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ABSTRACT

According to Self-Determination Theory (SDT), basic psychological needs will be influenced by other individuals' interpersonal behaviors. The objective of the present research is to extend the validity of the Interpersonal Behaviors Questionnaire (IBQ and IBQ-Self) to the sport context. The measure was designed to assess perceptions of interpersonal behaviors of others (IBQ) or self-reports of interpersonal behaviors (IBQ-Self) in the context of SDT. This measure consists of 24 items and six subscales looking at autonomy-supportive, autonomy-thwarting (controlling), competence-supportive, competence-thwarting, relatedness-supportive, and relatedness-thwarting interpersonal behaviors. In Study 1, athletes were asked to report on their perceptions of their coaches' interpersonal behaviors (IBQ). In Study 2, coaches were asked to report on their interpersonal behaviors when they coach their athletes (IBQ-Self). The results supported that the scale had a strong factor structure, internal consistency, and validity. Overall, the results supported the IBQ and IBQ-Self are valid measures of interpersonal behaviors in sport.

Over the years, sport research has moved beyond simply examining athletes' performances and has shifted focus to the psychological factors that determine whether athletes have a successful or unsuccessful experience in sport (e.g., Vallerand, 2001). One aspect of athletes' psychological experiences that have received a lot of empirical attention is their motivation for participating in their sport. Self-Determination Theory (SDT; Deci & Ryan, 1985) is a leading motivation theory that has helped guide a significant amount of research in sport and has helped explain how the sport context and athletes' psychological experiences interact and influence the reasons athletes participate in sport and enjoy what they do (Hagger & Chatzisarantis, 2007).

SDT posits that coaches' interpersonal behavior styles play an essential role in determining athletes' experiences in sport through the extent to which these behaviors either support or thwart their athletes' psychological needs (Deci & Ryan, 1985). As such, research has begun to examine athletes' perceptions of these behaviors (Mageau & Vallerand, 2003), as well as the factors that influence coaches' reported interpersonal behaviors when they coach (Rocchi, Pelletier, & Couture, 2013). One important limitation to this research is that there is currently no valid measure of perceptions of interpersonal behaviors, or self-reports of interpersonal behaviors, for all six interpersonal

behavior styles identified by SDT. Therefore, the objective of the present studies is to extend the validity of the Interpersonal Behaviors Questionnaire (IBQ; Rocchi, Pelletier, Cheung, Baxter, & Beaudry, 2017) to the sport context.

SDT and sport

According to SDT, motivation orientations for sport differ in their quality, based on the degree to which the reasons for practicing sport have been internalized and integrated into an individual's sense of self. Previous research has supported that, when the reasons for practicing their sport are more internalized, an individual experiences autonomous motivation where they participate because they value and/or enjoy it. This is shown to result in positive outcomes for athletes such as greater interest in sport, better concentration, more enjoyment, increased sport satisfaction, and improved competitive results (Mageau & Vallerand, 2003). When the reasons for practicing sport are less internalized, they experience controlled motivation towards their sport and participate because of external or internal pressures, which has been shown to lead to more negative outcomes like burnout, sport anxiety, or dropout (Li, Wang, Pyun, & Kee, 2013).

In order to encourage this process of internalization, an individual requires the support and satisfaction of

the three basic psychological needs (autonomy, competence, and relatedness; Deci & Ryan, 2002). In sport, the need for autonomy represents the need for individuals to act in line with their own interests and values while practicing their sport. Competence requires opportunities for athletes to increase the level of challenge in their sport and to develop increased skill mastery. Finally, the need for relatedness refers to needing a supportive network and strong interpersonal connections with other people involved in sport (Vallerand, 2001). Research has shown that, when these psychological needs are satisfied for athletes, it leads to an increase in sport motivation quality, and they experience positive outcomes in sport; adversely, when these needs are frustrated, it leads to a decrease in sport motivation quality and promotes negative outcomes (i.e., Gould, Dieffenbach, & Moffett, 2002).

The sport context has an impact on the extent to which athletes' psychological needs are satisfied or frustrated (Deci, Shwartz, Sheinman, & Ryan, 1981). The context includes both the structure of the sport (i.e., level of competition), as well as the people within it (i.e., coaches). Focusing on the people only, SDT postulates other people's behavior either positively or negatively influences athlete need satisfaction and frustration. Specifically, when people in the sport context engage in need-supportive interpersonal behaviors, it will promote the satisfaction of the basic psychological needs for athletes (Deci & Ryan, 1985). Alternatively, when people engage in (or are perceived to engage in) need-thwarting interpersonal behaviors, athletes will experience need frustration (Sheldon & Filak, 2008). As a result, depending on whether individuals within the sport context act in ways that support or thwart athletes' psychological needs, they can act to promote or undermine the quality of athletes' motivation.

Need-supportive and need-thwarting interpersonal behaviors

SDT postulates there are six different types of interpersonal behaviors: autonomy-supportive (AS), competence-supportive (CS), relatedness-supportive (RS), autonomy-thwarting (AT; also called controlling), competence-thwarting (CT), and relatedness-thwarting (RT; e.g., Williams, Whip, Jackson, & Dimmok, 2013). Looking at the need-supportive behaviors first, AS behaviors include providing athletes with rationale, a choice, and acknowledging their perspectives (Mageau et al., 2015). CS behaviors include acknowledging athletes' improvements, believing they are capable of achieving their goals and success, and providing

athletes with positive feedback (Sheldon & Filak, 2008). Lastly, RS behaviors include being warm with athletes, having an interest in their activities, showing a genuine liking for them, and providing them with support and care (Jones, Armour, & Potrac, 2004). As for the need-thwarting behaviors: AT behaviors include using intimidating language with athletes, making demands, and incorporating rewards (Bartholomew, Ntoumanis, & Thorgenson-Ntoumani, 2009). CT behaviors consist of discouraging athletes from trying difficult tasks, sending them the message they are incompetent, doubting their capacity to improve within their sport, and emphasizing their faults (Sheldon & Filak, 2008). Finally, RT behaviors include being distant with athletes, not listening to them, not being available, and excluding them from activities or opportunities (Sheldon & Filak, 2008).

