*International Sport Coaching Journal,* **(Ahead of Print)**
https://doi.org/10.1123/iscj.2022-0099

First Published Online: Oct. 31, 2023

Human Kinetics
ORIGINAL RESEARCH

# The *reROOT* Coaching Program: A Pilot Randomized Controlled Trial Evaluating Its Impact on Coaching Style and Athlete Sports Development

**Emilie Lemelin,[1] Joëlle Carpentier,[2] Sophie Gadoury,[3] Élodie Petit,[1] Jacques Forest,[2] Jean-Paul Richard,[4] Mireille Joussemet,[1] and Geneviève A. Mageau[1]**

[1]Departement of Psychology, Université de Montréal, Montreal, QC, Canada; [2]Department of Organization and Human Resources, Université du Québec à Montréal, Montreal, QC, Canada; [3]nimble bubble, Montreal, QC, Canada; [4]TANGIBLE performance, Montreal, QC, Canada

The *reROOT* program teaches coaches 40 behaviors belonging to a need-supportive coaching style (including structure, involvement, and autonomy support), as defined by self-determination theory. This pilot randomized controlled trial, conducted during the COVID-19-related lockdown, evaluated the impact of this 18-hr program on coaching style (e.g., *Problems in Sports* Questionnaire) and on athlete motivation (*Motivation Underlying Achievement Goals* Questionnaire), performance (tactical, technical, physical, and psychological skills), and well-being (*Satisfaction with Life Scale; Positive and Negative Affect Schedule*). Twenty-three sports teams from two universities were randomized in the experimental or the wait-list control condition. Coaches in the experimental condition evaluated autonomy-supportive coaching styles more favorably than those in the control condition at the 1-year follow-up, but not 2 months after the end of the program. Athletes whose coaches participated in the program did not rate them as having a higher need-supportive coaching style, but experienced greater autonomous motivation and (potentially) performance, and under certain circumstances greater well-being and less controlled motivation 2 months after the end of the program compared with the wait-list condition. These findings suggest that the *reROOT* program could potentially improve readiness to rely on more autonomy-supportive skills and promote some aspects of sports development in athletes.

***Keywords:*** autonomy support, intervention, self-determination theory, *reROOT* program, well-being, performance

In sports cultures centered on results and medals (rather than on progress and growth), some athletes may normalize and even seek out controlling coaching behaviors to reach valued performance standards (Lang, 2021). Controlling behaviors refer to pressures exerted by coaches to impose their own agenda and ways of thinking on athletes, regardless of their perspective (Bartholomew et al., 2009). Although these behaviors are sometimes believed to be successful in reaching short-term objectives (Bartholomew et al., 2009), they are linked to negative athlete outcomes (e.g., burnout, eating disorders; Bartholomew et al., 2011). Self-determination theory (SDT) proposes positive alternatives that could promote athlete sports development without relying on controlling behaviors (Deci & Ryan, 2000; Lemelin et al., 2022; Mageau & Vallerand, 2003; Ryan & Deci, 2017). Yet, these alternative behaviors are not instinctive, and to date, there are very few programs available for coaches to learn them. This pilot study aims to provide preliminary evidence of the efficacy of such a program.

## Need-Supportive Coaching Style

SDT proposes that all human beings have three fundamental psychological needs that are essential for human flourishing and optimal functioning: the need for competence (i.e., feeling capable of attaining valued outcomes), relatedness (i.e., feeling connected), and autonomy (i.e., feeling volitional and endorsing one's actions; Deci & Ryan, 2000; Ryan & Deci, 2017). SDT further proposes that socializing agents such as coaches can create environments that help satisfy (vs. frustrate) these psychological needs (Deci & Ryan, 2000; Ryan & Deci, 2017). Behaviors that can support (vs. thwart) the need for competence, relatedness, and autonomy are, respectively, structure (vs. chaos), involvement (vs. coldness), and autonomy support (vs. controlling behaviors; Delrue et al., 2019; Mageau & Vallerand, 2003; Pope & Wilson, 2015; Rocchi et al., 2017). Structure pertains to coaches' provision of clear and consistent rules, feedback, expectations, and consequences (Mageau & Vallerand, 2003), while chaos refers to an unpredictable social environment (Delrue et al., 2019). Involvement corresponds to acceptance, warmth, and emotional availability, while coldness refers to a distant social environment (Rocchi et al., 2017). Last, autonomy support refers to coaches' consideration for athletes' internal frame of reference and volition. Coaches can support athletes' autonomy by being empathic (e.g., acknowledging feelings), informational (e.g., giving rationales for demands and limits), and supportive of athletes' active participation (e.g., encouraging initiatives and choices; Mageau & Joussemet, 2023; Mageau & Vallerand, 2003). In contrast, controlling behaviors are defined as dominating, pressuring, or intrusive behaviors (e.g., threats, guilt inducements; Bartholomew et al., 2009). Combining need-supportive behaviors (and avoiding need-thwarting ones) results in a need-supportive coaching style (NSCS; Mageau & Vallerand, 2003; Rocchi et al., 2017).

Lemelin https://orcid.org/0000-0003-0994-1029
Carpentier https://orcid.org/0000-0001-7550-2134
Forest https://orcid.org/0000-0002-1476-7857
Joussemet https://orcid.org/0000-0003-4407-6149
Mageau https://orcid.org/0000-0002-5723-6554
Lemelin (emilie.lemelin@umontreal.ca) and Mageau (g.mageau@umontreal.ca) are corresponding authors.

## Associations Between a NSCS and Athlete Sports Development

A NSCS in turn seems essential to nurture key aspects of sports development, such as autonomous motivation, performance, and well-being (Deci & Ryan, 2000; Ryan & Deci, 2017). Autonomous motivation is characterized by high levels of self-determination and refers to behaviors enacted out of pleasure and in accordance with one's interests and values. Conversely, more controlled forms of motivation refer to behaviors prompted by internal (e.g., guilt, shame) or external pressures (e.g., reward, scholarship; Deci & Ryan, 2000). Previous research has shown that autonomous motivation is associated with the most positive outcomes in athletes, such as more persistence, effort, performance, and well-being, as well as less burnout (e.g., Gillet et al., 2010; Jõesaar & Hein, 2011; Li et al., 2013; Pope & Wilson, 2012, 2015). The type of motivation that underlies athletes' goals is also particularly decisive for athlete sports development (Gaudreau & Braaten, 2016; Vansteenkiste et al., 2014). It refers to the reasons why athletes pursue their goals (e.g., developing their skills, demonstrating high skill compared with others; Elliot & McGregor, 2001). Thus, whether oriented toward mastery or performance, goals pursued for autonomous reasons are linked to more benefits than goals pursued for controlled reasons (Gaudreau & Braaten, 2016), which highlights the importance of fostering autonomous motivation in athletes. Numerous studies have shown that autonomy support (e.g., Amorose & Anderson-Butcher, 2007; Delrue et al., 2019; Haerens et al., 2018; Mageau & Vallerand, 2003; Mossman et al., 2022; Pope & Wilson, 2015; Rocchi et al., 2017), structure (Delrue et al., 2019; Mageau & Vallerand, 2003; Rocchi et al., 2017), and involvement (Mageau & Vallerand, 2003; Rocchi et al., 2017) are likely to foster autonomous motivation toward sports in general. In contrast, controlling behaviors seem to trigger controlled motivations in athletes (Bartholomew et al., 2009; Haerens et al., 2018; Rocchi et al., 2017) and undermine autonomous motivation (Delrue et al., 2019; Mageau & Vallerand, 2003).

Performance is also central to athletes' sports experience as it is sometimes viewed as the end result of athlete motivation, in addition to being omnipresent in the general sports culture, especially in high-level sports where winning is associated with greater funding and support (Donnelly & Kidd, 2015). Beyond medals, performance can be defined with four types of skills: physical (e.g., physical aptitudes and physiology), tactical (e.g., understanding and applying sports-related strategies), technical (e.g., ability to perform specific sports-related gestures), and psychological (e.g., perseverance, resilience, fear management, etc.; Hughes & Bartlett, 2002; Morris, 2000). A few studies have shown that autonomy support is positively linked to athlete performance (Gillet et al., 2010; Haerens et al., 2018; Lemelin et al., 2022; Pope & Wilson, 2015), although this body of evidence remains small and correlational.

Well-being is another fundamental aspect of athlete sports development (Henriksen et al., 2020; Reardon et al., 2019). Diener (2009) defined subjective well-being as the presence of positive affect, paired with low negative affect, and high life satisfaction (Diener, 2009; Lundqvist, 2011). A recent meta-analysis (Mossman et al., 2022) showed that correlations between autonomy support and athlete well-being were, on average, strong and positive.

Together, these results suggest that by adopting a NSCS, coaches could help promote positive sports development in athletes, such as athlete autonomous motivation, performance, and well-being (e.g., Haerens et al., 2018; Lemelin et al., 2022; Mageau & Vallerand, 2003; Mossman et al., 2022; Pope & Wilson, 2015). However, few studies included involvement and/or structure in sports contexts (Delrue et al., 2019; Mageau & Vallerand, 2003; Pope & Wilson, 2015; Rocchi et al., 2017). Moreover, combining all need-supportive (vs. need-thwarting) components of NSCS (i.e., structure vs. chaos, involvement vs. coldness, and autonomy support vs. controlling behaviors) in their practice can represent a challenge for coaches as they may feel pressured to use controlling behaviors in some contexts, underestimate the effectiveness of autonomy-supportive behaviors, or confuse control with structure (Mageau & Vallerand, 2003; Reeve, 2009). Programs teaching NSCS could thus be beneficial in helping coaches integrate need-supportive (vs. thwarting) components into their daily coaching practice and, in turn, facilitate their athletes' sports development.

