Psychology of Sport & Exercise 40 (2019) 110–126

Contents lists available at ScienceDirect

Psychology of Sport & Exercise

journal homepage: www.elsevier.com/locate/psychsport

Adopting a helicopter-perspective towards motivating and demotivating coaching: A circumplex approach

Jochen Delrue[a,*,1], Bart Reynders[b,1], Gert Vande Broek[b], Nathalie Aelterman[a], Maarten De Backer[b], Steven Decroos[b], Gert-Jan De Muynck[a], Johnny Fontaine[c], Katrien Fransen[b], Stef van Puyenbroeck[b], Leen Haerens[d], Maarten Vansteenkiste[a]

[a] Ghent University, Department of Developmental, Personality & Social Psychology, Henri Dunantlaan 2, 9000 Ghent, Belgium
[b] KU Leuven, Department of Kinesiology, Tervuursevest 101, 3001 Leuven, Belgium
[c] Ghent University, Department of Personnel Management, Work and Organizational Psychology, Henri Dunantlaan 2, 9000 Ghent, Belgium
[d] Ghent University, Department of Movement and Sport Science, Watersportlaan 2, 9000 Ghent, Belgium

ARTICLE INFO

Keywords:
Need support
Multidimensional scaling
Athletes
Self-determination theory
Coaching behavior

ABSTRACT

Based on Self-Determination Theory, the present study adopts a helicopter-perspective towards motivating (i.e., autonomy support, structure) and demotivating coaching (i.e., control, chaos). Among five independent samples, consisting of individual and team sport coaches (N = 893; Mage = 37.83 years) and athletes (N = 377; Mage = 17.46 years), Multidimensional Scaling (MDS) analyses were used to examine how a variety of coaching practices reflective of four different coaching styles (i.e., autonomy support, control, structure, and chaos), assessed with a new vignette-based instrument, related to one another. Findings revealed that the (de)motivating practices could be graphically presented within a two-dimensional circumplex, with the horizontal axis representing the level of need-supportive coaching behavior and the vertical axis representing the level of coach directiveness. Moreover, the four coaching styles could be segmented in eight more specific approaches (i.e. clarifying, guiding, attuning, participative, awaiting, abandoning, domineering, and demanding), which formed an ordered sinusoid pattern of correlations, both among each other and in relation to a variety of critical outcomes (e.g. coach need satisfaction, athletes' motivation). It is discussed how a circumplex approach produces both a more integrative and more fine-grained insight regarding (de)motivating coaching behavior, with resulting implications for practice.

1. Introduction

Youth athletes' quality of sport motivation is essential for their enduring engagement, well-being, and performance (Gillet, Vallerand, Amoura, & Baldes, 2010; Podlog et al., 2015; Vallerand & Losier, 1999). A few dozen studies, grounded in Self-Determination Theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2017), a broad theory on human motivation and well-being, have shown that high quality motivation flourishes when coaches rely on an autonomy-supportive and structuring style, while the opposite is true if coaches hold a more chaotic or controlling style (Vansteenkiste, Niemiec, & Soenens, 2010). Coaches who adopt an autonomy-supportive style try to maximize athletes' sense of volition and psychological freedom by adopting a curious and accepting attitude (Mageau & Vallerand, 2003; Vansteenkiste & Soenens, 2015). When relying on a structuring style coaches aim to foster athletes' sense of effectiveness and mastery by adopting a process-oriented attitude (Curran, Hill, & Niemiec, 2013; Soenens & Vansteenkiste, 2010). In the case of coach control, coaches force athletes to think, feel, and behave in a prescribed way at the expense of athletes' sense of volition and psychological freedom (Bartholomew, Ntmoumanis, Thøgersen-Ntoumani, 2009; 2010). When coaches adopt a chaotic coaching style their behavior is unpredictable, inconsistent, or indifferent, thereby confusing their athletes about what they should do and even hindering athletes in their skill-development (Mageau & Vallerand, 2003; Skinner, Johnson, & Snyder, 2005).

In spite of its well-documented benefits (Mageau & Vallerand, 2003), some sport coaches fear that a highly autonomy-supportive style will turn into a chaotic or laissez-fair style. Similarly, too much structure may also have its downside, if it turns into rigid control and pressure. Recently, in the educational domain, Aelterman et al. (2018)

* Corresponding author.
E-mail address: jochen.delrue@ugent.be (J. Delrue).
[1] Both authors equally contributed to the content of the study, including the concept, design, data collection, data analysis, writing, and revision of the manuscript.

https://doi.org/10.1016/j.psychsport.2018.08.008
Received 14 July 2017; Received in revised form 29 June 2018; Accepted 20 August 2018
Available online 23 August 2018
1469-0292/

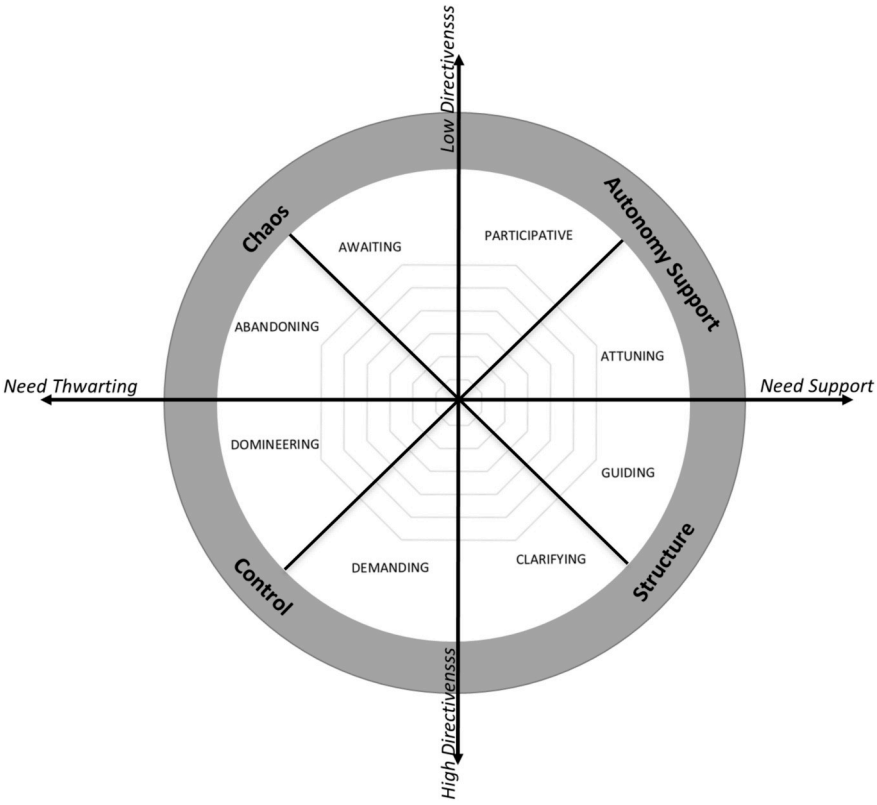

Fig. 1. Theoretical representation of the gradual approach to coaching.

provided a helicopter-perspective on these (de)motivating behaviors by combining the four teaching styles of autonomy support, structure, control and chaos within one circular structure. As can be noticed in Fig. 1, each teaching style (e.g., autonomy support) could be segmented into two more specific approaches (e.g., participative and attuning), each consisting of multiple teaching practices. Although research in sport has begun to systematically study the interplay between two motivating (i.e. autonomy support and structure) and two demotivating (i.e. control and chaos) coaching styles (e.g., Curran et al., 2013), what is lacking to date is a helicopter view that allows one to see how these styles relate to one another. Such a helicopter viewpoint may shed light on some of the pitfalls associated with the autonomy-supportive and structuring style, as echoed by coaches.

The primary aim of the current study was to build on previous work by examining whether motivating and demotivating coaching styles could equally be organized according to such a circumplex model. This was deemed important because a circumplex model allows both for greater integration, as multiple coaching styles are brought together in a broader picture, and for greater refinement, as these styles get subdivided in different approaches, which are systematically related to a host of desirable (e.g., autonomous motivation, need satisfaction) and undesirable (e.g., controlled motivation and need frustration) outcomes among both athletes and coaches. Two secondary aims involved examining whether mean level differences between identified coaching styles and approaches emerged as function of sport type and addressing coach-athlete convergence in the identified coaching styles and approaches.

2. Motivating and demotivating coaching

When athletes are autonomously motivated, and hence act with a sense of volition and psychological freedom (e.g., personal significance or fun), they will thrive (e.g., Pelletier, Fortier, Vallerand, & Brière, 2001; Podlog et al., 2015). Contrary, when athletes rely on controlled motives, and therefore act under influence of internal (e.g., guilt or shame) or external pressures (e.g., rewards or punishments), their development and emotional experience will suffer (e.g., Vansteenkiste et al., 2010). Within SDT, the psychological needs for autonomy, competence, and relatedness are considered essential nutriments for the quality of athletes' motivation (Deci & Ryan, 2000). That is, whether athletes enjoy their sport, persist, and excel (i.e., autonomous motivation) or instead need to drag themselves to the sport club, and perhaps drop-out (i.e., controlled motivation) depends on, respectively, the satisfaction and frustration of these basic psychological needs. Specifically, when satisfied, athletes experience a sense of psychological freedom and volition (i.e., autonomy), effectiveness (i.e., competence) and connection and warmth (i.e., relatedness) during their sport participation. When frustrated, however, athletes feel coerced and pressured (i.e., autonomy), ineffective and like a failure (i.e., competence), and isolated and excluded (i.e., relatedness). Importantly, need frustration does not denote the mere absence or lack of need satisfaction as the psychological needs must be actively thwarted or undermined for need frustration to occur (Bartholomew, Ntoumanis, Ryan, Bosch, & Thogersen- Ntoumani, 2011; Haerens, Aelterman, Vansteenkiste, Soenens, & Van Petegem, 2015; Vansteenkiste & Ryan, 2013).

2.1. Need-supportive coaching styles

Given the manifold benefits associated with need satisfaction, considerable attention has been devoted to the coaching style that is need-supportive. Athletes' needs are supported when coaches adopt an autonomy-supportive style (Adie, Duda, & Ntoumanis, 2012; Conroy & Coatsworth, 2007; Rocchi, Pelletier, & Couture, 2013). Autonomy support involves a variety of practices (see Table 1), which in the circumplex identified by Aelterman et al. (2018), were found to fall apart into a participative and attuning approach. Specifically, practices such as offering choice, asking for athletes' input and welcoming their suggestions were part of a *participative* approach, as these practices allow for individuals to have a say and to participate in a joint decision

Table 1
Description of the four coaching styles and eight motivational approaches based on Aelterman et al. (2018).

Coaching style	Conceptual Definition	Subarea	Description
Autonomy support	The coach's instructional goal and interpersonal tone of ***understanding***: the coach seeks to maximally identify and nurture athletes' interests, opinions and feelings, so that they can voluntarily engage in activities.	Participative	A ***participative*** coach identifies athletes' personal interests by engaging in a dialogue with athletes and inviting them to provide input and suggestions. In addition, where possible, the coach tries to offer (meaningful) choices in how athletes deal with activities and optimally follows their pace.
		Attuning	An ***attuning*** coach nurtures athletes' personal interests by trying to find ways to make the exercises more interesting and enjoyable, accepting athletes' expressions of negative affect and trying to understand athletes' perspective. The coach provides explanatory rationales that are meaningful in the eyes of athletes.
Structure	The coach's instructional goal and interpersonal tone of ***guidance***: starting from the capabilities and abilities of athletes the coach provides help and assistance, so that athletes feel competent to master skills.	Guiding	A ***guiding*** coach nurtures athletes' progress by providing appropriate help and assistance as and when needed. The coach goes through the steps that are necessary to complete a task, so that athletes can continue independently and, if necessary, can ask questions.
		Clarifying	A ***clarifying*** coach communicates expectations to athletes in a clear and transparent way and the coach monitors athletes' progress in meeting the communicated expectations.
Control	The coach's instructional goal and interpersonal tone of ***pressure***: the coach forces athletes to think, feel, and behave in a prescribed way and imposes his/her own agenda and requirements to athletes, irrespective of what athletes think.	Demanding	A ***demanding*** coach requires discipline from the athletes by using powerful and commanding language. The coach points athletes to their obligations, tolerates no contradiction, and threatens with sanctions if athletes don't comply.
		Domineering	A ***domineering*** coach exerts power to athletes to make them comply with his/her requests. The coach suppresses athletes by inducing feelings of guilt, shame and anxiety.
Chaos	The coach's instructional goal and interpersonal tone of ***laissez faire***: the coach lets athletes on their own, making it confusing for athletes what they should do, how they should behave, and how they can develop their skills.	Abandoning	After repeated interventions, an ***abandoning*** coach gives up on athletes. The coach allows athletes to just do their own thing and no longer pokes athletes to put effort, because eventually athletes have to learn to take responsibility for their own behavior.
		Awaiting	An ***awaiting*** coach offers a laissez-faire climate where the initiative fully lies with the athletes. The coach tends to wait to see how things evolve, doesn't plan too much and rather let things take their course.

process. Autonomy-supportive practices such as nurturing athletes' personal interests, acknowledging their negative affect and resistance, and offering a meaningful rationale (Mageau & Vallerand, 2003) fell within the *attuning* approach because when relying on these practices, coaches are trying to attune to the athletes' perspective in these instances. The benefits of coach autonomy support for athletes' motivation (e.g., Amorose & Anderson-Butcher, 2007; Reynolds & McDonough, 2015), enjoyment (e.g., Quested et al, 2013), perseverance (e.g., De Muynck et al., 2017; Pelletier, Fortier, Vallerand, & Brière., 2001), and well-being (e.g., Adie et al., 2012; Gagné, Ryan, & Bargmann, 2003), have been well-documented during the past decades.

