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ARTICLE

Teacher–Student relationship quality as a barometer of teaching and learning effectiveness: Conceptualization and measurement

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Abstract

Background: The Teacher–Student relationship (TSR) is instrumental for young children and adolescents' socio-emotional development and wellbeing as well as academic engagement and progress.

Aims: The primary aim of this study was to test the psychometric properties, including reliability and factorial, convergent, and predictive validity, of the Teacher–Student Relationship Quality Questionnaire (TSRQ-Q) with two samples of students.

Sample(s): Participants were 294 students from secondary schools in the East Midlands and the East of England. Participants were separated into two samples; those who completed the TSRQ-Q with their physical education teacher in mind ($n = 150$ students) and those who completed it with their mathematics teacher in mind ($n = 144$ students).

Method: A multi-section questionnaire comprised of the TSRQ-Q and other validated measures was completed on one occasion by students in both samples to assess their perceptions of the quality of the TSR, positive and negative affect, intrinsic motivation, physical self-concept, enjoyment, and perceived competence.

Results: In both samples, the TSRQ-Q demonstrated good internal consistency, factorial, convergent, and predictive validity. The quality of the TSR had both direct and indirect effects through positive affect on student outcomes in mathematics and physical education.

Conclusions: The TSRQ-Q is a valid measure for assessing students' perceptions of the quality of the relationship with their teacher. The conceptual and practical significance

of this unique relationship was reflected by its dual pathway effect on a range of student outcomes and via influencing students' positive affect in the classroom.

KEYWORDS
mathematics, physical education, relationship quality, Teacher–Student, TSRQ-Q, youth

Highlights

- We propose a new conceptualization of Teacher–Student relationship quality based on interdependence theory
- Relationship quality can be conceptualized through the constructs of closeness, commitment, and complementarity.
- We developed a new measure, the Teacher–Student Relationship Quality Questionnaire (TSRQ-Q) that was psychometrically sound.
- Student's cognitions, feelings, and behaviours play an equal role in how mathematics and PE students' experience the relationship.
- There was a dual pathway influence of relationship quality on student outcomes.

BACKGROUND

Relationships are central to human experience. The notion of connection with or relatedness to others has been viewed as a psychological need that leads to optimal functioning (Baumeister & Leary, 1995) while high quality, positive relationships are a vital pillar to a flourishing individual and an important contributing factor to wellbeing (Seligman, 2012). Young people spend a considerable amount of time at School (from approximately 175 to 220 days averaging 5–8.5 h every day) and during this time, they interact with their peers and school staff. Students' interactions and subsequent relationships with teachers are paramount for their emotional regulation, attention, problem solving, and subsequently their academic achievement (Pianta, 2006). For example, there is a voluminous body of evidence to indicate that Teacher–Student relationships (TSRs) associate with a range of academic-related outcomes including classroom behaviour such as attendance, engagement, motivation, mastery, and performance (Anozie & Anozie, 2017; Cornelius-White, 2007; Pianta, 1999; Roorda et al., 2011). Moreover, the results of many studies highlight that the teacher-student relationship is an important predictor of emotional wellbeing and notably young people often view these relationships as even more important than family support (Oberle et al., 2014; Troop-Gordon & Kopp, 2011).

While much of the empirical evidence captures the teacher's perspective, more recently, efforts have been made to also capture the student's perspective (Gehlbach et al., 2012; Koomen & Jellesma, 2015; Maulana et al., 2014), as well as the impact this relationship has on student engagement over time (see review by Quin, 2017). Specifically, Obsuth et al. (2017) found that students and teachers who reported better relationships with each other presented fewer problem behaviours up to 4 years later. It has also been found that students who have poor relationships with teachers compared to students who have good relationships with teachers, manifest more difficulties in emotional and behavioural adjustment and higher levels of aggressive behaviour (Milatz et al., 2014). While evidence has shown positive associations between TSRs and self-concept in students, such that higher quality TSRs were related to posi-

tive self-concept (Demaray et al., 2009; Leflot et al., 2010; Verschueren et al., 2012), other evidence has demonstrated that adverse aspects of TSRs such as interpersonal conflict, an indication of poor-quality relationships, were negatively associated with students' self-concept (McFarland et al., 2016).

A better understanding of the content and functions of Teacher–Student relationships through improved measurement is an important step towards producing a network of knowledge that translates to clearer practical guidelines about how to build healthy and effective Teacher–Student relationships as a way of improving adolescent achievement and wellbeing. Thus, the aims of the present study were to briefly review the main conceptualizations and measures of TSR quality, propose an alternative conceptualization and accompanied psychometric tool that is extensively tested within another achievement context, namely sport, and finally test the psychometric properties of reliability as well as factorial and concurrent predictive validity of the items of the proposed measure focusing on the student perspective in two subject areas: physical education (PE) and mathematics.

Conceptualization and measurement of the Teacher–Student relationship

There have been various conceptualizations and measurements put forward over the past 30 years or so that attempt to capture the intricacies of the quality of Teacher–Student relationships. For example, *caring* as a conceptual construct encompasses teachers' relational style whereby teachers engage students in ways that allow them to get to know and understand them and show their compassion (Noddings, 1992). Caring was operationalized via the Teacher Social Support and Teacher Academic Support subscales of the Classroom Life Measure (Johnson et al., 1985). Wentzel's (Wentzel, 1998; Wentzel et al., 2012) research is the most notable in this area and has found that students with nurturing teachers have increased academic interest and greater adherence to classroom norms and rules.

Another approach to measuring the TSR is via the construct of *relatedness*. As described by self-determination theorists, relatedness is one of the three basic psychological needs which are thought to be central for optimal human functioning (Deci & Ryan, 1985). Accordingly, relatedness is a need to feel securely connected, socially capable, and worthy of the affection of others. Several adapted measures have been employed to measure the construct of relatedness within the context of Teacher–Student relationships from a teacher's (see Lynch & Cicchetti, 1997; Ryan et al., 1994) and a student's viewpoint (see Marchand & Skinner, 2007). To our knowledge, the Basic Needs Satisfaction in Relationships Scale (La Guardia et al., 2000) has been utilized in two-person relationships but has yet to be employed in the TSR. Examining this research would suggest that relatedness lacks definitional clarity and measurement consistency making it very difficult to draw comparisons (Barch, 2015).

The Student–Teacher Relationship Scale (STRS, Pianta, 1994, 2001; see also Koomen et al., 2012; Koomen & Jellesma, 2015) is the most often used assessment tool that has been specifically developed to examine teachers' perceptions of relationships with their students through three relational dimensions: *closeness* (interactions and communications are warm and open), *conflict* (the degree of friction and discordant between the teacher and student), and *dependency* (the degree to which the student is overly dependent on the teacher). Its conceptual basis is derived from parent–child attachments. Bowlby's (1973) attachment theory describes these attachments as either warm or secure, angry or dependent, and anxious or insecure. While the STRS is being used widely and many may view it as the gold standard (Greece: Gregoriadis & Tsigilis, 2008; Netherlands: Koomen et al., 2012; German: Milatz et al., 2014), its psychometric properties have not always been consistent. Moreover, when student's perceptions of the relationship are measured using such scales as the Child-Report Student–Teacher Relationship Scale (Child-STRS; Koepke & Harkins, 2008), the associations between teacher and student perceptions of the relationship show only small or moderate associations (Hughes, 2011; Spilt et al., 2010) suggesting little correspondence.

Last but by no means least, Wubbels and colleagues' (Wubbels & Brekelmans, 2005; Wubbels & Levy, 1991) research work was grounded on the premise that teaching is an interpersonal situation. Their focus has been on understanding teachers' interpersonal behaviour through the Model for Interpersonal Teacher Behaviour (MITB) and its dimensions include: (a) Influence (Dominance-Submission) and (b)

Proximity (Opposition-Cooperation). In essence, these dimensions form a circumplex model whereby teachers' behaviours are mapped against them through either the teachers' own assessment or through the students' assessments. The Questionnaire on Teacher Interaction (QTI) was developed to facilitate these assessments and "map teacher-pupil relationships" (Wubbels & Brekelmans, 2005, p. 10). While this research has produced useful information for teachers especially as this pertains to professional development (Wubbels & Brekelmans, 2005), the emphasis placed on what teachers do is limiting. Much of the research conducted thus far at both conceptual and operational levels within education is unidirectional as it often focuses on teacher's behaviours, limiting the scope of the dyadic (two-person) relationships (see Hinde, 1997).