Although some programs focus on individual components of NSCS (e.g., targeting autonomy-supportive behaviors; Berntsen & Kristiansen, 2019; Cheon et al., 2015; Mahoney et al., 2016; Reynders et al., 2019), very few address all three need-supportive (vs. thwarting) components. Studies focusing on programs teaching autonomy-supportive coaching behaviors showed that they are effective in developing autonomy-supportive skills (Cheon et al., 2015) and self-awareness (Berntsen & Kristiansen, 2019; Mahoney et al., 2016). Cheon et al. (2015) also revealed that autonomy-supportive programs could even improve athlete performance (i.e., medals). One program focusing on autonomy support and structure was successful in increasing these two sets of skills, as well as fostering athletes' engagement and autonomous motivation (Reynders et al., 2019).

We found only two studies testing programs that targeted all three need-supportive coaching behaviors. Athletes whose coaches participated in one of these programs reported increased levels of competence and affiliation (Pulido et al., 2017) and fewer burnout symptoms (Langan et al., 2015) compared with those in the control condition. Improvements in coach autonomy support, structure, and involvement were also observed by independent coders during coach–athlete interactions for coaches who participated in the program compared with those in the wait-list control group (Langan et al., 2015). However, no significant difference was observed on the need for autonomy, motivation, and sports commitment (Langan et al., 2015; Pulido et al., 2017).

Overall, these results suggest that SDT-based programs show promise in helping coaches adopt more need-supportive behaviors and, in turn, improve athlete outcomes. Yet, empirical evidence remains scarce, and the number of need-supportive behaviors that are included in available coaching programs is limited. To address these limitations, we developed the *reROOT* program, an 18-hr coaching program that teaches need-supportive behaviors related to all three psychological needs.

## The *reROOT* Program

The *reROOT* program teaches coaches need-supportive skills that allow them to create a high-quality environment in which their athletes can develop their full potential as human beings, while achieving high levels of sports performance. This program is inspired by SDT research (e.g., basic psychological needs support, change-oriented feedback, logical consequences; Carpentier & Mageau, 2013; Deci & Ryan, 2000; Mageau et al., 2018; Mageau & Vallerand, 2003), as well as applied programs that have demonstrated their efficacy in parenting (Faber & Mazlish, 2012; Mageau et al., 2022), sport (Cheon et al., 2015), and school contexts (Reeve & Cheon, 2014). Through a total of 40 skills, this program teaches coaches to (a) consider athletes' needs satisfaction and avoid controlling language and behaviors, (b) acknowledge athletes' feelings and perspective, (c) give autonomy-supportive change-oriented feedback,

(d) provide autonomy-supportive structure, (e) provide information when asking for collaboration, and (f) offer optimal challenges and descriptive positive feedback (see Table 1 for the complete set of skills). These skills could help coaches to provide structure, involvement, and autonomy support, while reducing coldness, chaos, and controlling behaviors. However, the efficacy of this program has never been empirically tested.

## Objectives

The goal of the present study was thus to begin the evaluation of the *reROOT* program. To do so, a pilot randomized controlled trial was conducted during the COVID-19-related lockdown, to document the efficacy of this program in improving coaches' NSCS and athlete sports development. Coach NSCS and athlete sports development were examined at pre- and postintervention, and at a 1-year follow-up. Coaches' own perceptions of coaching styles and athlete perceptions of their coaches' NSCS, as well as athlete proximal (motivation toward goals) and distal outcomes (well-being and performance) were evaluated. It was hypothesized that (a) coaches in the experimental condition (ExpC; i.e., those who participated in the program) would rate coach NSCS more favorably and rely on need-supportive behaviors to a greater extent at postintervention (as perceived by their athletes) compared with coaches in the wait-list control condition (WLc) (i.e., those who did not participate in the program), and (b) athletes trained by coaches in the ExpC would experience greater well-being, performance, and autonomous motivation, as well as lower levels of controlled

**Table 1 *reROOT* Program Skills**

| Session | NSCS component | Skill |
|---|---|---|
| Session 1.<br>Avoid controlling language and behaviors | Autonomy support<br>Avoid controlling behavior<br>Avoid chaos<br>Avoid cold behavior | - Keep in mind the three psychological needs in one's daily actions, decisions, and behaviors<br>- Use the internal compass worksheet to identify one's own autonomous motivations<br>- Question one's beliefs in relation to athletes' psychological needs |
| Session 2.<br>Acknowledge athletes' feelings and perspective | Involvement<br>Autonomy support | - Prepare the training from the athletes' point of view<br>- Welcome, encourage, and integrate athletes' input and suggestions for improvements<br>- Listen carefully<br>- Acknowledge with one word<br>- Accept reactions as valid and natural<br>- Name the feeling<br>- Consider the request with the help of the imaginary |
| Session 3.<br>Give change-oriented feedback | Structure<br>Autonomy support | - Recognize athletes' obstacles and difficulties<br>- Describe the problem<br>- Provide possible ways to move forward<br>- Provide choice among these possible ways<br>- Name the objective<br>- Use a considerate tone of voice |
| Session 4.<br>Provide autonomy-supportive structure | Structure<br>Autonomy support | - Express own feeling without attacking character and before getting angry<br>- State expectations<br>- Show your athletes how to make amends<br>- Give a choice between two acceptable alternatives<br>- Take action<br>- Problem solve<br>- Look for opportunities to present the athletes with a new image of themselves<br>- Facilitate situations where they can see themselves from a different perspective<br>- Model appropriate behavior<br>- Be a storehouse for past counter role behavior<br>- If athletes return to old role, state feelings/expectations |
| Session 5.<br>Provide information when asking for collaboration | Structure<br>Autonomy support | - Provide a rationale that makes sense to athletes when rule setting<br>- Describe what you see or the problem<br>- Give information<br>- Remind it with one word<br>- Express own feeling without attacking character and before getting angry |
| Session 6.<br>Offer optimal challenges and descriptive positive feedback | Involvement<br>Autonomy support | - Offer choices<br>- Offer optimal challenges<br>- Respect struggle<br>- Avoid to rush to answer questions<br>- Promote outside resources<br>- Avoid taking away hope<br>- Describe athletes' behaviors or own positive feelings<br>- Summarize athletes' behaviors with one word |

*Note*. NSCS = need-supportive coaching style.

motivation, at postintervention compared with the WLc. It was also expected that the observed postintervention differences between the conditions would be maintained at follow-up.

As a secondary objective, we explored whether postintervention coach–athlete contact time, preintervention perceived coach NSCS, coach preintervention stress, type of sport (individual vs. collective sports), and athlete preintervention performance would moderate the impact of the program. These moderators were chosen based on the obstacles to skills implementation that were mentioned by participating coaches during postintervention focus groups (see Lemelin et al., 2023), for more details). Specifically, in these focus groups, participating coaches observed (or anticipated) that improvements would be less likely when they (a) had limited contact with their athletes, (b) had many suboptimal coaching habits, (c) experienced stress such as in competition (Mageau & Vallerand, 2003), (d) mostly coached in group context (Delrue et al., 2019; van de Pol et al., 2015), or (e) interacted with athletes who were less likely to correspond to the goals of their sport organization such as low-performing athletes (Mageau & Vallerand, 2003).

# Method

## Recruitment and Procedure

Procedures were approved by the institutional ethics board at the authors' home universities (CEREP-20-042-D; 4748_e_2020) and written informed consent was obtained prior to data collection. All athletes and coaches from 23 different teams (individual and collective sports; e.g., swimming, American football, golf, rugby, athletics, soccer, etc.) in two Canadian universities from the same city were invited to participate in this study. In each university, teams were randomly assigned to either the ExpC or the WLc (see Figure 1 for the flow chart). Coaches in the ExpC participated in the program during the COVID-19 pandemic between mid-January 2021 and the end of February 2021.[1] Coaches in the WLc were offered the program after the last assessment. All coaches (including assistant coaches) from the same team were assigned to the same condition to ensure consistency of practices within each team and to limit contamination across conditions.

Coaches and athletes were invited to complete questionnaires before randomization (and before the beginning of the program at T1; November 2020–January 2021), 2 months after the end of the program (T2; May 2021–July 2021), and approximately one year after the program (T3; January 2022–March 2022). At each time, all coaches and athletes of the two universities were solicited (whether or not they had participated at a prior assessment; see Figure 1 and "Attrition" section for more details). At T1 and during program delivery, all group practices and sports competitions were canceled due to COVID-19-related health restrictions. Some teams (randomly assigned to both conditions) were allowed to practice in small subgroups, but many coaches were limited to video conference trainings. At T2, the restrictions were progressively reduced, and sport practices were allowed in larger groups. At T3, and between T2 and T3, some health restrictions had been reinstated, but athletes had more opportunities to train compared with T1.