Much like coach autonomy support, the provision of structure is also said to be need-conducive and involves a number of key practices that belong to two approaches in the circumplex, that is, a *clarifying* and *guiding* approach (Aelterman et al., 2018; Table 1). When clarifying, coaches set clear expectations and goals and follow-up on them in a consistent way, thereby monitoring athletes' progress (Curran et al., 2013). When guiding, coaches express confidence in the athletes' capacity, they encourage their athletes in a constructive way and they offer adjusted and helpful information and suggestions (e.g. feedback) as to support athletes' progress (Curran et al, 2013; Fransen, Boen, Vansteenkiste, Mertens, & Vande Broek, 2018). When coaches are highly structured, athletes perceive the environment to be predictable, safe, and focused on their progress such they benefit in terms of competence, behavioral engagement, and well-being (Black & Weiss, 1992; Carpentier & Mageau, 2013; Curran et al., 2013).

2.2. Need thwarting coaching styles

Because coaches can not only help their athletes actualizing their potential, but may also actively interfere with their development and growth, the notion of need-thwarting coaching has received increasing attention (Bartholomew et al., 2011; Haerens et al., 2018). Specifically, in the case of coach control, coaches actively undermine athletes' volitional functioning through the use of a multitude of strategies that fell either in the *demanding* or *domineering* approach in the circumplex (Aelterman et al., 2018; Table 1). When demanding, coaches point to athletes' duties and responsibilities, thereby using forceful language, threats of sanctions, or the contingent use of rewards (Bartholomew et al., 2011). When domineering, coaches are experienced as highly intrusive and manipulative as the target involves the athlete as a person instead of the athlete's behavior. Domineering coaching involves the use of power-assertive practices such as excessive personal control, intimidation, guilt-induction and shaming (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2010). Controlling coaching has been found to be uniquely predictive of low quality motivation (i.e. controlled motivation), and even a lack of motivation (i.e. amotivation) (Pelletier et al., 2001), burn-out among young adolescent soccer players (Balaguer et al., 2012), and moral disengagement and antisocial behavior (Delrue, et al., 2017; Hodge & Lonsdale, 2011).

A second need-thwarting style involves the use of chaos, which denotes more than the absence of structure (Skinner et al., 2005; Vansteenkiste & Ryan, 2013). That is, when coaches are chaotic, they act in an inconsistent and unpredictable way, which creates confusion and may interfere with athletes' skill-development and their achievement of desired outcomes. The question whether coach chaos represents a separate style has largely been neglected in the SDT-literature. In their circumplex model, Aelterman et al. (2018) found teacher chaos to be subdivided into an *abandoning* and *awaiting* approach (Table 1). Extrapolating from this work, in the case of an abandoning approach, athletes feel left to their own devices as, after repeatedly intervening, their coach has given up. In the case of an awaiting approach, the coach does not plan very much and instead awaits how things unfold and whether athletes will take initiative themselves.

2.3. A helicopter-perspective: the circumplex model

To obtain a helicopter-perspective on how different motivating (i.e., autonomy support, structure) and demotivating (i.e., control, chaos) teaching styles relate to each other, Aelterman et al. (2018) made use of Multidimensional scaling (MDS; Borg, Groenen, & Mair, 2013). This explorative statistical technique graphically visualizes the relation between different (de)motivating practices by plotting inter-item distances in a geometrical space. Three key findings emerged from their analyses, involving two large samples of secondary school teachers and students.

First, as can be noticed in Fig. 1, a two-dimensional circumplex structure was identified, which allowed for a more integrative insight into the variety of teaching practices. Specifically, the horizontal dimension (i.e., x-axis) reflects the degree to which the teacher supports, relative to thwarts, students' psychological needs, with autonomy support and structure yielding positive coordinates, and control and chaos yielding negative coordinates. The vertical dimension (i.e., y-axis) concerned the extent to which the teacher is directive and taking the lead in the interaction, with structure and control yielding positive coordinates and chaos and autonomy support yielding negative coordinates. Second, the circumplex produced more refined insight as eight specific subareas (i.e., clarifying, guiding, attuning, participative, awaiting, abandoning, domineering, and demanding) were identified. These eight subareas were not a priori imposed, but naturally emerged from the data, with teaching practices within a given subarea forming a coherent cluster (i.e., an approach). Third, consistent with the assumptions of a circumplex, these identified approaches correlated in an ordered way with adjacent approaches being positively correlated (being indicative of their compatible nature), and correlations becoming weaker and even negative (being indicative of their more conflictual nature) when moving along the circular structure. To illustrate, whereas the guiding approach correlated positively with the adjacent attuning and clarifying approach, it yielded a negative correlation with the abandoning approach. Importantly, this ordered pattern of correlates, representing a sinusoid structure, was also found in relation to external outcomes. To illustrate, students' ratings of teacher's quality systematically correlated with the distinguished approaches (Aelterman et al., 2018), with the correlations peaking and being strongly positive for the guiding and attuning approach, while being strongly negative for the domineering and abandoning approach.

In light of these findings, it appears both illuminating and fruitful to describe coaches' behavior in a more holistic and meaningful way via a circumplex structure. That is, instead of treating autonomy support, control, structure, and chaos as distinct styles that should yield unique correlates, Aelterman et al. (2018) argued that the ordered pattern of correlates warrants a gradual instead of a categorical perspective. That is, the different motivating and demotivating approaches do not differ from each other in a black-white fashion. Instead, the differences are more gradual and these differences get reflected by the degree to which each identified approach in the circumplex is need-supportive relative to need-thwarting and high relative to low in directiveness. For example, although the guiding and attuning approach are both high on need support, they differ in their degree of directiveness, and although the clarifying and demanding approach are both high on directiveness, they differ in the degree to which they are need supportive rather than need thwarting.

Such a gradual perspective could make a meaningful contribution to the existing coaching literature and practice. That is, some coaches may be concerned that the use of autonomy support may result in chaos. Such concerns are legitimate and a gradual perspective may indicate which autonomy-supportive strategies exactly (e.g., asking input from athletes) may lean closer to an awaiting approach. Furthermore, by examining coaching from a gradual instead of a categorical perspective, the ordered pattern provides a first indication of how coaches may shift from one approach to another along the circumplex as a function of encountered obstacles or facilitating factors. Finally, the more differentiated assessment of motivating approaches will allow for a more detailed examination of mean level differences between individual and team sports. Past research indicated that athletes in team, relative to individual sports perceive their coach to display more autocratic and less democratic behavior (Hollembeak & Amorose, 2005; Terry, 1984). Whereas coaches of team sports may act in a more controlling way to maintain discipline, the one-on-one relationship characteristic of individual sports may allow for a more autonomy-supportive style in general and a more athlete-attuned and participative approach in particular (van de Pol, Kavussanu, & Kompier, 2015).

2.4. Present study

Although past research has focused on the role of coach autonomy support in combination with either coach control (e.g., Amorose & Anderson-Butcher, 2015; Bartholomew et al., 2011; Haerens et al., 2018) or coach structure (Curran et al., 2013), to the best of our knowledge, no single study within the SDT literature on sport coaching has conducted an in-depth investigation of how autonomy-supportive, structuring, controlling and chaotic coaching styles, when considered simultaneously, relate to each other. Therefore, following Aelterman et al. (2018), the primary objective of the present study was to adopt a helicopter-perspective to gain both a more integrative and fine-grained insight into how a broad variety of need-supportive (i.e., autonomy support, structure) and need-thwarting (i.e., control, chaos) coaching styles relate to each other as well as to external outcomes.

To achieve this goal, a new vignette-based instrument was developed, which contained specific situations that depict how sport coaches act during training, during competitive games as well as when they take up a pedagogical role. Concerning the latter, coaches introduce and monitor guidelines for desirable behavior. Although there exist several validated coaching style instruments (e.g., Bartholomew et al., 2011), the items used are rather generic in nature as they are not tied to a concrete situation and they are often incomplete because the chaotic coaching style is not assessed. To overcome these two shortcomings and to obtain a more encompassing instrument involving a variety of coaching styles and constituting approaches, a new vignette-based instrument was developed. The developed vignettes were highly ecologically valid as they represent frequently occurring and specifically described coach-athlete interactions. In response to each of these vignettes, four different reactions were formulated corresponding to the theoretical aspects of coach autonomy support, control, structure and chaos.

Consistent with the work in the educational domain (Aelterman et al., 2018), we expected that the variety of assessed (de)motivating coaching practices could be organized along a clearly interpretable two-dimensional circumplex (see Fig. 1). That is, four broader areas, reflecting each of the four assessed coaching styles (i.e., autonomy support, control, structure, and chaos), would be retained, which would be represented by a dimension denoting the degree of need-supportive (i.e. autonomy support, structure), relative to need-thwarting coaching (i.e. control, chaos) and a dimension denoting the level of high coach directiveness (i.e., structure, control) relative to low coach directiveness (i.e., autonomy support, chaos) (Hypothesis 1a). To gain confidence in the stability of this two-dimensional circumplex, we examined whether a similar structure would emerge in both coaches and athletes (Hypothesis 1b).

Further, given the assessment of a broad variety of practices, we expected that, congruent with the model obtained in the educational domain (Aelterman et al., 2018), each of the four coaching styles (i.e., autonomy support, structure, control, chaos) would get segmented into two approaches, each reflecting a more circumscribed cluster of practices (see Fig. 1; Hypothesis 2a). Further, in line with the assumptions underlying a circumplex model, testifying to the internal validity of the model, we expected the correlations between two adjacent approaches to be positive, while the correlations would become increasingly less positive and even negative as one moves along the circle away from a specific subarea, being reflective of a sinusoid pattern (Hypothesis 2b).

A similar ordered pattern of correlates was hypothesized between

the identified approaches and commonly used coaching measures in the literature (CCBS, Bartholomew et al., 2010; TASCQ, Belmont, Skinner, Wellborn, & Connell, 1988; SCQ, Williams, Grow, Freedman, Ryan, & Deci, 1996). That is, we expected the correlation between a specific subarea (e.g., attuning) and a corresponding coaching style measure in the literature (e.g., coach autonomy support) to be most pronounced, with these correlations becoming decreasingly positive and even negative as one gradually moves from one subarea to another along the circumplex (Hypothesis 3).

To further examine the external validity of the proposed circumplex, we examined the pattern of correlates between the identified coaching styles and approaches and a variety of external outcomes, as assessed among both coaches (i.e. need-based experiences) and athletes (i.e., need-based experiences, motivation, rated coach evaluation). Given that past work found coach need satisfaction to enable coaches to adopt a more autonomy-supportive stance towards their athletes (Stebbings, Tayler, Spray, & Ntoumanis, 2012), we expected the correlates between coach need satisfaction and the need-supportive coaching approaches (i.e., attuning, guiding) to be most pronounced positive, while coaches' experiences of need frustration would relate to the more need-thwarting approaches (i.e., abandoning, domineering). Along similar lines, the most need-supportive approaches were hypothesized to yield the strongest positive correlates with athletes' experienced need satisfaction, autonomous sport motivation, and the rated quality of the coach, while the most need-thwarting approaches would yield the strongest positive correlates with athlete need-frustration, controlled motivation, and amotivation (Hypothesis 4) (Aelterman et al., 2018; Amorose & Anderson-Butcher, 2007).

Supplementary to our main objective to adopt a helicopter-perspective towards (de)motivating coaching, we had two ancillary aims. First, given the paucity of past studies that focused on coaches and athletes simultaneously, we sought to directly compare the responses of coaches and athletes by examining their correspondence (i.e., to what extent do coach and athlete responses relate to each other?) and their discrepancy (i.e., to what extent are there mean-level differences between coaches and athletes?) (Korelitz & Garber, 2016). Past research has shown that such correspondence is rather modest (Smith, et al., 2016), possibly because athletes form their own idiosyncratic viewpoints of their coach (Macquet & Stanton, 2014) or because coaches have an overly positive view of their own coaching behavior due to biased interpretations or social desirable answering. If the latter tendencies are operative, mean level discrepancies may be found such that coaches score themselves relative higher on need-supportive and lower on need-thwarting approaches compared to athletes (Hypothesis 5). A second ancillary objective involved the examination of the role of sport type (i.e., team vs. individual sport). As previous research (e.g., Hollembeak & Amorose, 2005; Terry, 1984; van de Pol et al., 2015) found coaches in team sports to display different behavior compared to coaches in individual sports types, we explored whether any mean-level differences in the coaching styles and their approaches would be found as a function of sport type.

3. Method

3.1. Participants and procedure

For the present study, data were collected among four independent coach samples, and a mixed sample of coaches and athletes. As can be noticed in Table 2, different aims were addressed in different samples, depending on the type of measures being included. Table 3 describes the basic socio-demographic characteristics for each sample. Across all samples, a total of 893 coaches and 377 athletes participated. Both male (72.3%) and female coaches (27.7%) from a variety of individual (41.4%) and team sports (58.6%) participated. Coaches were on average 37.83 (SD = 12.73) years old and had 10.40 (SD = 9.32) years of experience in coaching. Athletes (43.5% female) were on average 17.46 (SD = 2.77) years old, and most of them came from team sports (68.2%). Sample 1 and 2 were collected in the context of a series of workshops for youth coaches on how to adopt a more motivating style. Online questionnaires were completed as part of a baseline assessment before youth coaches began the training. Undergraduate psychology students of Ghent University collected samples 3 and 4 of coaches in return for course credits. By ways of an information session about the recruitment procedure, it was assured that participants would be recruited in a standardized way. Finally, sample 5 involved a mixed sample of 41 coaches and their 377 athletes, who were invited via e-mail to complete an online version of the questionnaires. In each sample, an active informed consent form explaining the purposes of the study preceded the survey and was signed by athletes who were sixteen years or older. When athletes were under the age of sixteen, parents signed the informed consent. Participation in the study was voluntary and confidential and participants could drop out at any time for any reason. The study was conducted in line with the ethical guidelines of the first authors' Universities. Specifically, ethical approval was granted for the collection of data in underaged athletes.