The significance of the Teacher–Student relationship is central not only within the context of school but also outside it (Claessens et al., 2017). The effectiveness of teachers and the success of students (as students and human beings) can hinge on the *quality* of Teacher–Student relationship and research findings reviewed earlier suggest this. With that in mind, our study aimed to examine the *quality* of the Teacher–Student relationship by focussing on its dyadic and multi-dimensional nature through the employment of a conceptual framework that has been utilized extensively in an achievement-orientated environment and which draws many parallels with the school environment, namely sport. This framework was developed to examine the Coach–Athlete relationship quality and is grounded in interdependence theory (Jowett, 2007). Interdependence theory proposes that relationships are defined through interpersonal interdependence which is "the process by which interacting people influence one another's experience" (Van Lange & Balliet, 2015, p. 65). Accordingly, the dyadic relationship is defined as an interpersonal situation within which both persons' interpersonal *feelings* (*closeness*), *thoughts* (*commitment*), and *behaviour*s (*complementarity*) are mutually and causally interdependent (Jowett & Felton, 2014). Closeness reflects the affective ties the members of the relationship experience and include mutual trust, respect, appreciation, and liking (e.g., Teacher: I respect my student; Student: I respect my teacher). Commitment describes the intentions of the members of the relationship to maintain their proximity over time despite highs and lows they may experience (e.g., Teacher: I am committed to my student; Student: I am committed to my teacher). Complementarity captures the level to which relationship members are cooperative and collaborative with one another (e.g., Teacher: I am responsive to my student; Student: I am responsive to my teacher). This framework is known as the 3Cs model of relationship quality (Jowett, 2017).

The Coach–Athlete Relationship Questionnaire (CART-Q) was developed to assess the quality of the relationship as defined by the 3Cs (Jowett, 2009; Jowett & Ntoumanis, 2004). Both coach and athlete versions of the CART-Q have been extensively validated, reporting sound psychometric properties (Balduck et al., 2011; Jowett et al., 2017; Vieira et al., 2015; Yang & Jowett, 2012). Research employing the CART-Q has explored the correlates of the Coach–Athlete relationship and has found that better quality relationships associate with high levels of team cohesion and efficacy (Hampson & Jowett, 2014; Jowett et al., 2017), physical self-concept (Jowett, 2008), motivation (Adie & Jowett, 2010), satisfaction (Jowett & Nezlek, 2012) and wellbeing (Felton & Jowett, 2017), as well as less conflict (Wachsmuth et al., 2018), fear of failure (Sagar & Jowett, 2015), and burnout (Davis et al., 2019).

The present study

The purpose of this study was to provide an alternative conceptualization of Teacher–Student relationship quality and to validate a corresponding questionnaire to the conceptualization offered. Like the Coach–Athlete, the Teacher–Student relationship is a task-focused one and while it is formed to enhance learning its benefits are far reaching (cf. Gosai et al., 2021). Wubbels and Brekelmans (2005) have explained that teaching (and learning) is an interpersonal process. Subsequently, the joint contributions a teacher and each one student make, the ongoing reciprocal giving and receiving, naturally place the quality of their dyadic relationship at the heart of effective teaching and learning. The quality of the relationship as defined by the 3Cs capture a teacher and a student's mutual and causal interdependence (cf. Jowett & Poczwardowski, 2007). The emphasis is on the combined interrelating between a teacher and a

given student. For example, a teacher's 3Cs (e.g., I appreciate my student) are likely to influence student's 3Cs (e.g., I appreciate my teacher) and vice versa. As such this conceptualization is distinct from other conceptualizations put forward in the educational literature (Koomen et al., 2012; Pianta, 1999; Wentzel et al., 2012) in that the 3Cs model would place both the teacher and the student, as well as their unit relationship, at the heart of teaching and learning.

This is the first study of a series of studies that aimed to scrutinize a modified version of the CART-Q which we named the Teacher–Student Relationship Quality Questionnaire (TSRQ-Q) by employing two samples of students assessing the relationship quality with either their PE teacher or their mathematics teacher. The analyses conducted investigated the psychometric properties of the slightly modified items (internal consistency) contained within the TSRQ-Q and the proposed nature and content of the relationship (factorial validity). Furthermore, to establish the concurrent predictive validity of the TSRQ-Q, we examined the links between relationship quality as captured by the TSRQ-Q with important student outcomes including affect, motivation, competence, enjoyment, and self-concept. It was hypothesized that Teacher–Student relationship quality (TSRQ) as perceived by the students would be positively associated with positive affect, motivation and physical self-concept in the PE sample, and positive affect, enjoyment and competence in the mathematics sample. In contrast, TSRQ was hypothesized to be negatively associated with negative affect in both samples. For example, there is evidence to suggest that the higher the quality of TSRs the more positive students' self-concept (Verschueren et al., 2012) and the poorer the quality of TSRs or the higher the interpersonal conflict the more negative students' self-concept (McFarland et al., 2016). Due to recent evidence demonstrating that higher TSR quality is associated with greater positive emotions and reduced negative emotions over time (Goetz et al., 2021), the current study explored whether affect mediated the associations between TSRs and motivation, competence, and enjoyment in both samples.

METHOD

Participants and procedures

A total of 294 students from secondary schools in the East Midlands and the East of England in the UK participated in the study. The participants consisted of two samples (PE students and mathematics students) and were in Years 7, 8 or 9. The PE sample was comprised of 150 students (67 males and 83 females) with a mean age of 13.03 ± .80 years. The mathematics sample was comprised of 144 students (74 males and 70 females) with a mean age of 12.60 ± .90 years. Despite ethnicity not being recorded, most students were white.

In both samples, all procedures complied with the ethical guidelines of the British Psychological Society and were approved by an institutional ethical advisory committee. Consent for the study was sought from head teachers, heads of department, and class teachers. Parents were informed that they could opt their child out of the study if they wished (<1% of parents chose this option). Participants provided informed assent after being provided with a written and verbal overview of the study purpose and its procedures. All procedures took place before normal curriculum physical education and mathematics lessons. Participants were assured that all information collected would be anonymous and would remain confidential and that they had the right to withdraw at any time. A trained research assistant conducted the data collection procedures at each school. Each participant responded to an anonymous multi-section questionnaire which took approximately 15 min to complete. An explanation of how to complete each section of the questionnaire was given and any questions during data collection were answered.

Measures

Students in both samples completed the following measures:

Demographic information

The information collected included students' age, sex, and name of class teacher.

Teacher–Student relationship

The Teacher–Student Relationship Quality Questionnaire (TSRQ-Q) was developed from the Coach–Athlete Relationship Questionnaire (CART-Q; Jowett & Ntoumanis, 2004). Students responded to 11 items on a 7-point Likert scale that ranged from strongly disagree (1) to strongly agree (7), and measured Commitment (3 items: e.g., I can improve my PE skills with my PE teacher), Closeness (3 items: e.g., I trust my PE teacher) and Complementarity (4 items: e.g., When I am taught by my PE teacher, I am ready to do my best).

Students in the PE sample completed the following additional measures:

Intrinsic motivation

The five items of the intrinsic motivation subscale of the Perceived Locus of Causality Questionnaire (PLOCQ; Goudas et al., 1994) were used to assess participants' intrinsic motivation. Responses were reported on a 7-point Likert scale that ranged from strongly disagree (1) to strongly agree (7). Students responded to the stem 'I take part in PE…'. A sample item is 'because PE is fun'.

Physical self-concept

Students' physical self-concept in PE was measured using four items from the Physical Self-Description Questionnaire (PSDQ; Marsh et al., 1994). Items were responded to on a 6-point Likert scale that ranged from false (1) to true (6), an example is 'Physically, I feel good about myself'.

Positive and negative affect

This was measured using the scale validated for use with children by Ebbeck and Weiss (1998). It contained nine indicators of Positive (e.g., Proud, Satisfied) and Negative Affect (e.g., Nervous, Unhappy) measured on a 5-point Likert scale ranging from very slightly or not at all (1) to extremely (5). Students responded to the stem 'When participating in PE, to what extent do you feel…'.

Students in the mathematics sample completed the following additional measures:

Enjoyment/interest

Students' enjoyment and interest in mathematics was assessed using four items from the Self-Description Questionnaire (Marsh et al., 1984). The items were: 'I look forward to mathematics', 'I am interested in mathematics', 'I like mathematics', and 'I enjoy doing work in mathematics'. They were measured on a 5-point Likert scale ranging from false (1) to true (5).

Perceived competence

Students' perceived competence in mathematics was assessed using four items from the Self-Description Questionnaire (Marsh et al., 1984). The items were: 'Work in mathematics is easy for me', 'I get good marks in mathematics', 'I am good at mathematics', and 'I learn things quickly in mathematics'. They were measured on a 5-point Likert scale ranging from false (1) to true (5).

