patience vs. rushes athletes to produce prescribed behavior; and acknowledges and accepts negative affect vs. counters and tries to change negative affect. For practice, raters scored videotapes of physical education teachers trying to engage their students in a

classroom setting until they achieved acceptable levels of interrater reliability ( $Kappa > .40$ ; Landis & Koch, 1977) on all five coaching behaviors.

During the study (late-July; see Fig. 2), raters worked in pairs to score the five coaching behaviors. The raters did not know into which condition the coaches they observed had been assigned. In making their ratings, they observed each coach for one hour to generate five scores—one for each of the five coaching behaviors. The rater teams were only able to score 29 of the 33 coaches. This was because four coaches either did not show up for that week's practice sessions (because of meetings, interviews with journalists) or did not engage in sport-related coaching (held an informational meeting to discuss only administrative matters). For the 29 observed coaches, the raters scored each coaching behavior in a moderately reliable way: nurtures inner motivational resources,  $Kappa = .428$  ( $p < .001$ ) 95% CI (.289–.567), provides explanatory rationales,  $Kappa = .829$  ( $p < .001$ ) 95% CI (.736–.922), acknowledges and accepts negative affect,  $Kappa = .480$  ( $p < .001$ ) 95% CI (.339–.621), relies on informational language,  $Kappa = .722$  ( $p < .001$ ) 95% CI (.615–.829), and displays patience,  $Kappa = .452$  ( $p < .001$ ) 95% CI (.314–.590). Ratings across the five behaviors were internally consistent, so we averaged the five ratings into one overall "autonomy-supportive vs. controlling coaching behaviors" score (5-item  $\alpha = .95$ ).

#### Measures

The athlete questionnaire assessed two manipulation checks (perceived autonomy-supportive coaching, perceived controlling coaching) and three dependent measures (psychological need satisfaction, psychological need frustration, and practice engagement). The coach questionnaire assessed three dependent measures (psychological need satisfaction, coaching efficacy, and job satisfaction). With one exception, all items on both questionnaires utilized the same 7-point Likert scale that ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). The one exception involved the items assessing coaching efficacy, because we followed the recommendations of the developers of this scale (Tschannen-Moran & Woolfolk Hoy, 2001) to utilize a 9-point scale that ranged from 1 (*not at all true*) to 9 (*very true*). Each measure was originally developed in English, but we had a professionally-back translated

and previously-validated Korean version of each measure available from prior studies. Coaches and athletes completed their respective questionnaires twice—once prior to the intervention and a second time after the intervention (see Fig. 2).

#### *Athlete measures*

##### *Perceived motivating style*

To assess perceived autonomy-supportive and perceived controlling coaching, athletes completed the Korean translated versions (from Cheon & Reeve, 2013) of the Learning Climate Questionnaire (LCQ; Williams & Deci, 1996) and the Controlling Teaching Scale (CTS; Jang, Reeve, Ryan, & Kim, 2009). We slightly modified both questionnaires by changing “My teacher” to “My coach”. The 6-item LCQ has been successfully used in the physical education and sport contexts (Banack, Sabiston, & Bloom, 2011; Cheon et al., 2012), and a sample item is “My coach listens to how I would like to do things.” Scores on the LCQ were internally consistent for both assessment periods ( $\alpha = .89$  at T1,  $\alpha = .89$  at T2). The 4-item CTS has also been used successfully in previous studies (Cheon & Reeve, 2013; Jang et al., 2009), and a sample example item is “My coach puts a lot of pressure on me.” Scores on the CTS were internal consistency for both assessment periods ( $\alpha = .87$  at T1,  $\alpha = .86$  at T2).

##### *Need satisfaction*

To assess need satisfaction, athletes completed the Korean translated versions (from Cheon & Reeve, 2013) of the 5-item Perceived Autonomy scale (Standage, Duda, & Ntoumanis, 2006), the 4-item Perceived Competence subscale from the Intrinsic Motivation Inventory (McAuley, Duncan, & Tammien, 1989), and the 4-item Relatedness to Teachers scale (Furrer & Skinner, 2003). Each of these measures has been successfully used in previously published research to assess need satisfaction within the physical education and sports context (Cheon et al., 2012; Ntoumanis, 2005; Taylor & Lonsdale, 2010). Scores on the perceived autonomy scale (e.g., “When practicing my sport, I feel that I practice because I want to.”) showed acceptable internal consistency ( $\alpha = .74$  at T1,  $\alpha = .77$  at T2), as did scores on the perceived competence scale (e.g., “I think I am pretty good at my sport.”;  $\alpha = .90$  at T1,  $\alpha = .91$  at T2), and scores on the perceived relatedness scale (e.g., “When I am with my coach, I feel accepted.”;  $\alpha = .65$  at T1,  $\alpha = .80$  at T2). Scores from these three scales were positively intercorrelated across both assessment periods, so we followed the tradition in this literature (Deci et al., 2001; Standage, Duda, & Ntoumanis, 2005) and created a single need satisfaction composite score by averaging athletes' autonomy, competence, and relatedness scores at both waves of assessment (3-item  $\alpha$ 's were .75 at T1 and .78 at T2).