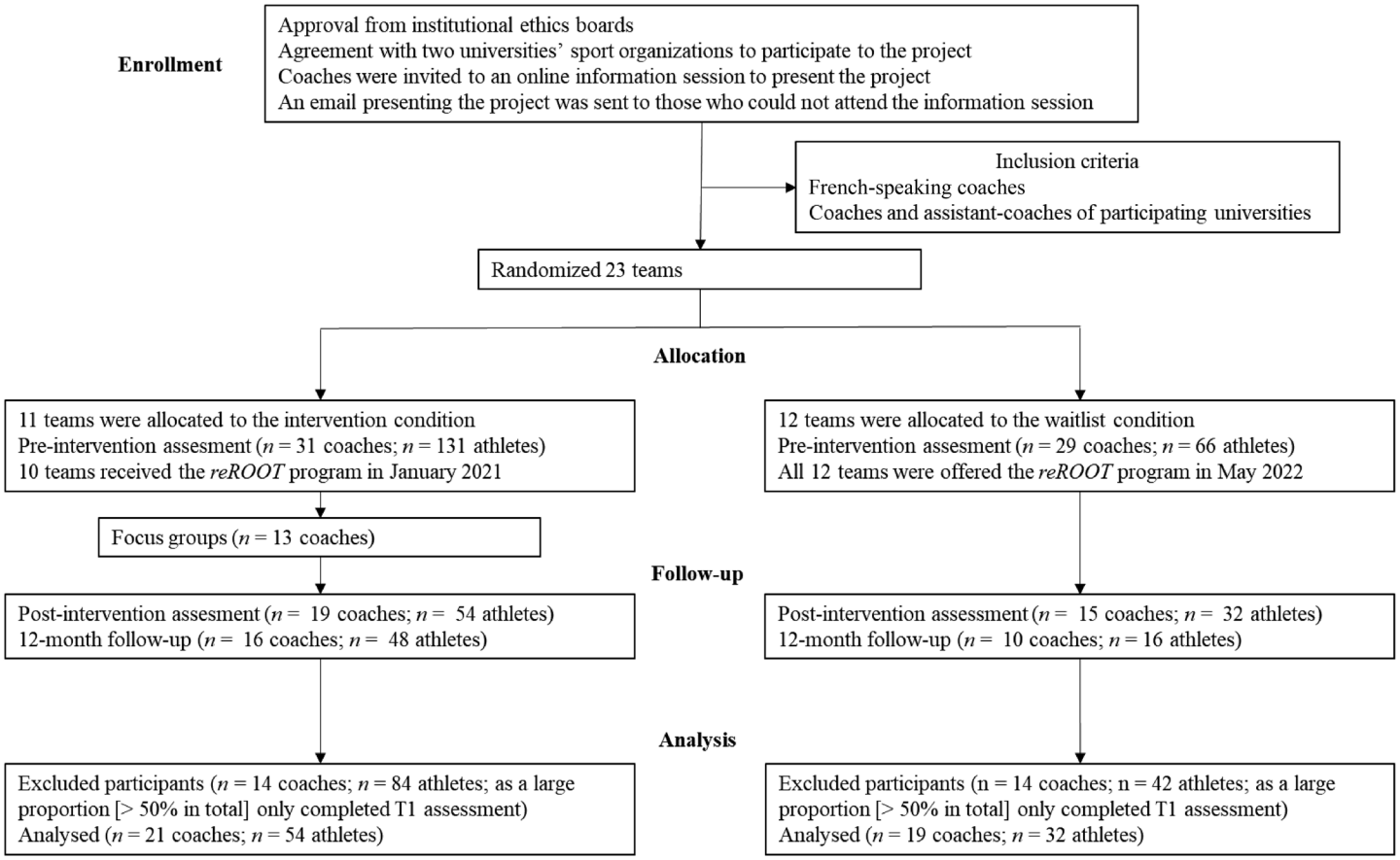


**Figure 1** — Consolidated Standards of Reporting Trials flow diagram.

## Participants

The sample of participants who were included in the analyses was composed of 40 coaches and 86 athletes (see "Attrition" section for more details). Coaches in the ExpC ($n = 21$ coaches; 12 men and five women) were between 25 and 60 years of age ($M = 40.88$, $SD = 9.99$), and had between 1 and 36 years of coaching experience ($M = 9.83$, $SD = 9.47$). The ExpC included 54 athletes (18 men and 35 women), aged between 19 and 31 years old ($M = 22.08$, $SD = 2.39$) and practiced their sport for 1–19 years ($M = 12.63$, $SD = 5.02$). At baseline (during the pandemic), they trained from 0 to 15 hr per week ($M = 5.97$, $SD = 4.53$) and had 0 to 12 hr of contact with their coach every week ($M = 1.15$, $SD = 2.05$).

Coaches in the WLc ($n = 19$ coaches; 12 men) were aged between 24 and 52 years old ($M = 36.75$, $SD = 9.07$). They had between 1 and 34 years of coaching experience ($M = 14.09$, $SD = 10.87$). The WLc included 32 athletes (seven men and 25 women), aged between 19 and 25 years old ($M = 21.68$, $SD = 1.46$), and practiced their sport for 1–18 years ($M = 8.40$, $SD = 4.81$). At baseline, they trained from 0 to 10 hr per week ($M = 3.42$, $SD = 2.45$) and had 0 to 3 hr of contact with their coach every week ($M = 0.29$, $SD = 0.53$).

## Intervention

The *reROOT* program is skill-based, offered in a group format, and includes hands-on activities as well as theoretical components. Coaches learn concrete coaching skills through perspective-taking activities, comic strips, role plays, and exercises to practice their skills during and between sessions (e.g., recognize athletes' obstacles and difficulties; see Table 1). They are also introduced to the basic principles of SDT (e.g., motivation, basic psychological needs).

For this study, the program was delivered online using the Zoom platform due to the COVID-19 pandemic and its related health restrictions. Coaches participated in the program once a week (3 hr/week) during six consecutive weeks. A total of five experienced facilitators (two men) with a scientific and/or sports background delivered the program, in dyads according to their availability per session. Coaches received a workbook containing skill summaries, session activities, and homework. Facilitators, who are also the authors of the program, did not participate in any data analysis.

## Measures

### *Coach Reports*

**Autonomy-Supportive Coaching Style (T1–T2–T3).** Coaches reported their beliefs regarding autonomy support using the *Problems in Sports Questionnaire* (Carpentier & Mageau, 2013), which was adapted from school and work contexts (Deci et al., 1981, 1989), as a proxy for their own coaching style. It includes eight vignettes that describe typical problems a coach might encounter with an athlete. Following each vignette, three possible ways a coach could deal with the problem are presented to participants. These items vary in the degree to which coaches in the vignette support athlete autonomy: one is highly supportive ($\alpha_{t1} = .72$; $\alpha_{t2} = .83$; $\alpha_{t3} = .68$), one moderately controlling ($\alpha_{t1} = .64$; $\alpha_{t2} = .67$; $\alpha_{t3} = .68$), and one highly controlling ($\alpha_{t1} = .65$; $\alpha_{t2} = .82$; $\alpha_{t3} = .66$). Internal consistency was similar in previous studies ($\alpha = .63$–$.80$; Carpentier & Mageau, 2013; Deci et al., 1981, 1989). Coaches were asked to rate how appropriate each response was on a 7-point Likert scale ranging from 1 = *Not at all appropriate* to 7 = *Totally appropriate*. An average score was calculated for each subscale across the eight vignettes. Then, using the same procedure as Carpentier and Mageau (2013), a composite score was created by combining the three subscale scores: highly supportive, moderately controlling, and highly controlling. A high score on this index indicates higher readiness toward a more autonomy-supportive style, whereas a low score represents a preference for a more controlling style.

**Perceived Stress (T1).** The 10-item French version of the *Perceived Stress Scale* (Lesage et al., 2012) was used to measure coaches' stress level. Coaches were asked to rate the extent to which they experienced each of the listed feelings and thoughts in the past month, using a 5-point Likert scale ranging from 1 = *Never* to 5 = *Very often* (e.g., In the last month . . . how often were you unable to control important things in your life). The average of the 10 items ($\alpha_{t1} = .88$) was calculated to obtain a composite score of perceived stress for each coach. This questionnaire has a good internal consistency ($\alpha = .83$; Lesage et al., 2012).

### *Athlete Reports*

**Number of Contact Hours With Coaches (T2).** Athletes reported how many hours, on average, they had contact with their coaches each week, including virtual meetings (e.g., Zoom).

**Need-Supportive Coaching Style (T1–T2).** A global score of athletes' perceptions of their coaches' NSCS was obtained by averaging coaches' mean on perceived AS, controlling behaviors (reversed), structure, and involvement ($\alpha_{t1} = .95$; $\alpha_{t2} = .97$). While filling out the questionnaires, athletes being coached by multiple coaches were invited to think about the way all of their coaches generally behave toward them. The correlations between these four coaching dimensions ranged between .16 and .78.

***Perceptions of Autonomy Support and Controlling Behaviors (T1–T2).*** An adaptation to sports context of the *Perceived Parental Autonomy Support Scale* (Mageau et al., 2015) was used to measure athletes' perceptions of their coaches' autonomy support (12 items; e.g., my coaches give me several opportunities to take my own decisions about what I do; $\alpha_{t1} = .92$; $\alpha_{t2} = .95$) and controlling behaviors (12 items; e.g., my coaches make me feel guilty for everything and nothing; $\alpha_{t1} = .90$; $\alpha_{t2} = .89$). It was adapted by changing the word "parents" to "coaches." Athletes rated each items using a Likert scale ranging from 1 = *Totally disagree* to 7 = *Totally agree*. An overall score for autonomy support and controlling behaviors was obtained by averaging their respective items. The original version of the *Perceived Parental Autonomy Support Scale* demonstrated good internal consistency ($\alpha > .89$; Mageau et al., 2015).

***Perceptions of Structure (T1–T2).*** The structure provided by coaches was evaluated by the athletes using an adaptation to the sports context of four subscales of the *Multidimensional Parental Structure Scale* (Ratelle et al., 2015). It was adapted by changing the word "parents" to "coaches." The selected subscales represent the four main dimensions of structure, namely (a) clear and consistent rules and expectations (four items; e.g., my coaches rules and expectations are clear), (b) predictability of practices (four items; e.g., when my coaches tell me they are going to do something, I know they are going to do it), (c) feedback (four items; e.g., my coaches tell me when I do something that respects the rules and expectations they have), and (d) the opportunity to meet the expectations (four items; e.g., when I have to do something, my coaches show me how to do it). For each item, athletes assigned a

score on a Likert scale ranging from 1 = *Completely disagree* to 7 = *Completely agree* ($\alpha_{t1}$ = .76–.89; $\alpha_{t2}$ = .77–.93). An overall score of structure was obtained by averaging the four subscales' means ($\alpha_{t1}$ = .91; $\alpha_{t2}$ = .94). These four subscales have shown satisfactory internal consistency (α = .73–.80; Ratelle et al., 2015).

