



Validity evidence for the attitudes on person-centered behavior toward students questionnaire (APBS): Internal structure and associations with external variables

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Abstract

Building positive teacher-student relationships (TSR) is a central task for teachers. According to the person-centered approach, teachers create positive relationships by treating students with unconditional positive regard, empathic understanding, and genuineness. Numerous studies demonstrate the impact of person-centered teacher behavior for students' achievement and well-being. The effectiveness of person-centered behavior is supposed to be determined by underlying attitudes. Accordingly, person-centered attitudes should receive greater focus in both teacher education and TSR research. However, a suitable measurement instrument is currently lacking. Therefore, the APBS instrument was developed, a theoretically-grounded self-report questionnaire that measures pre-service teachers' attitudes on person-centered behavior toward students. In previous studies, the suitability of the test's content and internal structure were empirically examined using EFA. The present study investigated the internal structure using CFA, as well as the associations with external variables, in a sample of $N=1284$ pre-service teachers from German universities ($Mage=23.3$, $SDage=5.2$; 79.8% female). Different factor models were tested and compared. The model with four first-order factors (unconditionality, empathic understanding, trust, genuineness) along with the APBS higher-order factor showed the best fit ($\chi^2/df(1504.868/520)=2.894$, $p<.001$; CFI = .968; RMSEA = .038). Both the four first-order scales ($\omega^* = .81-.90$), and the second-order scale ($\omega^* = .95$) exhibited satisfactory internal consistency. In addition, structural regression and mediation analyses revealed mostly theory-consistent relationships with respondents' attachment representation, empathy and relational competence. In summary, the findings support the intended interpretation of APBS test scores. The questionnaire can be used as a measurement instrument in TSR research and as a self-exploration tool in teacher education.

Keywords Teacher-student relationship · Attitudes · Person-centered approach · Empathy · Attachment · Research instrument validation

1 Introduction

A comprehensive body of international research demonstrates that positive teacher-student relationships (TSR) are essential for students' learning and developmental processes. Study findings consistently show moderate to strong associations with students' cognitive abilities and academic performance (e.g., Hamre & Pianta, 2001; Hughes, 2011) as well as motivational (e.g., Murray, 2009; Skinner et al., 2008) and social-emotional characteristics (e.g., Roorda & Koomen, 2021; Rucinski et al., 2018). However, at the same time, several studies suggest that teachers struggle to maintain positive relationships with their students: (1) (pre-service) teachers often cite relationship building as one of the most challenging aspects of their profession (e.g., Schmidt et al., 2017; Shoffner, 2011); (2) teachers frequently experience negative emotions in their interactions with students (e.g., Aldrup et al., 2018; Cui, 2022); (3) students encounter destructive interpersonal behavior from their teachers, such as sarcasm, humiliation, or physical punishment (e.g., Prengel, 2021; Romi et al., 2011). Therefore, it is of great importance to identify teacher characteristics that can help them build positive relationships with their students. Such insights can then be utilized for teacher education and training to promote teachers' relationship-related competencies in a systematic and evidence-based way. The APBS instrument, a theory-based self-report questionnaire measuring pre-service teachers' attitudes on person-centered behavior toward students, assesses such a teacher characteristic relevant to the TSR. Previous studies described the development process of the APBS and examined its internal structure using exploratory factor analyses (EFA; Teistler, 2021, 2022). This paper provides further validity evidence, investigating the internal structure using confirmatory factor analyses (CFA) as well as the relationships of APBS test scores with attachment representation, empathy, and relational competence in a sample of 1284 pre-service teachers from German universities. The second part of this article provides an overview of teacher characteristics relevant to TSR formation, with a particular emphasis on the role of teacher attitudes. The third part describes the person-centered approach, the theoretical foundation on which the instrument's development is based. The fourth part provides an overview of the previous development and validation process of the APBS. The aims and hypotheses of this study are presented in the fifth part of the article.