Limitations of the existing research

Although significant research has been conducted to explore the role of interpersonal behaviors in understanding sport outcomes for athletes, there are some limitations. First, SDT stipulates supporting all three psychological needs, beyond just autonomy, should lead to an increase in need satisfaction in athletes, and a subsequent increase in athletes' autonomous motivation for sport and other outcomes (e.g., Pomerantz, Cheung, & Qin, 2012). To date, however, most research has focused on autonomy exclusively (e.g., Moreau & Mageau, 2013), and only one study has examined the relationship between athletes' perceptions of their coaches' AS, CS, and RS interpersonal behaviors concurrently (Amorose & Anderson-Butcher, 2007). Related to this first limitation, it is also essential to measure both supportive and thwarting behaviors concurrently since the absence of supportive behaviors cannot automatically imply the presence of thwarting behavior (Sheldon, 2011). When considering the role of need-thwarting behaviors in sport, recent research has begun exploring the influence of athletes' perceptions of AT behaviors (Bartholomew, Ntoumanis, Ryan, Bosch, & Thorgenson-Ntoumani, 2011); however, similar to the need-supportive behaviors, the role of autonomy has received most of the empirical attention so far. Overall, no studies have explored how a coach's use of all six types of interpersonal behaviors influence athletes' need satisfaction and frustration in sport.

Next, looking at coaches, research in coaching should focus on examining the factors that predict coaches' use of all three types of need-supportive and need-thwarting

behaviors (i.e., all six interpersonal behaviors). No studies to date have examined the factors that predict coaches' AS behaviors, as well as CS and RS behaviors (e.g., Pelletier, Séguin-Lévesque, & Legault, 2002; Taylor, Ntoumanis, & Standage, 2008). Additionally, since coaches may simultaneously engage in need-thwarting behaviors and the absence of need-support does not necessarily mean the coach is using need-thwarting styles (Sheldon & Filak, 2008). Coaching research should also examine the factors that predict all three types of need-thwarting behavior (Bartholomew, Ntoumanis, & Thorgenson-Ntoumani, 2010). Again, similar to need-supportive behaviors, AT behaviors have received the most attention (Stebbings, Taylor, Spray, & Ntoumanis, 2012), and research also needs to examine the antecedents of CT and RT interpersonal behavior in coaches.

One reason for these limitations in the existing research is that there is currently no validated measure available for examining perceptions or self-reports of all six types of interpersonal behaviors according to SDT in the sport context. There are existing measures that look at athletes' perceptions of some dimensions like AS (i.e., Conroy & Coatsworth, 2007), or AS, AT, and RS (Smith et al., 2015), or coaches' self-reports of some dimensions like AS, AT, and RS (Smith et al., 2016). There are, however, no measures assessing CS, CT, or RT behaviors, and also no measures focusing on athletes' perceptions of all six need-supportive and need-thwarting interpersonal behaviors, or coaches' self-reports of their use of all six types of behaviors while coaching. Outside of sport, there is one measure, the IBQ (Rocchi et al., 2017), that has been validated as both a measure of perceptions of others' interpersonal behaviors (IBQ), and as a self-report of an individual's own behaviors (IBQ-Self), for all six types of interpersonal behaviors according to SDT. In order to address the limitations related to the lack of research in sport motivation, there is a need to develop and validate an instrument designed to assess both perceptions and self-reports of all six types of need-supportive and need-thwarting interpersonal behaviors in the sport context.

Present research

The purpose of the present studies is to validate the IBQ and IBQ-Self (Rocchi et al., 2017) in a sport setting. The original scale consisted of 24 items measuring six subscales that represent AS, AT, CS, CT, RS, and RT interpersonal behaviors. The structure of the scale was determined through three studies using undergraduate students. The purpose was to create a scale measuring perceptions of others' interpersonal behaviors, as well as a self-report of one's own behavior that could be used across multiple contexts. As such, the items were

developed by a pool of experts with advanced knowledge of SDT, using a general stem ("The people in my life"—IBQ; "When I am with the people that are important to me, I"—IBQ-Self) to ensure they were not bound to a specific interpersonal relationship or context. In Study 1 ($N = 572$), the structure of the IBQ was determined through a series of confirmatory factor analyses, and the results supported that the scale had a strong factor structure, good internal consistency, strong convergent and divergent validity, and the subscales correlated with other outcomes—as would be expected according to SDT. The results also supported that perceptions of need-supportive interpersonal behaviors were related to increases in reported general autonomy, competence, and relatedness satisfaction; while perceptions of need-thwarting interpersonal behaviors were related to decreases in the general satisfaction of all three needs. These results were replicated in Study 2 ($N = 372$) with a new sample—providing additional support for the validity of the IBQ. In Study 3 ($N = 736$), the factor structure of the IBQ-Self was tested, and demonstrated that it also has a strong structure, good internal consistency, acceptable validity and reliability, and the subscales correlated with outcomes as would be expected. For the IBQ-Self, it was found that when individuals reported they engaged in need-supportive behaviors, this was also associated with increased general need satisfaction and decreased need frustration; while individuals who reported increased need-thwarting behaviors saw the opposite.

Since the items were developed with the intention to make the scale applicable to multiple social contexts and social relationships (i.e., education, workplace, sport, etc.), the objective of the present studies is to validate the scale as a measure of perceptions of interpersonal behaviors (IBQ), as well as a self-report of interpersonal behaviors (IBQ-Self) in sport. In Study 1, the IBQ will be validated with a sample of athletes reporting on their perceptions of their coaches' interpersonal behaviors. In Study 2, the IBQ-Self will be validated with a sample of coaches reporting on their own interpersonal behaviors in their interactions with their athletes. For both studies, the factor structure, validity, reliability, and correlations with outcomes will be examined. Overall, it is anticipated these studies will extend the validity of both the IBQ and the IBQ-Self, and will demonstrate a strong fit in sport.