##### *Need frustration*

To assess need frustration, athletes completed the 12-item Psychological Need Thwarting Scale (PNTS; Bartholomew et al., 2011), a scale that has been used successfully in published research (Gunnell, Crocker, Wilson, Mack, & Zumbo, 2013; Mallinson & Hill, 2011). The PNTS includes a 4-item autonomy frustration scale (“When practicing my sport, I feel pushed to behave in certain ways.”;  $\alpha = .75$  at T1,  $\alpha = .87$  at T2), a 4-item competence frustration scale (“When practicing my sport, there are situations where I am made to feel inadequate.”;  $\alpha = .78$  at T1,  $\alpha = .78$  at T2); and a 4-item relatedness frustration scale (“I feel rejected by my coach.”;  $\alpha = .65$  at T1,  $\alpha = .80$  at T2). Scores from the three scales were positively intercorrelated across both assessment periods, so we again created a single composite score by averaging athletes' autonomy, competence, and relatedness frustration scores

at both waves of assessment (3-item  $\alpha$ 's were .83 at T1 and .84 at T2).

##### *Engagement*

Athletes completed the 19-item Engagement Scale (Reeve, 2013) to assess the behavioral, emotional, cognitive, and agentic aspects of engagement and also the 3-item concentration subscale from the Athletic Coping Skills Inventory-28 (ACSI-28; Smith, Schutz, Smoll, & Ptacek, 1995), which has been successfully adapted in the sport context (Mouratidis & Michou, 2011). All five engagement subscales showed acceptable internal consistency at both assessments: Behavioral engagement (“During practice, I work as hard as I can”; 5-items;  $\alpha = .78$  at T1,  $\alpha = .77$  at T2), emotional engagement (“When I'm practicing my sport, I feel good”; 5-items;  $\alpha = .87$  at T1,  $\alpha = .89$  at T2), cognitive engagement (“When practicing my sport, I try to relate what I'm working on to what I already know”; 4-items;  $\alpha = .86$  at T1,  $\alpha = .71$  at T2), agentic engagement (“I let my coach know what I need and want”; 5-items;  $\alpha = .83$  at T1,  $\alpha = .83$  at T2); and concentration (“When I am playing my sport, I can focus my attention and block out distractions”; 3-items;  $\alpha = .89$  at T1,  $\alpha = .87$  at T2). Scores from the five engagement scales were positively intercorrelated across both assessment periods, so we again created a single composite score by averaging participants' scores at both waves of assessment (5-item  $\alpha$ 's were .88 at T1 and .87 at T2).

##### *Medals won*

We collected which athletes did and did not win a medal at the Games from the objective record provided to us by the director of the Korean Athletic Complex for Athletes with Disabilities. Athletes in all nine sports competed for an individual medal, but two sports (archery, table tennis) also had team competitions that we excluded. In addition, a few athletes won two medals. We report these cases in the Results, but our dependent measure was scored as follows: won at least one medal in an individual competition = 1; did not win a medal in an individual competition = 0.

##### *Coach measures*

##### *Need satisfaction*

To assess need satisfaction, coaches completed the Korean-translated version (Cheon et al., 2014) of the widely-used 21-item Basic Psychological Needs Scale at Work scale (BPNS; Gagne, 2003). The BPNS includes a 7-item autonomy scale (e.g., “I feel like I am free to decide for myself how to coach my athletes during practice.”;  $\alpha = .70$  at T1;  $\alpha = .75$  at T2), a 6-item competence scale (e.g., “Most days I feel a sense of accomplishment from my coaching.”;  $\alpha = .65$  at T1;  $\alpha = .60$  at T2); and an 8-item relatedness scale (e.g., “I consider the people I regularly interact with at the Athletic Complex to be my friends.”;  $\alpha = .75$  at T1;  $\alpha = .77$  at T2). Scores from the three need satisfaction scales were all positively intercorrelated across both assessment periods, so we again followed the tradition in this literature to create a single need satisfaction composite score by averaging coaches' autonomy, competence, and relatedness satisfaction scores at both waves of assessment (3-item  $\alpha$ 's were .75 at T1 and .82 at T2).

##### *Coaching efficacy*

To assess coaching efficacy, coaches completed the widely-used Teachers' Sense of Efficacy Scale—short form (TSES; Tschannen-Moran & Woolfolk Hoy, 2001). In the present study, we modified the content of the items to reflect coaching, rather than teaching, efficacy. The TSES assess three aspects of efficacy (for instructional strategies, for engagement, and for classroom management),

though we included only the engagement scale and did not include the other two scales. Scores on the 4-item coaching efficacy for engagement scale showed acceptable internal consistency (e.g., “How much can you do to motivate athletes who show low interest during practice sessions?”;  $\alpha = .90$  at T1;  $\alpha = .95$  at T2).