Positive and negative affect

This was measured using the 20-item Positive and Negative Affect Schedule (PANAS) scale (Watson et al., 1988). Ten items assessed positive affect (e.g., Proud, Interested) and ten items assessed negative affect (e.g., Nervous, Upset). Items were measured on a 5-point Likert scale ranging from very slightly or not at all (1) to extremely (5). Students responded to the stem 'How do you feel today…'.

Data analysis

Factorial validity

The extent and pattern of missing data were assessed, less than 1% of data was missing so with the small sample sizes in the current study it was decided to replace the missing data with Expectation–Maximization imputation in Equations 6.1 (Bentler & Wu, 2008). Following the procedures outlined in Jowett and Ntoumanis (2004), a series of nested models testing alternative structures were assessed to determine the factorial validity of the TSRQ-Q. In both samples the normalized estimate of Mardia's coefficient of multivariate kurtosis was high (mathematics = 15.03; PE = 18.24) so all analyses were conducted using the robust maximum likelihood procedure. Model 1 (M1) tested a one factor model in which the sub-scales of closeness, commitment and complementarity loaded on to a single TSRQ factor. Model 2 (M2) tested a correlated two factor model in which the sub-scales of commitment and closeness loaded on to a single factor representing the feeling aspects of TSRs and the complementarity sub-scale loaded onto its own factor representing the behavioural aspects of TSRs. The final model (M3) tested a correlated three factor model in which all sub-scales loaded onto their own separate factors.

Model fit was assessed using both absolute (chi-square, Akaike's information criterion [AIC], root mean-square error of approximation [RMSEA], standardized root mean square residual [SRMR]) and relative fit indices (Bentler-Bonnett non-normed fit index [NNFI], comparative fit index [CFI]). Following the recommendations of Hu and Bentler (1999), values of <.6 and <.8 were taken as indicating good model fit for the RMSEA and SRMR, respectively. Values of >.90 or >.95 for the NNFI and CFI were taken as indicating acceptable and excellent fit, respectively. In addition, to determine which of the models showed a better fit to the data, the nested models were compared using Satorra-Bentler chi-square difference tests (Satorra & Bentler, 2001) using the 'sbdiff' software (Crawford & Henry, 2003).

Descriptive statistics

Descriptive statistics including skewness and kurtosis scores were calculated for each item in the TSRQ-Q in both samples. Internal reliability coefficients were computed to assess the reliability of the scale and its sub-scales.

Convergent validity

Following guidance from previous research (Sebire et al., 2008), mis-specified items were screened for by examining the standardized loadings for any <.40 and any standardized residuals >±2.00. In addition, we examined the average variance extracted values (AVE). A value of greater than .50 is satisfactory since it indicates that at least 50% of the variance in the measure is due to the factor that it is hypothesized to load on (Fornell & Larcker, 1981) and indicates that the validity of both the construct and the hypothesized factor is high (Bagozzi, 1991; Dillon & Goldstein, 1984). Finally, composite reliability scores, Raykov's rho (Raykov, 1997) were calculated with scores greater than .7 indicating convergent validity.

Predictive validity

Pearson's Product–Moment Correlation Coefficients and Path Analysis tested the associations between relationship quality, positive and negative affect, and the outcomes of enjoyment and perceived competence in mathematics, and of intrinsic motivation and physical self-concept in PE. The PROCESS procedure for SPSS, Version 3.1, Model 4, with 10,000 bootstrap resamples and 95% confidence interval (Hayes, 2018) was used to examine our hypothesis that positive and negative affect mediated the effect of relationship quality on the outcomes. The direct, indirect, and total effects were calculated to determine the effect of relationship quality on the outcomes studied.

RESULTS

Factorial validity

The Confirmatory Factor Analysis (CFA) results for both samples are presented in Table 1. All models exhibited a good fit to the data, the CFI and NNFI values exceeded .95, and the SRMR values were lower than .08. However, the RMSEA values were relatively high, in the mathematics sample the confidence intervals did not include the .05 value, but the PE sample contained this value at the lower end. However, it should be noted that in relatively small sample sizes, as in the current study, the RMSEA tends to over-reject true population models and so is a less preferable index for model fit (Hu & Bentler, 1999). Model comparisons using the S-B χ^2 difference test suggested that M1, the one factor model, was the preferred model for both samples. In the mathematics sample, the lower AIC value of M1 compared to M2 and M3 suggested that M1 was more likely to be replicated in an independent sample than models M2 and M3. In the PE sample, M3 was preferred over M2 but M1 was preferred over both M2 and M3 in the direct comparison. M1 was therefore chosen for all subsequent analyses on both samples.

Descriptive statistics

Tables 2 and 3 display the means, standard deviations, skewness and kurtosis scores for M1 for the mathematics and PE samples, respectively. For both samples, the mean scores for the items were relatively high, scoring greater than 4.11 (mathematics) and 4.59 (PE) on a 7-point scale. The skewness and kurtosis scores indicated some non-normality in the data distribution, skewness scores ranged from −.93 to −.12 (mathematics) and −1.27 to −.12 (PE) and kurtosis scores from −1.31 to −.26 (mathematics) and −.44 to 1.53 (PE). The one-factor 11 item scale exhibited good internal consistency (mathematics: $a = .96$; PE: $a = .94$).

TABLE 1 Confirmatory factor analysis results of the three models: mathematics and PE samples.

	Model	*df*	Satorra-Bentler χ^2	Scaled χ^2/df	Model AIC	NNFI	CFI	SRMR	RMSEA	RMSEA 90% CI	Model comparisons		
											Models	Δ Scaled χ^2	Δ *df*
Mathematics sample													
M1	One Factor	44	96.73**	2.20	8.73	.951	.961	.045	.092	.066–.116	M1 vs. M2	2.01	1
M2	Two Factor	43	94.82**	2.21	8.82	.951	.962	.045	.092	.066–.116	M1 vs. M3	3.96	3
M3	Three Factor	41	92.89**	2.26	10.89	.948	.962	.045	.094	.068–.119	M2 vs. M3	1.32	2
PE sample													
M1	One Factor	44	82.11**	1.87	−5.89	.942	.953	.047	.076	.050–.101	M1 vs. M2	.99	1
M2	Two Factor	43	81.84**	1.90	−4.16	.939	.953	.047	.078	.051–.103	M1 vs. M3	6.44	3
M3	Three Factor	41	75.79**	1.85	−8.54	.943	.957	.045	.075	.048–.101	M2 vs. M3	9.38*	2

Note: *$p < .05$; **$p < .001$.

TABLE 2 Item means, standard deviations, factor loadings, residuals, and skewness and kurtosis values following confirmatory factor analysis of a one-factor model: mathematics sample.

Subscale and items	*M*	*SD*	Loading	Residual	Skewness	Kurtosis
What do you think about your maths teacher?						
Commitment						
I am close to my maths teacher	4.11	2.07	.793	.609	−.12	−1.27
I am committed to my maths teacher	4.95	1.66	.746	.666	−.49	−.57
I can improve my maths with my maths teacher	4.98	1.83	.868	.497	−.70	−.54
Closeness						
I like my maths teacher	4.16	2.12	.818	.575	−.15	−1.31
I trust my maths teacher	4.75	2.05	.860	.510	−.50	−1.01
I respect my maths teacher	5.29	1.84	.795	.606	−.93	−.26
I appreciate my maths teacher's hard work in order to improve my maths	5.21	1.74	.812	.583	−.69	−.57
Complementarity						
When I am taught by my maths teacher, I am relaxed and comfortable	4.35	1.95	.860	.511	−.18	−1.15
When I am taught by my maths teacher, I respond to his/her efforts.	4.88	1.66	.819	.573	−.54	−.49
When I am taught by my maths teacher, I am ready to do my best	4.82	1.84	.828	.561	−.57	−.67
When I am taught by my maths teacher, I have a friendly character	4.72	1.92	.843	.539	−.42	−.95

TABLE 3 Item means, standard deviations, factor loadings, residuals, and skewness and kurtosis values following confirmatory factor analysis of a one-factor model: PE sample.