Table 2
Overview of the assessed variables across the five samples.

Sample	1	2	3	4	5	
	Coaches	Coaches	Coaches	Coaches	Coaches	Athletes
N	406	157	183	106	41	377
Coaching style						
SIS questionnaire	X	X	X	X	X	X
Autonomy support (SCQ)	X		X		X	X
Structure (TASCQ)	X		X		X	X
Control (CCBS)	X		X		X	X
Involvement (TASCQ)	X	X		X		
External outcomes						
Motivation (BRSQ)						X
Psychological needs (BPNSNF)	X	X			X	X
Coach evaluation						X

Note: SIS = Situation in Sport Questionnaire: SCQ = Sport Climate Questionnaire; TASCQ = Teacher as Social Context Questionnaire; CCBS = Controlling Coach Behaviors Scale; BRSQ = Behavioral Regulations in Sports Questionnaire: BPNSNF = Basic Psychological Need Satisfaction and Need Frustration scale

3.2. Measures

To obtain scores for each of the measured constructs, an aggregated score was calculated by averaging the items of the construct at hand.

3.3. Common coach and athlete reports

3.3.1. Coaching style

As noted, a new vignette-based instrument was developed for the present study. To generate vignettes, the validated Situation-in-School questionnaire (Aelterman et al., 2018) served a source of inspiration. Further, specific to the contexts of sports, three categories of vignettes were created, referring to the training context, the competition context, and the pedagogical role of coaches. As for the response items, different sources of information were relied upon. First, items were generated based on conceptual grounds, thereby ensuring that as many practices, being part of classic definitions of autonomy support, structure, control and chaos, would be covered in the items (Reeve, 2009; Ryan & Deci, 2017; Soenens & Vansteenkiste, 2010). Specifically, for each coaching style (e.g., autonomy support), the items covered practices belonging to one of both approaches (e.g., participative and attuning) identified by Aelterman et al. (2018). To assure that generated vignettes and its responses had high ecological and face validity (e.g., that they would occur in reality, be easily recognizable, and be perceived as believable),

Table 3
Demographic characteristics of participants of five samples.

Sample		1	2	3	4	5	
Target group		Coaches	Coaches	Coaches	Coaches	Coaches	Athletes
N		406	157	183	106	41	377
Sex	Male	71.2%	71.9%	70.5%	81.1%	70.7%	55.8%
	Female	28.8%	28.1%	29.5%	18.9%	29.3%	44.2%
Type of sport	Individual	45.6	51.6%	39.3%	42%	41.5%	30.6%
	Team	54.4	48.4%	60.7%	58%	58.5%	69.4%
Age	Range	16–73	17–78	17–65	17–67	20–66	12–24
	Mean	38.96	38.89	34.36	36.85	40.61	17.46
	SD	12.59	12.34	12.36	12.85	14.25	2.77
Coach experience	Range	0–57	0–42	1–40	1–40	1–40	–
	Mean	10.07	10.61	9.66	11.14	14.23	–
	SD	9.82	9.64	7.98	8.21	10.55	–
Level	Low level	67.0%	65.6%	54.1%	26.4%	32.5%	34.2%
	High level	33.0%	34.4%	45.9%	73.6%	67.5%	65.8%
Age group	Under 12y	45.3%	51.6%	45.9%	–	–	–
	12-18y	43.1%	38.9%	33.3%	–	80.5%	67.9%
	Over 18y	11.6%	9.6%	20.8%	–	19.5%	31.0%

sport psychologists and coaches of youth athletes were consulted. Prior to collecting the five samples reported in this contribution, two large pilot samples of youth coaches (N = 599) and athletes (N = 334) were collected, which helped to adjust and optimize the instrument.[2]

The newly developed Situations-in-Sport Questionnaire[2] presents 5 vignettes per role (i.e., during training, during competition and in a pedagogical role), resulting in a total of 15 situational vignettes (see Appendix 1). The presented vignettes either concern a problem situation, which requires an intervention and remedial action from the coach (e.g., "An athlete displays anxiety before the game. You …"), or a non-problematic situation in which the coach takes a more proactive role (e.g., "You give a hard and difficult exercise, which asks for an extra effort from your athletes. You …"). For each of the 15 vignettes coaches were provided with four different behavioral responses corresponding to the overarching autonomy-supportive, structuring, controlling and chaotic styles. Coaches were asked to rate on a 7-point Likert scale from 1 (*does not describe me at all)* to 7 (*describes me extremely well*) to which degree each of the four reactions described themselves. For example: 'You notice that an athlete is not satisfied with the fact that he is not selected for the team for the upcoming competitive event. How do you respond?': (a) 'You have a conversation with him/her and acknowledge his/her frustration, and give a meaningful explanation for the non-selection' (i.e., autonomy support), (b) 'You do not provide an explanation and leave him/her to it' (i.e., chaos), (c) 'You say: "You need to learn to accept this. This is my decision".' (i.e., control), (d) "You indicate which steps s/he needs to take in order to be selected in the future" (i.e., structure).

Athletes answered the same 15 vignettes, although the vignettes and responses were slightly adapted to represent the athlete rather than the coach perspective. Where necessary, the language of the vignettes and responses was simplified, as to make sure athletes aged 14 and older would be able to understand and complete the questionnaire. Athletes were asked to rate on a 7-point Likert scale from 1 (*does not describe my coach at all)* to 7 (*describes my coach extremely well*) the extent to which the items correspond to their coach's behavior.

3.3.2. Construct validation measures

Coaches completed adapted versions of the Sport Climate Questionnaire (SCQ; SDT website: http://www.psych.rochester.edu/SDT/), the Teacher as Social Context Questionnaire – Teacher version (TASCQ; Belmont et al., 1988) and the Controlling Coaching Behavior Scale (CCBS; Bartholomew et al., 2010). Adaptations primarily concerned changes in the perspective of the items, as all original scales assessed the athlete perspective on coaching behaviors, or changes in the domain specificity of the scale in case of the TASCQ, which was originally developed to assess the motivating styles of teachers. The SCQ provided six items for autonomy support (e.g., "I try to understand how my athletes see things before suggesting a new way to do things, α = .85). The TASCQ provided eight items for structure (e.g., "I talk with my athletes about my expectations for them", α = .81) and 11 for involvement (e.g., "I spend time with all athletes in my group"; α = .76). Further, the CCBS provided 15 items for controlling coaching (e.g., "I try to motivate my athletes by promising a reward when they do well", α = .83).

In a similar way, athletes answered to the translated original items of the SCQ, TASCQ and CCBS to measure athlete's perceptions of autonomy-supportive, structuring and controlling coaching behavior. Cronbach's alpha reliabilities were satisfactory and ranged from 0.71 to 0.86. Both coaches and athletes answered on a 7-point Likert scale ranging from 1 (*I completely disagree*) to 7 (*I completely agree*).

3.3.3. Need-based experiences

Coaches' and athletes' need satisfaction and frustration were measured with an adapted version of the Basic Psychological Need Satisfaction Need Frustration Scale (BPNSNF; Chen et al., 2015). The items were adapted by making them amendable for the sport context and

[2] A team of researchers and sport psychologists working in practice with athletes brainstormed multiple times about the content of vignettes and appropriate responses. A pilot version of the initial Situation-in-Sport Questionnaire, which contained 19 vignettes, was tested in sample of 599 coaches (*Mean age* = 38.35; *SD* = 12.65) and 334 athletes (*Mean age* = 15.89; *SD* = 2.07). Multidimensional scaling analyses provided promising initial evidence for the circumplex model, yet certain approaches appeared underrepresented, some vignettes and items required slight adaptations and the number of vignettes was reduced to 15 to make the questionnaire more suitable for research purposes. Vignettes were removed to obtain a balanced number of situations (i.e., 5) across the three roles of youth coaches. Further, in a small sample of 10 youth coaches, with an average of 14.20 (SD = 7.81) years of coaching experience, we assessed the extent to the vignettes were perceived as realistic. Average realism scores across vignettes ranged from 5.40 to 6.60 on a scale from 1 (not realistic at all) to 7 (very realistic), indicating that the selected vignettes fit with the daily coaching reality.

the scale was shortened to 12 items, which has proven valid in previous studies (e.g., Mabbe, Soenens, Vansteenkiste, Van der Kaap-Deeder, & Mouratidis, 2018). An explorative factor analysis on the coach and athlete data indicated that two factors could be retained, explaining 44% and 49% of the variance in total, with the need satisfaction and need frustration items loading on different factors. Internal consistencies were acceptable for both need satisfaction (six items, e.g., "During coaching, I feel a strong connection with people who are important to me"; α_{coach} = .71; $\alpha_{athlete}$ = .79) and need frustration (six items, e.g., "I feel I have no other choice but to coach athletes"; α_{coach} = .74; $\alpha_{athlete}$ = .78). Items were rated on a 7-point Likert scale ranging between 1 (*completely disagree*) and 7 (*completely agree*).

3.4. Unique coach reports

3.4.1. Social desirability

Across samples 1 and 2, a total of 547 coaches completed a 10-item social desirability scale derived from Crowne and Marlowe (1960). This scale assessed the extent to which coaches tend to answer in a social desirable way (e.g., "I have never said something to someone to deliberately hurt his/her feelings"; α = .58). Items were dichotomously answered with "true" or "false".

3.5. Unique athlete reports

3.5.1. Motivation

To assess athletes' motivation, we made used of the Behavioral Regulation in Sport Questionnaire (BRSQ: Lonsdale, Hodge, & Rose, 2008), which has been adapted by Assor, Vansteenkiste, and Kaplan (2009). Specifically, of the original 36 items of the BRSQ, only the items tapping into intrinsic motivation (n = 4) at a more general level were included, while items tapping into specific facets of intrinsic motivation (i.e., motivation to know, motivation to accomplish and motivation to experience stimulation) were left out. In line with Assor et al. (2009), we added four new introjection-approach motivation items (e.g., "I participate in my sport because I feel proud of myself if I persist") because the original BRSQ only includes 3 introjection-avoidance items and 1 rather general introjection motivation item. In a similar way, four newly created external-approach items were added (e.g., "I participate in my sport because I would be appreciated by others") in the present study. As can be noticed in Assor et al. (2009; Study 3), strong evidence for an ordered pattern of correlates between the different subtypes along the self-determination continuum was obtained. As a result, 32 items measuring three subtypes of autonomous motivation (i.e., intrinsic motivation, integrated regulation, and identified regulation; α = .85) and four subtypes of controlled motivation (i.e., introjection-approach regulation, introjection-avoidance regulation, external-approach regulation, and external-avoidance regulation α = .90) as well as amotivation (α = .88) were used.

3.5.2. Coach evaluation

To tap into coach evaluation, an 8-item scale used in prior work in the educational domain (Aelterman et al., 2018) was slightly adjusted to the coaching context. Athletes rated the quality of their coach by indicating whether they (a) wanted to be coached another season by this coach (e.g., "Next season, I would like to have the same coach"; 3 items), (b) found their coach's training clear and easy to execute (e.g., "my coach's training was easy to execute"; 2 items) (c) would recommend their coach to other athletes (e.g., "I would recommend this coach to other athletes"; 2 items), and (d) would evaluate their coach as an excellent coach ("My coach is an excellent coach"; 1 item). All items were answered on a 7-point Likert scale ranging from 1 (*I completely disagree*) to 7 (*I completely agree*). To justify the inclusion of all 8 items, an exploratory factor analysis was performed, thereby retaining one single factor explaining 56% of the variance. After removing one item with a low loading, the remaining seven items, which all yielded a minimal loading of 0.50, were averaged to create a composite score (α = .90).

3.6. Plan of analysis

To address the aims of this study we always used the maximum amount of data available. As different measures were collected across samples (see Table 2), the number of included participants somewhat varied across the examined aims and hypotheses. To address our primary aim, that is, obtaining a helicopter perspective towards (de)motivating coaching, we conducted a multidimensional scaling analysis (MDS; Borg, Groenen, J., & Mair, 2013) on the 60 items (4 responses by 15 vignettes) to examine the dimensional structure of the SISQ-sport items. Specifically, MDS provides a graphical representation of (dis)similarities between items as distances between points in a geometrical space, with high and low correlations between items being, respectively, represented by small and large distances[3] between points in the geometrical space. That is, practices tapping into the same coaching approach are clustering together within a given subarea in the geometrical representation.[4] Depending on their location in the circumplex, adjacent approaches should correlate positively, suggesting that both approaches are compatible, while approaches in direct opposition to one another should correlate negatively, suggesting that both approaches are more conflictual in nature. We used the PROXSCAL MDS procedure of SPSS to compute the configuration with non-metrical MDS. We performed this procedure once with all the coach data (Samples 1–5) combined in one larger sample (N = 893) to obtain a coach configuration and a second time to obtain an athlete configuration (Sample 5, N = 377). To test the stability of the dimensional structure across coaches and athletes, we subjected the obtained coach and athlete configurations to Generalized Procrustes Analysis (GPA; Borg et al., 2013; Borg & Groenen, 1997; Commandeur, 1991). GPA calculates the coach and athlete configurations in such a way that they correspond as closely as possible, without affecting the relative distances between items within each configuration. Based on this consensus configuration, we identified critical areas and subareas representing a specific coaching approach.