#### Job satisfaction

To assess job satisfaction, we used the 5-item Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985) that has been adapted successfully for the context of elite sports (Vallerand et al., 2008). Scores on the adapted SWLS measure exhibited acceptable internal consistency (e.g., “In most ways my life as a coach is close to my ideal”;  $\alpha = .85$  at T1,  $\alpha = .87$  at T2).

#### Coaches' rating of each athlete's practice engagement

Coaches rated each of their athlete's practice engagement during early August. To do so, coaches completed the 5-item Engagement Rating Sheet (Reeve, Jang, Carrell, Jeon, & Barch, 2004), which has been successfully adapted to the physical education domain (Tessier et al., 2010). Coaches rated each athlete's behavioral (effort), emotional (enjoyment), cognitive (extent of learning), agentic (verbal participation), and overall (passive vs. active) engagement using a bipolar format with the engaged response on the right side (scored as 7) accompanied by illustrative descriptors and the disengaged item on the left side (scored as 1) accompanied by illustrative descriptors. Coaches' ratings were internally consistent across the five scores, so we averaged the five positively intercorrelated ratings into one overall score (5-item  $\alpha = .90$ ).

## Results

### Preliminary analyses

#### Demographic characteristics

Prior to the main analyses, we tested for possible associations among the demographic characteristics and the dependent measures. Among the athletes, age correlated positively with baseline (T1) self-reported practice engagement,  $r(64) = .31, p = .013$ , while none of the other demographic characteristics, including gender, age, or disability status (disability by birth, disability by accident), correlated with any athlete measure. Among the coaches, years of coaching experience correlated positively with T1 job satisfaction,  $r(31) = .39, p = .028$ , while none of the other demographic characteristics, including gender, age, and disability status (disability present vs. disability absent), correlated with any coach measure. Given these associations, we included age as a covariate (i.e., as a statistical control) in the analyses of the athletes' dependent measures, and we included years of coaching experience as a covariate in the analyses of the coaching dependent measures.

#### Multilevel analyses

We conducted multilevel analyses using hierarchical linear modeling (HLM, Version 7.0; Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011) to determine whether meaningful between-sport differences might have affected the athlete- and coach-reported dependent measures. The intra-class correlation coefficients (ICCs) associated with the athlete-assessed baseline measures calculated from unconditional models were as follows: perceived autonomy support, 14.6%; perceived controlling, 8.8%; need satisfaction, 7.7%; need frustration, 6.3%; and practice engagement, 15.5%. The ICCs associated with the coach-assessed baseline measures were as follows: need satisfaction, 0.9%; coaching efficacy, 11.0%; and job satisfaction, 0.7%. Given these meaningful between-sport effects on some dependent measures, we used multilevel modeling to represent the nested nature of the data. By doing so,

we sought to partial out the “between-sport” effects such that the analyses tested the hypotheses in a way that controlled for these sport-level differences.

The data had a three-level hierarchical structure with repeated measures (Level 1) nested within coaches or athletes (Level 2) nested within sports (Level 3). At level 1, the longitudinal data allowed us to assess the post-intervention increase or decrease on each dependent measure. We centered the “time” independent variable on respondents' beginning-of-study score so that T1 score served as an initial status measurement so that the T2 score could function as a “change from baseline” score. At level 2, we entered the individual differences of age for the athletes and years of coaching experience for the coaches as time-invariant group-mean centered covariates. At level 3 (between sports), we entered experimental condition as an un-centered independent variable to retain its raw metric form of experimental group (+1) and control group (−1). Finally, we entered the crucial condition  $\times$  time interaction as a cross-level predictor to test the extent to which the changes in T2 scores depended on experimental condition.

#### Manipulation checks

We assessed the fidelity of the ASIP experimental manipulation in two ways. First, trained raters scored coaches' post-intervention autonomy-supportive vs. controlling coaching behaviors. Second, athletes reported their perceptions of their coaches' autonomy-supportive and controlling coaching twice—once pre-ASIP and once post-ASIP.

#### Objective ratings

Raters scored the coaches in the experimental condition as enacting significantly more autonomy-supportive coaching behaviors during practice than they scored coaches in the control condition,  $t(27) = 3.34, p = .002$ , two-tailed,  $M_s$ , 4.96 vs. 4.09 ( $d = 1.47$ ).

#### Athletes' perceptions

For athletes' perceptions of their coaches' motivating style, we conducted HLM-based multilevel regression analyses in which time of assessment (T1, T2) was the within-athlete Level 1 repeated measure, experimental condition was the between-sport Level 3 predictor, and age was the between-athlete Level 2 covariate. Of importance was the test for a significant condition  $\times$  time/wave interaction.