Subscale and items	*M*	SD	Loading	Residual	Skewness	Kurtosis
What do you think about your PE teacher?						
Commitment						
I am close to my PE teacher	4.59	1.21	.644	.765	−.12	−.40
I am committed to my PE teacher	4.94	1.37	.699	.716	−.49	.09
I can improve my PE skills with my PE teacher	5.66	1.40	.737	.676	−1.27	1.53
Closeness						
I like my PE teacher	5.69	1.36	.843	.539	−1.13	1.03
I trust my PE teacher	5.75	1.19	.769	.639	−.85	.09
I respect my PE teacher	5.96	1.13	.836	.549	−.91	−.10
I appreciate my PE teacher's hard work in order to improve my PE skills	5.88	1.11	.772	.635	−.75	−.33
Complementarity						
When I am taught by my PE teacher, I am relaxed and comfortable	5.47	1.23	.838	.545	−.53	−.44
When I am taught by my PE teacher, I respond to his/her efforts.	5.65	1.16	.816	.579	−.86	.55
When I am taught by my PE teacher, I am ready to do my best	5.77	1.23	.781	.624	−1.01	.43
When I am taught by my PE teacher, I have a friendly character	5.79	1.22	.738	.675	−.89	.10

Convergent validity of the one factor model

Convergent validity was analysed via the standardized factor loadings of M1 which are presented in Tables 1 and 2 for the mathematics and PE samples, respectively. For both samples, all items had substantial significant loadings to the one factor model of TSRQ. This one factor model consisted of items that measured closeness, commitment, and complementarity. For the mathematics sample the mean loading was .82 and for the PE sample .77. The convergent validity in both samples was further supported by the average variance extracted values (mathematics = .68; PE = .60) as they exceeded .50 (Fornell & Larcker, 1981) and the composite reliability values (mathematics = .93; PE = .91) which exceeded the cut-off point of .70 for the 11-item one factor solution.

Predictive validity of the one factor model

Table 4 displays the descriptive statistics and correlations among the variables used in the path analyses in the mathematics and PE samples, respectively. For both samples, all means were above the scale mid-point except negative affect. For the mathematics sample relationship quality was positively associated with positive affect, perceived competence, and enjoyment, and negatively associated with negative affect (*p*s < .01). For the PE sample, relationship quality was positively associated with positive affect, physical self-concept, and intrinsic motivation and negatively associated with negative affect (*p*s < .01).

Our mediation analyses provided further support for the predictive validity of TSRQ by exploring the relationship between TSRQ, students' outcomes, and positive and negative affect. As shown in Figures 1 and 2 respectively, PE and mathematics students who reported higher perceptions of the quality of their relationship with their teacher were more likely to report higher levels of positive affect and lower levels of negative affect.

In the PE sample (Figure 1), there was evidence of a total effect of relationship quality on students' intrinsic motivation and physical self-concept which suggests that for every 1 unit increase in relationship quality, intrinsic motivation in PE is increased by .869 (95% CI [.681–1.056]) and physical self-concept by .486 (95% CI [.292–.678]). In addition, relationship quality in PE indirectly influenced intrinsic motivation and physical self-concept through its effect on PE students' positive or negative affect. A bias-corrected bootstrap confidence interval for the indirect effect based on 10,000 bootstrap samples was entirely above zero for positive affect with both intrinsic motivation ($a_1b_1 = .560$, 95% CI [.399–.746]) and physical self-concept ($a_1b_3 = .376$, 95% CI [.211–.571]) and for negative affect with physical self-concept

TABLE 4 Descriptive statistics and bivariate correlations among variables in the mathematics and PE samples.

	Variable	Range	Mean	*SD*	1	2	3	4
Mathematics								
1	Teacher–Student relationship quality	1–7	4.74	1.59	–			
2	Positive affect	1–5	2.84	1.04	.68*	–		
3	Negative affect	1–5	1.78	.77	−.61*	−.52*	–	
4	Perceived competence	1–5	2.99	1.15	.67*	.62*	−.37*	–
5	Enjoyment	1–5	3.35	.82	.63*	.58*	−.46*	.68*
PE								
1	Teacher–Student relationship quality	1–7	5.56	.98	–			
2	Positive affect	1–5	3.67	.84	.65*	–		
3	Negative affect	1–5	1.46	.51	−.37*	−.31*	–	
4	Physical self-concept	1–6	4.32	1.28	.39*	.53*	−.37*	–
5	Intrinsic motivation	1–7	5.26	1.44	.61*	.74*	−.29*	.57*

Note: *$p < .01$.

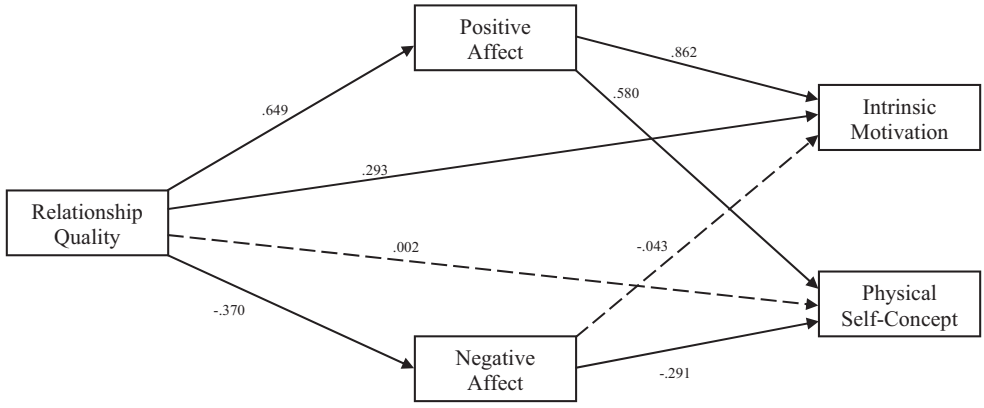

FIGURE 1 Path analysis assessing predictive validity of Teacher–Student relationship quality to, positive and negative affect, intrinsic motivation and physical self-concept in PE. *Note*: Complete lines are significant paths ($p < .01$); Dotted lines are non-significant paths ($p > .05$).

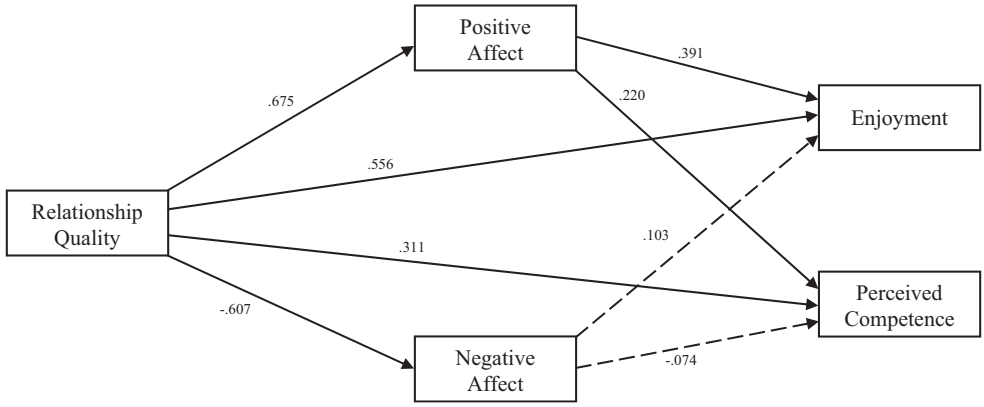

FIGURE 2 Path analysis assessing predictive validity of Teacher–Student relationship quality to, positive and negative affect, intrinsic motivation and physical self-concept in Mathematics. *Note*: Complete lines are significant paths ($p < .01$); Dotted lines are non-significant paths ($p > .05$).

($a_2b_4 = .108$, [.024–.208]), but not intrinsic motivation ($a_2b_2 = .016$, [−.068–.093]). The total indirect effect of relationship quality through positive and negative affect, suggests that for every 1 unit increase in relationship quality intrinsic motivation is increased by .575 (95% CI [.396–.760]), and physical self-concept by .485 (95% CI [.294–.678]). There was also evidence that relationship quality influenced students' intrinsic motivation ($c'_1 = .293$, 95% CI [.086–.501]), but not their physical self-concept ($c'_2 = .002$, 95% CI [−.232–.235]) in PE independently of its effects on positive and negative affect.

In the mathematics sample (Figure 2), there was evidence of a total effect of relationship quality on students' enjoyment and perceived competence and suggests that for every 1 unit increase in relationship quality, enjoyment in mathematics is increased by .758 (95% CI [.614–.901]) and perceived competence by .504 (95% CI [.399–.610]). In addition, relationship quality in mathematics indirectly influenced enjoyment and perceived competence through its effect on students' positive or negative affect. A bias-corrected bootstrap confidence interval for the indirect effect based on 10,000 bootstrap samples was entirely above zero for positive affect with both enjoyment ($a_1b_1 = .264$, 95% CI [.127–.443]) and perceived competence ($a_1b_3 = .149$, 95% CI [.461–.278]), but not for negative affect with both enjoyment ($a_2b_2 = -.063$, [−.180–.039]) and perceived competence ($a_2b_4 = .045$ [−.026 to .132]). The total indirect effect of relationship quality on enjoyment and perceived competence through positive and negative affect, suggests

that for every 1 unit increase in relationship quality enjoyment is increased by .201 (95% CI [.046–.396]) and perceived competence by .193 (95% CI [.086–.335]). There was also evidence that relationship quality influenced students' enjoyment ($c'_1 = .556$, 95% CI [.353–.760]) and perceived competence ($c'_2 = .311$, 95% CI [.159–.463]) in mathematics independently of its effects on positive affect. Predictive validity was therefore supported in both samples.

