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How Important Is Teacher Feedback for Self- and Relational-Efficacy Beliefs in High School Physical Education?

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ABSTRACT

Purpose: The first aim of the study was to examine the validity and reliability of the Turkish versions of the Tripartite Efficacy Beliefs Scales in Physical Education among 9th- and 10th-grade students. The second aim was to investigate the predictive role of perceived feedback from physical education teachers on students' relational efficacy beliefs, including self-efficacy, other-efficacy, and relation-inferred self-efficacy. The research was conducted in two separate studies.

Method: Participants were female and male high school students enrolled in the 9th and 10th grades recruited by using convenience sampling method. Two independent samples were used, with 210 students participating in Study 1 and 216 students in Study 2. Students completed measures of self-efficacy, other-efficacy, relation-inferred self-efficacy in physical education, and perceived teacher feedback. Confirmatory factor analysis was employed in Study 1, while multiple regression analysis was conducted in Study 2.

Results: The findings from Study 1 supported the original factor structure and demonstrated satisfactory reliability of the scales. In Study 2, regression analyses indicated that types of teacher feedback did not significantly predict students' self-efficacy. However, positive nonverbal feedback, positive general feedback, and performance-related feedback positively predicted other-efficacy, whereas negative nonverbal feedback showed a negative predictive effect. Additionally, relation-inferred self-efficacy was positively predicted by positive nonverbal feedback and negatively predicted by negative nonverbal feedback.

Conclusion: Overall, perceived feedback from physical education teachers appears to play a significant role in shaping high school students' other-efficacy and relation-inferred self-efficacy beliefs.

Keywords: Relational efficacy beliefs, self-efficacy, other-efficacy, relation-inferred self-efficacy, physical education.

ÖZET

Lise Beden Eğitimi Derslerinde Öz-Yeterlik ve İlişkisel Yeterlik Algıları için Öğretmen Geri Bildirimi Ne Kadar Önemlidir?

Amaç: Araştırmanın birinci amacı, beden eğitiminde üçlü yeterlik algılarını değerlendirmek amacıyla geliştirilen Beden Eğitimi Üçlü Yeterlik Algıları Ölçeklerinin Türkçe formlarının 9. ve 10. sınıf öğrencilerinde geçerlik ve güvenirliği incelenmesidir. Araştırmanın ikinci amacı ise, lise öğrencilerinde beden eğitimi öğretmeninden algılanan geri bildirimin ilişkisel yeterlik algıları (öz-yeterlik, diğer-yeterlik ve ilişki temelli öz-yeterlik) üzerindeki yordayıcı rolünün incelenmesidir. Araştırma, iki çalışma şeklinde planlanmıştır.

Yöntem: Çalışmanın katılımcıları kolayda örnekleme türüyle seçilen 9. ve 10. sınıfta öğrenim görmekte olan kız ve erkek lise öğrencileridir. Çalışma 1'e 210, Çalışma 2'ye 216 katılımcı olmak üzere iki farklı grup katılmıştır. Katılımcılara Beden Eğitiminde Öz-Yeterlik, Diğer-Yeterlik ve İlişki

* Study 1 of the present research was presented as an oral abstract at the 13th International Congress on Physical Education and Sports Teaching (Ankara, Türkiye, October 31-November 2, 2025) under the title *"Psychometric Properties of the Tripartite Efficacy Beliefs Scales in Physical Education among High School Students (Grades 9 and 10)."* Study 2 was presented as an oral abstract at the 23rd International Congress of Sport Sciences (Erzurum, Türkiye, December 1-4, 2025) under the title *"Tripartite Efficacy Beliefs in Physical Education Classes among High School Students: The Role of Perceived Feedback from Physical Education Teachers."*

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Temelli Öz-Yeterlik Ölçekleri ve Algılanan Öğretmen Geribildirimi Ölçeği uygulanmıştır. Çalışma 1'de doğrulayıcı faktör analizi, Çalışma 2'de çoklu regresyon analizi kullanılmıştır.
Bulgular: Analiz sonuçları, Çalışma 1'de ölçeklerin özgün yapısını ve güvenirliklerini desteklemiştir. Çalışma 2'de, regresyon analizleri, öğretmen geri bildirimi türlerinin öz-yeterlik üzerinde anlamlı bir etkisi olmadığını göstermiştir. Ancak diğer-yeterlik üzerinde pozitif sözel olmayan geribildirimin, pozitif genel geribildirimin ve performans bilgisinin pozitif yönde; negatif sözel olmayan geribildirimin ise negatif yönde anlamlı yordayıcı etkiler gösterdiği bulunmuştur. Ayrıca, ilişki temelli öz-yeterlik üzerinde pozitif sözel olmayan geri bildirimin pozitif ve negatif sözel olmayan geri bildirimin negatif yönde anlamlı yordayıcı etkileri olduğu belirlenmiştir.
Sonuç: Sonuç olarak beden eğitimi öğretmeninden algılanan geri bildirimlerin lise öğrencilerinin ilişki temelli öz-yeterlik ve diğer-yeterlik algıları üzerinde belirleyici bir role sahip olduğu söylenebilir.
Anahtar Kelimeler: İlişkisel yeterlik algıları, öz-yeterlik, diğer-yeterlik, ilişki temelli öz yeterlik, beden eğitimi