For *perceived autonomy-supportive coaching*, the condition  $\times$  time interaction was significant,  $t(53) = 3.14, p = .003$ . In the control group, athletes perceived coaches as becoming somewhat less autonomy supportive from T1 to T2 ( $M_s$ , 4.92 vs. 4.53,  $\Delta = -0.39, t = 1.86, p = .068, d = 0.34$ ); in the experimental group, athletes perceived coaches as becoming somewhat more autonomy supportive ( $M_s$ , 4.65 vs. 4.93,  $\Delta = +0.38, t = 1.61, p = .113, d = 0.33$ ).

For *perceived controlling teaching*, the condition  $\times$  time interaction was significant,  $t(53) = 3.52, p = .001$ . In the control group, athletes perceived coaches as becoming more controlling from T1 to T2 ( $M_s$ , 2.41 vs. 2.92,  $\Delta = +0.51, t = 2.74, p = .008, d = 0.40$ ); in the experimental group, athletes perceived coaches as becoming somewhat less controlling ( $M_s$ , 3.30 vs. 2.96,  $\Delta = -0.34, t = 1.83, p = .073, d = 0.27$ ).

#### Athletes' dependent measures

Table 1 shows the fixed effects results from the multilevel regressions for the three athletes' dependent measures. For *need*

**Table 1**  
Hierarchical linear modeling results showing the predictive effects of the condition  $\times$  time interaction on the athletes' dependent measures.

	Need satisfaction				Need frustration				Practice engagement			
	Coefficient	SE	t-ratio (df)	p	Coefficient	SE	t-ratio (df)	p	Coefficient	SE	t-ratio (df)	p
Fixed effects												
Intercept <sup>a</sup>	5.09	0.14	37.65 (7)	.001	2.65	0.15	18.04 (7)	.001	5.55	0.11	48.49 (7)	.001
Independent variables												
Experimental condition	-.06	0.13	0.47 (7)	.650	.05	0.14	0.39 (7)	.710	-.25	0.11	2.21 (7)	.063
Time	-.13	0.11	1.15 (53)	.254	.13	0.10	1.31 (53)	.195	-.27	0.10	2.80 (53)	.007
Condition $\times$ Time	.14	0.10	1.34 (53)	.185	-.17	0.09	1.78 (53)	.082	.39	0.09	4.25 (53)	.001
Statistical controls												
Age	.02	0.01	2.08 (54)	.042	-.02	0.01	1.88 (54)	.065	.03	0.01	3.03 (54)	.004
	Variance component				Variance component				Variance component			
Random effects												
Level 3 intercept: $u_0$		.03				.01				.02		
Level 1 variance: $r$		.43				.72				.29		

$N = 64$ . \* $p < .05$ .

<sup>a</sup> Possible range of scores was 1–7 for all three dependent measures.

satisfaction, the condition  $\times$  time interaction was not significant,  $t(53) = 1.34$ ,  $p = .185$ .

For *need frustration*, the condition  $\times$  time interaction was marginal,  $t(53) = 1.78$ ,  $p = .082$ . Athletes of coaches in the control condition showed a significant post-intervention increase in need frustration ( $M_s$ , 2.60 vs. 2.89,  $\Delta = +0.29$ ,  $t = 2.00$ ,  $p = .050$ ,  $d = 0.40$ ), while athletes of coaches in the experimental condition showed little change ( $M_s$ , 2.70 vs. 2.66,  $\Delta = -0.04$ ,  $t = 0.09$ ,  $p = .928$ ,  $d = 0.04$ ). To gain greater clarity on how the intervention effected need frustration, we repeated the analysis to examine each need separately. The condition  $\times$  time interaction was not significant for either autonomy,  $t(53) = 1.65$ ,  $p = .105$ , or competence,  $t(53) = 0.17$ ,  $p = .866$ , while it was significant for relatedness,  $t(53) = 2.24$ ,  $p = .029$ .

For *self-reported engagement*, the condition  $\times$  time interaction was significant,  $t(53) = 4.25$ ,  $p = .001$ . Athletes of coaches in the control condition suffered a significant post-intervention engagement decrease ( $M_s$ , 5.79 vs. 5.14,  $\Delta = -0.65$ ,  $t = 5.44$ ,  $p = .001$ ,  $d = 0.82$ ), while athletes of coaches in the experimental condition maintained their post-intervention engagement ( $M_s$ , 5.31 vs. 5.43,  $\Delta = +0.12$ ,  $t = 1.01$ ,  $p = .317$ ,  $d = 0.15$ ). When we repeated the analysis to examine each aspect of engagement separately, the condition  $\times$  time interaction was significant for all five aspects of engagement: behavioral,  $t(53) = 4.26$ ,  $p = .001$ ; emotional,  $t(53) = 3.49$ ,  $p = .001$ ; cognitive,  $t(53) = 2.91$ ,  $p = .005$ ; agentic,  $t(53) = 3.53$ ,  $p = .001$ ; and concentration,  $t(53) = 2.11$ ,  $p = .039$ .