In a next step, to provide formal evidence for the differentiation between identified approaches, a series of confirmatory factor analyses were conducted. Specifically, for each pair of adjacent approaches, a differentiated two-factor solution was compared against a non-differentiated single-factor solution, through the calculation of a chi^2 change statistic. Then, mean scores were calculated for each identified (sub) areas by averaging the respective items belonging to an identified (sub) area, before calculating the Pearson zero order correlations between the identified (sub)areas.

With respect to the assessed external outcomes, Pearson zero order correlations were run to investigate whether the identified (sub)areas in the dimensional configuration would meaningfully relate to construct validation measures (i.e. autonomy support, structure and control) among both coaches and athletes. Before calculating these correlations, mean scores were created for each validation measure and identified approach by averaging the items of each validation measure and approach. Further, we examined the correlations of the identified (sub) areas in the dimensional configuration with both coach (i.e., need satisfaction/frustration) and athlete outcomes (e.g., need satisfaction/

[3] Using Euclidean distances as association measures - rather than the more common Pearson correlations, which provide the same information - has the advantage that distances can also serve as input for metrical multidimensional scaling that assumes an interval-level association.

[4] While the term subarea is more technical in nature, denoting the different items that fall within a given region, the term approach is used in a more content-based way, thereby denoting the way how coaches interact with their athletes.

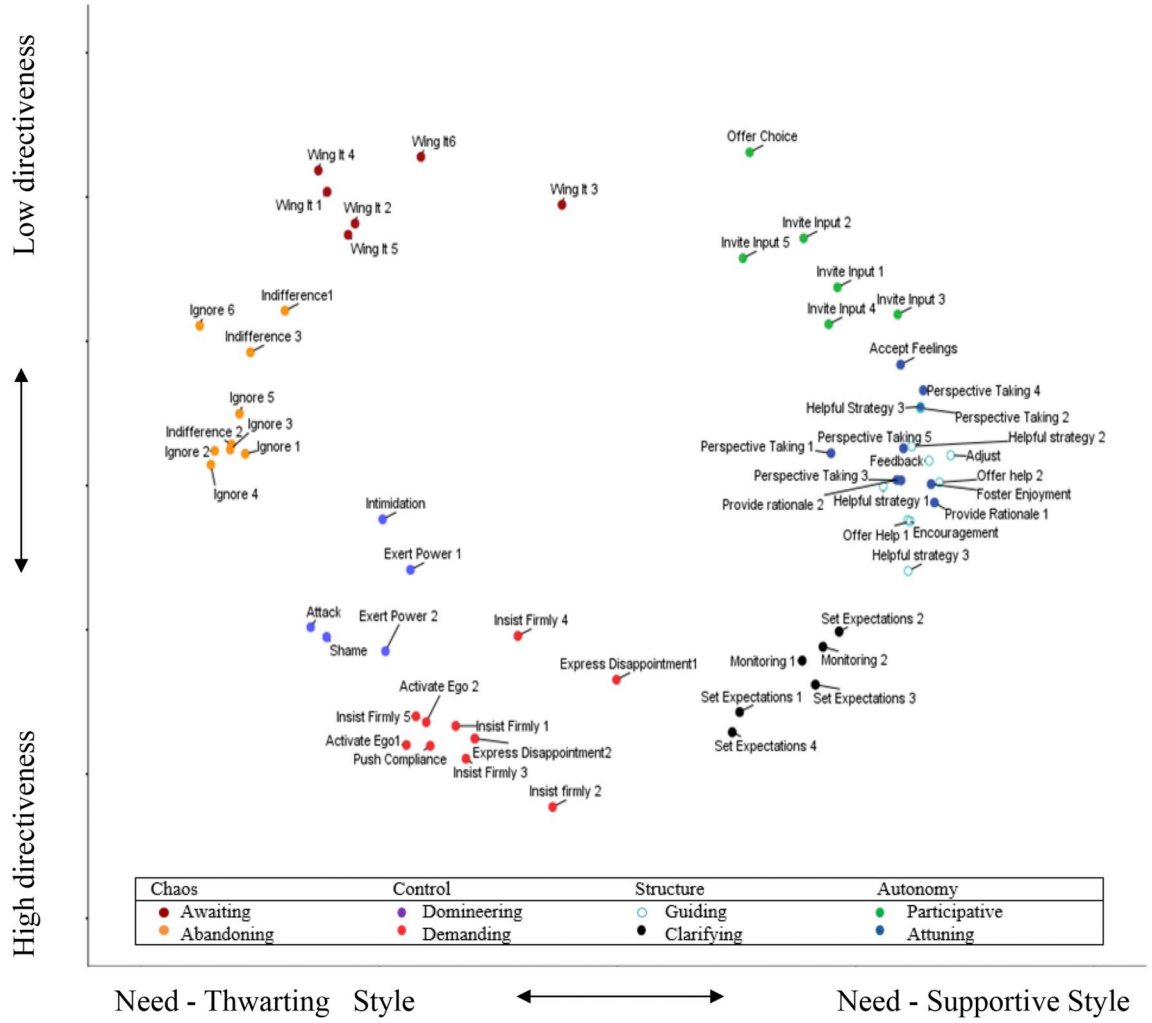

Fig. 2. Two-dimensional consensus representation of the SISQ-sport items.

frustration, motivation and coach evaluation).

To address our first ancillary aim, that is, examining the correspondence between athletes' and coaches' reports on (de)motivating coaching, we made use of Sample 5 only. Given the hierarchical structure of that sample, with 377 athletes nested in 41 teams, each associated with one coach, we made use of multilevel regression analyses. Specifically, in separate regression models, the coach-reports were entered as a single predictor of the corresponding athlete-reports. In addition, Multivariate Anova-analyses, we examined mean-level discrepancies between coach- and athlete-reports. Finally, to address our second ancillary aim, that is, considering the role of sport type, we used Multivariate Anova-analyses to examine mean-level differences in the identified (sub)areas as a function of sport type (i.e., individual vs. team).

4. Results

4.1. Primary analyses

4.1.1. Dimensionality

To investigate whether the variety of assessed coaching practices were organized along two dimensions (i.e., Hypothesis 1a), we evaluated several configurations ranging from a one-dimensional up to a six-dimensional solution produced by non-metric MDS analyses for both coaches (N = 893) and athletes (N = 377) separately. We opted for a two-dimensional instead of single-dimensional solution because it yielded a stress loss of 0.040 and 0.036 for coaches and athletes, respectively, and because the further reduction in stress in the case of the three-dimensional solution was minimal (i.e., 006 for both coaches and athletes). Further, in both cases, the scree-test confirmed this choice by pointing towards a two-dimensional representation, thereby confirming Hypothesis 1. The first dimension of the circular pattern (i.e., the X-axis in Fig. 2) can be interpreted as need thwarting, relative to need-supportive coaching with the control items (lower left quadrant) and chaos (higher left quadrant) items having negative coordinates and the autonomy support (higher right quadrant) and structure (lower right quadrant) items having positive coordinates on this dimension. The second dimension (i.e., Y-axis) can be interpreted in terms of the level of coach directiveness. All chaos items and all autonomy support items (except for one) have positive coordinates on this dimension. Contrary, all control items and the majority of the structure items (i.e., 67% or n = 10) have negative coordinates on this dimension. To summarize, all four a priori identified coaching styles (i.e., autonomy support, control, structure, chaos) could largely be represented in different areas by the circumplex, which were most parsimoniously captured by two overarching dimensions. All four coaching styles also showed good internal consistencies with Cronbach alpha values ranging between 0.78 and 0.87 (see Table 4), in both coach and athlete samples.

4.1.2. Stability of the circumplex

As both coach and athlete data pointed towards a two-dimensional circumplex model, we examined whether the obtained solution would

Table 4
Means, Standard Deviations, Reliabilities, and Correlations between Coaching Styles and Approaches among Coaches (below diagonal) and Athletes (above diagonal).

	Mean	SD	α	1	2	3	4	5	6	7	8	9	10	11	12
Mean				4.22	4.82	3.70	2.93	3.99	4.37	4.68	5.02	3.97	3.14	3.00	2.82
SD				0.93	0.89	0.94	0.90	1.01	1.03	1.05	0.91	0.99	1.13	1.06	0.89
α				.86	.87	.84	.85	.63	.82	.85	.70	.78	.68	.83	.60
Styles															
1.Autonomy support	5.13	0.78	.83	-	.79**	-.01	-.40**	.87**	.95**	.83**	.51**	.05	-.12*	-.49**	-.13*
2.Structure	5.64	0.68	.86	.68**	.-	.09	-.54**	.58**	.82**	.95**	.82**	.21**	-.14**	-.57**	-.36**
3.Control	3.02	0.96	.86	-.11**	.11**	-	.32**	-.05	.01	-.05	.33**	.95**	.84**	.34**	.19**
4.Chaos	2.29	0.68	.78	-.22**	-.39**	.34**	-	-.19**	-.48**	-.54**	-.40**	.18**	.49**	.95**	.82**
Approaches															
5.Participative	4.49	1.03	.69	.87**	.41**	-.10**	.01	-	.66**	.65**	.30**	-.02	-.07	-.30**	.06
6.Attuning	5.56	0.78	.80	.90**	.77**	-.10**	-.37**	.56**	-	.83**	.57**	.09	-.14**	-.55**	-.24**
7.Guiding	5.72	0.73	.85	.74**	.92**	-.08*	-.42**	.48**	.81**	-	.59**	.04	-.22**	-.59**	-.30**
8.Clarifying	5.51	0.81	.71	.43**	.84**	.34**	-.25**	.21**	.52**	.56**	-	.46**	.02	-.37**	-.34**
9.Demanding	3.42	1.06	.81	-.09**	.16**	.97**	.27**	-.10**	-.06	-.04	.38**	-	.63**	.21**	.07
10.Domineering	2.23	0.97	.71	-.14**	-.03	.84**	.43**	-.07*	-.16**	-.17**	.16**	.69**	-	.49**	.36**
11.Abandoning	2.09	0.76	.76	-.35**	-.42**	.40**	.91**	-.14**	-.46**	-.49**	-.21**	.33**	.46**	-	.61**
12.Awaiting	258	0.83	.54	.03	-.23**	.16**	.81**	.21**	-.13**	-.19**	-.22**	.10**	.26**	.49**	-

Note: $^{**}p < .01$, $^{***}p < .001$

be similar across informants by applying GPA to the sample-specific configurations (i.e., Hypothesis 1b). In total 97% of the (squared) distances in the two sample-specific configurations could be represented in a single consensus configuration, indicating that the spatial representations of the individual SISQ-sport items are highly comparable between coaches and athletes. Furthermore, we correlated the coordinates of the items on both dimensions in the consensus configuration with the coordinates of the items in the separate athlete and coach configurations. The correlations appeared all significant and very high. Specifically, the need support dimension of the consensus configuration correlated, respectively, 0.99 and 0.97 with the corresponding dimension in the separate coach and athlete configurations. Next, the directiveness dimension yielded a correlation of, respectively, 0.99 and 0.97 with the corresponding dimension in the coach and athlete configuration. Together, these results indicate that the two-dimensional structure is stable across informants (i.e., coaches and athletes), which justifies further analyses with the consensus configuration. Fig. 2 shows this two-dimensional consensus representation of the SISQ-sport items across samples based on the matrix of centroids.

4.1.3. Differentiation into approaches

Closer inspection of the position of each item in the circumplex structure and its content revealed that each of the four coaching styles (i.e., autonomy support, control, structure, chaos) fell apart into two meaningful approaches. Similar to the SISQ-education (Aelterman et al., 2018), six autonomy support items that refer to offering choice and stimulating input among athletes fell in the *participative* approach (α_{coach} = .69; $\alpha_{athlete}$ = .63), while nine other autonomy support items fell in the *attuning* approach and tapped into coaches' tendency to take athletes' perspectives, accept their feelings, foster enjoyment and provide a meaningful rationale (α_{coach} = .80; $\alpha_{athlete}$ = .82). Six practices referring to setting and monitoring expectations grouped together in the *clarifying* approach (α_{coach} = .71; $\alpha_{athlete}$ = .70), while nine other structure items, which assessed coaches' offer of help, feedback, and encouragement, but also adjusting exercises and providing a helpful strategy fell in the *guiding* approach (α_{coach} = .85; $\alpha_{athlete}$ = .85). Further, ten control items involving insisting firmly on or pushing for compliance, activating athletes' ego and expressing disappointment in athletes' behavior fell in the *demanding* approach (α_{coach} = .81; $\alpha_{athlete}$ = .78), while five items referring to, shaming, guilt- and anxiety-induction, intimidation or exerting power of athletes' perspective fell into a *domineering* approach (α_{coach} = .71; $\alpha_{athlete}$ = .68). Similarly, chaotic items got divided in two approaches: nine items involving coaches' indifference and lack of intervention or ignoring the situation when a reaction was called for fell in the *abandoning* approach (α_{coach} = .74; $\alpha_{athlete}$ = .81), whereas six items involving a lack of planning of the coach and letting the situation unfold itself (i.e., wing it) fell in the *awaiting* approach (α_{coach} = .61; $\alpha_{athlete}$ = .66).

To provide more formal evidence for the identification of these eight approaches, a series of confirmatory factor analyses were conducted, thereby contrasting a two-versus a one-factor solution for each pair of adjacent approaches (Hypothesis 2b). Among coaches, χ^2 change tests pointed out that a 2-factor solution appeared to yield a better fit for each of the eight pairs of adjacent approaches compared to a non-differentiated single factor solution, with $\Delta\chi^2(1)$ ranging from 6.35 to 385.19, all *p-values* ≤ .012. Also in the case of athletes, the more differentiated solution yielded a better fit compared to the non-differentiated solution in seven of the eight comparisons, with $\Delta\chi^2(1)$ ranging from 4.81 to 152.91, all *p-values* ≤ .028, with the exception of the guiding – attuning comparison ($\Delta\chi^2(1) = 0.01$, $p = .975$). In this case, the one-factor solution appeared to be more parsimonious. Yet, given that this non-differentiated solution was not systematically obtained across informants and deviates from the findings obtained in the educational domain, we chose to present the correlates of both approaches separately among athletes as well. Possible reasons for this coach-athlete discrepancy are provided in the discussion.