Study 1

The objective of this study was to extend the validity of the IBQ by confirming the scale structure held in a sport context. Specifically, this study will confirm the

IBQ is an appropriate measure for assessing athletes' perceptions of their coaches' interpersonal behaviors. It is hypothesized the structure of the scale will remain consistent and the subscales will relate to the outcomes in the same ways as the original validation studies (Rocchi et al., 2017) for athletes when they report on their coaches' behaviors.

Method

Participants

The sample was composed of 239 full-time undergraduate student-athletes (N_{male} = 130, N_{female} = 109), with an average age of 20.15 years (SD = 3.16), who were enrolled in first-year courses. These students had been competing in their sport for an average of 4.37 years (SD = 3.45), had been working with their current coach for an average of 2.59 years (SD = 3.08), and trained an average of 8.67 hr per week (SD = 3.28) with them. The majority of the athletes played hockey (N = 48, 16%), soccer (N = 39, 13%), basketball (N = 15, 5%), volleyball (N = 16, 5%), or cross country running (N = 12, 4%). The remaining athletes (N = 109, 47%) came from a variety of sport backgrounds including: badminton, baseball, boxing, equestrianism, figure skating, football, golf, road cycling, rowing, rugby, swimming, tennis, and weightlifting.

Procedures

The athletes were selected from a research participation pool and received credit towards their final course grade for their participation, and participated in an online survey about their sport experience. Participation was voluntary and participants gave their informed consent before beginning the study. To be eligible for this study, the participants had to be actively training in their sport at the time of data collection and have been working with their current coach for at least 1 year.

Materials

The following measures were completed through an online questionnaire.

Coach interpersonal behaviors
Participants completed the 24-item IBQ scale measuring perceived interpersonal behaviors of their coach using the stem "My coach …" (Rocchi et al., 2017). The athletes indicated their agreement with each statement using a 7-point scale ranging from 1 (do not agree at all) to 7 (completely agree). The scale consists of six subscales assessing coaches' use of AS, AT, CS, CT, RS, and RT interpersonal behaviors in their interactions. The original validation studies supported that the scale had sufficient internal reliability (α > .74).

Need satisfaction
Participants responded to the positive items from the Basic Need Satisfaction at Work Scale (Deci et al., 2001) to assess the extent their three basic psychological needs were met while practicing their sport. The scale consists of three subscales measuring participants' autonomy (three items), competence (three items), and relatedness satisfaction (four items). A confirmatory factor analysis (CFA) using Mplus Version 6 (Muthen & Muthen, 2010, Los Angeles, CA; this software was used for all analyses) was conducted on the scale to confirm the structure. The fit indices suggest the model has an acceptable fit (Satorra-Bentler [SB] scaled $\chi^2_{(41)}$ = 64.50, p < .001, Root Mean Square Error of Approximation [RMSEA] = .06 [90% Confidence Interval (CI) {.04, .08}], Standardized Root Mean Square Residual [SRMR] = .05, Comparative Fit Index [CFI] = .94, Tucker-Lewis Index [TLI] = .92). The internal consistency estimates for the three subscales were within acceptable range (autonomy α = .72; competence α = .70; relatedness α = .83), and a mean score was calculated for each subscale.

Need frustration
To assess psychological need frustration in sport, participants also completed the Psychological Need Thwarting Scale in Sport (Bartholomew et al., 2010). The scale also consists of three subscales measuring participants' autonomy, competence, and relatedness frustration with four items each. A confirmatory factor analysis was conducted to confirm the structure and the results supported the model had an excellent fit (SB$\chi^2_{(32)}$ = 22.68, p < .001, RMSEA = .00 [90% CI {.00, .05}], SRMR = .03, CFI = 1.00, TLI = 1.00). The internal consistency for the three subscales were within acceptable range (α > .76), and a mean score was calculated for each subscale to represent participants' frustration of each need.

Athlete motivation
Participants also completed the Revised Sport Motivation Scale (Pelletier, Rocchi, Vallerand, Deci, & Ryan, 2013) to assess their reasons for participating in sport. The 6-factor scale is comprised of 18 items (three per subscale) measuring sport motivation according to each of the six types of behavioral regulation according to SDT. A confirmatory factor analysis supported that the model had a good fit (SB$\chi^2_{(120)}$ = 194.92, p < .001, RMSEA = .06 [90% CI {.04, .07}], SRMR = .03,

CFI = .95, TLI = .93). The Cronbach's alpha was calculated for each subscale and revealed they were above the acceptable limit ($\alpha > .77$), except for the introjected subscale, which had a lower internal consistency ($\alpha = .60$). A mean score was calculated for autonomous (mean of intrinsic, integrated, and identified regulation) and controlled motivation (mean of introjected, external, and amotivated regulation).

Analyses

First, the data was cleaned and screened for univariate and multivariate outliers. Next, a confirmatory factor analysis was performed on the IBQ to confirm the structure of the scale held for a sample of athletes reporting on their coaches' behaviors. The model was estimated using maximum likelihood robust (MLR) estimator (Muthen & Muthen, 2010). The fit of the model was assessed according to Hu and Bentler's (1999) recommendation of using a scaled chi-square (χ^2) and the SRMR as absolute fit indices; the TLI as a relative fit index; and finally, the RMSEA and the CFI as noncentrality-based indices. For the SRMR and RMSEA, values below .08 indicated adequate model fit, and values below .06 indicated excellent fit; for the CFI and TLI, values above .90 represented good fit, and values above .95 indicated excellent fit (Hooper, Coughlan, & Mullen, 2008). Next, invariance tests were conducted to confirm the scale performed equally for both male and female athletes. Then, internal consistency was examined using Cronbach's alpha for each subscale, and the discriminant and convergent validity were examined using the average variance extracted (AVE) and the average shared square variance (ASV). Finally, a series of outcome correlation analyses were conducted to confirm the subscales related to the outcomes as expected according to SDT.