DISCUSSION

The aims of the present study were to (a) put forward a conceptualization of the Teacher–Student relationship that has been extensively utilized in sport to study the Coach–Athlete relationship and (b) examine the psychometric properties of the Teacher–Student Relationship Quality Questionnaire (TSRQ-Q). The TSRQ was administered to two samples of students who evaluated the quality of the relationship with a PE or a mathematics teacher. Overall, the validity, both factorial and convergent, of a one-factor model for assessing the TSR through the TSRQ-Q was supported. Moreover, the predictive validity of the TSRQ factor demonstrated support in relation to both the study hypotheses and previous research. The analyses for the validity conducted confirm the efficacy of measuring TSRs in relation to the items contained within the dimensions of closeness, commitment and complementarity (3Cs). While the findings suggest that all three models tested are factorially valid, comparisons among the models indicated that the best model was the one-factor model in which the relationship dimensions of the 3Cs load onto a single relationship quality factor. This single factor of relationship quality captures: *the emotional relational properties* for closeness via students' perceptions of respect, trust, appreciation, and liking for the teacher; *the cognitive relational properties* of commitment via students' willingness and dedication to improve and develop capacities and skills with their teacher; and *the behaviour relational properties* of complementarity via students' realization that they can be responsive, ready, receptive and friendly in the presence of their teacher. This suggests that when considering TSRQ, a student's interpersonal cognitions, feelings, and behaviours (via the 3Cs) play an equal role rather than a differentiated role in how the student experiences the quality of the TSR.

This finding is different from research conducted within the Coach–Athlete relationship in sport where the 3Cs have been found to either be subsumed under a higher order factor of relationship quality or form a three-factor model where the 3Cs are separate yet correlated factors (Balduck et al., 2011; Jowett & Ntoumanis, 2004; Yang & Jowett, 2012). Nonetheless, it is worth pointing out that the validation studies in sport have been conducted with athletes over the age of 16-year-old. It is, therefore, plausible that cognitive maturity and social development (including interpersonal communication skills) has a role to play in the manner young people make sense of their relationships with others (i.e., relationship schema; see Baldwin, 1992; Fiske, 1992; Horowitz, 1989). Over time, and as people grow and develop cognitively and socio-emotionally, they may be able to understand, describe, organize, structure, and portray TSRs in much more sophisticated, complex or multi-dimensional ways. This conjecture warrants investigation because in both samples in the present study, the fit indices for the three-factor conceptualization of TSRQ were good and the one-factor model was selected simply based on parsimony.

In educational psychology, there is proliferation of conceptual and operational definitions as well as corresponding measurement tools (Koomen & Jellesma, 2015; Mantzicopoulos & Neuharth-Pritchett, 2003; Pianta, 1994; Wubbels & Levy, 1991) suggesting that the concept of TSRs needs clarification, consolidation and consensus. In this study, we employed a psychometric tool via the TSRQ to measure the *quality* of the dyadic Teacher–Student relationship that had never been used before in school settings. Guided by extensive research conducted in sport settings examining the Coach–Athlete relationship (see Jowett, 2017; Jowett & Poczwardowski, 2007) and other such relationships as caddie-golfer (Jowett & Zhong, 2016), peer/athlete-athlete (Balduck & Jowett, 2011) and parent-athlete (Jowett & Cramer, 2010) relationships, the TSRQ was grounded in interdependence theory and operationalized through the 3Cs model of relationship quality. Based on the 3Cs model, the dyadic Teacher–Student relationship was

defined as an interpersonal situation within which a student's and a teacher's feelings (*closeness*), thoughts (*commitment*) and behaviours (*complementarity*) are mutually and causally interconnected (cf. Jowett & Poczwardowski, 2007). The 3Cs model and its corresponding TSRQ-Q provide a clear description of what the quality of the connection between a student and a teacher looks like. Collectively, the findings of this study would seem to lend initial support for the application of the 3Cs model to TSRQ from the student's perspective (e.g., I trust, respect; I am committed; I am responsive to my teacher).

Future research should consider capturing TSRQ from the teacher's perspective (e.g., I trust, respect, am committed, responsive to my student) using corresponding items as these found in the TSRQ-Q (see Jowett & Ntoumanis, 2004). Such adaptations would allow for the measurement of both a teacher and a student's perceptions of their unique relationship enabling the investigation of direct comparisons to be made between single Teacher–Student dyads within classes and between classes cross-sectionally and longitudinally (cf. Jowett & Nezlek, 2012). Currently, attempts to measure both members' (i.e., teacher and student) perceptions of relationship quality by employing different measures (often assessing different target variables) lead to discrepancies, weak or no correlations between measures or reports (see Henricsson & Rydell, 2004; Valiente et al., 2008). The TSRQ-Q has the potential to provide a more holistic picture of what goes on in the relationship and how the combined interrelating between a teacher and a student affects important outcomes. Thus, future research should consider the validation of a teacher version. The advantage of the 11-item TSRQ-Q is that it is an easy, simple to complete, and a short measure, requiring minimal time from students, and in future research with teachers, which makes it an appealing option.

Moreover, the findings of this study reveal that in these two different curriculum subject areas, students that perceived their relationship with their teacher to be characterized by closeness (perceived mutual trust, respect, appreciation, and liking), commitment (motivated to maintain a close tie over time), and complementarity (experienced cooperative acts of interaction) reported positive experiences in the classroom. Students whose relationships with their teachers are of high quality (as captured by the 3Cs) are more likely to experience more positive affect, enjoyment, and intrinsic motivation, as well as higher levels of physical self-concept and perceived competence, and less negative affect. This set of findings support our hypotheses. These findings and are in line with results found in previous research that has assessed the associations between TSRs and important outcomes such as interest, enjoyment, competence, motivation, self-concept, achievement, school engagement, and emotional experience (Brubacher & Silinda, 2019; Cairney et al., 2012; Goetz et al., 2021; Maulana et al., 2014; Opdenakker et al., 2012; Prewett et al., 2019; Roorda et al., 2011; Verschueren et al., 2012).

The findings of this study also established that students' feelings of positive and negative affect in both subject areas and their experiences of enjoyment and competence in relation to mathematics and intrinsic motivation in relation to PE were directly influenced by the quality of the TSR. Interestingly, for physical self-concept in PE the effects of relationship quality were mediated by both positive and negative affect. While the effect of relationship quality on intrinsic motivation in PE, and perceived competence and enjoyment in mathematics were mediated by its effect on students' positive affect only. We can infer from these findings that encouraging teachers to develop relationships with their students that are grounded in the concepts of closeness, commitment, and complementarity has as a two-fold effect on student outcomes. It should allow students to experience greater positive affect, lower negative affect, as well as increased enjoyment, intrinsic motivation, physical self-concept, and perceived competence. In addition, our findings highlighted that this dual pathway from relationship quality to student outcomes is important for future research and practice as the direct and indirect influences varied by the outcomes under investigation. Given the range of student outcomes that are likely to be influenced by the quality of the TSR and that factors such as affective responses may mediate these effects, this dual pathway ensures a strong route for enhancing young people's experiences in the classroom.

Moreover, the dual pathway highlights that the building of interpersonal connections and the maintenance of positive and high-quality Teacher–Student relationships from the student perspective ignites growth and development and elevates positive emotions; students experience "the feel-good factor" where they feel positive, energetic, and vital within a social situation that the relationship with their teacher

has created. This set of finding highlights the reciprocity and interdependent nature of two-person relationships (Hinde, 1997). Relationships may be the vehicle that allows teachers to win over the "hearts and minds" of their students. Subsequently, teachers could employ communication strategies to develop closeness, commitment, and complementarity that encompass the provision of constructive, motivational and assuring feedback, showing recognition, paying attention to each one student's needs, being prepared to offer additional time to help individual students, ensuring lessons are focused, engaging, and fun, establishing clear rules and expectations, and inviting students contributions into lessons (cf. Shanmugam & Jowett, 2017).