2 The teacher-student relationship and relevant teacher characteristics

Social relationships arise from regular interactions between at least two individuals, influenced on the one hand by the individual characteristics of the interactants, and on the other hand by the socio-cultural context in which the interactions are embedded (Hinde, 1976). In the transactional model of the TSR, Nickel (1976) applied these general assumptions derived from social psychological relationship research to the conceptualization of the TSR construct (see online resource 1, p. 1 for an English translation of the model). Nickel (1976) describes

various teacher and student characteristics, out of whose complex and dynamic interplay the TSR emerges. At the core of the model is the interpersonal behavior of teachers and students, understood as a response to the subjectively perceived behavior of the interaction partner. Teachers and students interpret and evaluate each other's behavior against the backdrop of interpersonal attitudes and expectations that develop over the course of life through interpersonal experiences and cultural context factors, simultaneously influenced by current social interactions. The model demonstrates how complex the TSR is and how the behavior of teachers and students can only be understood when considering their personal characteristics and contextual factors. Based on Nickel's TSR model, the following will provide a description of teacher characteristics that influence the TSR, connecting them with current research findings, and finally presenting them in a summarized theoretical framework.

- (1) Interactions, which arise from regularly interrelated behaviors between teachers and students, form the core of TSRs (Nickel, 1976). *Interpersonal teacher behavior*, including both educational and instructional practices, is one of the most investigated teacher characteristics in TSR research (Knierim et al., 2017; Teistler et al., 2019). Studies examining interpersonal teacher behavior and its association with student outcomes are based on a variety of theoretical concepts (Davis, 2003; Knierim et al., 2017). For example, studies refer to Bowlby's (1969) attachment theory, Deci and Ryan's (1985) self-determination theory, Leary's (1957) interpersonal theory, Mehrabian's (1971) social constructivist approach, Rogers' (1969) person-centered approach, and McCombs' (1997) learner-centered model. Meta-analyses have revealed mostly moderate associations between the different relationship-enhancing teacher behaviors derived from the respective theories and cognitive, motivational, and socio-emotional student outcomes (e.g., Cornelius-White, 2007; García-Rodríguez et al., 2023; Roorda et al., 2011; Witt et al., 2004). However, the heterogeneity of theoretical orientations has led to a plethora of different operationalizations and instruments for assessing relationship-enhancing teacher behavior in recent decades (Phillipo et al., 2017; Teistler et al., 2019). Thus, despite the extensive body of research, there is still a lack of transparency about which teacher behaviors are most conducive to the formation of positive TSRs.
- (2) *Internal teacher variables* relevant to TSRs encompass interpersonal attitudes, beliefs, subjective theories, and expectations about various aspects of the TSR (e.g., student characteristics; teachers' educational practices), as well as knowledge related to relationship aspects of the teaching profession (Hamre et al., 2012; Nickel, 1976; Teistler et al., 2019). These variables play a central role in the formation of TSRs, as they influence how teachers perceive their students' behavior and determine how teachers behave toward their students (Hamre et al., 2012; Nickel, 1976; Pianta et al., 2003). Empirical evidence regarding the impact of internal teacher variables on their interpersonal behavior has been primarily provided by qualitative studies in recent years (e.g., Haagenen et al., 2020; Newberry & Davis, 2008). Quantitative studies were predominantly conducted

in the 1970s and 1980s (e.g., Lewin et al., 1983; Mayr et al., 1987). More recent quantitative studies on internal teacher variables mainly focus on beliefs about teaching and learning in general or about diversity and inclusion (Fives & Buehl, 2012). In summary, although the importance of internal teacher variables for TSR building is emphasized in many theoretical approaches (e.g., McCombs, 1997; Nickel, 1976; Pianta et al., 2003; Rogers, 1969), current quantitative research on internal teacher variables related to aspects of the TSR is relatively sparse (Teistler et al., 2019).