4.1.4. Correlational pattern

As can be observed in Table 4, autonomy support was positively correlated with structure among both coaches and athletes. In contrast, it correlated negatively with control in coaches, but showed a null correlation with control in athletes. Finally, structure was unrelated to control among athletes, while being positively associated with control among coaches, while being negatively correlated with chaos in both the coach and athlete samples.

Further, the correlations between the eight approaches are congruent with and provide further evidence for the circumplex structure (Hypothesis 2b). Specifically, as hypothesized, the correlations between the eight approaches followed a clear sinusoid pattern, both among coaches as well as athletes. More precisely, each coaching approach correlated most strongly with the adjacent approaches and the correlations became decreasingly positive and increasingly negative as one moves away from a specific approach. In the athlete sample, for instance, the attuning approach correlated most strongly with the participative and the guiding approach, with the correlation dropping to zero (demanding approach) and becoming slightly negative (awaiting and domineering) and even strongly negative (abandoning) as one moves along the circumplex. A similar pattern was observed in coaches.

Table 5
Pattern of correlations of the four overarching coaching styles and the eight identified approaches with outcomes among coaches.

		Styles				Approaches							
						Autonomy support		Structure		Control		Chaos	
		Autonomy Support	Structure	Control	Chaos	Participa-tive	Attuning	Guiding	Clarifying	Demanding	Domineering	Abandoning	Awaiting
Construct Validity	*N*												
Autonomy support	605	.48**	.40**	-.08[a]	-.17**	.43**	.42**	.45**	.22**	-.08	-.07	-.23**	-.03
Control	605	-.15**	-.10[a]	.51**	.33**	-.09	-.18**	-.19**	.05	.50**	.44**	.38**	.17**
Structure	605	.31**	.41**	.04	-.18**	.19**	.34**	.41**	.30**	.05	-.01	-.19**	-.12**
Involvement	582	.38**	.46**	-.09	-.35**	.22**	.44**	.49**	.30**	-.07	-.11**	-.38**	-.21**
Social desirability Tendency	547	.18**	.12**	-.15**	-.18**	.14**	.17**	.20**	-.02	-.14**	-.13**	-.25**	-.01
Predictive validity[b]													
Need satisfaction	544	.26***	.24***	.04	.03	.21***	.25***	.25***	.16***	.03	.04	-.03	.10[a]
Need frustration	544	-.15**	-.19***	.22***	.31***	-.01	-.23***	-.23***	-.08	.21***	.20***	.32***	.21***

[a] $*p < .01$, $***p < .001$.
[b] Partial correlations were calculated, examining the relation between a coaching style or approach and need-based functioning, controlling for social desirability

4.1.5. External outcomes

Next, we examined whether the four coaching styles and the eight identified coaching approaches were meaningfully associated with other measures of autonomy support, structure and control (i.e., construct validity; cf. Hypothesis 3). Three observable patterns of correlations supported the construct validity of our newly developed measurement. First, Tables 4 and 5 show that the four coaching styles most strongly correlated with the corresponding coaching style measure in both coach and athlete samples. The structuring coaching style in athletes counts as one exception, as it correlated most strongly with autonomy support (SCQ; $r = .74$), closely followed by the construct validation measure of structure (TASCQ; $r = .64$). Second, Table 5 and 6 clearly show that the eight coaching approaches primarily correlated with the corresponding measures, and this in both coach and athlete samples. For example, autonomy support (SCQ) correlated most strongly with the participative approach and the attuning approach. The same pattern of correlations was apparent concerning the construct validation measures of structure (TASCQ) and control (CCBS). Interestingly, involvement (TASCQ) was positively correlated with the autonomy supportive and structuring style as well as with all need-supportive approaches (i.e., participative, attuning, guiding, and clarifying), while being negatively correlated with the chaotic style as well as with the need-thwarting approaches (domineering, abandoning, and awaiting).

Concerning the coach reports, social desirability showed modest positive correlations with the autonomy-supportive and structuring style. Contrary, negative associations were found with the controlling and chaotic styles. Roughly the same pattern was evident concerning the eight coaching approaches, with social desirability being positively correlated with the participative, attuning, and guiding approaches, but negatively with the demanding, domineering, and abandoning approaches (see Table 5).

Next, we tested whether the four coaching styles and the eight coaching approaches logically correlated with both coach and athlete outcomes. Given the high correlations between the coaching approaches and coaches' reports on social desirability, we controlled for the latter in the coach samples by calculating partial correlations. As expected, Table 5 shows that coaches' need satisfaction was positively correlated with autonomy support and structure but unrelated to control and chaos. Further, coaches' need satisfaction appeared most strongly positively related to the attuning and guiding approach, followed by the participative and clarifying approach. In contrast, coach need frustration was positively correlated with the controlling and chaotic styles, but negatively with the autonomy-supportive and structuring styles. Furthermore, the strongest positive correlation was observed for the abandoning approach, closely followed by domineering, demanding, and awaiting approach. Further moving along the circumplex, coach need frustration appeared unrelated to the demanding and participative approach, but negatively correlated with the attuning and guiding approach.

Concerning the athlete outcomes, the expected pattern of results was evident (see Table 6). Athletes' need satisfaction correlated positively with both athletes' perceived autonomy-supportive and structuring coaching styles, but negatively with the perceived chaotic style. Further, the strongest positive correlation with need satisfaction was observed for the attuning and guiding approach, followed by the participative and clarifying approach. The strongest negative associations with need satisfaction emerged for the abandoning approach, followed by the domineering and awaiting approach. In general, a similar pattern was found for athletes' autonomous motivation (Fig. 3b) and for coach evaluation. Contrary, athletes' need frustration was positively correlated with athletes' perceived control and chaos, but negatively with structure. Further, the strongest positive associations were observed for the abandoning and domineering approach, followed by the demanding and awaiting approach. A similar pattern emerged for controlled motivation and amotivation.

4.2. Ancillary analyses

4.2.1. Coach-athlete convergence

In a series of ancillary analyses in Sample 5, we examined whether athlete and coach reports would correspond to one another. Multilevel regression analyses resulted in significant correspondence between coach and athlete reports for the controlling coaching style ($\beta = .39$, $\chi^2(1) = 14.754$, $p < .001$), but not for the autonomy-supportive ($\beta = .26$, $\chi^2(1) = 2.580$, $p = .108$), structuring ($\beta = .32$, $\chi^2(1) = 2.452$, $p = .117$), nor the chaotic coaching style ($\beta = -.04$, $\chi^2(1) = 0.091$, $p = .763$). As for the identified coaching approaches, correspondence was found for the demanding ($\beta = .32$, $\chi^2(1) = 11.439$, $p < .001$), domineering ($\beta = .39$, $\chi^2(1) = 10.020$, $p = .002$), guiding ($\beta = .51$, $\chi^2(1) = 5.825$, $p = .016$) and attuning approach ($\beta = .46$, $\chi^2(1) = 6.432$, $p = .011$), but not for the clarifying ($\beta = .05$, $\chi^2(1) = 0.079$, $p = .779$), participative ($\beta = .06$, $\chi^2(1) = 0.204$, $p = .652$), awaiting ($\beta = -.13$, $\chi^2(1) = 1.076$, $p = .300$) and abandoning approach ($\beta = .04$, $\chi^2(1) = 0.146$, $p = .702$).

Further, a multivariate ANOVA-analysis indicated that, across all four coaching styles and the eight identified coaching approaches, a

Table 6
Pattern of correlations of the four overarching coaching styles and the eight identified approaches with outcomes among athletes.

		Styles				Approaches								
						Autonomy support		Structure		Control		Chaos		
		Autonomy Support	Structure	Control	Chaos	Partici-pa-tive	Attuning	Guiding	Clarifying	Demanding	Domineering	Abandoning	Awaiting
Construct Validity	*N*												
Autonomy support	*241*	.78**	.74**	-.05	-.38**	.67**	.76**	.78**	.44**	.02	-.16*	-.46**	-.15**
Control	*241*	.05	-.06	.64**	.51**	.09	.01	-.12	.08	.55**	.65**	.48**	.43**
Structure	*241*	.64**	.67**	.08	-.33**	.56**	.62**	.70**	.44**	.14*	-.07	-.37**	-.16**
Predictive Validity													
Need-experiences													
Satisfaction	*374*	.40**	.46**	-.10	-.27**	.35**	.38**	.47**	.30**	-.04	-.19**	-.29**	-.15**
Frustration	*474*	-.09	-.17**	.36**	.45**	-.02	-.13*	-.21**	-.05	.30**	.40**	.45**	.33**
Motivation													
Autonomous	*374*	.20**	.30**	-.10*	-.19**	.13*	.21**	.29**	.24**	-.05	-.17**	-.19**	-.14**
Controlled	*374*	.12*	.03	.32**	.29**	.18**	.07	.03	.04	.28**	.31**	.25**	.28**
Amotivation	*374*	-.02	-.13*	.32**	.40**	.05	-.05	-.13*	-.09	.23**	.41**	.37**	.34**
Coach evaluation	*238*	.58**	.66**	-.24**	-.54**	.46**	.59**	.70**	.41**	-.14*	-.38**	-.60**	-.30**

Note: *$p <$, **$p <$ .01, ***$p <$ .001

significant mean-level difference was found, Wilk's Lambda = .498, F (12,285.00) = 23.897, $p < 001$; SE = 0.502. Follow-up univariate ANOVA-analyses with Bonferroni correction pointed to coach-athlete discrepancies for all four coaching styles with coaches perceiving themselves to use a more autonomy-supportive and structuring and a less controlling and chaotic style than they were rated by their athletes (all F-values $ps < .002$). Further, the same pattern was evident concerning six out of the eight coaching approaches: coaches reported themselves to score significantly higher on the participative, attuning, guiding, and clarifying approach (significant F-values $ps < .002$) and significantly lower on the domineering and abandoning approach (significant F-values $ps < .001$) compared to their athletes, while no differences were found for the demanding and awaiting approach.

4.2.2. Difference between type of sport

In a second series of ancillary analyses, we considered the role of type of sport in greater detail. Specifically, mean-level differences were examined through multivariate ANOVA analyses. In the coach data, an overall multivariate effect, Wilk's Lambda = .845, F (12,844.00) = 12.897, $p < 001$; SE = 0.155, was found. After taking into account Bonferroni correction, coaches of individual sports reported higher use of autonomy support and lower use of control than their colleagues in team sports (see Table 7). At the approach level, coaches in individual sports reported greater use of the participative, but less use of the clarifying approach than coaches in team sports. Meanwhile, the latter scored higher on the demanding and domineering approach but lower on the awaiting approach than their colleagues in individual sports.

Likewise, in the athlete sample, an overall multivariate effect, Wilk's Lambda = .696, F(12,364.00) = 13.231, $p < 001$; SE = 0.304, was found. After Bonferroni correction, individual sport athletes perceived their coach as more autonomy-supportive, more structuring, less controlling, and less chaotic than the athletes in team sports (Table 6). Concerning the eight approaches, athletes of individual sports perceived their coach as more participative, attuning, and guiding than their counterparts in team sports. The latter however, reported their coach higher on the demanding, domineering and abandoning approaches.[56]

5. Discussion

The topic of (de)motivating sport coaching has been heavily researched over the past few decades (e.g., Adie et al., 2012; Amorose & Anderson-Butcher, 2007; Bartholomew et al., 2010; Delrue et al., 2017). Much of this work has been grounded in Self-Determination Theory, especially focused on the notion of coach autonomy support. However, to date research within SDT lacks a helicopter perspective

[5] MANOVA analyses concerning gender in coach reports (N = 875, 72% male) on the 4 coaching styles and 8 coach approaches resulted in four out of 12 significant differences (F-values ranging from 0.01 to 73.03). Male coaches reported higher on the controlling style, the demanding, domineering, and clarifying approach then female coaches. The same MANOVA analyses concerning athletes' (N = 373, 56% male) perceptions of coaching styles and approaches resulted in six out of 12 significant differences (F-values ranging from 0.04 to 28.05). Male athletes reported higher on the controlling and chaotic style, the demanding, domineering, abandoning, and awaiting approach than female athletes.

[6] In a more explorative way, it was also investigated whether the correspondence between coach-athlete ratings was moderated by the type of sport as the athlete-coach correspondence may be more elevated among athletes of individual sports. Relying on multilevel modeling, for each athlete-reported approach separately, the interaction between the respective coach-reported approach and sport type was entered as a predictor into the regression model. None of the interactions were found significant (Chi^2-values ranged from 0.003 to 1.800, all $ps > .179$).