INTRODUCTION

School-based physical education (PE) provides children and adolescents with opportunities to engage in physical activity and shape positive exercise attitudes (Sallis and McKenzie, 1991). This role is particularly critical given that approximately 81% of adolescents aged 11-17 years worldwide are physically inactive, with inactivity rates being higher among girls than boys (85% vs. 78%), failing to meet World Health Organization guidelines (Guthold et al., 2020). PE can influence adolescents' leisure-time physical activity (LTPA), as their exercise intentions and participation outside school are affected by their school experiences (Hagger et al., 2005; Standage et al., 2003). Moreover, optimal PE experiences support academic achievement (Trudeau and Shephard, 2008), enhance positive affect (Standage et al., 2005), and boost self-esteem (Bailey, 2006). Recent studies have increasingly focused on the psychological processes that shape students' experiences and participation in physical education. Evidence suggests that both students' confidence in their abilities and their perceptions of PE teachers' interpersonal behaviors are key determinants of motivational, emotional, and behavioral responses. Higher levels of self-efficacy are linked to greater enjoyment, persistence, and performance in PE settings (Bandura, 1997; Samuels and Gibb, 2002; Barr-Anderson et al., 2008; Gao et al., 2009; Barkoukis et al., 2010; Huang et al., 2025). Likewise, when teachers are viewed as supportive of students' basic psychological needs and demonstrate transformational teaching practices, students report more positive emotions, stronger engagement, and increased physical activity beyond school (Beauchamp et al., 2010; Hagger et al., 2009; Taylor and Ntoumanis, 2007).

Lent and Lopez (2002) proposed that self-efficacy operates within a dynamic network of beliefs formed through close social relationships, whereby specific interpersonal interactions influence how individuals interpret their experiences. Within this relational framework named tripartite efficacy model, individuals hold beliefs about others' abilities

(other-efficacy) and perceptions of how others view their own abilities, referred to as relation-inferred self-efficacy (RISE) (Saville et al., 2014). In the literature, the structures (self-efficacy, other-efficacy, and RISE) included in the tripartite efficacy model are referred to as tripartite efficacy or relational efficacy beliefs. Other-efficacy reflects beliefs about another person's capabilities, such as a PE teacher's confidence in a student's physical abilities. In contrast, RISE represents individuals' perceptions of others' confidence in their abilities, for example, a student recognizing that his/her teacher believes in his/her competence. Therefore, verbal cues from significant others, such as expressions of confidence, can enhance individuals' RISE beliefs (Lent and Lopez, 2002). In educational and physical education contexts, teachers may represent a salient social agent whose feedback may directly influence students' interpretations of their competence through these relational mechanisms. Moreover, considering that teacher feedback can take different forms (e.g., positive, negative, verbal, or nonverbal), it is important to examine whether these different types of feedback differentially influence students' self-efficacy, other-efficacy, and RISE beliefs.

In the literature, the examination of the constructs proposed in Lent and Lopez's (2002) tripartite efficacy model initially began with qualitative studies conducted in sport settings (Jackson et al., 2008; Jackson et al., 2009; Jackson and Beauchamp, 2010). These studies, which involved in-depth interviews with athlete-coach and athlete-teammate dyads, provided evidence supporting the model's assumptions that interpersonal feedback from significant others and beliefs about others' competence contribute to the development of both relation-inferred self-efficacy and self-efficacy. Subsequent quantitative research has adapted and employed physical education- and sport-specific efficacy measures to assess self-efficacy, other-efficacy, and RISE. Jackson et al. (2012) developed a physical education-specific measure to assess relational efficacy beliefs based on student-teacher relationship among students. The scale consists of three related but distinct subscales: Physical Education Self-Efficacy, Other-Efficacy (teacher efficacy), and Relation-Inferred Self-Efficacy, each comprising nine items. The authors also supported the cross-cultural validity of the instrument in Singaporean students, and the Australian sample consisted of seventh-, -grade, and nineth-grade students (M_{age}=13.54, SD=.76), while the Singapore sample included students with a mean age of 14.10±1.01 (Jackson et., 2012). Subsequent studies confirmed its validity and reliability in Turkish middle school samples (Keskin Akın and Aşçı, 2021) as well as in Korean populations (Cheon and Song, 2017). Examining the Turkish validity and reliability of the scale in older age groups is particularly important, given the well-documented decline in physical activity participation during adolescence (World Health Organization [WHO],

2024). Investigating relational efficacy beliefs across different age groups within physical education contexts may therefore provide valuable insights.

In the sport and exercise psychology literature, several studies have examined relational efficacy beliefs in relation to significant others, such as coaches, parents, peers, and teachers. These studies have identified various motivational, emotional, and behavioral outcomes influenced by relational efficacy beliefs. Higher levels of other-efficacy and relation-inferred self-efficacy toward physical education teachers have been associated with greater engagement in LTPA, while self-efficacy has been linked to increased intrinsic motivation, indirectly promoting physical activity behavior (Jackson et al., 2013). In addition, RISE based on teacher and peer relationships is negatively related to social anxiety (Gairns et al., 2015). Students' enjoyment of physical education has also been positively predicted by self-efficacy and beliefs about teachers' competence, with relation-inferred self-efficacy showing an indirect effect (Jackson et al., 2012). Furthermore, self-efficacy has been shown to foster positive attitudes toward physical activity, whereas higher RISE in teacher-student relationships supports intentions to maintain participation (Jackson et al., 2014). Also in Turkish literature, a small number of studies, which are methodological studies (Keskin Akın ve Aşçı, 2020; Keskin Akın ve Aşçı, 2024) and a relational study in sport context (Özkaya ve Engür, 2023), exist. Özkaya and Engür (2023) found that perceived perfectionism was positively correlated with tripartite efficacy beliefs.