- (3) Recent TSR research has increasingly focused on teachers' *relational competence* (e.g., Aspelin & Jönsson, 2019; Jensen et al., 2015), which represents their potential to act in social interactions in a way that fosters the formation of positive TSRs (Aspelin & Jönsson, 2019). This potential, in turn, arises from a complex interplay of cognitive, motivational, and emotional variables. (Blömeke et al., 2015; Korthagen, 2004). Consequently, relational competence can be conceptually understood as a kind of interface between the teachers' internal variables and their interpersonal behavior. Current researchers focus on the conceptualization of the construct and the promotion of relational competence in pre-service teachers (e.g., Aspelin & Jönsson, 2019; Jensen et al., 2015) as well as the development of corresponding research instruments (e.g., Aldrup et al., 2020; Borremans & Spilt, 2022). To the best of the author's knowledge, studies on the impact of teachers' relational competence on their interpersonal behavior or student outcomes have not been conducted thus far.
- (4) Based on attachment theory (e.g., Bowlby, 1969), researchers in the TSR field assume that teachers' *interpersonal experiences* obtained in relationships with significant others (e.g., parents, romantic partners) and the resulting generalized representations of attachment affect TSR quality by shaping teachers' cognitions, emotions and behaviors toward students (Nickel, 1976; Pianta et al., 2003; Rimm-Kaufman & Hamre, 2010; Spilt et al., 2011). Attachment representations are organized into cognitive schemas called internal working models that reflect expectations, beliefs and emotions about the self, others, and self–other relationships (Baldwin, 1992). In social psychology research on adult attachment representations, a two-dimensional model has emerged, consisting of attachment anxiety (fear of separation, abandonment, rejection) and attachment avoidance (discomfort with dependency, closeness, and openness) (Brennan et al., 1998). Individuals who score low on both dimensions have a strong sense of attachment security, while those with high scores on at least one of the dimensions experience strong feelings of attachment insecurity, which can negatively impact interpersonal functioning and relationship quality (Mikulincer & Shaver, 2016). Another attachment representation model based on the person-centered approach (Höger & Buschkämper, 2002; Höger et al., 2008) includes the dimension of care (need for attention and care) in addition to anxiety and avoidance. However, Höger et al. (2008) argue that the impact of the care dimension on relationship quality varies depending on its combination with the other two attachment dimensions. In line with findings from social psychology research, studies examining the impact of teachers' representations of attachment anxiety and

avoidance (mainly based on their relational experiences with romantic partners) have consistently shown low to moderate negative associations with teachers' relationship-enhancing behavior toward students (Morris-Rothschild & Brassard, 2006; Sher-Censor et al., 2019) and students' school adjustment (Lifshin et al., 2020). However, the negative associations with the anxiety dimension were typically less strong in comparison and thus not always statistically significant. A study by Evans et al. (2019) found no empirical evidence for the impact of teachers' attachment representation regarding care.

- (5) Scholars assume that teachers' *personality traits* are crucial for TSR quality by shaping their own internal variables and behaviors toward students (e.g., McCombs, 1997; Pianta et al., 2003; Rimm-Kaufman & Hamre, 2010). In this regard, research mainly focuses on teachers' social-emotional and Big Five traits (Jennings & Greenberg, 2009; Rimm-Kaufman & Hamre, 2010). One frequently examined characteristic is teachers' empathy, which is generally understood as a person's responsiveness to the mental state and experiences of another (Davis, 1983; Davis & Oathout, 1987). Thus, empathy facilitates the maintenance of social interactions and is considered the foundation of human prosocial behavior (Decety & Jackson, 2004). Research commonly distinguishes between two dimensions of empathy: the affective dimension reflects emotional reactions to the mental state of another person, while the cognitive dimension describes the ability to understand what others feel and think by taking their perspective (Decety & Jackson, 2004). Numerous studies provide evidence that both dimensions have a positive impact on the quality of social relationships (e.g., Sened et al., 2017; Vachon et al., 2014). Therefore, in recent TSR research, teachers' empathy has been increasingly examined (for an overview of studies, see Aldrup et al., 2022). Some studies have found low to moderate positive associations between the two empathy dimensions and teachers' relationship-enhancing behaviors (e.g., Huang et al., 2018), teachers' relationship-enhancing attitudes (e.g., Barr, 2013) as well as cognitive and social-emotional student outcomes (e.g., Aldrup et al., 2020). The cognitive empathy dimension mostly exhibited weaker associations in comparison, which were less frequently statistically significant.