***Perceptions of Involvement (T1–T2).*** Coaches' involvement was evaluated by athletes using two subscales of the *Interpersonal Behavior Questionnaire in Sport* (Rocchi et al., 2017), namely relatedness support (e.g., my coach is interested in what I do; $\alpha_{t1}$ = .94; $\alpha_{t2}$ = .96) and relatedness thwarting (e.g., my coach is distant when we spend time together; $\alpha_{t1}$ = .78; $\alpha_{t2}$ = .80). Athletes rated each of the eight items on a Likert scale ranging from 1 = *Completely disagree* to 7 = *Completely agree*. The internal consistency of the two subscales is good (α = .90 for relatedness support; α = .87 for relatedness thwarting; Rocchi et al., 2017). Relatedness support and relatedness thwarting (reversed) scores were averaged to obtain a composite score of involvement ($\alpha_{t1}$ = .92; $\alpha_{t2}$ = .93).

**Motivation Toward Goals (T1–T2).** The *Motivation Underlying Achievement Goals Questionnaire* (Gaudreau, 2012; Gaudreau & Braaten, 2016) was used to measure motivations toward athletes' goals. This questionnaire includes four goal statements (e.g., In sport competition, athletes can try to show that they are better than other athletes and to do better than most other athletes). For each statement, athletes indicated why they pursued each goal using four items: two items measuring autonomous motivation (e.g., I pursue this goal . . . because of the fun and enjoyment that this goal provides me) and two items for controlled motivation (e.g., I pursue this goal . . . to avoid criticisms from some others), using Likert scales ranging from 1 = *Not at all for this reason* to 7 = *Totally for this reason*. This instrument has shown good internal consistency in previous studies (α ≥ .73; Gaudreau, 2012; Gaudreau & Braaten, 2016). Composite scores of autonomous ($\alpha_{t1}$ = .90; $\alpha_{t2}$ = .91) and controlled motivation ($\alpha_{t1}$ = .84; $\alpha_{t2}$ = .83) were obtained by averaging their respective items.

**Well-Being (T1–T2).** In line with Diener's definition (2009), athletes filled out the French version of the *Satisfaction With Life Scale* (Blais et al., 1989; Diener et al., 1985). For each of the five items (e.g., I am satisfied with my life; $\alpha_{t1-t2}$ = .83), athletes evaluated their life satisfaction using a Likert scale ranging from 1 = *Do not agree at all* to 7 = *Very strongly agree*. They also completed a French version of the *Positive and Negative Affect Schedule* (Watson et al., 1988) using a Likert scale ranging from 1 *Not at all* to 7 = *Extremely* (e.g., For each statement, indicate to what extent you generally feel [happy]; $\alpha_{t1-t2}$ = .88). This questionnaire contains 10 positive and 10 negative emotions. Satisfaction with life, positive affect, and reversed negative affect scores were averaged to obtain a composite score of subjective well-being ($\alpha_{t1-t2}$ = .90). In past studies, both scales possess good internal consistency (α ≥ .80; Blais et al., 1989; Watson et al., 1988).

**Performance (T1–T2).** Each athlete reported their perception of their level of tactical, technical, physical, and psychological performance using a Likert scale ranging from 1 = *Strong regression* to 7 = *Strong progression*, where four represented a maintenance of their skills. At T1, athlete reported their progression since the beginning of the season, and at T2, since the end of the program. The average of the four items was calculated to obtain a composite score of performance ($\alpha_{t1}$ = .80; $\alpha_{t2}$ = .73; see Carpentier & Mageau, 2013; Mouratidis et al., 2008, for a similar procedure). In a previous study, this procedure showed a good internal consistency (α = .86; Mouratidis et al., 2008).

## Plan of Analyses

Preliminary analyses were conducted to examine attrition, descriptive statistics, correlations, and baseline differences between the two conditions. It was planned to include all participants in the analyses, as long as attrition rates were below, or close to, a 50% threshold. If attrition rates were greatly above this threshold and given that we were interested in postintervention differences between the conditions, it was planned to include all participants who completed at least one postintervention assessment, regardless of whether or not they had completed baseline measures. Given our limited sample size and the hierarchical nature of our data (between one and nine participating athletes per team), main analyses were conducted with the complex survey approach available in Mplus (Muthén & Muthén, 2017) separately for short- and long-term effects. To account for departure from normality and to handle missing data, the robust maximum likelihood estimator (Muthén & Muthén, 2017) was used. For both short- and long-term effects, five models were planned, one per type of outcomes: (a) coach perceptions of NSCS at T2 and T3, (b) athlete-reported NSCS, (c) autonomous and controlled motivation toward goal (proximal athlete outcomes), and (d) performance and subjective well-being (distal athlete outcomes). The impact of the *reROOT* program (WLc was coded 0) on each type of outcome, while controlling for their respective baseline levels (centered at the grand mean) was examined. Effect sizes of the specific impact of the conditions were reported (i.e., subtracting the contribution of baseline measures).

Finally, it was planned to explore the potential role of five moderators: (a) postintervention contact time, (b) athlete perceptions of preintervention NSCS, (c) coach preintervention stress, (d) type of sport (individual vs. collective sports), and (e) athlete preintervention performance. For contact time (due to its distribution during a pandemic), a dichotomous variable was created by separating athletes who had 0 hr of contact with their coaches from those who had at least 1 hr of contact. For coach stress, when teams had more than one coach who participated, the mean level of the team's coaches was used and we repeated this score for each athlete on the team. To reduce the number of models and given that these were exploratory analyses, the moderation analyses were conducted on all athletes' variables at T2 (i.e., athlete-reported NSCS, motivation toward goals, performance, and well-being) while controlling for baseline levels without controlling for potential accumulation of Type I error probabilities. For continuous moderators, simple effects were examined at 1*SD* below and above the variable means. Effect sizes of the specific impact of the interactions were reported (i.e., subtracting the contribution of baseline measures).

# Results

## Preliminary Analyses

### *Attrition*

All together, a total of 68 coaches (35 in the ExpC) and 263 athletes (176 in the ExpC) completed at least one questionnaire. In the ExpC, 31 coaches and 131 athletes completed the baseline measures. At T2, 19 coaches and 54 athletes completed the questionnaire. Of these participants, 16 coaches (48% of attrition) and 39 athletes (70% of attrition) had also completed T1. At T3, 16 coaches and 48 athletes completed the questionnaire. Of these participants, 13 coaches (58% of attrition) and 16 athletes (88% of attrition) had also completed T1. In the WLc, 29 coaches and 66

athletes completed the baseline measures. At T2, 15 coaches and 32 athletes completed the questionnaire. Of these participants, 12 coaches (59% of attrition) and 24 athletes (64% of attrition) had also completed T1. At T3, 10 coaches and 16 athletes completed the questionnaire. Of these participants, nine coaches (69% of attrition) and two athletes (97% of attrition) had also completed T1.

Considering these high attrition rates, it was decided to exclude T3 athletes' data but to include all coaches who had completed at least a T2 or T3 questionnaire, and athletes who had completed a T2 questionnaire, regardless of whether or not they had completed baseline measures. Thus, the sample of participants included in the analyses was composed of the 40 coaches (21 in the ExpC) and 86 athletes as described above (54 in the ExpC; see Figure 1).[2] At T1, this sample did not differ from participants who only completed baseline measures, Wilks's $\Lambda = .98$, $F(6, 167) = .64$, $p = .70$. Furthermore, when we examined the missing data in each condition at each time in this sample, there was no difference in attrition between the conditions at each time for coaches or athletes ($ps \geq .12$).

### *Descriptive Statistics*

Descriptive statistics and bivariate correlations are presented in Tables 2 and 3, respectively. One outlier was found (well-being T1) and it was transformed into a score no further than 3.29 *SD*s from the sample mean (Tabachnick & Fidell, 2013). All variables had normal or near-normal distributions (skewness between −1.17 and 0.77; kurtosis between −0.81 and 2.54; Curran et al., 1996), which justified the choice of relying on robust estimators for the main analyses. A multivariate analysis of variance also revealed that there was no statistical difference between WLc and ExpC on baseline measures ($p = .27$), which may be due to our small sample size. There was one exception: autonomous motivation underlying goals was higher in the WLc ($M = 5.38$) than in the ExpC ($M = 4.83$, $p = .048$).

## Main Analyses

### *Need-Supportive Coaching Style*

**Coach Reports.** First, coaches' perceptions of coaching styles after the program were examined. At T2, results revealed that, controlling for T1 coaching style, coaches in the ExpC did not significantly differ from those in the WLc, $B = 0.22$, $R^2 = .003$, $p = .61$ (see Table 4). At T3, controlling for T1 coaching style, coaches in the ExpC evaluated autonomy-supportive coaching styles more favorably than coaches in the WLc, $B = 0.97$, $R^2 = .133$, $p = .01$ (see Table 4).

**Table 2 Descriptive Statistics**

| | Time 1 | | Time 2 | | Time 3 | |
|---|---|---|---|---|---|---|
| | WLc | ExpC | WLc | ExpC | WLc | ExpC |
| | *M* (*SD*) | *M* (*SD*) | *M* (*SD*) | *M* (*SD*) | *M* (*SD*) | *M* (*SD*) |
| NSCS (coaches report) | −1.44 (1.08) | −1.17 (1.95) | −1.25 (1.09) | −0.69 (2.11) | −2.29 (1.13) | −1.34 (1.59) |
| NSCS (athletes report) | 5.18 (0.73) | 5.49 (0.87) | 5.37 (0.94) | 5.60 (0.82) | —— | —— |
| Well-being | 5.49 (0.66) | 5.42 (0.89) | 5.44 (0.76) | 5.58 (0.68) | —— | —— |
| Performance | 4.46 (1.22) | 4.16 (1.24) | 3.91 (0.96) | 4.10 (1.10) | —— | —— |
| Autonomous motivation | 5.37 (1.01) | 4.85 (1.06) | 4.78 (1.00) | 5.16 (1.08) | —— | —— |
| Controlled motivation | 2.47 (1.27) | 2.64 (1.45) | 2.55 (1.14) | 2.46 (1.30) | —— | —— |

*Note.* NSCS = need-supportive coaching style; WLc = wait-list control condition; ExpC = experimental condition.