In the literature, relatively few studies have examined teacher behaviors and feedback as determinants of relational efficacy beliefs; however, some research has addressed these relationships within sports contexts. Research conducted in physical education contexts has consistently shown that students' relational efficacy beliefs are positively influenced by teachers' relatedness-supportive behaviors (Gairns et al., 2015; Jackson et al., 2013) and transformational teaching practices (Bourne, 2011). A recent study conducted with middle school students examined the relationships among perceived motivational climate from PE teachers, tripartite efficacy beliefs, flow in PE, and LTPA (Keskin Akın, 2021). The results indicated that self-efficacy positively influenced both flow and LTPA, whereas RISE predicted flow. Empowering motivational climate was a significant determinant of other-efficacy and RISE. Moreover, self-efficacy and RISE mediated the relationship between empowering motivational climate and flow, while self-efficacy mediated the relationship between empowering motivational climate and LTPA (Keskin Akın, 2021). Research examining relational efficacy beliefs and feedback together remains limited, particularly within the Turkish literature. However, some evidence can be drawn from studies focusing on

self-efficacy in physical education contexts. For example, Küçük Kılıç (2021) investigated perceived social support from parents and peers for physical activity alongside students' self-efficacy and attitudes toward physical education. The findings indicated that knowledge of performance, positive nonverbal feedback, and negative nonverbal feedback played a significant role in students' attitudes toward physical education. In addition, both self-efficacy related to physical education and perceived peer support for physical activity were found to be significant predictors of students' attitudes toward physical education (Küçük Kılıç, 2021). This highlights the need to examine relational efficacy beliefs and different types of teacher feedback together to understand better the processes that shape relational efficacy beliefs in PE settings.

Beyond correlational findings, experimental evidence indicates that relatedness-supportive instructional programs in physical education significantly enhance students' perceived relational support, enjoyment, other-efficacy toward teachers, and relation-inferred self-efficacy with peers, compared to control conditions (Sparks et al., 2017). McMullen et al. (2020) examined coaching behaviors as sources of relation-inferred self-efficacy (RISE) among American male high school athletes, using self-report measures to assess athletes' perceptions of coaching behaviors and their efficacy beliefs. The findings indicated that autonomy-supportive and positive coaching behaviors were positively associated with athletes' RISE, suggesting that athletes' interpretations of coaches' interpersonal actions play a key role in shaping relational efficacy beliefs. Similarly, Hewitt (2023) investigated the relationships between observed coaching behaviors and collegiate athletes' self-, other-, collective-, and RISE using a mixed-method approach. While athletes reported varying levels of efficacy beliefs, none of the objectively observed coaching behaviors significantly predicted efficacy outcomes, emphasizing the influence of athletes' subjective perceptions rather than solely observable instructor behaviors (Hewitt, 2023). Together, these studies highlight that efficacy beliefs are strongly linked to how athletes interpret interpersonal feedback and interactions, which is highly relevant to the physical education teacher context, where students' perceptions of teachers' feedback and relational behaviors may critically influence the development of efficacy beliefs.

Given the growing emphasis on interpersonal processes in physical education, understanding how teacher feedback influences students' relational efficacy beliefs is particularly important. Although self-efficacy has been widely examined in educational contexts, relatively limited attention has been given to other-efficacy and RISE within physical education settings, especially among high school students. Moreover, the availability

of valid and reliable instruments is essential for accurately assessing these psychological constructs. Therefore, adapting a measurement tool to assess relational efficacy beliefs in physical education will provide valuable contributions to the literature. Accordingly, the present research was designed as a two-study investigation. Study 1 aimed to examine the validity and reliability of the Turkish version of the Tripartite Efficacy Beliefs Scale in Physical Education among 9th- and 10th-grade students. Study 2 aimed to investigate the predictive role of perceived feedback from physical education teachers on students' relational efficacy beliefs, including self-efficacy, other-efficacy, and relation-inferred self-efficacy. The hypotheses tested in Study 1 are presented below:

H1: The Turkish version of the Tripartite Efficacy Beliefs Scale in Physical Education exhibits a factor structure similar to that obtained in the original/Turkish adaptation study for this age group.

H2: The internal consistency coefficients of the Turkish version of the Tripartite Efficacy Beliefs Scale in Physical Education for this age group are at an acceptable level.

The hypotheses tested in Study 2 are presented below:

H1: Positive nonverbal feedback perceived from teachers has a positive effect on self-efficacy.

H2: Negative nonverbal feedback perceived from teachers has a negative effect on self-efficacy.

H3: Positive general feedback from teachers has a positive effect on self-efficacy.

H4: Knowledge of performance from teachers has a positive effect on self-efficacy.

H5: Positive nonverbal feedback perceived from teachers has a positive effect on other-efficacy.

H6: Negative nonverbal feedback perceived from teachers has a negative effect on other-efficacy.

H7: Positive general feedback from teachers has a positive effect on other-efficacy.

H8: Knowledge of performance from teachers has a positive effect on other-efficacy.

H9: Positive nonverbal feedback perceived from teachers has a positive effect on RISE.

H10: Negative nonverbal feedback perceived from teachers has a negative effect on RISE.