For *coach-reported engagement*, coaches rated how engaged each individual athlete was post-intervention. Only 61 of the 64 athletes were rated, as coaches did not rate 1 of the 23 table tennis athletes and 2 of the 6 boccia athletes, due to absences during that week. Coaches in the experimental group rated their 42 athletes as significantly more engaged during practice than did coaches in the control group who rated their 19 athletes,  $M_s$ , 5.89 vs. 5.18,  $t(59) = 2.69$ ,  $p = .009$  ( $d = 0.79$ ). When type of sport was controlled for in a 2-level multilevel regression analysis (Level 1 = athlete, Level 2 = sport), experimental condition (entered as a Level 2 predictor) continued to predict coaches' ratings,  $t(7) = 2.42$ ,  $p = .046$ . Because coaches in the experimental group might hold an engagement-inflating expectancy effect that coaches in the control group would not be expected to hold (e.g., "Since I learned strategies during ASIP to engage my athletes, I better say on this questionnaire that my athletes are highly engaged."), we sought to validate the coaches' engagement rating in a supplemental analysis. We correlated coach-reported engagement with athletes' T2 self-reported engagement. These two measures significantly

correlated,  $r(61) = .50$ ,  $p = .001$ , suggesting that coaches' ratings reflected athletes' engagement rather well.

#### Medals won

For medals won, 31 athletes won an individual medal during the Games, while 33 did not. Six of the 31 medalists won two medals (5 multiple medalists in the experimental condition, 1 multiple medalist in the control condition). Athletes of coaches in the experimental condition were significantly more likely to win a medal (27 won a medal, while 18 did not) than were athletes of the coaches in the control condition (4 won a medal, while 15 did not),  $\chi^2(1, N = 64) = 8.11$ ,  $p = .001$ . When type of sport was controlled for in a 2-level multilevel regression analysis, experimental condition (entered as a Level 2 predictor) continued to predict medals won,  $t(7) = 3.00$ ,  $p = .020$ , as 60% of the athletes of coaches in the four sports in the experimental group were medalists (6 of 8 in archery, 15 of 23 in table tennis, 3 of 7 in swimming, and 3 of 7 in boccia) while only 21% of the athletes of coaches in the five sports in the control group were medalists (2 of 6 in track and field, 1 of 4 in weightlifting, 1 of 3 in judo, 0 of 4 in tennis, and 0 of 2 in rowing).

Experimental condition predicted which athletes won medals and which did not. To explore the possibility that ASIP-induced changes in athletes' motivation and engagement might explain medals won, we conducted a supplemental analysis to correlate medals won with ASIP-induced changes in athletes' perceived autonomy support, perceived controlling coaching, need satisfaction, need frustration, and practice engagement. These correlations appear in Table 3. None of these athlete-centric measures correlated significantly with medals won. We further explored if raters' objective scoring of coaches' autonomy-supportive vs. controlling coaching behaviors correlated with medals won, and it did. Extent of coach-provided autonomy support during practice correlated significantly with medals won,  $r(29) = .68$ ,  $p = .001$ . When type of sport was controlled for, coach-provided autonomy support continued to correlate with medals won,  $r(9) = .66$ ,  $p = .054$ , as depicted graphically in Fig. 3.

#### Coaches' dependent measures

Table 2 shows the fixed effects results from the multilevel regressions for the three coaches' dependent measures. For *need satisfaction*, the condition  $\times$  time interaction was significant,  $t(21) = 2.22$ ,  $p = .038$ . Coaches in the control condition experienced

**Table 2**Hierarchical linear modeling results showing the predictive effects of the condition  $\times$  time interaction on the coaches' dependent measures.

	Need satisfaction				Coaching efficacy				Job satisfaction			
	Coefficient	SE	t-ratio (df)	p	Coefficient	SE	t-ratio (df)	p	Coefficient	SE	t-ratio (df)	p
Fixed effects												
Intercept <sup>a</sup>	5.07	0.11	47.70 (6)	.001	7.30	0.23	32.42 (6)	.001	5.14	0.13	40.10 (6)	.001
Independent variables												
Experimental condition	.01	0.11	0.03 (6)	.975	-.07	0.23	0.32 (6)	.757	-.01	0.13	0.09 (6)	.930
Time	-.14	0.08	1.81 (21)	.085	-.29	0.21	1.41 (21)	.173	.01	0.08	0.10 (21)	.924
Condition $\times$ Time	.17	0.08	2.22 (21)	.038	.40	0.21	1.92 (21)	.069	.31	0.08	3.75 (21)	.001
Statistical controls												
Coaching experience	.02	0.02	1.23 (22)	.233	.06	0.03	1.90 (22)	.071	.09	0.02	4.16 (22)	.001
	Variance component				Variance component				Variance component			
Random effects												
Level 3 intercept: $u_0$			.00				.09*				.01	
Level 1 variance: $r$			.29				.53				.33	

N = 31. \* $p < .05$ .<sup>a</sup> Possible range of scores was 1–7 for need satisfaction and job satisfaction but was 1–9 for coaching efficacy.**Table 3**

Correlations among experimental condition and athletes' dependent measures.