**Table 3 Correlations**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. NSCS T1 (CR) | —— | | | | | | | | | | | | |
| 2. NSCS T1 (AR) | .23$^{\dagger}$ | —— | | | | | | | | | | | |
| 3. Well-being T1 | .20 | .29$^{*}$ | —— | | | | | | | | | | |
| 4. Performance T1 | .05 | .33$^{*}$ | .28$^{*}$ | —— | | | | | | | | | |
| 5. Autonomous motivation T1 | .07 | .05 | −.10 | .14 | —— | | | | | | | | |
| 6. Controlled motivation T1 | −.05 | −.05 | −.50$^{**}$ | −.13 | .06 | —— | | | | | | | |
| 7. NSCS T2 (CR) | .42$^{**}$ | .16 | .13 | −.18 | −.10 | −.02 | —— | | | | | | |
| 8. NSCS T2 (AR) | .11 | .70$^{**}$ | .16 | .34$^{**}$ | .02 | −.04 | −.06 | —— | | | | | |
| 9. Well-being T2 | .13 | .32$^{*}$ | .76$^{**}$ | .23$^{\dagger}$ | −.11 | −.52$^{**}$ | .21$^{\dagger}$ | .28$^{*}$ | —— | | | | |
| 10. Performance T2 | .08 | .19 | .08 | .45$^{**}$ | −.07 | −.09 | −.07 | .31$^{**}$ | .28$^{*}$ | —— | | | |
| 11. Autonomous motivation T2 | .02 | .12 | −.09 | .20 | .55$^{*}$ | −.01 | −.08 | .19$^{\dagger}$ | −.05 | .23$^{*}$ | —— | | |
| 12. Controlled motivation T2 | −.05 | −.02 | −.28$^{*}$ | −.12 | .03 | .69$^{**}$ | .05 | −.19$^{\dagger}$ | −.29$^{*}$ | −.08 | −.06 | —— | |
| 13. NSCS T3 (CR) | .61$^{**}$ | .18 | .24 | −.1 | −.16 | −.10 | .74$^{**}$ | −.09 | .36$^{**}$ | .09 | .02 | −.17 | —— |

*Note.* NSCS = need-supportive coaching style; CR = coaches report; AR = athletes report.
$^{\dagger}p \leq .10$. $^{*}p \leq .05$. $^{**}p \leq .01$.

**Table 4 Main Analyses: Condition Predicting Each Outcome, Controlling for the Baseline**

| | Model 1 | Model 2 | Model 3 | Model 4 | | Model 5 | |
|---|---|---|---|---|---|---|---|
| | NSCS T2—coach report | NSCS T3—coach report | NSCS T2—athlete report | Automous motivation T2 | Controlled motivation T2 | Performance T2 | Well-being T2 |
| Intercept | –1.11 (0.28)** | –2.33 (0.34) ** | 5.41 (0.10)** | 4.68 (0.11)** | 2.61 (0.29)** | 3.91 (0.10)** | 5.49 (0.07)** |
| Outcome at T1 | 0.68 (0.13)** | 0.58 (0.13)** | 0.76 (0.13)** | 0.58 (0.07)** | 0.61 (0.06)** | 0.39 (0.09)** | 0.66 (0.11)** |
| Condition | 0.22 (0.43) | 0.97 (0.64)** | 0.10 (0.16) | 0.55 (0.17)** | –0.20 (0.31) | 0.28 (0.15)† | 0.14 (0.10) |
| $R^2$ total | .42 | .54 | .49 | .37 | .50 | .22 | .62 |

*Note.* WLc was coded 0; ExpC was coded 1; Unstandardized coefficients are presented; SEs are in parentheses. Intercept = mean at T2/T3 for WLc, adjusted for baseline; Condition = adjusted means difference between WLc and ExpC; NSCS = need-supportive coaching style; WLc = wait-list control condition; ExpC = experimental condition.
†$p \le .10$. **$p \le .01$.

**Athlete Reports.** Next, analyses were performed to examine whether athletes perceived changes in their coaches' behaviors. Results revealed no significant difference between the conditions at T2, controlling for T1, $B = 0.10$, $R^2 = .0003$, $p = .55$ (see Table 4). Moreover, exploring each component of NSCS separately (e.g., autonomy support and controlling behaviors separately) did not reveal significant difference between conditions at T2, controlling for their respective baselines, $ps \ge .37$.

### *Athlete Sports Development*

**Proximal Outcomes.** Turning to the impact of the program on athletes' motivation toward their goals, results showed that, controlling for each outcome's baseline level, athletes in the ExpC reported higher level of autonomous motivation at T2 compared with those in the WLc, $B = 0.55$, $R^2 = .035$, $p < .001$. However, no difference was found between the conditions for controlled motivation at T2, $B = –0.20$, $R^2 = .004$, $p = .52$ (see Table 4).

**Distal Outcomes.** Examining well-being at T2, athletes in the ExpC did not differ from athletes in the WLc, controlling for the same variable at T1, $B = 0.16$, $R^2 = .007$, $p = .30$ (see Table 4). However, controlling for performance at T1, athletes from the ExpC reported higher performance than athletes in the WLc at T2, $B = 0.28$, $R^2 = .019$, $p = .08$ (see Table 4), although this difference was marginal, and thus not significant.

## Exploring Potential Moderations

Interactions between conditions and the potential moderators were tested on athlete reports of NSCS as well as their well-being, performance, and motivation toward their goals.

### *Limited Contact With Athletes*

There was no significant interaction between conditions and the number of hours of contact between coaches and athletes at T2 (0 hr vs. at least 1 hr), $ps \ge .33$.

### *Suboptimal Initial Coaching Behaviors*

To test the moderating effect of suboptimal initial coaching behaviors, it was examined if athlete reports of NSCS at T1 could moderate the impact of the program on athlete reports of NSCS and outcomes at T2. Results showed that such a moderation was significant for athlete reports of NSCS at T2, $B = –0.471$, $R^2 = .03$, $p = .03$, and well-being at T2, $B = –0.30$, $R^2 = .018$, $p = .02$.

Regarding NSCS at T2, athletes in the ExpC who perceived their coaches as having high NSCS at T1 felt that their coaches had lower levels of NSCS at T2 than athletes in the WLc, $B = –0.33$, $p = .06$, although this difference was marginal. No difference between the conditions was found in athletes who perceived their coaches as having a low NSCS at T1, $B = 0.46$, $p = .12$. With regard to well-being, athletes who perceived their coaches as having high NSCS at T1 did not differ on this outcome at T2 as a function of conditions, $B = –0.15$, $p = .41$. On the contrary, the program seemed beneficial for athletes who perceived their coaches as having a low NSCS at T1: among such athletes, those in the ExpC experienced higher well-being at T2 compared with their WLc counterparts, $B = 0.35$, $p < .01$.

No interaction between conditions and athlete reports of NSCS at T1 on athlete performance or on types of motivation was found, $ps \ge .71$.

### *Coaching Under Stress*

Significant interactions were found between conditions and coach stress at T1 on athlete well-being at T2, $B = –0.63$, $R^2 = .033$, $p < .01$; autonomous motivation at T2, $B = –0.89$, $R^2 = .015$, $p = .05$; and controlled motivation at T2, $B = 1.38$, $R^2 = .033$, $p \le .001$.

Decomposing significant interactions among athletes whose coaches were less stressed, those in the ExpC reported higher levels of well-being, $B = 0.47$, $p < .001$, and autonomous motivation, $B = 0.95$, $p < .01$, as well as lower levels of controlled motivation, $B = –0.99$, $p \le .001$, than those in the WLc. There was no program impact among athletes whose coaches were more stressed, $ps \ge .20$.

No evidence of an interaction was found between conditions and coach stress at T1 on athlete reports of NSCS at T2 nor on athlete performance at T2, $ps \ge .44$.

### *Coaching in Group Context*

There were significant interactions between conditions and the type of sport on athlete reports of NSCS at T2, $B = 0.553$, $R^2 = .021$, $p = .02$, as well as on controlled motivation at T2, $B = –0.69$, $R^2 = .017$, $p = .03$. While there was no program impact in collective sports, $ps \ge .59$, individual sport athletes in the ExpC reported higher level of NSCS, $B = 0.49$, $p < .001$, and less controlled motivation, $B = –0.85$, $p \le .001$, than athletes in the WLc, controlling for each outcome's respective baseline level.

No interaction between conditions and the type of sport on athlete performance at T2, well-being at T2, or autonomous motivation at T2 was found, $ps \ge .29$.

### *Lower Athlete Performance*

There was no significant interaction between conditions and T1 athlete performance. The impact of the program was thus not

moderated by the degree to which athletes performed well at T1, $ps \geq .12$.

## Discussion

This study constitutes the first step in the evaluation of the *reROOT* program, as this was an exploratory pilot randomized controlled trial. The preliminary efficacy of the program in improving coach NSCS and athlete sports development was evaluated with university-level coaches and athletes during the COVID-19 pandemic. Results showed that compared with coaches who did not participate in the program (i.e., the WLc), coaches who did participate (i.e., the ExpC) did not perceive autonomy-supportive coaching styles more favorably 2 months after their participation, but they did 1 year later. In a coherent way, athletes whose coaches participated to the program did not perceive any significant changes in their coaches' behaviors 2 months after the program compared with athletes whose coaches did not participate, although the observed difference favored them. They also did not differ significantly from athletes whose coaches did not participate in the program in terms of their well-being or controlled motivation toward goals, but again observed differences favored those whose coaches participated in the program. The program was, however, efficacious in improving autonomous motivation for pursuing goals, and it tended to foster greater performance.