In comparison, only partial support for our hypotheses with regard to the associations between relationship quality, negative affect, and the outcome variables was observed. Specifically, students' feelings of negative affect mediated the effect of relationship quality on physical self-concept in the PE sample only. Negative affect was found to be a non-significant predictor of all other student outcomes in the study, this could potentially be explained by considering the outcome variables under investigation. Enjoyment, perceived competence, and intrinsic motivation are all positive outcomes that demonstrated positive associations with relationship quality and positive affect. It could be the case that in the current models, the abundance of positive associations may have rendered any negative associations relating to negative affect to become non-significant. As a result of including a negatively oriented outcome variable, such as poor behaviour for example, we may have observed some significant associations in respect to negative affect. This is an area that future research should consider when selecting which outcome variables to assess.

Limitations and future directions

The findings of this study have demonstrated that the 3Cs conceptualization and its corresponding measure (TSRQ-Q) have the capacity to measure students' perceptions of the relationship quality with their teachers. Future research may wish to address the limitations of the current study to extend our understanding of relationship quality in educational settings. The current study was cross-sectional in nature and, therefore, does not infer causality in relation to the associations reported in the two models. Future research should conduct longitudinal research to examine whether changes in TSRQ over time, as measured by the TSRQ-Q, are related to changes in student outcomes and should encompass student transitions between school grades and different educational stages. This would provide further support for the utility of the TSRQ-Q in education research and, in turn, can confirm its dimensional structure based on age and maturity, and across challenging transitions. In terms of the TSRQ-Q, the current study has only provided evidence of its validation for examining students' perceptions of the TSR. It is important to highlight this relationship is dyadic in nature and, therefore, future research should seek to validate the TSRQ-Q for use in assessing teachers' perceptions of the relationship. Having both a student and teacher version of the TSRQ-Q validated would allow for future research to explore perceptions of relationship quality within specific Teacher–Student dyads, potentially offering a more holistic view of relationship quality and providing suggestions for interventions aimed at improving the quality of the specific dyads. Moreover, the validated versions of both the student and teacher TSRQ-Q would allow to design multilevel research acknowledging that a teacher has individual relationships with a number of students (dyadic level) within any given class (group level). Subsequently, such research would have the capacity to ascertain how variations in perceptions about relationship quality between teachers and students impact outcomes at both the student level (e.g., individual competence, enjoyment) and class level (e.g., class engagement, management). This type of research is likely to have theoretical, practical and methodological significance in the teacher-student relationship research. Finally, the current study examined a limited number of mediator and outcome variables that were specific to the two samples studied. Future research should examine a wider range of mediators and outcomes, such as academic achievement, self-esteem, the social and emotional support provided by teachers, school engagement, and congruence between teacher and student perceptions of relationship quality to provide further support for the validity of the TSRQ-Q.

CONCLUSION

The Teacher–Student relationship quality is a phenomenon that occurs between two people. In this paper, we argued that the emphasis on what teachers do (their styles and/or approaches) is not enough to address the quality of the relationship and its outcomes. It is thus important to shift focus on the combined interrelating between the student and the teacher by examining their interpersonal behaviours (complementarity e.g., receptiveness, responsiveness, easiness, friendliness) as well as interpersonal feelings (closeness e.g., trust, respect, appreciation, liking) and interpersonal thoughts (commitment e.g., their intention, willingness, or motivation to maintain a bond over time). Guided by extensive research conducted in sport revolving around the interpersonal constructs of closeness, commitment and complementarity (3Cs), we examined the psychometric properties of the Teacher–Student Relationship Quality Questionnaire (TSRQ-Q), which is a slightly modified version of the original Coach–Athlete Relationship Questionnaire, from a student's perspective. Findings demonstrated its sound psychometric properties (validity and reliability) and highlighted that the Teacher–Student relationship quality as defined by the 3Cs and measured by the TSRQ-Q, was associated with student emotions and outcomes in accordance with the study hypotheses and previous research findings. Overall, the 3Cs conceptualization of the quality of the Teacher–Student relationship and its accompanied instrument pave the way for more research in a significant area for students' (and teachers') performance and attainment, as well as social–emotional growth and wellbeing more generally.

AUTHOR CONTRIBUTIONS

Sophia Jowett: Conceptualization; methodology; resources; supervision; writing – original draft; writing – review and editing. **Victoria E. Warburton:** Conceptualization; formal analysis; methodology; project administration; resources; supervision; writing – original draft; writing – review and editing. **Lee C. Beaumont:** Conceptualization; methodology; project administration; supervision; writing – original draft; writing – review and editing. **Luke Felton:** Writing – original draft.

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CONFLICT OF INTEREST STATEMENT

None.

DATA AVAILABILITY STATEMENT

Data are not available. At the time the data for this study were collected the institutional template that was used for consent did not explain to participants about the depositing of data in a repository nor request their consent to do so. Consequently, the data cannot be made available.

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REFERENCES

Adie, J. W., & Jowett, S. (2010). Meta-perceptions of the coach–athlete relationship, achievement goals, and intrinsic motivation among sport participants. *Journal of Applied Social Psychology*, *40*(11), 2750–2773. https://doi.org/10.1111/j.1559-1816.2010.00679.x

Anozie, E. U., & Anozie, O. O. (2017). Parent-child and teacher-pupil relationships as predictors of academic motivation and achievement among primary school pupils. *Journal of Psychology and Sociological Studies*, *1*(1), 62–79. https://journals.aphriapub.com/index.php/JPSS/article/view/52

Bagozzi, R. P. (1991). Further thoughts on the validity of measures of elation, gladness, and joy. *Journal of Personality and Social Psychology*, *61*(1), 98–104. https://doi.org/10.1037/0022-3514.61.1.98

Balduck, A.-L., & Jowett, S. (2011). An examination of the interpersonal relationships of coach-athlete-peer triangle. *International Journal of Sport Psychology*, *42*(1), 84–96.

Balduck, A.-L., Jowett, S., & Buelens, M. (2011). Factorial and predictive validity of the Belgian (Dutch) athlete version of the coach-athlete relationship questionnaire (CART-Q). *International Journal of Sport Psychology*, *42*(2), 204–226.

Baldwin, M. (1992). Relational schemas and the processing of social information. *Psychological Bulletin*, *112*(3), 461–484. https://doi.org/10.1037/0033-2909.112.3.461

Barch, J. C. (2015). *On measuring student-teacher relationships: Sorting out predictors, outcomes, and schematic structure of students' internal relationship representations*. [Unpublished PhD thesis]. Graduate College, University of Iowa.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–529. https://doi.org/10.1037/0033-2909.117.3.497

Bentler, P. M., & Wu, E. J. C. (2008). *EQS 6.1 for windows user's guide*. Multivariate Software.

Bowlby, J. (1973). Self-reliance and some conditions that promote it. In R. Gosling (Ed.), *Support, innovation, and autonomy* (pp. 23–48). Tavistock Publications.

Brubacher, M. R., & Silinda, F. T. (2019). Enjoyment and not competence predicts academic persistence for distance education students. *The International Review of Research in Open and Distance Learning*, *20*(3), 165–179. https://doi.org/10.19173/irrodl.v20i4.4325

Cairney, J., Kwan, M. Y., Velduizen, S., Hay, J., Bray, S. R., & Faught, B. E. (2012). Gender, perceived competence and the enjoyment of physical education in children: A longitudinal examination. *International Journal of Behavioral Nutrition and Physical Activity*, *9*(26), 1–8. https://doi.org/10.1186/1479-5868-9-26

Claessens, L. C. A., van Tartwijk, J., van der Want, A. C., Pennings, H. J. M., Verloop, N., den Brok, P. J., & Wubbels, T. (2017). Positive teacher-student relationships go beyond the classroom, problematic ones stay inside. *The Journal of Educational Research*, *110*(5), 478–493. https://doi.org/10.1080/00220671.2015.1129595

Cornelius-White, J. (2007). Learner-centered teacher-student relationships are effective: A meta-analysis. *Review of Educational Research*, *77*(1), 113–143. https://doi.org/10.3102/003465430298563

Crawford, J. R., & Henry, J. D. (2003). The depression anxiety stress scales (DASS): Normative data and latent structure in a large non-clinical sample. *British Journal of Clinical Psychology*, *42*(2), 111–131. https://doi.org/10.1348/014466503321903544

Davis, L., Stenling, A., Gustafsson, H., Appleby, R., & Davis, P. (2019). Reducing the risk of athlete burnout: Psychosocial, sociocultural, and individual considerations for coaches. *International Journal of Sports Science & Coaching*, *14*(4), 444–452. https://doi.org/10.1177/1747954119861076

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Plenum Publishers.

Demaray, M. K., Malecki, C. K., Rueger, S. Y., Brown, S. E., & Summers, K. H. (2009). The role of youth's ratings of the importance of socially supportive behaviors in the relationship between social support and self-concept. *Journal of Youth and Adolescence*, *38*(1), 13–28. https://doi.org/10.1007/s10964-007-9258-3

Dillon, W. R., & Goldstein, M. (1984). *Multivariate analysis: Methods and applications*. Wiley.