Results

First, the scoring distributions of the 24 IBQ items were examined for univariate normality and results suggested that, similar to the original validation studies (Rocchi et al., 2017), it had not been achieved for all variables (skewness range: −10.15 to 9.54; kurtosis range: −6.55 to 5.41). Next, missing data patterns were examined and it was revealed 24 participants (11%) were missing between 1 and 3 observations on their reports of the IBQ. Since this represented less than 1% of the overall sample, the missing data was estimated using full information ML (FIML). Then, the univariate and multivariate outlier analyses revealed two multivariate outliers and they were removed from

the subsequent analyses. Finally, the composite scores were calculated for the coaches' interpersonal behaviors (see Table 1 for descriptive statistics), as well as for athletes' need satisfaction, need frustration, and sport motivation (see Table 2 for descriptive statistics).

Scale structure

The structure of the IBQ was tested through a CFA using the MLR estimator. The results supported the factorial model had excellent fit ($SB\chi^2_{(237)} = 296.23$, $p < .001$, CFI = .95, TLI = .95, RMSEA = .05 [90% CI {.04, .06}], SRMR = .05) and the standardized factor loadings for each subscale were larger than .60 (see Table 3). Next, since both groups achieved the minimum recommended sample size of 100, a series of invariance tests were conducted to determine the scale performed equally for both men ($N = 105$) and women ($N = 131$) athletes (MacCallum, Widaman, Zhang, & Hong, 1999; Meade, 2005). In the first step, the baseline models were tested for each gender to confirm the structure of the IBQ held for men ($SB\chi^2_{(237)} = 317.76$, $p < .001$, CFI = .90, TLI = .90, RMSEA = .07

Table 1. Study 1 and 2: Final items with standardized factor loadings (FL) and standard errors (SE).

	Study 1		Study 2	
Items	FL	SE	FL	SE
STEM: *"My coach …"* (Study 1); *"When I am with my athletes …"* (Study 2)				
AS				
Gives me the freedom to make my own choices.	.791	.043	.712	.041
Supports my decisions.	.872	.032	.722	.036
Supports the choices that I make for myself.	.828	.045	.681	.031
Encourages me to make my own decisions.	.813	.045	.731	.035
AT				
Pressures me to do things their way.	.699	.051	.722	.030
Imposes their opinions on me.	.794	.045	.741	.029
Pressures me to adopt certain behaviors.	.756	.048	.693	.039
Limits my choices.	.756	.051	.687	.103
CS				
Encourages me to improve my skills.	.693	.066	.658	.045
Provides valuable feedback.	.739	.052	.720	.041
Acknowledges my ability to achieve my goals	.811	.043	.765	.032
Tells me that I can accomplish things.	.859	.035	.748	.033
CT				
Points out that I will likely fail.	.739	.054	.761	.024
Sends me the message that I am incompetent.	.830	.039	.652	.044
Doubts my capacity to improve.	.741	.051	.674	.030
Questions my ability to overcome challenges.	.819	.049	.748	.037
RS				
Is interested in what I do.	.804	.054	.715	.050
Takes the time to get to know me.	.830	.039	.755	.032
Honestly enjoy spending time with me.	.741	.051	.734	.045
Relates to me.	.819	.049	.633	.033
RT				
Does not comfort me when I am feeling low.	.804	.054	.443	.028
Is distant when we spend time together.	.862	.028	.529	.031
Does not connect with me.	.832	.031	.656	.046
Does not care about me.	.855	.027	.618	.055

Note. Study 1: $N = 237$. Study 2: $N = 240$. The verb tenses and pronouns of the items were modified in the IBQ-Self to reflect the new stem. For example: "Give them the freedom to make their own choices" instead of "Gives me the freedom to make my own choices" or "Do not comfort them when they are feeling low" instead of "Does not comfort me when i am feeling low."

Table 2. Study 1 and 2: Factor correlations, variance, means, standard deviations, and internal consistency.

Subscales	1	2	3	4	5	6	AVE	ASV	M	SD
Study 1 (IBQ—General Stem)										
1. AS	−.89						.68	.28	5.03	1.39
2. AT	−.39**	−.84					.57	.15	3.23	1.49
3. CS	.70**	−.30**	−.87				.61	.18	5.54	1.28
4. CT	−.34**	.69**	−.47**	−.87			.62	.18	1.37	1.37
5. RS	.71**	−.32**	.74**	−.36**	−.90		.64	.19	4.98	1.44
6. RT	−.40**	.60**	−.37**	.68**	−.50**	−.87	.70	.17	2.41	1.41
Study 2 (IBQ-Self—Athlete Stem)										
1. AS	−.71						.51	.07	6.01	0.83
2. AT	−.36**	−.70					.51	.05	2.11	2.11
3. CS	.40**	−.14**	−.73				.53	.09	5.66	0.59
4. CT	−.13	.42**	.04	−.75			.52	.05	1.40	0.76
5. RS	.44**	−.18**	.65**	−.05	−.72		.50	.11	6.00	0.65
6. RT	−.17**	.16**	−.27**	.11	−.27**	−.40	.33	.03	1.41	0.73

Note. Study 1: N = 237. Study 2: N = 240. α = diagonals; .AVE = average variance extracted; ASV = average shared square variance.
*p < .05; **p < .001.

Table 3. Study 1 and 2: Descriptive statistics and correlations with outcome variables for the IBQ (Study1) and the IBQ-Self (Study 2).