Moreover, the observed interactions revealed that using the skills may be easier in some contexts and that the program may be efficacious on a larger range of outcomes but only in certain circumstances. Specifically, the program's impact was greater when coaches were perceived as having a low initial NSCS, experienced less stress, and coached individual sports. Contrary to our hypotheses, contact time and initial athlete performance did not moderate the program's impact. These mixed results suggest that the *reROOT* program may be a promising avenue to increase coaches' readiness to adopt a NSCS and to facilitate athlete sports development; however, additional research documenting its impact is nevertheless required.

### Impact of the Program on NSCS

Results first showed that coaches who participated in the program did not perceive autonomy-supportive coaching styles more favorably 2 months after their participation in the program than coaches who did not participate, but they did 1 year later. One possible explanation is that at the second assessment, coaches did not have sufficient opportunities to practice their new skills during in-person interactions with their athletes due to the COVID-19 pandemic, which in turn led to few opportunities to reconsider their beliefs regarding autonomy support. In contrast, the third assessment was completed after COVID-19-related confinements, when sports training was once again possible. It is, therefore, possible that skill practice is key to modifying coaches' beliefs about NSCS.

Regarding athletes' perceptions of NSCS, the 2 conditions did not differ 2 months after the program, which is coherent with coaches' self-reported perceptions of NSCS at the same assessment. Examining the interactions, athletes who practiced individual sports reported higher levels of NSCS when their coaches participated in the program than when they did not. No difference was found between the conditions in collective sports. Looking at the means, results showed that, in collective sports, coaches in both conditions already demonstrated high levels of NSCS (mean level over 5 on 7-point scales). A ceiling effect could perhaps be responsible for this nonsignificant result. This pattern of difference is surprising given that other studies had shown that coach autonomy support was higher in individual than in collective sports (Delrue et al., 2019; van de Pol et al., 2015). The results of the present study nevertheless indicate that coaches may find it easier to apply the program skills in one-on-one interactions than in group interactions. One-on-one interaction was also proposed as a facilitating factor by coaches who participated in our focus groups (see Lemelin et al., 2023).

Contrary to expectations, the program did not have an impact among athletes who initially perceived their coaches as having a low NSCS. However, surprisingly, among athletes who perceived their coaches as having an initially high NSCS, the ones whose coaches participated to the program tended to have a *lower* NSCS level 2 months after the program than those whose coaches did not participate. This may be due to a ceiling effect. Coaches who were perceived by their athletes as having a high NSCS before their participation in the program (mean level over 5 on a 7-point scale) may have had little room for improvement. Yet, a ceiling effect cannot account for the higher level of NSCS in the WLc compared with the ExpC. Perhaps the program encouraged coaches to focus on changing very specific aspects of the NSCS that were not necessarily captured by our NSCS assessment. They may have, as a result, somewhat neglected more prototypical behaviors associated with the NSCS that they had already mastered (e.g., providing rationales or giving choices), resulting in lower overall levels of NSCS for coaches who participated to the program compared with those who did not.

### Impact of the Program on Athletes

Even if athletes whose coaches participated in the *reROOT* program perceived limited changes in their coaches' NSCS, they appear to have benefited from their coaches' participation in the program. This is consistent with the idea that coaches may have changed some behaviors that were not assessed in the present study. Indeed, the 40 skills presented in the program were not all targeted by our NSCS assessment (e.g., giving information; using descriptive positive feedback). Another possibility is that the changes in coaches' behaviors were too small to be statistically significant but were still sufficient to yield improvements in some of the athlete outcomes. Specifically, results showed that athletes whose coaches participated in the program reported higher levels of autonomous motivation and (potentially) performance 2 months after the end of the program, compared with those whose coaches did not participate. These results are coherent with past studies showing that coaches' participation to SDT-based programs enhances athletes' motivation (Cheon et al., 2015; Pulido et al., 2017; Reynders et al., 2019) and performance (Cheon et al., 2015). Past studies evaluating the efficacy of SDT-based programs reported mostly small to medium effect sizes (Cohen's $d = 0.1–0.55$) with few large effects (see Cheon et al., 2015; Langan et al., 2015; Mahoney et al., 2016). In the present study, effect sizes were small (Cohen, 1988), except for coaches' perceptions of NSCS, which were between medium and large, although the fact that the present study was conducted during a pandemic makes direct comparison of effect sizes difficult.

There was, however, no difference between athletes whose coaches participated in the program and those who did not for controlled motivation and well-being, contrary to our hypothesis. Controlled motivation may be harder to change given the salience and benefits associated with winnings in sports, such as scholarships, international competitions, or sponsorship possibilities. Regarding well-being, it is likely that this variable was more affected by contextual factors associated with the ongoing

pandemic (Vincent et al., 2022), although mean levels of well-being were generally high (over 5 on a 7-point scale). It is thus possible that coaches' participation in the program had a smaller impact in this particular context than what could be expected during normal circumstances.

Looking at the moderated impact of the program on athlete outcomes, results showed that athletes whose coaches were less stressed at baseline enjoyed and valued their sport participation more and also reported higher well-being when their coaches participated to the program than when they did not, whereas no difference between conditions was observed when coaches were more stressed. This moderating effect highlights that coaches who are under stress may be less able to learn or implement new skills in their daily practice. This finding is in line with past studies showing that stress is associated with a less optimal interpersonal style both in sports (Mageau & Vallerand, 2003) and in other hierarchical relationships (Andreadakis et al., 2020). Moreover, a qualitative study revealed that athletes can detect their coaches' stress and report that it has negative impacts on their motivation, confidence, and enjoyment in addition to increasing their own experiences of stress (Thelwell et al., 2017).

As expected, athletes who practiced individual sports were less motivated by internal and/or external pressure after their coaches' participation to the program compared with athletes whose coaches did not participate, but no difference was found for collective sports. This result is coherent with Reynders et al. (2019) who have shown that their program, focused on autonomy support and structure, had greater effects on athlete outcomes in individual than in collective sports. It is not clear, however, why similar moderating effects were not obtained on other athlete outcomes. Perhaps in individual sports, athletes' focus on medals and its associated self-esteem contingencies may be more apparent such that coaches who participated in the program may have targeted their athletes' controlled motivation more specifically compared with coaches who did not participate.

Athletes who perceived their coaches as having a low NSCS at baseline experienced higher well-being when their coaches participated in the program than when they did not. This result suggests that coaches who have learned or benefited the most from the program were those who were initially less autonomy-supportive, structuring, and involved. It is possible to hypothesize that some coaches who were initially perceived as having lower levels of NSCS might have been more in need of more positive coaching alternatives. When offered skills to be more autonomy-supportive, structuring, and involved, many may have been able to modify their behaviors accordingly, resulting in greater well-being in athletes. Surprisingly, this moderating effect of NSCS on athlete well-being was not observed with athlete perceptions of NSCS. These inconsistencies suggest that some effects were small in magnitude, which may be due to the particular context of this study.

Finally, contact time between coaches and athletes and athlete performance at baseline were not significant moderators. The average contact time was quite low (mean level lower than 2 hr), which might not have been enough for this variable to have a significant moderating effect. It also suggests that coaches may need more than 2 hr of contact with their athletes each week, on average, to implement the program skills adequately, and for athletes to perceive significant changes in their coaches' behaviors. Regarding athlete performance, due to health restrictions in place, all competitions were canceled and athletes were mostly training at home. It is thus possible that the performance measure at baseline was not necessarily representative of usual performances. Moreover, performance was rated by athletes. Past studies show that coaches' beliefs about athletes' performance or motivation (and not necessarily the actual performance) could impact their way of interacting with their athletes (Mageau & Vallerand, 2003; Pelletier & Vallerand, 1996; Rocchi & Pelletier, 2017). Therefore, while athletes' own perceptions of their performance may not moderate the program's efficacy, coaches' evaluations of their athletes' performance could yet modify coaches' capacity to implement the program's skills with high- versus low-performing athletes.

## Practical Implications

This study has several practical implications. First, results highlight that teaching NSCS to coaches was associated with greater athlete autonomous motivation and (potentially) performance, and under certain circumstances (when coaches were perceived as initially having less optimal coaching style and were less stressed), well-being. Second, results highlight that the program skills were easier to implement in one-on-one contexts, as some differences between the conditions were only found in individual sports. This underscores the importance of including both individual and collective sports in future studies. This is especially relevant given that there is only one other SDT-based program (Reynders et al., 2019) that was evaluated with both individual and collective sports. Finally, coach stress emerged as an important moderator of the program's impact, as athletes whose coaches were less stressed at baseline reported higher levels of autonomous motivation and well-being, as well as lower levels of controlled motivation when their coaches participated to the program than when they did not. This finding highlights that coaching behaviors are largely dependent on contextual factors and that coaches also need support. This may have been particularly true in a context as stressful as the pandemic, but past studies (Mageau & Vallerand, 2003; Rocchi & Pelletier, 2017) point out that it is probably the case in any circumstances. Accordingly, sports organizations can make a difference for athlete sports development by creating supportive environments for coaches, where their learning and application of NSCS are facilitated (Mageau & Vallerand, 2003; Rocchi & Pelletier, 2017).

## Limitations and Future Studies

Several limitations must be kept in mind before generalizing these results. This study is the first to evaluate the efficacy of the *reROOT* program, and it was conducted during the COVID-19 pandemic with a small sample. Considering the COVID-19 pandemic and its associated health restrictions, one may hypothesize that the effects of the program would have been greater in a context where coaches and athletes would have had regular contact, training, and competition. Because of the modest sample size, the statistical power was limited and some links may have been underestimated. At the same time, a total of 15 moderation models were explored, which resulted in an accumulation of Type I error probabilities. These moderations could guide future research by providing insights on potential moderators of coaches' interventions. Other studies are yet needed to evaluate the program in a more natural context with a larger sample and using a confirmatory approach based on the present pilot randomized controlled trial.