H11: Positive general feedback from teachers has a positive effect on RISE.

H12: Knowledge of performance from teachers has a positive effect on RISE.

METHODS

This section provides details regarding the participants, data collection instruments, procedures, and data analysis of the two studies included in the present research.

Study 1: Validation of the Relational Efficacy Beliefs Scales in Physical Education Among High School Students (Grades 9-10)

Participants

Participants were 210 high school students (137 female, 73 male; $\bar{M}$age = 14.93 ± 0.70) recruited from four different Anatolian High School in the central district of Ağrı, Türkiye. The students participated in 2 hours of school PE per week.

Measures

A demographic form which includes information about grades, age and gender and Tripartite Efficacy Beliefs Scales (Self-Efficacy, Other-Efficacy and Relation-Inferred Self-Efficacy Scales) were used as the data collection tools.

Relational Efficacy Beliefs: Relational efficacy beliefs in physical education classes, grounded in the teacher-student relationship, were assessed using three scales developed by Jackson et al. (2012): the *Self-Efficacy Scale*, the *Other-Efficacy Scale*, and the *Relation-Inferred Self-Efficacy Scale*. These instruments assess students' self-efficacy, perceptions of their teacher's ability (other-efficacy), and relation-inferred self-efficacy, respectively. Together, the three scales form a three-factor measurement model in which the factors are conceptually related yet empirically distinct. Each scale consists of nine items rated on a five-point Likert scale. The original scale development study reported an acceptable fit of the three-factor model (χ^2/df = 2.62, CFI = 0.95, TLI = 0.95, SRMR = 0.048, RMSEA = 0.05) (Jackson et al., 2012). The Turkish validity and reliability of the scales were later established by Keskin Akın and Aşçı (2021) in a sample of middle school students with a mean age of 12.42 ± 0.89 years.

Data Analysis

Item-level analyses were first conducted using IBM SPSS Statistics (Version 28) to examine descriptive statistics and assess univariate normality. Construct validity of the scales was tested using confirmatory factor analysis (CFA) using maximum likelihood estimation (Hair et al., 2014) in IBM SPSS AMOS (Version 24). Interpretation of the CFA results was based on established reference values for model fit indices (Schermelleh-Engel et al., 2003). Convergent and discriminant validity were assessed by calculating the average variance extracted (AVE), composite reliability (CR), average shared squared variance (ASV), and

maximum shared squared variance (MSV). Scale reliability was evaluated using Cronbach's alpha coefficients and CR values. For convergent validity of the scale, the criterion CR ≥ AVE ≥ 0.5 was considered; for divergent validity, the criterion MSV ≤ AVE; ASV ≤ MSV was considered (Fornell and Larcker, 1981).

Study 2: Examining the predictive effects of perceived teacher feedback types on relational efficacy beliefs

Participants

The participants were 216 high school students (147 females, 69 males) from the 9th and 10th grades selected using the convenience sampling method, a non-probability sampling method (Büyüköztürk, 2013), separate from those who participated in Study 1, attending physical education classes at four public Anatolian high schools in the central district of Ağrı, Türkiye. The mean age of the students was 14.85 ± 0.78 years (female: 14.78 ± 0.78; male: 15.01 ± 0.76). Of the participants, 133 were in Grade 9 and 83 in Grade 10.

Measures

The data collection instruments used in Study 2 were a demographic information form, the Tripartite Efficacy Beliefs Scales, and the Perceived Teacher Feedback Scale. Demographic information form and the Tripartite Efficacy Beliefs Scales were not described in this section as they were included before in the Methods section of Study 1.

Perceived Teacher Feedback: The Perceived Teacher Feedback Scale (PTF) was originally developed by Koka and Hein (2003) to assess students' perceptions of teachers' feedback behaviors. The scale measures the types of feedback provided by physical education teachers to students following their performance in physical education classes. Items are rated on a five-point Likert scale. The scale was later revised by Koka and Hein (2005). The revised version consists of 14 items grouped into four subscales**:** positive nonverbal feedback (3 items), negative nonverbal feedback (3 items), positive general feedback (4 items), and knowledge of performance (4 items). The Turkish adaptation of the revised Perceived Teacher Feedback Scale was conducted by Kara, Kazak and Aşçı (2018). The confirmatory factor analysis of the Turkish version of the scale indicated an acceptable model fit for the scale (χ^2 = 172.06, df = 61, RMSEA = 0.063, SRMR = 0.053, TLI = 0.94, CFI = 0.96, GFI = 0.95).

Data Analysis

Descriptive statistics (frequencies, means, and standard deviations), Pearson correlation analyses and multiple regression analyses were performed using SPSS (Version 28). Assumptions for parametric tests were evaluated by examining skewness and kurtosis values (Büyüköztürk, 2013). Prior to the regression analyses, multicollinearity was assessed using

Pearson correlation coefficients, tolerance (TOL), variance inflation factor (VIF), and condition index (CI) values (Field, 2018). The results indicated that the assumption of multicollinearity was satisfied (TOL: 0.45-0.93, VIF: 1.07-2.21, CI: 1-12.67) (Field, 2018).

Procedure

Following ethical approval from the Ethics Committee of Ağrı İbrahim Çeçen University (Decision No. 137, March 27, 2025), the necessary permissions were obtained from the Ağrı Provincial Directorate of National Education. Subsequently, school administrators at the selected high schools were contacted to facilitate participant recruitment. Prior to data collection, parental information and consent forms were distributed, and written consent was obtained from parents. Students were then informed about the study through information and consent forms, and their voluntary participation was confirmed. Data were collected from students who agreed to participate on a voluntary basis. The data collection instruments were administered by the researchers using a face-to-face survey method in classroom settings, outside of physical education lesson hours. The same procedures were followed in both Study 1 and Study 2.