Ebbeck, V., & Weiss, M. R. (1998). Determinants of children's self-esteem: An examination of perceived competence and affect in sport. *Pediatric Exercise Science*, *10*(3), 285–298. https://doi.org/10.1123/pes.10.3.285

Felton, L., & Jowett, S. (2017). Self-determination-theory perspective on attachment, need satisfaction, and well-being in a sample of athletes: A longitudinal study. *Journal of Clinical Sport Psychology*, *11*(4), 304–323. https://doi.org/10.1123/jcsp.2016-0013

Fiske, A. P. (1992). The four elementary forms of sociality: Framework for a unified theory of social relations. *Psychological Review*, *99*(4), 689–723. https://doi.org/10.1037/0033-295X.99.4.689

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.2307/3151312

Gehlbach, H., Brinkworth, M. E., & Harris, A. D. (2012). Changes in teacher-student relationships. *British Journal of Educational Psychology*, *82*(4), 690–704. https://doi.org/10.1111/j.2044-8279.2011.02058.x

Goetz, T., Bieleke, M., Gogol, K., van Tartwijk, J., Mainhard, T., Lipnevich, A. A., & Pekrun, R. (2021). Getting along and feeling good: Reciprocal associations between student-teacher relationship quality and students' emotions. *Learning and Instruction*, *71*, 101349. https://doi.org/10.1016/j.learninstruc.2020.101349

Gosai, J., Jowett, S., & Nascimento-Júnior, J. R. A. (2021). When leadership, relationships, and psychological safety promote flourishing in sport and life. *Sports Coaching Review*. https://doi.org/10.1080/21640629.2021.1936960

Goudas, M., Biddle, S., & Fox, K. (1994). Perceived locus of causality, goal orientations, and perceived competence in school physical education classes. *British Journal of Educational Psychology*, *64*(3), 453–463. https://doi.org/10.1111/j.2044-8279.1994.tb01116.x

Gregoriadis, A., & Tsigilis, N. (2008). Applicability of the student-teacher relationship scale (STRS) in the Greek educational setting. *Journal of Psychoeducational Assessment*, *26*(2), 108–120. https://doi.org/10.1177/0734282907306894

Hampson, R., & Jowett, S. (2014). Effects of coach leadership and coach–athlete relationship on collective efficacy. *Scandinavian Journal of Medicine & Science in Sports*, *24*(2), 454–460. https://doi.org/10.1111/j.1600-0838.2012.01527.x

Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (2nd ed.). The Guilford Press.

Henricsson, L., & Rydell, A.-M. (2004). Elementary school children with behavior problems: Teacher-child relations and self-perception. A prospective study. *Merrill-Palmer Quarterly*, *50*(2), 111–138. https://doi.org/10.1353/mpq.2004.0012

Hinde, R. A. (1997). *Relationships: A dialectical perspective*. Routledge.
Horowitz, M. J. (1989). Relationship schema formulation: Role-relationship models and intrapsychic conflict. *Psychiatry*, *52*(3), 260–274. https://doi.org/10.1080/00332747.1989.11024449
Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118
Hughes, J. N. (2011). Longitudinal effects of teacher and student perceptions of teacher-student relationship qualities on academic adjustment. *The Elementary School Journal*, *112*(1), 38–60. https://doi.org/10.1086/660686
Johnson, D. W., Johnson, R. T., Buckman, L. A., & Richards, P. S. (1985). The effect of prolonged implementation of cooperative learning on social support within the classroom. *The Journal of Psychology*, *119*(5), 405–411. https://doi.org/10.1080/00223980.1985.10542911
Jowett, S. (2007). Interdependence analysis and the 3+1Cs in the coach-athlete relationship. In S. Jowett & D. Lavallee (Eds.), *Social psychology in sport* (pp. 15–27). Human Kinetics.
Jowett, S. (2008). Moderators and mediators of the association between the coach-athlete relationship and physical self-concept. *International Journal of Coaching Science*, *2*(1), 43–62.
Jowett, S. (2009). Validating coach-athlete relationship measures with the nomological network. *Measurement in Physical Education and Exercise Science*, *13*(1), 34–51. https://doi.org/10.1080/10913670802609136
Jowett, S. (2017). Coaching effectiveness: The coach-athlete relationship at its heart. *Current Opinion in Psychology*, *16*, 154–158. https://doi.org/10.1016/j.copsyc.2017.05.006
Jowett, S., Adie, J. W., Bartholomew, K. J., Yang, S. X., Gustafsson, H., & Lopez-Jiménez, A. (2017). Motivational processes in the coach-athlete relationship: A multi-cultural self-determination approach. *Psychology of Sport and Exercise*, *32*, 143–152. https://doi.org/10.1016/j.psychsport.2017.06.004
Jowett, S., & Cramer, D. (2010). The prediction of young athletes' physical self from perceptions of relationships with parents and coaches. *Psychology of Sport and Exercise*, *11*, 140–147.
Jowett, S., & Felton, L. (2014). Coach-athlete relationships and attachment styles within sport teams. In M. Beauchamp & M. A. Eys (Eds.), *Group dynamics in exercise and sport psychology* (2nd ed., pp. 73–90). Routledge.
Jowett, S., & Nezlek, J. (2012). Relationship interdependence and satisfaction with important outcomes in coach-athlete dyads. *Journal of Social and Personal Relationships*, *29*(3), 287–301. https://doi.org/10.1177/0265407511420980
Jowett, S., & Ntoumanis, N. (2004). The coach-athlete relationship questionnaire (CART-Q): Development and initial validation. *Scandinavian Journal of Medicine & Science in Sports*, *14*(4), 245–257. https://doi.org/10.1111/j.1600-0838.2003.00338.x
Jowett, S., & Poczwardowski, A. (2007). Understanding the coach-athlete relationship. In S. Jowett & D. Lavallee (Eds.), *Social psychology in sport* (pp. 3–14). Human Kinetics.
Jowett, S., & Zhong, X. (2016). Promoting performance and satisfaction through quality golfer-caddie relationships. *International Journal of Golf Science*, *5*(2), 98–115. https://www.golfsciencejournal.org/article/4988-promoting-performance-and-satisfaction-through-quality-golfer-caddie-relationships
Koepke, M. F., & Harkins, D. A. (2008). Conflict in the classroom: Gender differences in the teacher-child relationship. *Early Education and Development*, *19*(6), 843–864. https://doi.org/10.1080/10409280802516108
Koomen, H. M. Y., & Jellesma, F. C. (2015). Can closeness, conflict, and dependency be used to characterize students' perceptions of the affective relationship with their teacher? Testing a new child measure in middle childhood. *British Journal of Educational Psychology*, *85*(4), 479–497. https://doi.org/10.1111/bjep.12094
Koomen, H. M. Y., Verschueren, K., van Schooten, E., Jak, S., & Pianta, R. C. (2012). Validating the student-teacher relationship scale: Testing factor structure and measurement invariance across child gender and age in a Dutch sample. *Journal of School Psychology*, *50*(2), 215–234. https://doi.org/10.1016/j.jsp.2011.09.001
La Guardia, J. G., Ryan, R. M., Couchman, C. E., & Deci, E. L. (2000). Within-person variation in security of attachment: A self-determination theory perspective on attachment, need satisfaction, and well-being. *Journal of Personality and Social Psychology*, *79*(3), 367–384. https://doi.org/10.1037/0022-3514.79.3.367
Leflot, G., Onghena, P., & Colpin, H. (2010). Teacher-child interactions: Relations with children's self-concept in second grade. *Infant and Child Development*, *19*(4), 385–405. https://doi.org/10.1002/icd.672
Lynch, M., & Cicchetti, D. (1997). Children's relationships with adults and peers: An examination of elementary and junior high school students. *Journal of School Psychology*, *35*(1), 81–99. https://doi.org/10.1016/S0022-4405(96)00031-3
Mantzicopoulos, P., & Neuharth-Pritchett, S. (2003). Development and validation of a measure to assess head start children's appraisals of teacher support. *Journal of School Psychology*, *41*(6), 431–451. https://doi.org/10.1016/j.jsp.2003.08.002
Marchand, G., & Skinner, E. A. (2007). Motivational dynamics of children's academic help-seeking and concealment. *Journal of Educational Psychology*, *99*(1), 65–82. https://doi.org/10.1037/0022-0663.99.1.65
Marsh, H. W., Richards, G. E., Johnson, S., Roche, L., & Tremayne, P. (1994). Physical self-description questionnaire: Psychometric properties and a multitrait-multimethod analysis of relations to existing instruments. *Journal of Sport and Exercise Psychology*, *16*(3), 270–305. https://doi.org/10.1123/jsep.16.3.270
Marsh, H. W., Smith, I. D., & Barnes, J. (1984). Multidimensional self-concepts: Relationships with inferred self-concepts and academic achievement. *Australian Journal of Psychology*, *36*(3), 367–386. https://doi.org/10.1080/00049538408255318
Maulana, R., Opdenakker, M.-C., & Bosker, R. (2014). Teacher-student interpersonal relationships do change and affect academic motivation: A multilevel growth curve modelling. *British Journal of Educational Psychology*, *84*(3), 459–482. https://doi.org/10.1111/bjep.12031