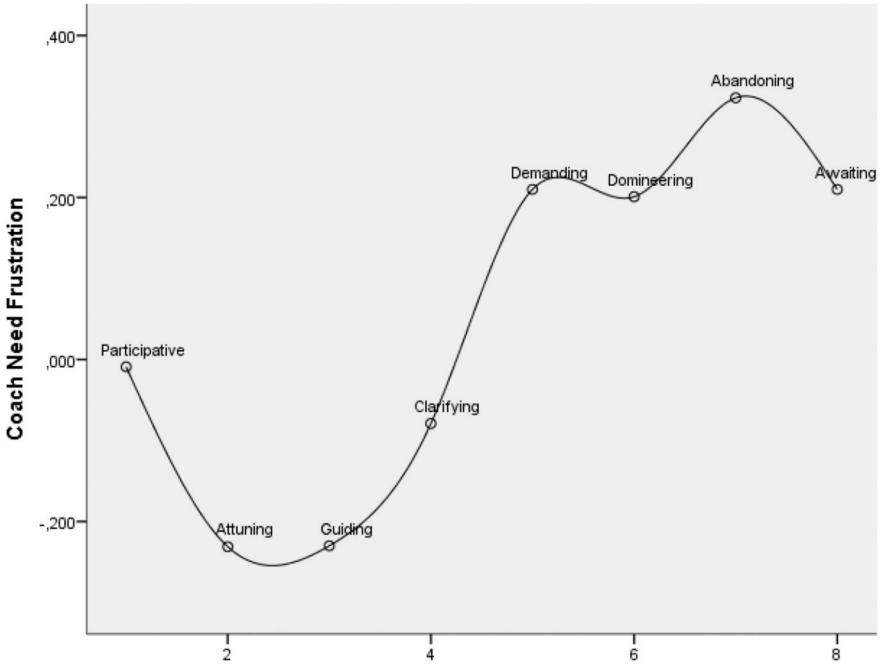

Fig. 3. a. Example of Sinusoid Relations between the Eight Subareas and Coach Outcomes.
b: Example of Sinusoid Relations between the Eight Subareas and Athlete Outcomes.

shedding light on the way how different motivating (i.e., autonomy support, structure) and demotivating (i.e., control, chaos) coaching styles relate to each other. To achieve this global aim, the current study, involving two large samples of sport coaches and athletes, made use of multidimensional scaling analyses. A circumplex model emerged among both coaches and athletes, which helped to provide both more integrative and refined insight in the variety of (de)motivating coaching practices.

5.1. Towards increased integrative and refined insight

As hypothesized, the broad array of motivating and demotivating coach practices could best be summarized according to a circumplex pattern consisting of two dimensions. A first dimension denotes the extent to which coaching practices are supportive of, relative to undermining athletes' basic psychological needs for autonomy, competence, and relatedness. As shown in Fig. 2, the left pole of this axis involves the controlling and chaotic practices, whereas the right pole of this axis compromises a mix of autonomy-supportive and structuring practices. The second dimension denotes the degree of coach directiveness, with either the coach or the athlete being more in charge. In the case of high directiveness, coaches typically rely on a mix of controlling or structuring practices, whereas the use of autonomy-supportive and chaotic practices leaves relatively more room for athletes to take the lead. Taken together, the two-dimensional structure divides the assessed coaching practices into four quadrants, mainly representing the four overarching coaching styles (i.e., autonomy support, structure, control and chaos).

These findings are in line with previous work in the educational domain (Aelterman et al., 2018), in which evidence was found for the same two-dimensional structure. Further, the obtained circumplex structure appeared stable across informants (i.e., coach vs. athlete). More precisely, both coach and athlete reports of the same (de)motivating practices point towards the same two-dimensional circumplex. Such high consensus among informants suggests that the exact location of the assessed coaching practices was very similar across coaches and athletes.

The resulting circumplex does not only produce an integrative picture, it also provides a more refined insight in how different coaching practices cluster together as both the need-supportive (i.e. autonomy support and structure) and need-thwarting styles (i.e. chaos and control) could be further divided into different approaches. Each of these approaches, eight in total, involve a variety of co-occurring coaching practices. Moreover, the coaching approaches related in a sinusoid pattern across the circumplex, supporting a gradual perspective towards coaching. That is, the difference between a specific approach and the adjacent ones is not abrupt but instead more gradual, with the differences being characterized by the extent to which a specific approach is either need-supportive or need-thwarting and the coach is high or low in directiveness. Importantly, an analogous ordered pattern of results was found when the relations between the distinguished coaching approaches and the construct validation measures as well as the external outcomes were considered (see Fig. 3a,b).

5.2. Moving around the circle

One of the key features of autonomy-supportive coaching involves the provision of choice and the creation of sufficient room for athletes to take initiative and to provide input and suggestions (Mageau & Vallerand, 2003). These practices fell in a distinct autonomy-supportive approach in the circumplex labelled the *participative* approach. Interestingly, both coaches and athletes of individual, relative to those from team sports scored higher on this approach. Presumably, in individual sports the one-to-one relation allows coaches to adopt a more individualized approach (van de Pol et al., 2015), leaving more room for athletes to voice their opinion, to make choices, and to take initiative. In contrast, for a coach of a team sport it may be more time-consuming and difficult to provide choice and input to meet the preferences of all team members (Chelladurai & Turner, 2006; Rhind, Jowett, & Yang, 2012).

Some coaches may be reluctant to use participative practices as they are concerned about losing grip on their athletes and to end up with a laissez-faire style (Cushion, Ford, & Williams, 2012; Ntoumanis & Mallet, 2014). The present findings suggest that this concern is legitimate as the participative approach is situated next to the *awaiting* approach, which is part of the chaotic style. Especially coaches of individual sports (compared to team sports) reported to adopt a more

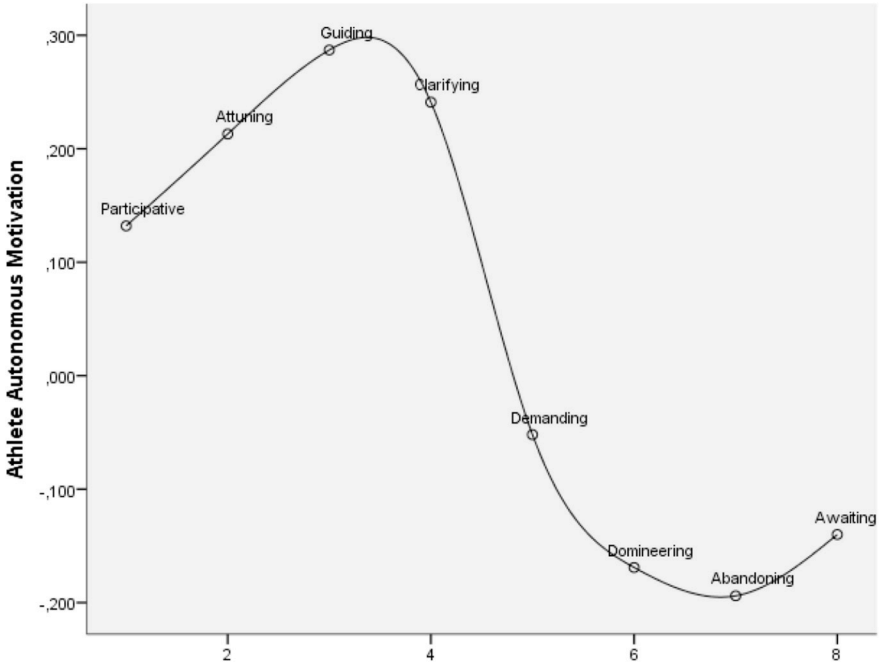

Fig. 3. (*continued*)

awaiting approach, presumably because they are more participative as well. When awaiting, coaches do not foresee a lot of planning and they refrain from intervening instead letting things unfold themselves. Whereas the participative approach was positively related to adaptive outcomes among athletes (e.g., need satisfaction), the awaiting approach was negatively correlated with adaptive outcomes (e.g., rated coach evaluation) and positively with maladaptive outcomes (e.g., amotivation). The awaiting approach may involve too little guidance and expectation setting, which helps to explain why the awaiting approach related to higher need frustration and even a sense of helplessness and indifference (cf. amotivation) among athletes.

Moving along the circle to the other side of the participative approach, a variety of autonomy-supportive practices, such as taking the athletes' perspective, providing meaningful rationales and building in interesting and enjoyable exercises were found to cluster together in the *attuning* approach. For rationales to be perceived as meaningful and tasks to be interest-provoking, they are best attuned, that is, matched with athletes' personal values, convictions, and preferences. Next to the attuning approach, the *guiding approach* involves a variety of structuring practices, which are meant to guide athletes' competence development, such as the provision of feedback and help, encouragement, and scaffolding of tasks. As can be noticed in Fig. 2, these two approaches are situated closely to each other and may often go hand-in-hand at the far end of the need-supportive dimension (Curran et al., 2013). In sport settings, these two approaches strongly cohere as feedback and providing help (i.e., guiding) are often attuned to the developmental pace of athletes, and matched with what athletes' wishes (i.e., attuning). Similarly, giving a meaningful rationale is often linked with feedback (e.g., to indicate why a technique should be used in a different way). Due to their strong need-supportive nature, the attuning and guiding approach correlated most strongly with desirable athletes' outcomes, such as need satisfaction, autonomous motivation, and the evaluation of the coach.

Much like the autonomy-supportive coaching style got differentiated into two approaches (i.e. participative and attuning), the structuring coaching style also involves a second approach, which

Table 7
Results of Multivariate ANOVA-analyses involving Type of Sport as Predictors among Coaches (left) and Athletes (right).

	Coaches					Athletes				
	Individual sport		Team sport			Individual		Team		
	M	*SD*	*M*	*SD*	*F*(1,855)	*M*	*SD*	*M*	*SD*	*F*(1,375)
Styles										
Autonomy Support	5.24	0.78	5.05	0.77	13.10***	4.61	0.87	4.04	0.91	32.56***
Structure	5.60	0.70	5.65	0.67	1.43	5.03	0.84	4.72	0.90	10.57**
Control	2.78	0.91	3.17	0.95	36.63***	3.13	0.85	3.96	0.87	75.06***
Chaos	2.32	0.73	2.25	0.65	2.07	2.65	0.85	3.06	0.89	17.24***
Approaches										
Participative	4.70	0.98	4.34	1.03	26.29***	4.50	0.93	3.75	0.96	50.60***
Attuning	5.60	0.79	5.52	0.78	2.37	4.67	0.96	4.23	1.03	15.69***
Guiding	5.78	0.72	5.66	0.75	5.55	5.09	1.03	4.49	1.00	29.28***
Clarifying	5.32	0.85	5.64	0.77	33.55***	4.94	0.78	5.06	0.97	1.37
Demanding	3.12	1.00	3.61	1.05	46.03***	3.39	0.91	4.24	0.91	70.57***
Domineering	2.10	0.92	2.31	0.99	9.80**	2.59	0.98	3.39	1.11	46.85***
Abandoning	2.03	0.78	2.13	0.75	3.49	2.58	1.00	3.19	1.03	29.16***
Awaiting	2.75	0.88	2.43	0.77	31.72***	2.76	0.88	2.85	0.90	0.80

$^{**}p < .004$, $^{***}p < .001$. Bonferroni corrected alpha value of 0.004

reflects the *clarifying* approach. When clarifying, coaches are clear about what they expect from their athletes and monitor athletes' adherence to these expectations. Coaches of team sports indicated using this approach more frequently than those of individual sports. Apparently, coaches of team sports provide a clear framework, thereby being transparent about their expectations and guidelines and also monitoring athletes' behavior more intensively compared to coaches of individual athletes. The way coaches set expectations and monitor progress can vary considerably though (Curran et al., 2013; Grolnick, 2012; Vansteenkiste et al., 2012). That is, when setting expectations in a unilateral fashion, hence pointing towards athletes' duties, and monitoring expectations and guidelines by threatening with sanctions in case of non-compliance, coaches may be perceived as rather *demanding* (Bartholomew, Ntmoumanis, Thøgersen-Ntoumani, 2009).

From a conceptual perspective, the circumplex structure suggests that, more than the guiding approach, it is the clarifying approach which most easily covaries with a demanding approach, thereby pointing to a potential pitfall of clarification and monitoring. In spite of the fact that coaches are directive and thus take the lead when they are either clarifying or demanding, the associated pattern of correlates was clearly different. Among athletes, the clarifying approach was positively related to the coach evaluations. In contrast, to the extent athletes perceived their coach to be demanding, they evaluated them less positively. Interestingly, also coaches' own experiences of need frustration were found to underlie coaches' reliance on a demanding approach, while experiences of need satisfaction related positively to the clarifying approach. Future longitudinal work may want to examine whether need frustration, especially when accumulated over time, increases coaches' risk of slipping from a clarifying into a demanding approach.

When experiences of need frustration persist, coaches may further increase pressure onto their athletes, thereby relying on a *domineering* approach (Bartholomew, Ntmoumanis, Thøgersen-Ntoumani, 2009; Stebbings, Taylor, Spray, & Ntoumanis, 2012). When domineering, a coach may rely on a variety of practices such as expressing disappointment, shaming, guilt- and anxiety-induction and intimidation. These practices are especially applied in situations where athletes may not have complete control over the outcome of their behavior (e.g., 'When athletes display anxiety before the game'). Although positively correlated with the demanding approach, the domineering approach appears to yield more maladaptive outcomes, as demonstrated through its more pronounced positive relation with maladaptive outcomes (e.g., athlete need frustration) and its negative association with adaptive outcomes (e.g., ratings of coach evaluation). One reason for the more pronounced cost associated with the domineering approach might be that, while the primary target of a demanding coach is the athletes' behavior, the athlete as a person is targeted in the case of a domineering approach (Bartholomew, Ntmoumanis, Thøgersen-Ntoumani, 2009; Vansteenkiste, Aelterman, Haerens, & Soenens, 2018).