RESULTS

The results are presented under two main headings, reporting the findings of Study 1 and Study 2 separately.

Study 1: Validation of the Relational Efficacy Beliefs Scales in Physical Education Among High School Students (Grades 9-10)

In the descriptive analysis, skewness (-0.59 to -0.10) and kurtosis (-1.04 to -0.44) statistics indicated univariate normality for the nine items of the self-efficacy scale. Descriptive analyses for other-efficacy items univariate normality as evidenced by skewness (-0.35 to -0.09) and kurtosis (-1.03 to -0.73) statistics and RISE items displayed acceptable values for skewness (-0.50 to 0.16), and kurtosis (-0.81 to -0.22) (Büyüköztürk, 2013).

In Figure 1, the CFA fit indices indicated good model fit ($\chi^2/df = 1.48$, RMSEA = 0.05, CFI = 0.94, TLI = 0.94) (Schermelleh-Engel et al., 2003). Factor loadings ranged between 0.59-0.74 for the Self-Efficacy Scale, 0.63-0.77 for the Other-Efficacy Scale, and 0.59-0.79 for the Relation-Inferred Self-Efficacy Scale (Figure 1). Cronbach's alpha coefficients were found to be 0.89 for all three scales (Table 1). The calculated values demonstrated adequate convergent validity and partial divergent validity for the Self-Efficacy (AVE = 0.31, CR = 0.84, MSV = 0.54, ASV = 0.28), Other-Efficacy (AVE = 0.34, CR = 0.86, MSV = 0.54, ASV

= 0.20), and Relation-Inferred Self-Efficacy (AVE = 0.33, CR = 0.85, MSV = 0.54, ASV = 0.25) scales (Fornell and Larcker, 1981).

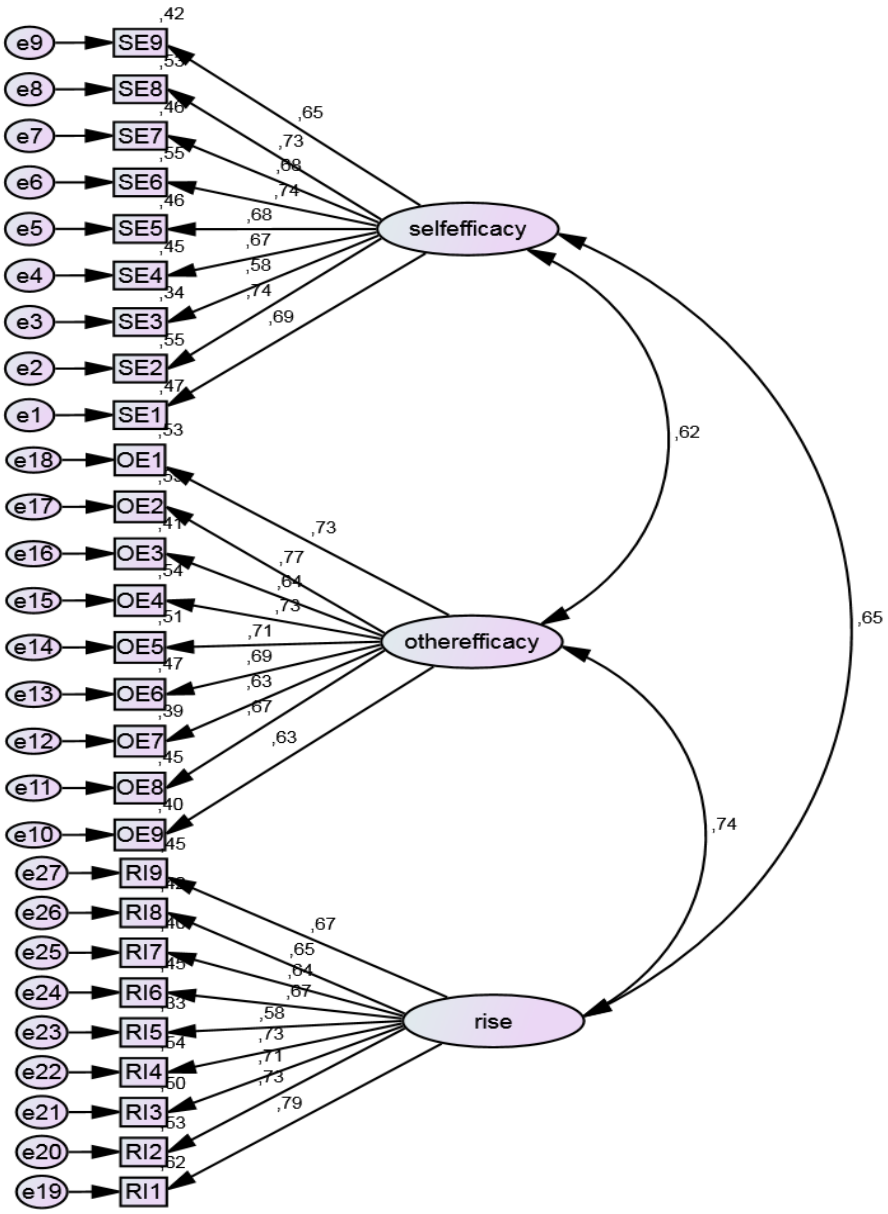

Figure 1. Factor structure and inter factor correlations of the three-factor model