	1	2	3	4	5	6	7
1. Experimental condition	–	.37**	-.40**	.17	-.22	.47**	.34**
2. Change (T1 $\rightarrow$ T2) in perceived autonomy support		–	-.05	.29*	-.34**	.38**	.00
3. Change (T1 $\rightarrow$ T2) in perceived controlling coaching			–	-.03	.30*	-.36**	-.06
4. Change (T1 $\rightarrow$ T2) in need satisfaction				–	-.23	.42**	.09
5. Change (T1 $\rightarrow$ T2) in need frustration					–	-.48**	.03
6. Change (T1 $\rightarrow$ T2) in practice engagement						–	.15
7. Medals won							–

N = 64 \*\* $p < .01$ .

For experimental condition: 0 = control group (no ASIP); 1 = experimental group (ASIP).

For medals won: 0 = no medal won; 1 = at least one medal won.

a significant post-intervention decrease in need satisfaction ( $M_s$ , 5.08 vs. 4.78,  $\Delta = -0.30$ ,  $t = 2.70$ ,  $p = .013$ ,  $d = 0.55$ ), while coaches in the experimental condition maintained their need satisfaction ( $M_s$ , 5.07 vs. 5.09,  $\Delta = +0.02$ ,  $t = 0.12$ ,  $p = .906$ ,  $d = .03$ ). To gain greater clarity on how the intervention effected changes in coaches' need satisfaction, we repeated the analysis to examine each need separately. The condition  $\times$  time interaction was not significant for either autonomy,  $t(21) = 1.08$ ,  $p = .293$ , or competence,  $t(21) = 1.68$ ,  $p = .108$ , while it was significant for relatedness,  $t(21) = 2.21$ ,  $p = .038$ .

For *coaching efficacy*, the condition  $\times$  time interaction was marginal,  $t(21) = 1.92$ ,  $p = .069$ . Coaches in the control condition experienced a significant post-intervention decrease in coaching efficacy ( $M_s$ , 7.37 vs. 6.68,  $\Delta = -0.69$ ,  $t = 3.01$ ,  $p = .007$ ,  $d = 0.51$ ), while coaches in the experimental condition maintained their sense of coaching efficacy ( $M_s$ , 7.23 vs. 7.34,  $\Delta = +0.11$ ,  $t = 0.09$ ,  $p = .929$ ,  $d = 0.11$ ).

For *job satisfaction*, the condition  $\times$  time interaction was significant,  $t(21) = 3.75$ ,  $p = .001$ . Coaches in the control condition experienced a significant post-intervention decrease in job satisfaction ( $M_s$ , 5.15 vs. 4.83,  $\Delta = -0.32$ ,  $t = 3.21$ ,  $p = .004$ ,  $d = 0.53$ ), while coaches in the experimental condition experienced a significant increase in job satisfaction ( $M_s$ , 5.13 vs. 5.44,  $\Delta = +0.31$ ,  $t = 2.43$ ,  $p = .024$ ,  $d = 0.32$ ).