Figure 1 illustrates the teacher characteristics presented in this chapter in a theoretical model, which serves as the conceptual foundation for the present study. However, it should be noted that the model is not exhaustive, as it includes only those characteristics considered particularly relevant for the formation of teachers' interpersonal attitudes and thus for the validation of the APBS test score interpretation. In TSR research, other teacher characteristics are also deemed important to TSR formation, such as gender, teaching experience, or mental representations of relationships with specific students (Pianta et al., 2003; Spilt et al., 2011). Cultural context factors (e.g., teacher education, school climate) that can influence the development of teacher characteristics and thus indirectly impact

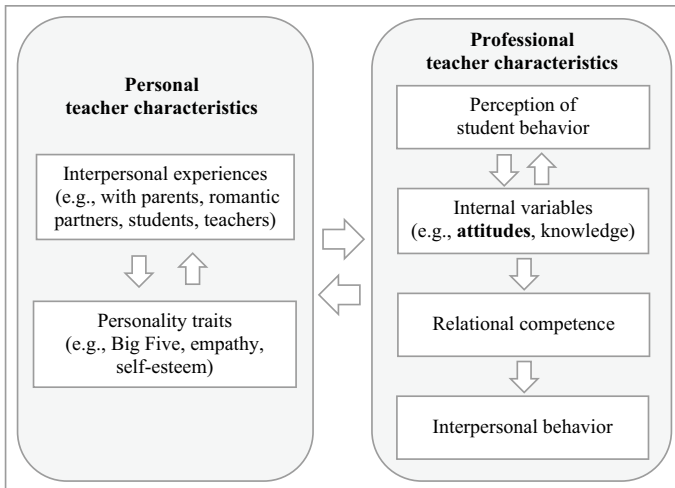


Fig. 1 Teacher characteristics relevant to the teacher-student relationship. *Note.* Model is based on the transactional model of the TSR (Nickel, 1976)

teacher-student interactions were not accounted for in the model, either (Nickel, 1976; Pianta et al., 2003).

3 Person-centered teacher behavior and attitudes

TSR research often focuses on interpersonal teacher behavior as a relevant aspect of the TSR (Knierim et al., 2017; Teistler et al., 2019). In this regard, the person-centered approach, which was coined by humanistic psychologist Carl Rogers (1902–1987), has been used in numerous studies to operationalize and measure relationship-enhancing teacher behavior (Cornelius-White, 2007). Rogers initially developed the approach as the foundation for a psychotherapy method (e.g., Rogers, 1951), which he applied to the educational context in later work (e.g., Rogers, 1969, 1983; Rogers et al., 2014). For Rogers, facilitating learning is the primary goal of education. Accordingly, the focus should be on helping the student develop the ability for self-instruction because only "the man who has learned how to learn; the man who has learned how to adapt and change; the man who has realized that no knowledge is secure, that only the process of seeking knowledge gives a basis for security" can be considered educated (Rogers, 1969, p. 120). Rogers (1969) argued that teachers could promote this kind of learning by approaching their students with unconditional positive regard, empathetic understanding, and genuineness/congruence.

Studies consistently provide evidence for positive associations between the three person-centered teacher behaviors and students' academic achievement (e.g., Aspy, 1972; Boak & Conklin, 1975), cognitive abilities (e.g., Aspy & Roebuck, 1972; Joost, 1978), learning and social behavior (e.g., Ryans, 1961; Spanhel et al.,

1975), as well as affective-motivational characteristics (e.g., Fittkau, 1969; Wittern & Tausch, 1983). Additional empirical evidence stems from the meta-analysis conducted by Cornelius-White (2007), who found a corrected correlation of $r = .41$ ($SD = .34$) between person-centered teacher behavior and 18 different cognitive, affective, and behavioral student outcomes. These results were taken up by Hattie (2010) in a meta-meta-analysis that compared the effectiveness of 138 factors on student academic achievement. The TSR factor, which in the first publication of Hattie's study was represented exclusively by the results of Cornelius-White's study, ranked 11th, with an effect size of $d = .72$. Based on these study results, it can be concluded that person-centered teacher behavior represents one of the most important contributing factors to students' academic achievement. However, it should be noted that there is no current empirical evidence on the impact of person-centered teacher behavior. Nevertheless, the findings of these previous studies, mainly conducted in the 1960s to the 1980s, can be considered relatively reliable, since different informants were employed for assessing independent and dependent variables: While interpersonal teacher behavior was typically assessed by trained observers, student outcomes were measured via teachers' and students' evaluations (e.g., Boak & Conklin, 1975; Wittern & Tausch, 1983). Observer ratings have the advantage of being more objective than evaluations by teachers or students (Pianta et al., 2003). In more recent studies, in comparison, teacher behavior is often assessed relying solely on teacher or student judgments (García-Rodríguez et al., 2023; Teistler et al., 2019), leading to potential overestimation of the associations with student outcomes (Roorda et al., 2011).