Table 1. Reliability and convergent and discriminant validity values for the relational efficacy beliefs scales

Scales	Cronbach Alpha	CR	AVE	MSV	ASV
Self-efficacy	0.89	0.84	0.31	0.54	0.28
Other-efficacy	0.89	0.86	0.34	0.54	0.20
Relation-inferred self-efficacy	0.89	0.85	0.33	0.54	0.25

Study 2: Examining the predictive effects of perceived teacher feedback types on relational efficacy beliefs

Descriptive statistics for the scale scores, including means, standard deviations, skewness and kurtosis coefficients are presented in Table 2. Examination of skewness and kurtosis values indicated that the scale scores met the assumptions of normality (see Table 2). Multicollinearity was assessed by examining Pearson correlation coefficients among the variables. All coefficients were below the commonly accepted threshold of 0.80 (Field, 2018) (see Table 3).

Table 2. Descriptive statistics for the scale scores

	Scales	$\bar{M}$	*SD*	Skewness	Kurtosis
Perceived Teacher Feedback Scale	**Positive nonverbal feedback**	3.05	1.04	-0.03	-0.79
	Negative nonverbal feedback	2.87	1.05	0.12	-0.70
	Positive general feedback	2.72	0.91	0.04	-0.39
	Knowledge of performance	3.38	1.01	-0.34	-0.51
	Self-efficacy	3.38	0.92	-0.17	-0.67
	Other-efficacy	3.06	0.97	-0.03	-0.58
	RISE	3.18	0.96	-0.16	-0.47

Table 3. Correlations among the subscales of the Perceived Teacher Feedback Scale and three types of Relational efficacy beliefs

Variables		1	2	3	4	5	6	7
1	**Positive nonverbal feedback**	1						
2	**Negative nonverbal feedback**	0.17*	1					
3	**Positive general feedback**	0.68**	0.16*	1				
4	**Knowledge of performance**	0.66**	0.26**	0.65**	1			
5	**Self-efficacy**	0.18**	-0.01	0.12	0.12	1		
6	**Other-efficacy**	0.43**	-0.07	0.42**	0.40**	0.38**	1	
7	**RISE**	0.38**	-0.05	0.21**	0.28**	0.64**	0.66**	1

**p<0.01, *p<0.05

Results of the multiple regression analysis conducted to examine the predictive effects of perceived teacher feedback types on self-efficacy beliefs are presented in Table 4. When considered jointly, positive nonverbal feedback, negative nonverbal feedback, positive general feedback, and knowledge of performance explained approximately 2% of the total variance in perceived self-efficacy in physical education ($F(4, 215) = 1.79$, $p = 0.13$). Based on the standardized regression coefficients (β), the relative importance of the predictor

variables for self-efficacy was, in descending order: positive nonverbal feedback, negative nonverbal feedback, knowledge of performance, and positive general feedback**.** Examination of the *t*-test results for the regression coefficients indicated that none of the four predictor variables had a statistically significant effect on self-efficacy (see Table 4).

Table 4. Results of the multiple regression analysis examining the predictive effects of perceived teacher feedback types on self-efficacy beliefs

Variables	B	Standard error$_B$	β	t	p	R	R^2
Positive nonverbal feedback	0.16	0.09	0.18	1.76	0.08	0.18	0.02
Negative nonverbal feedback	-0.03	0.06	-0.04	-0.50	0.62		
Positive general feedback	-0.02	0.10	-0.02	-0.17	0.85		
Knowledge of performance	0.03	0.09	0.03	0.28	0.79		
$F_{4,215}$=1.79, p = 0.13							

Results of the multiple regression analysis conducted to examine the predictive effects of perceived teacher feedback types on other-efficacy beliefs are presented in Table 5. Positive nonverbal feedback, negative nonverbal feedback, positive general feedback, and knowledge of performance explained 29% of the total variance in other-efficacy. According to the standardized regression coefficients (β), the relative importance of the predictor variables for other-efficacy was, in descending order: positive nonverbal feedback, positive general feedback, negative nonverbal feedback, and knowledge of performance**.** Examination of the *t*-test results for the regression coefficients indicated that all four predictor variables were statistically significant predictors of other-efficacy (see Table 5).

Table 5. Results of the multiple regression analysis examining the predictive effects of perceived teacher feedback types on other-efficacy beliefs

Variables	B	Standard error$_B$	β	t	p	R	R^2
Positive nonverbal feedback	0.19	0.08	0.20	2.30	0.02*	0.50	0.29
Negative nonverbal feedback	-0.17	0.06	-0.18	-2.92	0.004**		
Positive general feedback	0.20	0.09	0.190	2.17	0.03*		
Knowledge of performance	0.18	0.08	0.17	2.15	0.03*		
$F_{4,215}$=17.80, p=0.000.*p<0.05, **p<0.01							

Results of the multiple regression analysis conducted to examine the predictive effects of perceived teacher feedback types on RISE beliefs are presented in Table 6. When considered jointly, positive nonverbal feedback, negative nonverbal feedback, positive general feedback, and knowledge of performance explained 15% of the total variance in RISE ($F(4, 215) = 10.30$, $p < .001$). Based on the standardized regression coefficients (β), the relative importance of the predictor variables for RISE was, in descending order: positive nonverbal feedback, negative nonverbal feedback, positive general feedback, and knowledge of performance**.** Examination of the *t*-test results for the regression coefficients indicated that positive nonverbal feedback was a significant positive predictor**,** whereas negative nonverbal feedback was a significant negative predictor of RISE. In contrast, positive general feedback and knowledge of performance were not significant predictors (see Table 6).