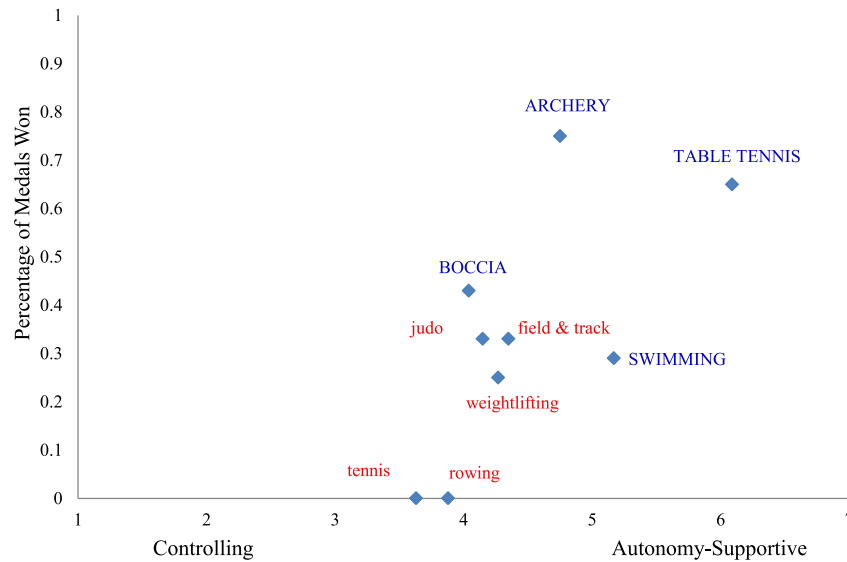
## Discussion

The high-stakes, results-focused social environment that was the 2012 London Paralympic Games exerted a detrimental effect across all dependent measures for athletes and coaches in the control condition. The athletes reported deteriorated motivation and engagement, and, at the Games, few won a medal. The coaches were rated by observers as relatively controlling, and they were perceived by athletes as relatively controlling. These coaches themselves reported significantly lower need satisfaction from coaching, lower coaching efficacy, and lower job satisfaction. Given this pattern of findings, we conclude that the high-stakes pressure affected these coaches in the same way that being held accountable for others' outcomes affects practically anyone—namely, the coaches became social conduits that received, absorbed, and then rather directly passed along that pressure to their athletes (Deci et al., 1982; Pelletier et al., 2002; Reeve, 2009).

In the context of this high-stakes competition, we implemented an ASIP. Coaches in the experimental group were affected by the high-stakes social context, but they also learned during the intervention not to pass along the social-performance pressure to their athletes but instead to support their athletes' daily autonomy. By adopting an autonomy-supportive style, these coaches buffered their athletes against motivation, engagement, and performance declines. As for themselves, coaches in the experimental condition largely maintained their need satisfaction and coaching efficacy and even experienced a significant longitudinal increase in their job satisfaction.

While the high-stakes context pulled a controlling motivating style out of the coaches in the control group, it was not necessarily the case that the ASIP promoted an autonomy-supportive motivating style in the coaches in the experimental group. We suggest two reasons to explain the absence of an ASIP-induced enhancement effect. First, coaches' greater autonomy support might have been largely offset by the urgent and salient social pressure to win a medal. That is, it is likely that athletes of coaches in the experimental group were daily affected by two messages, one of autonomy support from their coaches but another of controlling pressure from administrators and social expectations. Second, in retrospect, it is possible that the ASIP was too mild an intervention experience, given the magnitude of the social pressure these coaches and athletes faced. If elite athletes are going to show significant longitudinal increases in their motivation and engagement as they prepare for high-stakes competitions, then their coaches may need to transform practice sessions and the coach–athlete relationship into something substantially more autonomy supportive.





**Fig. 3.** Scatterplot of the bivariate relation between medals won and rater-scored coaching behavior (controlling vs. autonomy supportive) across the 9 sports. Sports in red lowercase letters represent coaches in the control group; sports in blue UPPERCASE letters represent coaches in the experimental group. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

The most surprising result occurred with respect to the need satisfaction and frustration measures. While athletes and coaches in the experimental group did experience both greater relatedness satisfaction and lesser relatedness frustration, these same effects did not occur for autonomy and competence satisfaction and frustration. The observed changes in relatedness frustration make sense, because the pressure from the high-stakes competition led coaches in the control condition toward daily coaching behaviors such as intimidation, controlling language, and demands for strict compliance. Such controlling coaching thwarted athletes' need for relatedness, as athletes felt disrespected and rejected by their coaches (Barber, 1996). Such coaching also leads to athletes' oppositional defiance to their coach's demands (Haerens, Aelterman, Vansteenkiste, Soenens, & Van Petegem, 2015). The observed changes in relatedness satisfaction also make sense, because autonomy-supportive behaviors from coaches in the experimental condition allowed athletes to feel respected and accepted by their coaches (Tessier et al., 2010).

The lack of observed changes in autonomy and competence need satisfaction and frustration did not make sense, so this pattern of findings needs to be explained. The lack of these effects was surprising because ASIPs in the PE context have so consistently shown these effects, as students of PE teachers who participate in an ASIP show greater autonomy and competence need satisfaction and lesser autonomy and competence need frustration than do students of PE teachers who do not participate in an ASIP (Cheon & Reeve, 2013, 2015; Cheon et al., 2012, 2014). In a contrast between students taking a PE class vs. athletes preparing for a competition, four differentiating factors seem important—social context (leisure vs. high stakes), mentor (coach vs. teacher), mentee (athlete vs. student) and activity (specialized sport vs. new weekly activity). Both mentors (sport coaches, PE teachers) are experienced, trained, paid professionals, so this is not the key difference. In addition, the autonomy-thwarting quality of a high-pressure social context has been established (Reeve & Deci, 1996), but this factor affects mean levels of need satisfaction and frustration. So, the unique features within sport vs. PE seem to be activity and mentee.

In terms of activity, it changes each week in PE (e.g., basketball today, table tennis tomorrow). Because activities are somewhat interchangeable, the activity per se may not be a particularly rich (or at least enduring) source of autonomy and competence experiences. In elite sports, however, the activity is constant, salient, and sometimes even self-definitional (e.g., "I am a tennis player"). Because athletes have an extremely close, enduring, and historical (almost biographical) relation with their sport, autonomy and competence might tightly covary with activity-generated experiences. In terms of mentee, PE students are relative novices whose autonomy and competence may be quite malleable and sensitive to their teacher's motivating style. Athletes, on the other hand, are relative experts who have entrenched histories with their sport, well-developed practice and training procedures, and ways of self-evaluating not only their performances but also their sense of autonomy and competence. If so, variations in athletes' autonomy and competence may be more activity- and self-referenced, while PE students' autonomy and competence may be more social context- and mentor-referenced (because they lack strong activity- and self-references).