Completing the circle, a second chaotic approach, reflecting an abandoning approach, was found. As the term suggests, coaches have in this case given up on their athletes, leaving them to their own devices at moments when an intervention is called for the most. The abandoning approach yielded the strongest positive correlates with maladaptive outcomes and the strongest negative correlates with adaptive outcomes, effects which appeared to be stronger than those observed for the domineering approach (see Table 5 and 6). From an applied perspective, it is sensible that coaches go back and forth between acting domineering and abandoning, such that they are dynamically related to each other. That is, the use of harsh domineering practices may often be the "last resort" for coaches before giving up all together, especially if they find out that their domineering approach does not produce desired outcomes. Especially coaches of team sports seem to be most vulnerable to these need-thwarting approaches as they reported themselves to be more demanding and domineering. Congruent with this interpretation, athletes of team sports, relative to those of individual sports, felt that their coach made significantly more use of a cocktail of demanding, domineering and abandoning behaviors.

Finally, the abandoning approach also differs from the other chaotic approach (i.e., awaiting). The abandoning approach did not only yield stronger associations with negative outcomes, but, when considering the vignettes of the newly developed questionnaire, also seems to occur in different situations compared to the awaiting approach. The abandoning approach especially emerges in situations of repeated failed attempts to motivate athletes to alter their behavior. In contrast, the practices that are part of the awaiting approach especially emerge in situations that coaches encounter for the first time and which they adopt a more explorative approach, while in fact more guidance may be called for in the eyes of the athletes.

5.3. Additional findings

Besides our main objective to adopt a helicopter-perspective on (de) motivating coaching, some additional findings deserve being mentioned. First, as both athletes and coaches were administered in this study, we investigated the degree of convergence between the obtained circumplex across coaches and athletes. The fact that the obtained circumplex model as such is stable across informants (i.e., coach vs. athlete) does not imply that athletes share the opinion of their coach. Indeed, coach-reported autonomy support, structure, and chaos corresponded only minimally with the same athlete-perceived reports. Only for the controlling coaching style in general and the two constituting approaches significant convergence was found, presumably because controlling practices are most visible (e.g., commanding and shouting can be easily noticed; see also De Meyer et al., 2014). Such a low correspondence has been reported in previous studies in the sport literature (Macquet & Stanton, 2014) and is in line with previous research using the same vignette-methodology in the educational domain (Aelterman et al., 2018). Furthermore, in terms of mean-level discrepancies, coaches scored higher on the need-supportive styles and lower on the need-thwarting styles compared to athletes. It is unclear whether coaches are overly optimistic about their motivating role or whether athletes are too critical for their coaches, an issue that could be sorted out through observational research which allows the integration of three sources of information (e.g., Aelterman, Vansteenkiste, Van den Berghe, De Meyer, & Haerens, 2014). Overall, the current results support the idea that athletes form an idiosyncratic image of coach behaviors which only minimally relates to how coaches perceive themselves (Macquet & Stanton, 2014).

Second, the obtained circumplex may create the impression that coaches' need supportive (e.g., autonomy) and need thwarting (e.g., control) behavior are to be considered as direct opposites of each other, which would be in contrast with previous work that conceptualized and studied need-supportive and need-thwarting coaching as separate dimensions (Bartholomew et al., 2011; Haerens et al., 2018; Vansteenkiste & Ryan, 2013). However, it must be noted that MDS (Borg et al., 2013) plots the relative and not the absolute distances between different coaching practices. In fact, while autonomy-supportive and controlling practices are graphically most distant from each other (relative to the other practices included), both were found to be unrelated (athletes) or only slightly negatively correlated (coaches) at the correlational level. Such findings imply that, across training and competitive context, as studied through the vignettes herein, coaches can rely on a mix of autonomy-supportive and controlling strategies. Indeed, the lack of autonomy support by coaches does not by definition imply that they are controlling as a more active thwarting of athletes' psychological needs is required in the latter case (Aelterman et al., 2018; Bartholomew et al., 2010; Haerens et al., 2015; 2018). Likewise, the absence of coach control does not mean that coaches are actively supporting their athletes' autonomy (Vansteenkiste & Ryan, 2013).

5.4. Theoretical and practical reflections and implications

Given the novelty of the circumplex approach used herein, the theoretical implications and the added practical value of this approach are discussed more deeply (Vansteenkiste et al., 2018). Overall, the circumplex provides a more integrative picture as a variety of critical coaching styles are graphically placed in relation to each other, while simultaneously producing more refined insights as critical coaching styles get partitioned in approaches.

While different critical coaching styles have been treated as fairly distinct categories in past work, the circumplex structure suggests that a more *gradual* perspective instead of a categorical perspective to (de) motivating coaching is warranted. The idea of a gradual perspective is that not all coaching practices and approaches are equally need-supportive or need-thwarting. Specifically, some approaches of autonomy support (i.e., attuning) and structure (i.e., guiding) seem to support athletes' psychological needs more directly, which also explains their high correlation herein. Yet, different from these more direct need-supportive approaches, other autonomy-supportive (i.e., participative) and structuring (i.e., clarifying) approaches may foster need satisfaction in a more indirect way. That is, such more need-enabling approaches create the optimal conditions under which athletes can get their psychological needs met (Aelterman et al., 2018). On the other hand, as some of the specified approaches actively thwart athletes' needs and therefore can be seen as directly need-thwarting (e.g., abandoning, domineering), other more need-depriving approaches (e.g., awaiting, demanding) may neither support nor thwart one's needs or motivation directly, but rather hinder possible need support.

Next, the study of Aelterman et al. (2018) in the educational domain is the only precedent of the current study and, although conducted in different domains, the results of both are remarkably parallel. That is, the circumplex pattern identified by Aelterman et al. (2018) involved the same two dimensions and the same four overarching coaching styles, involving the same eight approaches. In both domains, the findings point to the strong complementary nature of the attuning and guiding approach. Moreover, in the current athlete sample, the attuning and guiding approach could not be differentiated into two factors. Presumably, as pointed out above, both set of practices are often exerted in tandem because a similar basic attitude underlies both (Aelterman et al., 2018; Vansteenkiste & Soenens, 2015), that is, one where the coach is trying to optimally connect to the athlete in terms of interests, preference, and perspective (attuning) or skill-level and competencies (guiding). Although some readers may question the lack of discrimination between both approaches, given that different key practices of both autonomy support and structure were carefully operationalized, we suggest that this high correlation is a finding in and of itself. Although attuning and guiding practices can be conceptually differentiated, in practice, they co-occur. Note that this high inter-correlation between these two autonomy supportive and structuring approaches does not apply to all approaches, as the participative and clarifying approach could be clearly differentiated. When considered from a circumplex model, what is especially important is the gradual pattern of correlates between identified approaches themselves and external outcomes. Having said this, the gradual perspective on (de) motivating coaching is still in its infancy, such that future research within sport contexts is needed to substantiate the obtained circumplex and to sort out whether this configuration of approaches gets replicated.

Further, the circumplex provides deeper insights in what *motivational tailoring* looks like. That is, the beauty of motivating coaching is that coaches are capable of selecting those need-supportive strategies that fit well with both the athlete to be motivated as well as the situation at hand. To illustrate, whereas in some situations and in front of some athletes coaches may involve athletes in the decision process (participative approach), in other situations or with different types of athletes, the provision of choice may yield less desirable correlates and it may suffice to give a meaningful rationale (attuning approach) for an assigned task or introduced guideline. Future work would do well to examine whether the effectiveness of certain need-supportive practices depends on athlete characteristics (e.g., age, competence of the athlete; e.g., De Meyer et al., 2016), situational features (e.g., training vs. competition; time constraints; e.g., Delrue et al., 2017) or even coach characteristics (e.g., experienced vs. non-experienced coaches). Along similar lines, the exact impact of need-thwarting practices may also depend on these three features. An important note is that such motivational tailoring does not equal a relativistic perspective on motivating practices (Soenens, Vansteenkiste, & Van Petegem, 2015). Indeed, it is unlikely that any athlete will experience an abandoning approach as motivating, presumably because it involves a need thwart for every athlete in any situation.

From an applied perspective, the availability of both a coach and athlete version of the SISQ-sport is interesting in two ways. First, it allows coaches to gauge the perceptions of the athletes concerning their coaching style and consequently compare both obtained profiles to detect any differences or similarities regarding their perspectives. This information may serve as a basis to start a dialogue and accustom their coaching behavior in practice. In line with this, future work may also rely on this circumplex model by observing coaches' behavior with the help of this circumplex and scoring each specific approach. Second, along the way, the current contribution provided evidence for the validity of a newly developed instrument. That is, besides its associations with existing measures of autonomy support, structure and control (i.e., construct validity) and relevant outcomes such as need satisfaction/frustration and motivation (i.e., external validity), it is one of the first within the sport context to include the often neglected chaotic coaching style. Moreover, by using vignettes instead of more generic items, coaching styles are assessed in a more situation- and sport-specific and, hence, more ecologically valid way. Because coaches may easily identify themselves with these situations, the obtained measures might better align with their actual coaching behavior in practice. As a result, intervention studies on need-supportive coaching (Cheon, Reeve, Lee, & Lee, 2015) may use the SISQ-sport as a diagnostic or (self) reflection tool. After the intervention program, both self and athletes' reports may be used to identify any improvement.

5.5. Limitations

The present study has several limitations. First, given that the current study solely relied on self-report measures, future studies may complement these self-reports with observational measures. Such multi-informant research (e.g., Haerens et al., 2013; Smith et al., 2016) would be useful to directly compare athletes' and coaches' self-report to the ratings of an independent, third observer. Second, herein we focused on the coaching styles of autonomy support, structure, control and chaos, thereby failing to address the role of coach relational support and neglect (see Amorose & Anderson-Butcher, 2007). Based on the observed correlations with involvement (see Table 5), it is well possible that items tapping into these two styles may be characterized by, respectively, a high level of need-supportiveness and a high level of need-thwarting. In terms of their more exact position in the circumplex, it is possible that further differentiation in the circumplex would be warranted or that the items would fall in the most need-supportive subareas (i.e., guiding and attuning) and most need-thwarting subareas (i.e., domineering-abandoning) Third, the used correlational approach prevents one from drawing directional conclusions. Although an autonomy-supportive coaching style may be rooted in coaches' experiences of need-satisfaction, the opposite may also be true. Although coaches who experience greater need satisfaction may be more psychologically available to support their athletes' needs (Stebbings et al., 2012), enhanced need-based experiences may also result from adopting an autonomy-supportive approach towards others (Cheon, Reeve, Yu, & Jang, 2014; Deci, La Guardia, Moller, Scheiner, & Ryan, 2006). Fourth,

the current study investigated mostly proximal outcomes of perceived coaching behavior such as athlete need satisfaction/frustration and motivation. Future research may consider examining the association between the eight identified coach approaches and more distal outcomes such as athlete engagement, disengagement, progress and performance.

6. Conclusion

In the last two decades, research within the context of Self-Determination Theory in sport (Aelterman et al., 2018; Bartholomew et al., 2010; Mageau & Vallerand, 2003) has studied distinct (de)motivating styles. The identification of a circumplex in the present study draws both a more refined and integrative picture as it becomes clear how different (de)motivating styles get divided in approaches and how these approaches are located in a more holistic structure. Consistent with a circumplex structure, the eight approaches, differing in their level of coach need support and coach directiveness, showed a systematic sinusoid pattern of correlates with critical external outcomes among both coaches and athletes. These finding suggest that a gradual approach towards (de)motivating coaching is warranted, with coaching approaches differing from one another in more graded instead of a black-white fashion.

Funding

This work was supported by Government of Flanders, Department of Sport: B/14197/02-IV2.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.psychsport.2018.08.008.

References

Adie, J. W., Duda, J. L., & Ntoumanis, N. (2012). Perceived coach-autonomy support, basic need satisfaction and the well- and ill-being of elite youth soccer players: A longitudinal investigation. *Psychology of Sport and Exercise, 13*, 51–59.

Aelterman, N.*, Vansteenkiste, M.*, Soenens, B., Fontaine, J., Haerens, L., & Reeve, J. (2018). Toward an integrative fine-grained insight in motivating and demotivating teaching styles: The merits of a gradual approach. *(*equal contributions. Journal of Educational Psychology* In press for.

Aelterman, N., Vansteenkiste, M., Van den Berghe, L., De Meyer, J., & Haerens, L. (2014). Fostering a need-supportive teaching style: Intervention effects on physical education teachers' beliefs and teaching behaviors. *Journal of Sport & Exercise Psychology, 36*, 595–609.

Amorose, A. J., & Anderson-Butcher, D. (2007). Autonomy-supportive coaching and self-determined motivation in high school and college athletes: A test of self-determination theory. *Psychology of Sport and Exercise, 8*, 654–670.

Amorose, A. J., & Anderson-Butcher, D. (2015). Exploring the independent and interactive effects of autonomy-supportive and controlling coaching behaviors on adolescent athletes' motivation for *sport. Sport, Exercise, and Performance Psychology, 4*, 206–218.

Assor, A., Vansteenkiste, M., & Kaplan, A. (2009). Identified versus introjected-approach and introjected-avoidance motivations in school and in sports: The limited benefits of self-worth strivings. *Journal of Educational Psychology, 101*, 482–497.

Balaguer, I., Gonzalez, L., Fabra, P., Castillo, I., Merce, J., & Duda, J. L. (2012). Coaches' interpersonal style, basic psychological needs and the well- and ill-being of young soccer players: A longitudinal analysis. *Journal of Sports Sciences, 30*, 1619–1629.

Bartholomew, K. J., Ntoumanis, N., Ryan, R. M., Bosch, J. A., & Thogersen- Ntoumani, C. (2011). Self-determination theory and diminished functioning: The role of interpersonal control and psychological need thwarting. *Personality and Social Psychology Bulletin, 37*, 1459–1473.

Bartholomew, K. J., Ntoumanis, N., & Thøgersen-Ntoumani, C. (2009). A review of controlling motivational strategies from a self-determination theory perspective: Implications for sports coaches. *International Review of Sport and Exercise Psychology, 2*, 215–233.