McFarland, L., Murray, E., & Phillipson, S. (2016). Student-teacher relationships and student self-concept: Relations with teacher and student gender. *Australian Journal of Education*, *60*(1), 5–25. https://doi.org/10.1177/0004944115626426

Milatz, A., Glüer, M., Harwardt-Heinecke, E., Kappler, G., & Ahnert, L. (2014). The student-teacher relationship scale revisited: Testing factorial structure, measurement invariance and validity criteria in German-speaking samples. *Early Childhood Research Quarterly*, *29*(3), 357–368. https://doi.org/10.1016/j.ecresq.2014.04.003

Noddings, N. (1992). *The challenge to care in schools: An alternative approach to education*. Teachers College Press.

Oberle, E., Schonert-Reichl, K. A., Guhn, M., Zumbo, B. D., & Hertzman, C. (2014). The role of supportive adults in promoting positive development in middle childhood: A population-based study. *Canadian Journal of School Psychology*, *29*(4), 296–316. https://doi.org/10.1177/0829573514540116

Obsuth, I., Murray, A. L., Malti, T., Sulger, P., Ribeaud, D., & Eisner, M. (2017). A non-bipartite propensity score analysis of the effects of teacher-student relationships on adolescent problem and prosocial behavior. *Journal of Youth and Adolescence*, *46*(8), 1661–1687. https://doi.org/10.1007/s10964-016-0534-y

Opdenakker, M.-C., Maulana, R., & den Brok, P. (2012). Teacher-student interpersonal relationships and academic motivation within one school year: Developmental changes and linkage. *School Effectiveness and School Improvement*, *23*(1), 95–119. https://doi.org/10.1080/09243453.2011.619198

Pianta, R. C. (1994). Patterns of relationships between children and kindergarten teachers. *Journal of School Psychology*, *32*(1), 15–31. https://doi.org/10.1016/0022-4405(94)90026-4

Pianta, R. C. (1999). *Enhancing relationships between children and teachers*. American Psychological Association.

Pianta, R. C. (2001). *STRS. Student-teacher relationship scale: Professional manual*. Psychological Assessment Resources.

Pianta, R. C. (2006). Teacher-child relationships and early literacy. In D. K. Dickinson & S. B. Neuman (Eds.), *Handbook of early literacy research* (Vol. 2, pp. 149–162). The Guilford Press.

Prewett, S. L., Bergin, D. A., & Huang, F. L. (2019). Student and teacher perceptions on student-teacher relationship quality: A middle school perspective. *School Psychology International*, *40*(1), 66–87. https://doi.org/10.1177/0143034318807743

Quin, D. (2017). Longitudinal and contextual associations between teacher-student relationships and student engagement: A systematic review. *Review of Educational Research*, *87*(2), 345–387. https://doi.org/10.3102/0034654316669434

Raykov, T. (1997). Estimation of composite reliability for congeneric measures. *Applied Psychological Measurement*, *21*(2), 173–184. https://doi.org/10.1177/01466216970212006

Roorda, D. L., Koomen, H. M. Y., Spilt, J. L., & Oort, F. J. (2011). The influence of affective teacher-student relationships on students' school engagement and achievement: A meta-analytic approach. *Review of Educational Research*, *81*(4), 493–529. https://doi.org/10.3102/0034654311421793

Ryan, R. M., Stiller, J. D., & Lynch, J. H. (1994). Representations of relationships to teachers, parents, and friends as predictors of academic motivation and self-esteem. *The Journal of Early Adolescence*, *14*(2), 226–249. https://doi.org/10.1177/027243169401400207

Sagar, S. S., & Jowett, S. (2015). Fear of failure and self-control in the context of the coach-athlete relationship quality. *International Journal of Coaching Science*, *9*(2), 3–21.

Satorra, A., & Bentler, P. M. (2001). A scaled difference chi-square test statistic for moment structure analysis. *Psychometrika*, *66*(4), 507–514. https://doi.org/10.1007/BF02296192

Sebire, S. J., Standage, M., & Vansteenkiste, M. (2008). Development and validation of the goal content for exercise questionnaire. *Journal of Sport and Exercise Psychology*, *30*(4), 353–377. https://doi.org/10.1123/jsep.30.4.353

Seligman, M. E. P. (2012). *Flourish: A visionary new understanding of happiness and well-being*. Atria Paperback.

Shanmugam, V., & Jowett, S. (2017). Creating a successful and effective coaching environment through interpersonal sport coaching. In S. Cotterill, N. Weston, & G. Breslin (Eds.), *Sport and exercise psychology: Practitioner case studies* (pp. 215–238). Wiley.

Spilt, J. L., Koomen, H. M. Y., & Mantzicopoulos, J. (2010). Young children's perceptions of the teacher-child relationship: An evaluation of two instruments and the role of child gender in kindergarten. *Journal of Applied Developmental Psychology*, *31*(6), 428–438. https://doi.org/10.1016/j.appdev.2010.07.006

Troop-Gordon, W., & Kopp, J. (2011). Teacher-student relationship quality and children's peer victimization and aggression in late childhood. *Social Development*, *20*(3), 537–561. https://doi.org/10.1111/j.1467-9507.2011.00604.x

Valiente, C., Lemery-Chalfant, K., Swanson, J., & Reiser, M. (2008). Prediction of children's academic competence from their effortful control, relationships, and classroom participation. *Journal of Educational Psychology*, *100*(1), 67–77. https://doi.org/10.1037/0022-0663.100.1.67

Van Lange, P. A. M., & Balliet, D. (2015). Interdependence theory. In M. Mikulincer, P. R. Shaver, J. A. Simpson, & J. F. Dovidio (Eds.), *APA handbook of personality and social psychology, Vol. 3. Interpersonal relations* (pp. 65–92). American Psychological Association.

Verschueren, K., Doumen, S., & Buyse, E. (2012). Relationships with mother, teacher, and peers: Unique and joint effects on young children's self-concept. *Attachment & Human Development*, *14*(3), 233–248. https://doi.org/10.1080/14616734.2012.672263

Vieira, L. F., Nascimento-Júnior, J. R. A., Pujals, C., Jowett, S., Codonhato, R., & Vissoci, J. R. N. (2015). Cross-cultural adaptation and psychometric properties of the Brazilian coach-athlete relationship questionnaire (CART-Q) – Athlete version. *Revista Brasileira de Cineantropometria & Desempenho Humano*, *17*(6), 635–649. https://doi.org/10.5007/1980-0037.2015v17n6p635

Wachsmuth, S., Jowett, S., & Harwood, C. G. (2018). On understanding the nature of interpersonal conflict between coaches and athletes. *Journal of Sports Sciences*, *36*(17), 1955–1962. https://doi.org/10.1080/02640414.2018.1428882

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*(6), 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063

Wentzel, K. R. (1998). Social relationships and motivation in middle school: The role of parents, teachers, and peers. *Journal of Educational Psychology*, *90*(2), 202–209. https://doi.org/10.1037/0022-0663.90.2.202

Wentzel, K. R., Baker, S. A., & Russell, S. L. (2012). Young adolescents' perceptions of teachers' and peers' goals as predictors of social and academic goal pursuit. *Applied Psychology. An International Review*, *61*(4), 605–633. https://doi.org/10.1111/j.1464-0597.2012.00508.x

Wubbels, T., & Brekelmans, M. (2005). Two decades of research on teacher–student relationships in class. *International Journal of Educational Research*, *43*(1–2), 6–24. https://doi.org/10.1016/j.ijer.2006.03.003

Wubbels, T., & Levy, J. (1991). A comparison of interpersonal behavior of Dutch and American teachers. *International Journal of Intercultural Relations*, *15*, 1–18.

Yang, S. X., & Jowett, S. (2012). Psychometric properties of the Coach–Athlete relationship questionnaire (CART-Q) in seven countries. *Psychology of Sport and Exercise*, *13*(1), 36–43. https://doi.org/10.1016/j.psychsport.2011.07.010

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