	Need Satisfaction			Need Frustration			Motivation		
IBQ Subscales	Aut	Comp	Rel	Aut	Comp	Rel	Aut	Ctl	Soc Des
Study 1									
AS	.58**	.48**	.46**	−.28**	−.32**	−.24**	.40**	−.08	—
AT	−.33**	−.20**	−.27**	.63**	.56**	.54**	−.08	.45**	—
CS	.43**	.52**	.48**	−.30**	−.40**	−.34**	.39**	−.17*	—
CT	−.30**	−.23**	−.33**	.64**	.66**	.63**	−.14*	.51**	—
RS	.52**	.50**	.49**	−.26**	−.32**	−.25**	.37**	−.06	—
RT	−.44**	−.29**	−.39**	.62**	.58**	.64**	−.25**	.41**	—
Mean	5.19	5.70	5.82	3.04	2.86	2.54	5.50	3.26	—
Standard Deviation	1.14	1.04	1.03	1.14	1.54	1.03	1.16	1.12	—
Study 2									
AS	.20**	.23**	.23**	−.02	−.02	−.01	.25**	.02	.10
AT	−.11	.05	.02	.23**	.30**	.24**	.11	.36**	.06
CS	.31**	.48**	.34**	−.18*	−.11	−.06	.28**	−.01	.10
CT	.01	.06	−.03	.07	.28**	.26**	.06	−.30**	.08
RS	.36**	.53**	.37**	−.16*	−.12	−.12	.29**	.05	.06
RT	−.04	−.06	−.02	.01	.22*	.35**	.12	−.19*	.11
Mean	6.11	5.04	1.32	1.73	1.60	1.67	5.05	2.29	4.53
Standard Deviation	0.92	0.79	0.88	1.06	1.00	0.78	1.20	0.97	2.57

Note. Study 1: N = 237. Study 2: N = 240. Soc Des = social desirability. For Study 2, correlations are while controlling for social desirability, except for the correlations between the subscales of the IBQ and social desirability. Need satisfaction and frustration are related to sport or coaching. Motivation is for participating in sport or coaching.
*p < .05; **p < .001.

[90% CI {.06, .08}], SRMR = .06) and women ($SB\chi^2_{(237)}$ = 334.95 p < .001, CFI = .92, TLI = .91, RMSEA = .07 [90% CI {.06, .08}], SRMR = .06). Then, configural invariance was established by testing a CFA model with both groups where no constraints were placed on the parameters. The results suggested the factor structure of the IBQ was the same for men and women athletes ($SB\chi^2_{(474)}$ = 672.40, p < .001, CFI = .91, TLI = .90, RMSEA = .07 [90% CI {.06, .08}], SRMR = .06). Next, metric invariance was established by constraining the factor indicators to be equal for groups and the results found the data fit the model well ($SB\chi^2_{(492)}$ = 681.20, p < .001, CFI = .91, TLI = .90, RMSEA = .07 [90% CI {.06, .08}], SRMR = .07) and the change in chi-square between the constrained and unconstrained model was not significant ($SB\Delta\chi^2_{(18)}$ = 11.99, p > .05). Finally, scalar invariance was established by constraining the intercepts to be equal for both groups. Again, the results supported the model had good fit ($SB\chi^2_{(510)}$ = 709.16, p < .001,

CFI = .91, TLI = .90, RMSEA = .07 [90% CI {.06, .08}], SRMR = .07) and the chi-square difference test confirmed the model fit remained stable ($SB\Delta\chi^2_{(18)}$ = 27.61, p > .05). Overall, these results support men and women athletes were invariant with regards to the factor structure, and composite variables can be created for both groups.

Validity and reliability

The AVE and ASV were examined to assess convergent and divergent validity (see Table 1). All subscales met the requirements for convergent validity as the AVEs were above .5 (Hair, Black, Babin, & Anderson, 2010). Discriminate validity was also achieved since all ASV values were smaller than their respective AVEs (Hair et al., 2010). The factor correlations and internal reliabilities for each subscale support each subscale has achieved acceptable internal consistency (see Table 1).

Outcome correlations

The IBQ subscales were correlated with need satisfaction in sport, need frustration in sport, and sport motivation as predicted (see Table 3). Specifically, the need-supportive subscales of the IBQ correlated positively with need satisfaction and negatively with need frustration. The need-thwarting subscales of the IBQ correlated negatively with need satisfaction and positively with need frustration. Looking at athletes' motivation for sport, the need-supportive subscales correlated positively with autonomous motivation and the need-thwarting subscales correlated with controlled motivation. For CT, it was related to an increase in athletes' autonomous motivation and a decrease in their controlled motivation. For both perceptions of CT and RT coach behaviors, this was related to decreases in autonomous motivation for athletes, as well as an increase in controlled motivation.

Discussion

Overall, the results of Study 1 support the psychometric properties of the IBQ in a sample of athletes, reporting on their coaches' interpersonal behaviors and the scale performed equally for male and female athletes. This is the first set of results to support the IBQ can be used to assess perceptions of interpersonal behaviors in the sport context. In this sample, the structure of the scale held, as well as the reliabilities and outcome correlations, supporting the scale performed as would be expected, similar to the original validation studies (Rocchi et al., 2017). Although there are relatively high relationships between the need-supportive and need-thwarting subscales that are in line with the results of the original validation studies, the relationships are not high enough to suggest multicollinearity (< .80) may be an issue (Field, 2009). The results of this study support the validity of the IBQ to assess athletes' perceptions of coaches' behaviors. Specifically, these results are in line with what would be expected according to SDT as athletes who report their coaches use need-supportive interpersonal behaviors reported increased need satisfaction and autonomous motivation in sport (Mageau & Vallerand, 2003); while athletes who reported their coaches use need-thwarting interpersonal behaviors reported need frustration and controlled motivation in sport (Bartholomew et al., 2009).

Study 2

The objective of Study 2 is to evaluate the psychometric properties of the IBQ self-report version within the sport context. Specifically, this will be validated using a sample of sport coaches who are reporting on their behaviors when they interact with their athletes. It is anticipated the factor structure of the IBQ-Self will hold for this sample, in this context, and it will correlate with outcomes as would be expected according to SDT.

Method

Participants

The sample was composed of 240 coaches (N_{male} = 170, N_{female} = 66, $N_{missing}$ = 4) with an average age of 47.01 years (SD = 10.31). The large majority of the coaches had a college (N = 53, 22%) or university education (N = 168, 70%). They were either basketball (N = 111, 46%) or track and field coaches (N = 129, 54%), and they had an average of 17.50 years of coaching experience (SD = 12.83). The majority (N = 122, 51%) identified as a head coach or as an assistant coach (N = 60, 25%) and indicated their athletes were very (N = 94, 39%) or extremely (N = 61, 25%) competitive compared to other athletes of their age.