Bartholomew, K. J., Ntoumanis, N., & Thøgersen-Ntoumani, C. (2010). The controlling interpersonal style in a coaching context: Development and initial validation of a psychometric scale. *Journal of Sport & Exercise Psychology, 32*, 193–216.

Belmont, M., Skinner, E., Wellborn, J., & Connell, J. (1988). *Teacher as social context: A measure of student perceptions of teacher provision of involvement, structure, and autonomy support (tech. Rep. No. 102)*. Rochester, NY: University of Rochester.

Black, S. J., & Weiss, M. R. (1992). The relationship among perceived coaching behaviors, perceptions of ability, and motivation in competitive age-group swimmers. *Journal of Sport & Exercise Psychology, 14*, 309–325.

Borg, I., & Groenen, P. J. F. (1997). *Modern multidimensional scaling: Theory and applications.* New York: Springer.

Borg, I., Groenen, P., J, F., & Mair, P. (2013). *Applied multidimensional scaling.* New York: Springer.

Carpentier, J., & Mageau, G. A. (2013). When change-oriented feedback enhances motivation, well-being and performance: A look at autonomy-supportive feedback in sport. *Psychology of Sport and Exercise, 14*, 423–435.

Chelladurai, P., & Turner, B. (2006). Styles of decision making in coaching. In J. Williams (Ed.). *Applied sport psychology: Personal growth to peak performance* (pp. 140–154). (5th ed.). Boston: McGraw-Hill.

Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E., Kaap-Deeder, J., Duriez, B., Lens, W., Matos, L., Mouratidis, A., Ryan, R., Sheldon, K., Soenens, B., Petegem, S., & Verstuyf, J. (2015). Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motivation and Emotion, 39*, 216–236.

Cheon, S. H., Reeve, J., Lee, J., & Lee, Y. (2015). Giving and receiving autonomy support in a high-stakes sport context: A field-based experiment during the 2012 London paralympic games. *Psychology of Sport and Exercise, 19*, 59–69.

Cheon, S. H., Reeve, J., Yu, T. H., & Jang, H. R. (2014). The teacher benefits from giving autonomy support during physical education instruction. *Journal of Sport & Exercise Psychology, 36*, 331–346.

Commandeur, J. J. F. (1991). *Matching configurations.* Leiden, the Netherlands: DSWO Press.

Conroy, D. E., & Coatsworth, J. D. (2007). Assessing autonomy-supportive coaching strategies in youth sport. *Psychology of Sport and Exercise, 8*, 671–684.

Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology, 24*, 349–354. https://doi.org/10.1037/h0047358.

Curran, T., Hill, A. P., & Niemiec, C. P. (2013). A conditional process model of children's behavioral engagement and behavioral disaffection in sport based on self-determination theory. *Journal of Sport & Exercise Psychology, 35*, 30–43.

Cushion, C., Ford, P. R., & Williams, A. M. (2012). Coach behaviours and practice structures in youth soccer: Implications for talent development. *Journal of Sports Sciences, 30*, 1631–1641.

De Meyer, J., Soenens, B., Vansteenkiste, M., Aelterman, N., Van Petegem, S., & Haerens, L. (2016). Do students with different motives for physical education respond differently to autonomy-supportive and controlling teaching? *Psychology of Sport and Exercise, 22*, 72–82.

De Meyer, J., Tallir, I., Soenens, B., Vansteenkiste, M., Aelterman, N., Van den Berghe, L., Speleers, L., & Haerens, L. (2014). Does observed controlling teaching behavior relate to students' motivation in physical education? *Journal of Educational Psychology, 106*, 541–554.

De Muynck, G. J., Vansteenkiste, M., Delrue, J., Aelterman, N., Haerens, L., & Soenens, B. (2017). The effects of feedback valence and style on need satisfaction, self-talk and perseverance among tennis players: An experimental study. *Journal of Sport & Exercise, 39*, 67–80. https://doi.org/10.1123/jsep.2015-0326.

Deci, E. L., La Guardia, J., Moller, A., Scheiner, M., & Ryan, R. (2006). On the benefits of giving as well as receiving autonomy support: Mutuality in close friendships. *Personality and Social Psychology Bulletin, 32*, 313–327.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 227–268.

Delrue, J., Haerens, L., Mouratidis, A., Gevaert, K., Vande Broek, G., & Vansteenkiste, M. (2017). A game-to-game investigation in the relation between need-supportive and need-thwarting coaching and moral behavior in soccer. *Psychology of Sport and Exercise, 31*, 1–10. https://doi.org/10.1016/j.psychsport.2017.03.010.

Fransen, K., Boen, F., Vansteenkiste, M., Mertens, N., & Vande Broek, G. (2018). The power of competence support: The impact of coaches and athlete leaders on intrinsic motivation and performance. *Scandinavian Journal of Medicine & Science in Sports, 28*, 725–745.

Gagné, M., Ryan, R. M., & Bargmann, K. (2003). Autonomy support and need satisfaction in the motivation and well-being of gymnasts. *Journal of Applied Sport Psychology, 15*, 372–390.

Gillet, N., Vallerand, R. J., Amoura, S., & Baldes, B. (2010). Influence of coaches' autonomy support on athletes' motivation and sport performance: A test of the hierarchical model of intrinsic and extrinsic motivation. *Psychology of Sport and Exercise, 11*, 155–161.

Grolnick, W. (2012). The relations among parental power assertion, control, and structure. Commentary on Baumrind. *Human Development, 55*, 57–64.

Haerens, L., Aelterman, N., Van den Berghe, L., De Meyer, J., Soenens, B., & Vansteenkiste, M. (2013). Observing physical education teachers' need-supportive interactions in classroom settings. *Journal of Sport & Exercise Psychology, 35*, 3–17.

Haerens, L., Aelterman, N., Vansteenkiste, M., Soenens, B., & Van Petegem, S. (2015). Do perceived autonomy-supportive and controlling teaching relate to physical education students' motivational experiences through unique pathways? Distinguishing between the bright and dark side of motivation. *Psychology of Sport and Exercise, 16*, 26–36. https://doi.org/10.1016/j.psychsport.2014.08.013.

Haerens, L., Vansteenkiste, M., De Meester, A., Delrue, J., Tallir, I., Vande Broek, G., Goris, W., & Aelterman, N. (2018). Different combinations of perceived autonomy support and control: Identifying the most optimal motivating style. *Physical Education and Sport Pedagogy, 23*(1), 16–36.

Hodge, K., & Lonsdale, C. (2011). Prosocial and antisocial behavior in sport: The role of coaching style, autonomous vs. controlled motivation, and moral disengagement. *Journal of Sport & Exercise Psychology, 33*, 527–547.

Hollembeak, J., & Amorose, A. J. (2005). Perceived coaching behaviors and college athletes' intrinsic motivation: A test of self-determination theory. *Journal of Applied*

Sport Psychology, 17, 20–36.
Korelitz, K. E., & Garber, J. (2016). Congruence parents' and children's perceptions of parenting: A meta-analysis. *Journal of Youth and Adolescence, 10*, 1973–1995.
Lonsdale, C., Hodge, K., & Rose, E. A. (2008). The behavioral regulation in sport questionnaire (BRSQ): Instrument development and initial validityevidence. *Journal of Sport & Exercise Psychology, 30*, 323–355.
Mabbe, E., Soenens, B., Vansteenkiste, M., Van der Kaap-Deeder, J., & Mouratidis, A. (2018). Day-to-day variation in autonomy-supportive and psychologically controlling parenting: The role of parents' daily experiences of need satisfaction and need frustration. *Parenting: Science and Practice, 18*, 86–98.
Macquet, A., & Stanton, N. (2014). Do the coach and athlete have the same "picture" of the situation? Distributed situation awareness in an elite sport context. *Applied Ergonomics, 45*, 724–733.
Mageau, G. A., & Vallerand, R. J. (2003). The coach-athlete relationship: A motivational model. *Journal of Sports Science, 21*, 883–904.
Ntoumanis, N., & Mallet, C. (2014). Motivation in sport: A self-determination theory perspective. In A. Papaioannou, & D. Hackfort (Eds.). *Routledge companion to sport and exercise psychology: Global perspectives and fundamental concepts*. Taylor and Francis.
Pelletier, L. G., Fortier, M. S., Vallerand, R. J., & Brière, N. M. (2001). Associations among perceived autonomy support, forms of self-regulation, and persistence: A prospective study. *Motivation and Emotion, 25*, 279–306.
Podlog, L., Gustafsson, H., Skoog, T., Gao, Z., Westin, M., Werner, S., & Alricsson, M. (2015). Need satisfaction, motivation, and engagement among high performance youth athletes: A multiple mediation analysis. *International Journal of Sport and Exercise Psychology, 13*, 415–433.
van de Pol, P. K., Kavussanu, M., & Kompier, M. (2015). Autonomy support and motivational responses across training and competition in individual and team sports. *Journal of Applied Social Psychology, 45*, 697–710.
Quested, E., Ntoumanis, N., Viladrich, C., Haug, E., Ommundsen, Y., Van Hoye, A., Mercé, J., Hall, H., Zourbanos, N., & Duda, J. (2013). Intentions to drop-out of youth soccer: A test of the basic needs theory among european youth from five countries. *International Journal of Sport and Exercise Psychology, 11*, 395–407.
Reeve, J. (2009). Why teachers adopt a controlling motivating style toward students and how they can become more autonomy-supportive. *Educational Psychologist, 44*, 159–175.
Reynolds, A. J., & McDonough, M. H. (2015). Moderated and mediated effects of coach autonomy support, coach involvement, and psychological need satisfaction on motivation in youth soccer. *The Sport Psychologist, 29*, 51–61.
Rhind, D., Jowett, S., & Yang, S. (2012). A comparison of athletes' perceptions of the coach-athlete relationship in team and individual sports. *Journal of Sport Behavior, 35*, 433–452.
Rocchi, M., Pelletier, L., & Couture, A. L. (2013). Determinants of coach motivation and autonomy-supportive coaching behaviours. *Psychology of Sport and Exercise, 14*, 852–859.
Ryan, R. M., & Deci, E. L. (2017). *Self-Determination Theory: Basic psychological needs in motivation, development, and wellness* (1st ed.). New York: Guilford Press.
Skinner, E., Johnson, S., & Snyder, T. (2005). Six dimensions of parenting: A motivational model. *Parenting: Science and Practice, 5*, 175–235.
Smith, N., Tessier, D., Tzioumakis, Y., Fabra, P., Quested, E., Appleton, P., Sarrazin, P., Pappaioannou, A., Balaguer, I., & Duda, J. (2016). The relationship between observed and perceived assessments of the coach-created motivational environment and links to athlete motivation. *Psychology of Sport and Exercise, 23*, 51–63. https://doi.org/10.1016/j.psychsport.2015.11.001.
Soenens, B., & Vansteenkiste, M. (2010). A theoretical upgrade of the concept of parental psychological control: Proposing new insights on the basis of Self-Determination Theory. *Developmental Review, 30*, 74–99.
Soenens, B., Vansteenkiste, M., & Van Petegem, S. (2015). Let's not throw out the baby with the bathwater: Applying the principle of 'universalism without uniformity' to autonomy-supportive and controlling parenting. *Child Development Perspectives, 9*, 44–49. https://doi.org/10.1111/cdep.12103.
Stebbings, J., Taylor, I. M., Spray, C. M., & Ntoumanis, N. (2012). Antecedents of Perceived coach interpersonal behaviors: The coaching environment and coach psychological well- and ill-being. *Journal of Sport & Exercise Psychology, 34*, 481–502.
Terry, P. (1984). The coaching preferences of elite athletes competing at Universiade '83. *Canadian Journal of Applied Sport Sciences, 9*, 201–208.
Vallerand, R. J., & Losier, G. F. (1999). An integrative analysis of intrinsic and extrinsic motivation in sport. *Journal of Applied Sport Psychology, 11*, 142–169.
Vansteenkiste, M., Aelterman, N., Haerens, L., & Soenens, B. (2018). Seeking stability in stormy educational times: A need-based perspective on (de)motivating teaching grounded in self-determination theory. In N. E, & M. S. Lemons (Vol. Eds.), *Advances in Motivation and Achievement: Motivation in education at a time of global change: Theory, research, and implications for practices: . Vol. 20*Emerald (in press).
Vansteenkiste, M., Niemiec, C., & Soenens, B. (2010). The development of the five mini-theories of Self-Determination Theory: An historical overview, emerging trends, and future directions. In T. Urdan, & S. Karabenick (Vol. Eds.), *Advances in motivation and achievement: The decade ahead: vol. 16*. Bingley, UK: Emerald Publishing.
Vansteenkiste, M., & Ryan, R. M. (2013). On psychological growth and vulnerability: Basic psychological need satisfaction and need frustration as a unifying principle. *Journal of Psychotherapy Integration, 23*, 263–280. https://doi.org/10.1037/a0032359.
Vansteenkiste, M., Sierens, E., Soenens, B., Goossens, L., Dochy, F., Aelterman, N., Haerens, L., Mouratidis, A., & Beyers, W. (2012). Identifying configurations of perceived teacher autonomy support and structure: Associations with self-regulated learning, motivation and problem behavior. *Learning and Instruction, 22*, 431–439.
Vansteenkiste, M., & Soenens, B. (2015). *Vitamines voor groei: Ontwikkeling voeden vanuit de Zelf-Determinatie Theorie.* Leuven: Acco.
Williams, G. C., Grow, V. M., Freedman, Z. R., Ryan, R. M., & Deci, E. L. (1996). Motivational predictors of weight loss and weight-loss maintenance. *Journal of Personality and Social Psychology, 70*, 115–126.