If this is so, then the design of future ASIPs in high-stakes sport contexts may need to be developed and implemented to accomplish two goals: (1) help coaches learn how to become more autonomy-supportive (as in the present study) but also (2) help coaches learn how to help their athletes generate intrinsic satisfactions (autonomy, competence, and relatedness) during practice. To help progress toward this second goal, we provide some examples. To help athletes self-structure (sometimes solitary) practice sessions around greater autonomy need satisfaction, coaches could reveal new ways to make practice time more interesting, offer athletes a greater say in what they do during practice, allocate some practice time for athletes to pursue their own needs and priorities, ask athletes about their intrinsic personal goals (e.g., personal growth), and encourage athletes to think of their coach as a provider of needed resources. To help athletes self-structure practice sessions around greater competence need satisfaction, coaches could teach athletes how to self-create the conditions of flow (clear goals, unambiguous feedback), encourage athletes to set

self-referenced improvement goals, suggest sport-specific standards of excellence to pursue, and use technology with built-in competence-diagnosing feedback (e.g., wearable technology, computer simulators). In all these examples, the coach is supporting athletes by helping them interact with their sport in need-satisfying ways and, in doing so, alter the need-satisfaction vs. need-frustration developmental trajectory they have with their sport.

#### Limitations and opportunities for future research

We highlight four limitations of the present investigation. First, we focused only on individual sports. A focus on team sports requires a different level of analysis (group vs. individual), and it needs to consider not only autonomy support vs. control from coaches but also autonomy support vs. control from peers (teammates).

Second, while all of the measures used in the present study have been validated and successfully used in published research, new and psychometrically stronger measures of need satisfaction and frustration have become available since we conducted our research (e.g., Chen et al., 2015; Costa, Ntoumanis, & Bartholomew, 2015; Sheldon & Hilpert, 2012), as has a more sophisticated measure of coaches' controlling motivating style (Bartholomew et al., 2010). Athletes' motivation may also need to be assessed in more specific and varied ways. Competence need satisfaction and frustration, for instance, is relational (affected by coaches, teammates, opponents, media) but also situational (affected by context, competitive outcomes) and personal (affected by personal goals, standards, interpretations, and appraisals).

Third, our raters used a bipolar scale to score coaches' motivating style. While this is a valid approach, it has the limitation of not being able to determine if the intervention increased coaches' autonomy support, decreased coaches' control, or produced both of these effects. To make this determination, we suggest that future research assess autonomy-supportive coaching with one unipolar scale and assess controlling coaching with a second, separate unipolar scale. We would expect these two scores to be highly negatively correlated, but collecting both scores would allow for a more detailed understanding of post-intervention changes in coaches' motivating style. Collecting two scores would also allow for more specific predictions, such as the prediction that autonomy support might uniquely predict need satisfaction, engagement, and enhanced performance, while controlling might uniquely predict need frustration, disengagement, and impaired performance (for an illustration, see Haerens et al., 2015).

Fourth, we did not assess all dependent measures longitudinally. Autonomy-supportive vs. controlling coaching behavior was assessed only as a post-intervention manipulation check. In retrospect, it would add methodological strength to future investigations in this area if coaching behavior was assessed as a dependent measure in its own right. That is, future investigations could assess coaching behavior pre-intervention as well as post-intervention. Given the findings reported in Fig. 3, it would be interesting to test if, not only post-intervention motivating style, but also the T1 to T2 change in motivating style predicted athletes' medals won. We also did not assess medals won longitudinally. We encourage future researchers to collect a baseline performance measure, such as medals won at previous international competitions. We also note that winning a medal depends partly on the quality of one's competition, so future research might want to assess not only medals won (absolute performance) but also performance relative to the athlete's own prior performances (relative performance), such as past performances or performance relative to that individual's personal best.

We highlight two unique contributions of the study. First, we conducted an ASIP in the context of elite sports. We believe ours is the first ASIP experiment conducted with such a sample and in such a context. Second, we collected an ecologically valid performance measure. Experimental condition and observed coaches' motivating style both predicted the "medals won" performance measure, but it is difficult to determine if coaches' participation in ASIP increased medals won or whether coaches' non-participation in ASIP decreased medals won. Given the strong detrimental effect that non-participation in ASIP had on coaches' and athletes' dependent measures, we suspect that the athletes of coaches in the control condition likely failed to earn the medals that they might otherwise have won had their coaches not adopted such a controlling style toward them.

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