Procedures

Coaches were recruited through their respective provincial sporting associations (basketball or athletics) to participate in an online survey. Each organization sent an email to all coaches inviting them to participate in an online study. The coaches' participation was voluntary and they gave their informed consent before participating. To be eligible, the coaches had to be registered with a provincial sport organization at the time of data collection and actively coaching.

Materials

The following measures were completed by the coaches through an online questionnaire.

My interpersonal behaviors

The coaches completed the *IBQ-Self* to assess the extent to which they believed they engaged in AS, AT, CS, CT, RS, and RT interpersonal behaviors with their athletes (Rocchi et al., 2017). Coaches were presented each item using the stem, "When I am with my athletes, I ..." and indicated their agreement with each statement using a 7-point scale ranging from 1 (*do not agree at all*) to 7 (*completely agree*). The original validation studies supported the scale had sufficient internal reliability (α > .80).

Need satisfaction

The coaches responded to the positive items from the *Basic Need Satisfaction at Work Scale* adapted to the sport context (Deci et al., 2001) to assess the extent their three basic psychological needs were met while coaching. Like in Study 1, the stems were modified to ask the coaches about their need satisfaction while coaching instead of at work. The fit indices suggest the model has an acceptable fit, except for the TLI ($SB\chi^2_{(41)}$ = 38.36, p < .001, RMSEA = .06 [90% CI {.03, .08}], SRMR = .05, CFI = .90, TLI = .89); however, since the other fit indices were acceptable, the scale was used. The internal consistency estimates were within acceptable range (autonomy α = .83; competence α = .71; relatedness α = .74), and a mean score was calculated for each subscale.

Need frustration

The coaches also completed the *Psychological Need Thwarting Scale in Sport* (Bartholomew et al., 2010) to assess the extent to which their needs were frustrated while coaching, like in Study 1. A confirmatory factor analysis confirmed the structure of the scale for coaches and the results supported that the model had an excellent fit ($SB\chi^2_{(32)}$ = 26.00, p < .001, RMSEA = .04 [90% CI {.00, .07}], SRMR = .06, CFI = .96, TLI = .94). The internal consistency for the three subscales were above the minimum (α > .74), and a mean score was calculated for each subscale to represent the coaches' frustration of each need.

Coach motivation

The coaches completed the *Coach Motivation Questionnaire* (CMQ; McLean, Mallet, & Newcombe, 2012) to assess their reasons for participating in sport. The CMQ is a 6-factor scale comprised of 22 items measuring sport motivation according to each of the six types of behavioral regulation according to SDT. A confirmatory factor confirmed the structure of the scale in this sample ($SB\chi^2_{(194)}$ = 336.57, p < .001, RMSEA = .06 [90% CI {.04, .07}], SRMR = .07, CFI = .91, TLI = .90). The Cronbach's alphas were calculated for each subscale and revealed they were above the acceptable limit (α > .72), except for the introjected subscale, which had a lower internal consistency (α = .68). Like in Study 1, a mean score was calculated for autonomous motivation and controlled motivation.

Social desirability

Finally, the coaches also completed the short form of the *Marlowe-Crowne Social Desirability Scale* (Reynolds, 1982) to control for whether they were responding to survey items based on providing favorable responses. The short form of this measure consists of 10 items where participants are asked to indicate whether these statements are true or false for them. The sum of all responses considered to be socially desirable is calculated to provide an overall measure of social desirability.

Analyses

Using the same procedures as the first study, the data was cleaned and then the scale structure was examined. Then, the validity and reliability of the subscales were examined. Finally, outcome correlations were conducted to examine the relationship between coach need satisfaction, frustration, and motivation, while controlling for social desirability.

Results

Similar to the first study, the descriptive statistics analyses on the 24 IBQ-Self items suggested the variables did not all have a normal distribution (skewness range: −13.25 to 9.12; kurtosis range: −6.20 to 8.21). Data screening analyses did not reveal any multivariate outliers; as such, the entire sample was retained for the full analyses. The missing data analyses suggested 15 participants were missing one or two observations on the IBQ-Self; however, since these missing observations made up less than 5% of the total observations, the data was imputed using the same methods as Study 1. The composite scores for the coaches' reported use of need-supportive and need-thwarting behaviors, as well as their need satisfaction and frustration in coaching, their motivation towards coaching, and their likelihood of responding in socially desirable ways was calculated (see Tables 1 and 2 for the descriptive statistics).

Scale structure

The results supported that the factorial model had good fit ($SB\chi^2_{(237)}$ = 303.04, p < .001, CFI = .93, TLI = .92, RMSEA = .06 [90% CI {.03, .05}], SRMR = .04). The standardized factor loadings for each subscale were larger than .46 (see Table 1), and the factor correlations as well as the internal reliabilities for each subscale (Cronbach's alpha) are in Table 1. Since there were only 66 female coaches in this sample, gender invariance tests were not performed in this study. Next, convergent and divergent validity was examined for each of the subscales (see Table 2) and the results supported that the scale met the thresholds for both, across all subscales, except for the RT subscale. Internal

consistency analyses revealed all of the alphas were over the minimum criteria, again, except for the RT subscale ($\alpha = .40$), which was nowhere near the baseline criteria. The internal consistency for that subscale was calculated using all of the potential combinations of items to see if one specific item was causing the issue, and the results found there was no combination of the four items that promoted a better internal consistency. As a result, the reliability for the four items was retained.

Outcome correlations

The IBQ-Self subscales were correlated with need satisfaction, need frustration, autonomous, and controlled motivation, while controlling for social desirability (see Table 2) to confirm the relationships were in the expected directions. The results found that the support subscales of the IBQ-Self correlated moderately and positively with need satisfaction and autonomous motivation, while they had weak or negative relationships with need frustration and controlled motivation. The opposite was found with the need-thwarting subscales where there were moderate positive relationships with need frustration and controlled motivation, and weak negative or no relationships with need satisfaction and autonomous motivation. Overall, the results were similar to those in Study 1, except the strength of the relationships was weaker.