Table 6. Results of the multiple regression analysis examining the predictive effects of perceived teacher feedback types on RISE beliefs

Variables	B	Standard error$_B$	β	t	p	R	R^2
Positive nonverbal feedback	0.27	0.87	0.30	3.19	0.002**	0.40	0.15
Negative nonverbal feedback	-0.12	0.06	-0.13	-1.99	0.048*		
Positive general feedback	0.10	0.08	0.08	1.08	0.28		
Knowledge of performance	0.05	0.09	0.05	0.52	0.60		

$F_{4,215}$=10.30, p=0.000.*p<0.05, **p<0.01

DISCUSSION and CONCLUSION

The present study aimed to examine the psychometric properties of the relational efficacy beliefs scales in physical education and to investigate the predictive role of perceived teacher feedback on students' efficacy beliefs. The results of Study 1 confirmed the original three-factor structure of the scales and demonstrated satisfactory levels of reliability, supporting their use among high school students in physical education contexts. In Study 2, the results revealed a differentiated pattern of associations between teacher feedback and efficacy beliefs. None of the feedback types significantly predicted students' self-efficacy. Positive nonverbal feedback, positive general feedback, and knowledge of performance positively predicted other-efficacy, whereas negative nonverbal feedback was a negative

predictor. Furthermore, RISE was positively associated with positive nonverbal feedback and negatively associated with negative nonverbal feedback.

The findings of Study 1 further supported the construct validity of the relational efficacy beliefs scales in the physical education context. The confirmatory factor analysis yielded a good model fit, with all fit indices meeting or exceeding the recommended reference values recommended by Schermelleh-Engel et al. (2003), indicating that the three-factor structure was well represented among high school students. The factor loadings for all items were within acceptable ranges, suggesting that each item meaningfully contributed to its construct. These results are consistent with previous validation studies conducted in physical education settings (Jackson et al., 2012; Cheon and Song, 2017; Keskin Akın and Aşçı, 2021), confirming the robustness of the tripartite efficacy framework across age groups and cultures. In line with the criteria proposed by Fornell and Larcker (1981), the reliability and validity analyses provided further support for the psychometric adequacy of the scales. The Cronbach's alpha coefficients and composite reliability values exceeded the recommended thresholds, indicating strong internal consistency across all three constructs. These results were similar to the values obtained for the original scale (Jackson et al., 2012). Although the AVE values did not reach the conventional cutoff of 0.50, the higher composite reliability values suggest that adequate convergent validity was achieved, as previously acknowledged in the methodological literature (Fornell and Larcker, 1981). Although the average values were below the threshold, the factor loadings ranged from 0.59 to 0.79, indicating that the item reliability was acceptable. Because AVE is calculated based on the squared factor loadings, moderate loadings may lead to relatively lower AVE values despite adequate item performance (Hair et al., 2014). Moreover, all composite reliability (CR) values exceeded the recommended threshold, supporting the adequacy of convergent validity (Fornell & Larcker, 1981). Regarding discriminant validity, the results indicated partial support, as the ASV values were lower than the MSV, and the constructs demonstrated moderate interrelations while remaining theoretically distinct from each other. Overall, the results support that self-efficacy, other-efficacy, and RISE are interconnected yet conceptually distinct constructs within physical education contexts. These consistent findings suggest that the scale is robust across different age groups, thereby supporting its generalizability. Practically, this allows researchers and practitioners to confidently use the scale with this population for assessment and intervention in physical education settings.

The findings of Study 2 indicated that types of teacher feedback did not significantly predict students' self-efficacy, whereas several forms of feedback were associated with other-

efficacy and relation-inferred self-efficacy (RISE). This pattern aligns with previous research suggesting that social-contextual factors in physical education influence self-efficacy primarily through relational efficacy beliefs rather than through direct effects. For example, Jackson et al. (2013) showed that perceived relatedness support from PE teachers enhanced students' self-efficacy indirectly via increases in other-efficacy and RISE. Similarly, in a study conducted by Keskin Akın (2021), neither empowering nor disempowering motivational climate had a significant direct effect on self-efficacy. However, the empowering motivational climate demonstrated a significant indirect effect on self-efficacy through other-efficacy and RISE, whereas the disempowering motivational climate showed no significant indirect effects through relational efficacy beliefs (Keskin Akın, 2021). On the other hand, according to Bandura (1997), self-efficacy is most strongly influenced by mastery experiences, which provide direct evidence of personal capability. In contrast, social persuasion and feedback typically may play a more supportive and indirect role (Bandura, 1997). In physical education contexts, students' confidence in their abilities may therefore depend more heavily on successful task performance and skill acquisition than on teachers' verbal or nonverbal feedback alone. Although positive feedback may encourage effort and persistence, it may not be sufficient to alter self-efficacy unless accompanied by concrete performance improvements. Together, these findings indicate that supportive interpersonal environments may foster students' self-efficacy by first shaping their perceptions of others' competence and their inferences about how others perceive them. Accordingly, the present results suggest that teacher feedback may contribute to students' self-efficacy indirectly by influencing relational efficacy beliefs, even in the absence of a direct relationship.