Additionally, this study only included university sports teams and, thus, adult athletes. It would, therefore, be important to replicate this study with younger athletes and athletes performing at different levels (e.g., recreational, provincial, international) to

evaluate if the program could also be helpful for these populations. Moreover, including experienced coaches may have created a ceiling effect. Coaches (randomly assigned to both conditions) were rated as demonstrating high baseline levels of NSCS (over 5 on a 7-point scale). The program's efficacy should thus be tested with less experimented coaches.

Another important limitation of this study is attrition. Results cannot be generalized to the large number of participants who had only completed the preintervention questionnaire, as these participants were removed from the analyses. It is not possible to know if obtained results would also apply to these athletes. Although they did not differ from athletes who completed a postintervention questionnaire on any of our T1 assessments, they could nevertheless differ on other variables. Also, due to attrition, it was not possible to explore long-term effects of the program on athlete sports development. Although coaches' perceptions of NSCS suggest potential long-term benefits of the program, future studies should evaluate its impact on athlete outcomes.

In addition, athletes were asked to think about all of their coaches to evaluate NSCS. These scores thus represent mean perceptions of several coaches, which can be overestimated by a positive relationship with one coach in the team or, conversely, underestimated by one negative relationship. In some teams, not all of the coaches participated to the program, which may have reduced the observed effects, as the perceptions reported by athletes were based on all their coaches. Given that all variables were measured by questionnaires and most of them were self-reported (except for athletes' perceptions of NSCS), social desirability and common method biases are possible. One must also keep in mind that coaches' self-reports of NSCS questionnaire measured their beliefs about appropriate behaviors rather than their actual usage of autonomy-supportive and controlling behaviors. Moreover, this questionnaire yields a composite score of beliefs regarding autonomy-supportive versus controlling behaviors. It thus remains unclear which specific belief was impacted by the program at T3 or whether these beliefs actually led to behavioral changes.

Although the *reROOT* program was designed to nurture all need-supportive behaviors while reducing need-thwarting ones, we focused on coach perceptions of autonomy support (vs. controlling behaviors) and treated athlete perceptions of NSCS as a unidimensional construct. Future studies should thus examine the impact of the program on each component of the NSCS separately (i.e., autonomy support, controlling behavior, structure, chaos, involvement, coldness) to clarify the program's impact on NSCS. In addition, future studies should include observational measures of coaches NSCS and multirespondents to evaluate long-term effects of the *reROOT* program.

Finally, coaches were not blind to their condition or to the study's purpose, which may have led to certain biases. Indeed, coaches who participated to the program may have over- or underestimated their questionnaire ratings to justify their investment in the program or to downplay its importance. We can also not exclude the possibility that coaches who did not participate to the program may have obtained training from other sources (e.g., readings) or that coaches who participated to the program shared some of their new knowledge with coaches who did not, though they were explicitly asked to refrain from doing so. In contrast, athlete reports should be less biased, as coaches were instructed not to tell them if they had participated in the program. Future studies should nonetheless include an active control condition to further reduce these potential sources of bias.

## Conclusion

In conclusion, this pilot study presented mixed results regarding the efficacy of the *reROOT* program. Despite limited coach–athlete contact due to the COVID-19 pandemic, university coaches who were exposed to need-supportive skills had athletes who reported more autonomous motivation, a tendency toward higher performance, and greater well-being, especially in individual sports and when coaches were less stressed. Future studies will determine the efficacy of the *reROOT* program in nonpandemic circumstances, various sports context, and with larger samples.

## Notes

1. Three learning groups were formed in the ExpC, each containing between 10 and 12 coaches, two from one university and one from the other. Coaches from different universities attended the program separately.

2. More precisely, in the ExpC, 14 coaches completed only T1 (excluded), one completed only T2, one completed only T3, four completed T1 and T2, one completed T1 and T3, two completed T2 and T3, and 12 completed all questionnaires. For athletes, 84 completed only T1 (excluded), 13 completed only T2, 30 completed only T3 (excluded), 31 completed T1 and T2, eight completed T1 and T3 (excluded), two completed T2 and T3, and eight completed the three questionnaires. In the WLc, 14 coaches completed only T1 (excluded), three completed only T2, one completed only T3, six completed T1 and T2, three completed T1 and T3, one completed T2 and T3, and five completed all questionnaires. For athletes, 42 completed only T1 (excluded), seven completed only T2, 13 completed only T3 (excluded), 22 completed T1 and T2, zero completed T1 and T3 (excluded), one completed T2 and T3, and two completed the three questionnaires.

### Author Biographies

Emilie Lemelin is a PhD Student in clinical psychology at Université de Montréal. Her research examines autonomy support, coach–athlete relationship in relation to well-being, and performance in sport.

Joëlle Carpentier is a professor at the UQAM School of Management Science. Her research focuses on coach–athlete relationship, optimal feedback, and autonomy support.

Sophie Gadoury has a master's degree in sport psychology at the Université de Montréal. She is the founder of nimble bubble, an EdTech company aimed at transferring motivational knowledge to improve talent and performance management in organizations.

Élodie Petit is a master student in psychoeducation at the Université de Montréal. Her research explores student engagement and motivational climate in school context.

Jacques Forest is a professor at UQAM School of Management Science. He is is also a psychologist and Certified Human Resources Professional. His research interests include the antecedents and consequences of motivation and how to reconcile performance and well-being at work.

Jean-Paul Richard was a Freestyle World Cup coach and coached the Canadian Women's Freestyle Ski Team during the 2014 Olympic Winter Games. He is now a certified executive coach and plays a key role in leadership and performance management in various organizations.

Mireille Joussemet is a professor at the Psychology Department of the Université de Montréal. Her research examines autonomy support and basic psychological need satisfaction in parent–child relationships.

Geneviève A. Mageau is a professor at the Psychology Department of the Université de Montréal. Her research focuses on determinants and outcomes of autonomy support in hierarchical relationships.

## Acknowledgments

**Conflict of Interest**: The first, fourth, and seventh authors have no current conflict of interest to declare. The second, third, fifth, sixth, and last authors benefit financially from the reROOT program, either to deliver the program and/or for having created it (https://rerootcollectif.com/en-ca/about) although delivery of the program for the present study was pro bono. No program material is currently available for purchase.

## References

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 & Exercise, 8,* 654–670. https://doi.org/10.1016/j.psychsport.2006.11.003

Andreadakis, E., Laurin, J.C., Joussemet, M., & Mageau, G.A. (2020). Toddler temperament, parent stress, and autonomy support. *Journal of Child and Family Studies, 29,* 3029–3043. https://doi.org/10.1007/s10826-020-01793-3

Bartholomew, K.J., Ntoumanis, N., Ryan, R.M., Bosch, J.A., & Thøgersen-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. https://doi.org/10.1177/0146167211413125

Bartholomew, K.J., Ntoumanis, N., & Thogersen-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. https://doi.org/10.1080/17509840903235330

Berntsen, H., & Kristiansen, E. (2019). Guidelines for need-supportive coach development: The Motivation Activation Program in Sports (MAPS). *International Sport Coaching Journal, 6,* 88–97. https://doi.org/10.1123/iscj.2018-0066

Blais, M.R., Vallerand, R.J., Pelletier, L.G., & Brière, N.M. (1989). L'Échelle de satisfaction de vie: Validation canadienne-française du "Satisfaction with Life Scale." *Revue Canadienne des Sciences du Comportement, 21,* 210–223. https://doi.org/10.1037/h0079854

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. https://doi.org/10.1016/j.psychsport.2013.01.003

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. https://doi.org/10.1016/j.psychsport.2015.02.007

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences,* (2nd ed.). Erlbaum.

Curran, P.J., West, S.G., & Finch, J.F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods, 1,* 16–29. https://doi.org/10.1037/1082-989X.1.1.16

Deci, E.L., Connell, J.P., & Ryan, R.M. (1989). Self-determination in a work organization. *Journal of Applied Psychology, 74,* 580–590. https://doi.org/10.1037/0021-9010.74.4.580

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. https://doi.org/10.1207/S15327965PLI1104_01

Deci, E.L., Schwartz, A.J., Sheinman, L., & Ryan, R.M. (1981). An instrument to assess adults' orientations toward control versus autonomy with children: Reflections on intrinsic motivation and perceived competence. *Journal of Educational Psychology, 73,* Article 642. https://doi.org/10.1037/0022-0663.73.5.642

Delrue, J., Reynders, B., Broek, G.V., Aelterman, N., De Backer, M., Decroos, S., … Vansteenkiste, M. (2019). Adopting a helicopter-perspective towards motivating and demotivating coaching: A circumplex approach. *Psychology of Sport and Exercise, 40,* 110–126. https://doi.org/10.1016/j.psychsport.2018.08.008

Diener, E. (2009). Subjective well-being. In E. Diener (Ed.), *Social Indicators of Research Series. The science of well-being* (pp. 11–58). Springer Science - Business Media B.V.

Diener, E., Emmons, R.A., Larsen, R.J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49,* 71–75. https://doi.org/10.1207/s15327752jpa4901_13

Donnelly, P., & Kidd, B. (2015). Two solitudes: Grass-roots sport and high-performance sport in Canada. In R. Bailey & M. Talbot (Eds.), *Elite sport and sport-for-all* (pp. 57–71). Routledge.

Elliot, A.J., & McGregor, H.A. (2001). A 2×2 achievement goal framework. *Journal of Personality and Social Psychology, 80,* 501–519. https://doi.org/10.1037/0022-3514.80.3.501

Faber, A., & Mazlish, E. (2012). *How to talk so kids will listen & listen so kids will talk*. Simon and Schuster.