Discussion

The results of this study support the factor structure and validity of the IBQ-Self as a questionnaire for coaches about their use of interpersonal behaviors, according to SDT, in their interactions with their athletes. Unfortunately, the reliability for the RT subscale was weak. Since some coaches and athletes may choose to engage in the relationship when they choose to participate in the sport (i.e., select athlete for a team) and others do not (i.e., everyone trains during the same session), it is not totally surprising that coaches care about their athletes and this made the results somewhat ambiguous. Perhaps, in another context where there is either less control over being in a relationship with the other people, such as a family member or a supervisor at work, or more control like a best friend or partner, that subscale internal consistency would improve. Overall, these results support that coaches who report using more need-supportive behaviors also report higher need satisfaction and autonomous motivation for their coaching, while coaches who report more need-thwarting behaviors report more need frustration

and controlled motivation for coaching—all after controlling for social desirability. The results of this study support that, generally, the IBQ-Self is a valid measure of coaches' own reports of their interpersonal behaviors when interacting with their athletes.

General discussion

The purpose of these two studies was to extend the validity of the IBQ by testing the structure of the scale in a sport setting. The results of Study 1 supported that the IBQ scale factor structure holds in cases where athletes report on their perceptions of their coaches' interpersonal behaviors. The scale also demonstrated adequate validity and reliability and, overall, the inter-correlations between the IBQ subscales, as well as the correlations between the IBQ subscales and the other related factors provided support for the fit of the scale within the existing SDT measures and literature. In terms of the relationships between the IBQ subscales, the results supported there were moderately high positive and negative correlations between the subscales. Additionally, the subscales also correlated with need satisfaction, need frustration, and motivation in the directions that would be expected according to SDT. In the case of some relationships, the outcomes had similar correlations with all three need-supportive behaviors and all three need-thwarting behaviors, but this is not unexpected since the satisfaction or frustration of the three basic needs are often related (Deci & Ryan, 1985).

The results of Study 2 supported that the IBQ-Self structure held in a sample of coaches—reporting on their behaviors with their athletes. Similar to Study 1, the scale also demonstrated adequate validity and reliability. Overall, the inter-correlations between the IBQ-Self subscales and the correlations between the IBQ-Self subscales and other factors showed a similar pattern to Study 1—supporting that the scale relates to other factors as would be expected.

Limitations

These results support the applicability of the scale to a sport context; however, there are some limitations. First, the structure of the scales was tested using a student sample of athletes, as well as basketball and track and field coaches. The IBQ should be tested with a more varied sample of athletes to ensure the scale is a valid measure of perceptions of coaches for other groups such as older athletes and recreational athletes. Furthermore, the IBQ-Self should be validated with coaches from a larger variety of sports.

In this sample, coaches were coaching team (basketball) and individual sports (athletics); however, coaches can work with all sorts of different athletes, at varying levels of competition, and the scale's validity should be extended to include these coaches too. A second limitation is that the IBQ and IBQ-Self only focused on two people within the sport context: athletes and coaches. There are a number of different social agents in the sport context that impact athletes (or coaches) including the athletes' parents, the other athletes, sport administrators, etc., and the validity of the scale should also be tested to examine perceptions of their behaviors, or their own reports of their behaviors. Finally, since the IBQ and IBQ-Self were validated using coaches' and athletes' self-reports, their reports should be triangulated by a third party (e.g., video recording and coding of interpersonal behaviors) to confirm reports on these measures correspond to their real world behaviors.

Future directions

The IBQ and the IBQ-Self promote a number of initiatives for future research in sport motivation. First, research should continue to examine the psychometric properties of the IBQ. For example, athletes or coaches should be examined at multiple time points in order to establish the scale's test–retest reliability and coaches' scores should be corroborated with athletes' scores in order to provide support for the construct validity of the scale. Next, the IBQ can be used to explore the role of all six types of need-supportive and need-thwarting interpersonal behaviors in relation to how they impact athletes' psychological need satisfaction and frustration. This will help extend the existing research in sport to move beyond the influential role of AS and AT, and focus on CS, CT, RS, and RT interpersonal behaviors as well. Next, the IBQ-Self can be used to identify and understand the antecedents of all six types of interpersonal behaviors according to SDT. Specifically, the scale should be used to explore the factors that influence coaches' behaviors with their athletes. Finally, the IBQ and IBQ-Self should be used to explore how coaches' behaviors change over the course of a given season, and how this relates to athlete psychological needs and their motivation for sport.

Overall, the IBQ and IBQ-Self are new instruments for assessing perceptions, or self-reports, of all six types of need-supportive and need-thwarting interpersonal behaviors for coaches and athletes. It is hoped the IBQ and the IBQ-Self will promote research directed at assessing the behavior of others in sport, and how it impacts need satisfaction, need frustration, and motivation for athletes.

References

Amorose, 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. doi:10.1016/j.psychsport.2006.11.003

Bartholomew, K., Ntoumanis, N., Ryan, R., Bosch, J., & 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. doi:10.1177/0146167211413125

Bartholomew, K., 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. doi:10.1080/17509840903235330

Bartholomew, K., Ntoumanis, N., & Thørgenson-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. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/20479478

Conroy, D., & Coatsworth, J. (2007). Assessing autonomy-supportive coaching strategies in youth sport. *Psychology of Sport and Exercise*, 8, 671–684. doi:10.1016/j.psychsport.2006.12.001

Deci, E., & Ryan, R. (1985). Intrinsic motivation and self-determination in human behaviour. In E. Deci & R. Ryan (Eds.), *Handbook of self-determination research*. Rochester, NY: University of Rochester Press.

Deci, E., & Ryan, R. (2002). *Handbook of self-determination research*. Rochester, NY: The University of Rochester Press.