The results of the study showed that positive general feedback and knowledge of performance were significantly and positively related to other-efficacy. These significant positive effects highlight the central role of teachers' instructional communication in shaping students' beliefs about their competence in physical education. In PE settings, where learning often involves observable motor skills and immediate performance outcomes, students may rely heavily on teachers' feedback to evaluate their expertise and instructional effectiveness (Lent & Lopez, 2002). Positive general feedback can convey encouragement and overall instructional confidence, fostering students' perceptions of teachers as being capable and supportive. Likewise, knowledge of performance provides specific and meaningful information regarding skill execution and improvement, reinforcing teachers' roles as knowledgeable guides in the learning process (Koka and Hein, 2005). These findings are consistent with previous research showing that students' relational efficacy beliefs are

influenced by teachers' interpersonal and instructional behaviours (Jackson et al., 2013; Gairns et al., 2015) and emphasise the importance of feedback-related interactions in PE contexts. These consistent findings suggest that specific types of teacher feedback, particularly positive general feedback and knowledge of performance, play a stable and meaningful role in shaping students' other-efficacy beliefs. From a practical perspective, this highlights the importance of providing clear, constructive, and performance-related feedback in physical education settings. Teachers should be encouraged to provide such forms of feedback, as they may help students develop more accurate and positive perceptions of others' competence, thereby supporting more effective interpersonal dynamics and learning processes in PE classes.

The results revealed that perceived positive and negative nonverbal teacher feedback predicted other-efficacy and RISE. It was determined that positive nonverbal feedback had a positive effect on other-efficacy and RISE, whereas negative nonverbal feedback had a negative effect on other-efficacy and RISE. Analysis showed that positive general feedback and knowledge of performance did not significantly predict RISE. The strong predictive role of nonverbal feedback highlights the importance of subtle interpersonal cues in PE. Nonverbal behaviors, such as facial expressions, gestures, tone of voice, and body language, may convey teachers' evaluations of students' competence more immediately and emotionally than verbal feedback (Koka and Hein, 2005). Previous research has shown that students' beliefs about their relational efficacy are particularly sensitive to teachers' relatedness-supportive and transformational behaviors (Bourne, 2011; Gairns et al., 2015; Jackson et al., 2013). Such teaching methods often rely heavily on nonverbal communication to convey encouragement, respect, and belief in students' abilities. Similarly, Sparks et al. (2017) found in their experimental study that instructional programs emphasizing relational support enhanced both other-efficacy and RISE. This suggests that students internalize interpersonal signals as indicators of their competence and value within the teacher-student relationship. In this context, nonverbal feedback may function as a powerful source of social information through which students infer teachers' confidence in them and form judgments about the effectiveness of their relational interactions. Beyond the physical education context, research in sports settings further supports the role of perceived interpersonal behaviors in shaping relational efficacy beliefs. McMullen et al. (2020) found that autonomy-supportive and positive coaching behaviors were positively associated with high school athletes' RISE, emphasizing that athletes' interpretations of coaches' actions are central to the development of relational efficacy. Interestingly, Hewitt (2023) reported that objectively observed coaching behaviors

did not significantly predict efficacy beliefs, underscoring the primacy of athletes' subjective perceptions. These findings are relevant to the present study, as they suggest that students' perceptions of teachers' feedback—particularly nonverbal cues—may exert a stronger influence on relational efficacy beliefs than the mere presence of specific instructional behaviors in the classroom.

Overall, the present study provides further support for the tripartite efficacy framework in physical education by confirming the validity and reliability of the adapted scales and demonstrating the differential roles of teacher feedback in shaping relational efficacy beliefs. While various forms of feedback were associated with students' perceptions of teachers' competence (other-efficacy) and their inferences about how teachers and peers viewed their abilities (RISE), no direct effects were observed on self-efficacy. These findings highlight the importance of interpersonal processes in physical education and suggest that students' efficacy development is strongly embedded within relational contexts. Specifically, feedback is thought to primarily influence students by shaping their beliefs about others and their relational interpretations, which may, in turn, contribute to the development of self-efficacy over time. Therefore, PE teachers should emphasize supportive interpersonal behaviors, particularly positive nonverbal communication, to foster students' perceptions of competence and positive relational interpretations. Additionally, providing clear and constructive performance-related feedback may strengthen students' confidence in teachers' instructional abilities and promote greater engagement in physical education classes.

Suggestions

Several limitations should be considered when interpreting the present results. The cross-sectional design of Study 2 prevents causal conclusions regarding the effects of teacher feedback on efficacy beliefs. Future research employing longitudinal or experimental designs may help clarify these relationships. In addition, future studies could examine relational efficacy beliefs as potential mediators between perceived teacher feedback and self-efficacy to understand why perceived feedback from teachers does not affect self-efficacy. Using the self-report measures may reflect students' subjective perceptions rather than objective teacher behaviors, although these perceptions are central to efficacy development. Further studies integrating observational methods and examining the role of mastery experiences may provide deeper insights into how feedback contributes to self-efficacy over time. Based on the present findings, physical education teachers and coaches are encouraged to provide clear, constructive, and performance-related feedback, as such feedback appears to play an

important role in shaping students' efficacy beliefs. The differential effects of various types of feedback on relational efficacy beliefs across different age groups and contexts may be further examined in future research.

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