Gaudreau, P. (2012). Goal self-concordance moderates the relationship between achievement goals and indicators of academic adjustment. *Learning and Individual Differences, 22,* 827–832. https://doi.org/10.1016/j.lindif.2012.06.006

Gaudreau, P., & Braaten, A. (2016). Achievement goals and their underlying goal motivation: Does it matter why sport participants pursue their goals? *Psychologica Belgica, 56,* 244–268. https://doi.org/10.5334/pb.266

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. https://doi.org/10.1016/j.psychsport.2009.10.004

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,* 16–36. https://doi.org/10.1080/17408989.2017.1346070

Henriksen, K., Schinke, R., Moesch, K., McCann, S., Parham, W.D., Larsen, C.H., & Terry, P. (2020). Consensus statement on improving the mental health of high performance athletes. *International Journal of Sport and Exercise Psychology, 18*(5), 553–560. https://doi.org/10.1080/1612197X.2019.1570473

Hughes, M.D., & Bartlett, R.M. (2002). The use of performance indicators in performance analysis. *Journal of Sports Sciences, 20,* 739–754. http://doi.org/10.1080/026404102320675602

Jõesaar, H., & Hein, V. (2011). Psychosocial determinants of young athletes' continued participation over time. *Perceptual and Motor Skills, 113*(1), 51–66. https://doi.org/10.2466/05.06.13.PMS.113.4.51-66

Langan, E., Toner, J., Blake, C., & Lonsdale, C. (2015). Testing the effects of a self-determination theory-based intervention with youth Gaelic football coaches on athlete motivation and burnout. *The Sport Psychologist, 29,* 293–301. https://doi.org/10.1123/tsp.2013-0107

Lang, M. (Ed.). (2021). *Routledge handbook of athlete welfare*. Routledge.

Lemelin, E., Kil, H., Petit, É., Carpentier, J., Forest, J., Gadoury, S., Richard, J-P., Joussemet, M., & Mageau, G.A. (2023). How to

support athlete autonomy in elite sports: Coaches' evaluation of the reROOT program. *The Sport Psychologist*. Advance online publication. https://doi.org/10.1123/tsp.2022-0124

Lemelin, E., Verner-Filion, J., Carpentier, J., Carbonneau, N., & Mageau, G.A. (2022). Autonomy support in sport contexts: The role of parents and coaches in the promotion of athlete well-being and performance. *Sport, Exercise, and Performance Psychology, 11*(3), 305–319. https://doi.org/10.1037/spy0000287

Lesage, F.X., Berjot, S., & Deschamps, F. (2012). Psychometric properties of the French versions of the Perceived Stress Scale. *International Journal of Occupational Medicine and Environmental Health, 25,* 178–184. https://doi.org/10.2478/S13382-012-0024-8

Li, C., Wang, C.J., & Kee, Y.H. (2013). Burnout and its relations with basic psychological needs and motivation among athletes: A systematic review and meta-analysis. *Psychology of Sport and Exercise, 14*(5), 692–700. https://doi.org/10.1016/j.psychsport.2013.04.009

Lundqvist, C. (2011). Well-being in competitive sports—The feel-good factor? A review of conceptual considerations of well-being. *International Review of Sport and Exercise Psychology, 4,* 109–127. https://doi.org/10.1080/1750984X.2011.584067

Mageau, G.A., & Joussemet, M. (2023). Autonomy-supportive behaviors: Common features and variability across socialization domains. In R. Ryan (Ed.), *The Oxford handbook of self-determination theory* (pp. 509–528). Oxford University Press.

Mageau, G.A., Joussemet, M., Robichaud, J.M., Larose, M.P.& Grenier, F. (2022). How-to parenting program: A randomized controlled trial evaluating its impact on parenting. *Journal of Applied Developmental Psychology, 79,* Article 383. https://doi.org/10.1016/j.appdev.2021.101383

Mageau, G.A., Lessard, J., Carpentier, J., Robichaud, J.M., Joussemet, M., & Koestner, R. (2018). Effectiveness and acceptability beliefs regarding logical consequences and mild punishments. *Journal of Applied Developmental Psychology, 54,* 12–22. https://doi.org/10.1016/j.appdev.2017.11.001

Mageau, G.A., Ranger, F., Joussemet, M., Koestner, R., Moreau, E., & Forest, J. (2015). Validation of the Perceived Parental Autonomy Support Scale (P-PASS). *Canadian Journal of Behavioural Science, 47,* 251–262. https://doi.org/10.1037/a0039325

Mageau, G.A., & Vallerand, R.J. (2003). The coach-athlete relationship: A motivational model. *Journal of Sports Sciences, 21,* 883–904. https://doi.org/10.1080/0264041031000140374

Mahoney, J.W., Ntoumanis, N., Gucciardi, D.F., Mallett, C.J., & Stebbings, J. (2016). Implementing an autonomy-supportive intervention to develop mental toughness in adolescent rowers. *Journal of Applied Sport Psychology, 28,* 199–215. https://doi.org/10.1080/10413200.2015.1101030

Morris, T. (2000). Psychological characteristics and talent identification in soccer. *Journal of Sports Sciences, 18,* 715–726. https://doi.org/10.1080/02640410050120096

Mossman, L.H., Slemp, G.R., Lewis, K.J., Colla, R.H., & O'Halloran, P. (2022). Autonomy support in sport and exercise settings: A systematic review and meta-analysis. *International Review of Sport and Exercise Psychology*. Advance online publication. https://doi.org/10.1080/1750984X.2022.2031252

Mouratidis, A., Vansteenkiste, M., Lens, W., & Sideridis, G. (2008). The motivating role of positive feedback in sport and physical education: Evidence for a motivational model. *Journal of Sport & Exercise Psychology, 30,* 240–268.

Muthén, L.K., & Muthén, B.O. (2017). *Mplus user's guide* (8th ed.). Muthén & Muthén.

Pelletier, L.G., & Vallerand, R.J. (1996). Supervisors' beliefs and subordinates' intrinsic motivation: A behavioral confirmation analysis. *Journal of Personality and Social Psychology, 71,* 331–340. https://doi.org/10.1037/0022-3514.71.2.331

Pope, J.P., & Wilson, P.M. (2012). Understanding motivational processes in university rugby players: A preliminary test of the hierarchical model of intrinsic and extrinsic motivation at the contextual level. *International Journal of Sports Science & Coaching, 7*(1), 89–107. http://dx.doi.org/10.1260/1747-9541.7.1.89

Pope, J.P., & Wilson, P.M. (2015). Testing a sequence of relationships from interpersonal coaching styles to rugby performance, guided by the coach–athlete motivation model. *International Journal of Sport and Exercise Psychology, 13,* 258–272. https://doi.org/10.1080/1612197X.2014.956325

Pulido, J.J., Sánchez-Oliva, D., Leo, F.M., Matos, S., & García-Calvo, T. (2017). Effects of an interpersonal style intervention for coaches on young soccer players' motivational processes. *Journal of Human Kinetics, 59,* 107–120. https://doi.org/10.1515/hukin-2017-0151

Ratelle, C.F., Boisclair Châteauvert, G., Duchesne, S., & Guay, F. (2015). *The Multidimensional Parental Structure Scale (MPSS)*. Université Laval.

Reardon, C.L., Hainline, B., Aron, C.M., Baron, D., Baum, A.L., Bindra, A., … Engebretsen, L. (2019). Mental health in elite athletes: International Olympic Committee consensus statement (2019). *British Journal of Sports Medicine, 53,* 667–699. https://doi.org/10.1136/bjsports-2019-100715

Reeve, J. (2009). Why teachers adopt a controlling motivating style toward students and how they can become more autonomy supportive. *Educational Psychologist, 44*(3), 159–175. https://doi.org/10.1080/00461520903028990

Reeve, J., & Cheon, S.H. (2014). An intervention-based program of research on teachers' motivating styles. *Advances in Motivation and Achievement, 18,* 292–339. https://doi.org/10.1108/S0749-742320140000018008

Reynders, B., Vansteenkiste, M., Van Puyenbroeck, S., Aelterman, N., De Backer, M., Delrue, J., … Broek, G.V. (2019). Coaching the coach: Intervention effects on need-supportive coaching behavior and athlete motivation and engagement. *Psychology of Sport and Exercise, 43,* 288–300. https://doi.org/10.1016/j.psychsport.2019.04.002

Rocchi, M., Pelletier, L., & Desmarais, P. (2017). The validity of the Interpersonal Behaviors Questionnaire (IBQ) in sport. *Measurement in Physical Education and Exercise Science, 2,* 15–25. https://doi.org/10.1080/1091367X.2016.1242488

Rocchi, M., & Pelletier, L.G. (2017). The antecedents of coaches' interpersonal behaviors: The role of the coaching context, coaches' psychological needs, and coaches' motivation. *Journal of Sport and Exercise Psychology, 39,* 366–378. https://doi.org/10.1123/jsep.2016-0267

Ryan, R.M., & Deci, E.L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Publications.

Tabachnick, B.G., & Fidell, L.S. (2013). *Using multivariate statistics* (6th ed.). Pearson.

Thelwell, R.C., Wagstaff, C.R., Rayner, A., Chapman, M., & Barker, J. (2017). Exploring athletes' perceptions of coach stress in elite sport environments. *Journal of Sports Sciences, 35,* 44–55. https://doi.org/10.1080/02640414.2016.1154979

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. https://doi.org/10.1111/jasp.12331

Vansteenkiste, M., Mouratidis, A., Van Riet, T., & Lens, W. (2014). Examining correlates of game-to-game variation in volleyball

players' achievement goal pursuit and underlying autonomous and controlling reasons. *Journal of Sport & Exercise Psychology, 36,* 131–145. https://doi.org/10.1123/jsep.2012-0271

Vincent, H.K., Patel, S., & Zaremski, J.L. (2022). Impact of COVID on sports injury patterns, changes in mental well-being, and strategies to prepare for future pandemics in sport. *Current Sports Medicine Reports, 21,* 196–204. https://doi.org/10.1249/JSR.0000000000000966

Watson, D., Clark, L.A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54,* 1063–1070.