Deci, E., Ryan, R., Gagné, M., Leone, D., Usunov, J., & Kornazheva, B. (2001). Need satisfaction, motivation, and well-being in the work organizations of a former eastern bloc country: A cross-cultural study of self-determination. *Personality and Social Psychology Bulletin*, 27, 930–942. doi:10.1177/0146167201278002

Deci, E., Schwartz, A., Sheinman, L., & Ryan, R. (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, 642–650. doi:10.1037//0022-0663.73.5.642

Field, A. (2009). *Discovering statistics using SPSS*. Sage Publications.

Gould, D., Dieffenbach, K., & Moffett, A. (2002). Psychological characteristics and their development in Olympic champions. *Journal of Applied Sports Psychology*, 14, 172–204. doi:10.1080/10413200290103482

Hagger, M., & Chatzisarantis, N. (2007). *Intrinsic motivation and self-determination in exercise and sport*. Leeds, UK: Human Kinetics Europe Ltd.

Hair, J., Black, W., Babin, B., & Anderson, R. (2010). *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Prentice-Hall, Inc.

Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural equation modelling: Guidelines for determining model fit. *The Electronic Journal of Business Research Methods*, 6, 53–60. Retrieved from www.ejbrm.com/issue/download.html?idArticle=183

Hu, L., & Bentler, P. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1–55. doi:10.1080/10705519909540118

Jones, R., Armour, K., & Potrac, P. (2004). *Sports coaching cultures: From practice to theory*. London, UK: Routledge.

Li, C., Wang, C., Pyun, D., & Kee, Y. (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, 692–700. doi:10.1016/j.psychsport.2013.04.009

MacCallum, R., Widaman, K., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods*, 4, 84–99. doi:10.1037/1082-989X.4.1.84

Mageau, G., 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. doi:10.1037/a0039325

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

McLean, K., Mallet, C., & Newcombe, P. (2012). Assessing coach motivation: The development of the Coach Motivation Questionnaire (CMQ). *Journal of Sport & Exercise Psychology*, 34, 184–207. doi:10.1123/jsep.34.2.184

Meade, A. W. (2005, April). *Sample size and tests of measurement invariance*. Los Angeles, CA: Society for Industrial and Organizational Psychology. Retrieved from http://www4.ncsu.edu/~awmeade/Links/Papers/N&CFA(SIOP05).pdf

Moreau, E., & Mageau, G. (2013). Consequences and correlates of autonomy support in various life domains. *Psychologie Française*, 58, 195–227. doi:10.1016/j.psfr.2013.03.003

Muthen, L., & Muthen, B. (2010). *Mplus user's guide: Statistical analysis with latent variables* (6th ed.). Los Angeles, CA: Authors.

Pelletier, L., Rocchi, M., Vallerand, R., Deci, E., & Ryan, R. (2013). Validation of the revised sport motivation scale (SMS-II). *Psychology of Sport and Exercise*, 14, 329–341. doi:10.1016/j.psychsport.2012.12.002

Pelletier, L., Séguin-Lévesque, C., & Legault, L. (2002). Pressure from above and pressure from below as determinants of teachers' motivation and teaching behaviors. *Journal of Educational Psychology*, 94, 186. doi:10.1037/0022-0663.94.1.186

Pomerantz, E., Cheung, C., & Qin, L. (2012). Relatedness between children and parents: Implications for motivation. In R. Ryan (Ed.), *The Oxford handbook of motivation* (pp. 335–349). New York, NY: Oxford University Press.

Reynolds, W. (1982). Development of reliable and valid short forms of the Marlowe-Crowne social desirability scale. *Journal of Clinical Psychology*, 38, 119–125. doi:10.1002/1097-4679

Rocchi, M., Pelletier, L., Cheung, S., Baxter, D., & Beaudry, S. (2017). Assessing need-supportive and need-thwarting interpersonal behaviours: The Interpersonal Behaviours Questionnaire (IBQ). *Personality and Individual Differences*, 104, 423–433. doi:10.1016/j.paid.2016.08.034

Rocchi, M., Pelletier, L., & Couture, A. (2013). Determinants of coach motivation and autonomy supportive coaching behaviours. *Psychology of Sport and Exercise*, 14, 852–859. doi:10.1016/j.psychsport.2013.07.002

Sheldon, K. (2011). Integrating behavioural-motive and experiential-requirement perspectives on psychological needs: A two process model. *Psychological Review*, 118, 552–569. doi:10.1037/a0024758

Sheldon, K., & Filak, V. (2008). Manipulating autonomy, competence, and relatedness support in a game-learning context: New evidence that all three needs matter. *British Journal of Social Psychology*, 47, 257–283. doi:10.1348/014466607χ238797

Smith, N., Tessier, D., Tzioumakis, Y., Fabra, P., Quested, E., Appleton, P., . . . Duda, J. L. (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. doi:10.1016/j.psychsport.2015.11.001

Smith, N., Tessier, D., Tzioumakis, Y., Quested, E., Appleton, P., Sarrazin, P., . . . Duda, J. L. (2015). Development and validation of the multidimensional motivational climate observation system. *Journal of Sport & Exercise Psychology*, 37, 4–22. doi:10.1123/jsep.2014-0059

Stebbings, J., Taylor, M., Spray, C., & 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. Retrieved from http://journals.humankinetics.com/jsep

Taylor, I., Ntoumanis, N., & Standage, M. (2008). A self-determination theory approach to understanding the antecedents of teachers' motivational strategies in physical education. *Journal of Sport and Exercise Psychology*, 30, 75–94. doi:10.1123/jsep.30.1.75

Vallerand, R. (2001). A hierarchical model of intrinsic and extrinsic motivation in sport and exercise. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 263–319). Champaign, IL: Human Kinetics.

Williams, N., Whipp, P., Jackson, B., & Dimmock, J. (2013). Relatedness support and the retention of young female golfers. *Journal of Applied Sport Psychology*, 25, 412–430. doi:10.1080/10413200.2012.749311