However, it is worth criticizing that the studies based on the person-centered approach focused exclusively on interpersonal teacher behavior, which does not do justice to the humanistic principles Rogers described. Rogers was adamant that his approach should not be reduced to mere methods, since person-centered behaviors can only have positive effects on the interaction partner when they are genuine (Rogers, 1951, pp. 25–26). Consequently, he considered the three teacher characteristics as "attitude-dependent behaviors", emphasizing the importance of attitudes underlying the teacher's behavior in the formation of TSRs (Rogers, 1969, p. 106). According to Rogers' approach, it is therefore not sufficient to train teachers in person-centered methods (e.g., communication techniques; Tausch, 2017). They need to be *simultaneously* encouraged to reflect on their attitudes that underlie their behavior since these not only determine the effectiveness of person-centered behavior but also the willingness to learn and apply this behavior in the first place (Rogers, 1951, pp. 34–35).

4 The APBS instrument

From a theoretical perspective, it seems obvious that person-centered teacher attitudes are a necessary condition for building positive TSRs. However, there is no empirical research exploring the extent to which these attitudes are actually related to interpersonal teacher behavior or different student outcomes. Despite the long-standing popularity of the person-centered approach in German educational

research, a review conducted on the assessment of TSR aspects in German-speaking countries found no German-language instrument for assessing person-centered attitudes (Teistler et al., 2019). In the author's view, the lack of an instrument to assess (pre-service) teachers' person-centered attitudes represents a limitation in the field of TSR research. Therefore, the APBS instrument was developed as a German-language, theory-based self-report questionnaire to measure these attitudes in pre-service teachers. The goal was to develop an instrument that could be used both in TSR research and as a teaching and self-exploration tool in teacher education.

The APBS questionnaire presents pre-service teachers with person-centered behaviors and asks them to indicate how positively or negatively they evaluate these behaviors in interactions with students. Conceptually, the instrument measures what is known as a behavioral attitude. Attitude, following Eagly and Chaiken's (2007, p. 582) definition, reflects one's overall evaluation of a particular entity with some degree of favor or disfavor. A behavioral attitude refers to the evaluation of behaviors—in this case, a specific behavior is the attitude object. This operationalization has the advantage that behavioral attitudes have been found to be good predictors of future behavior (in contrast to attitudes toward objects or persons; e.g., Glasman & Albarracín, 2006). In summary, for the APBS instrument, it is assumed that the test scores achieved by pre-service teachers reflect their attitudes on person-centered behavior toward students in line with the theoretical approach of Carl Rogers.

Based on the argument-based validation approach—and thus adhering to the standards for psychological testing set forth by AERA, APA, and NCME in 2014—two studies have already been conducted to validate the APBS test score interpretation using methods from classical test theory: The first study (Teistler, 2021) gathered validity evidence based on test content. It discussed the construct conceptualization, item development, and an investigation of the test's content suitability by means of a survey of ten subject matter experts. The second study (Teistler, 2022) examined the internal structure using a sample of 363 pre-service teachers from two German universities. The EFA results provided evidence for a four-factor model comprising unconditionality ($\alpha = .91$; $\omega_T = .93$), empathic understanding ($\alpha = .92$; $\omega_T = .93$), trust ($\alpha = .89$; $\omega_T = .90$), and genuineness ($\alpha = .83$; $\omega_T = .86$), which accounted for 46% of the total variance. The factor correlations ranged from .53 to .72. In summary, the previous study findings indicated that the APBS test scores can preliminarily be interpreted as intended.

5 The current contribution

The present study aimed to provide further empirical evidence to support the proposed interpretation of APBS test scores. The first step involved gathering additional evidence based on the test's *internal structure* (AERA et al., 2014, p. 16). When applying classical test theory, it is recommended to first conduct an EFA, modify the instrument if necessary, and then test the revealed factor structure using CFA with a separate sample (e.g., McCoach et al., 2013, p. 113). Teistler (2022) provided initial insights into the internal structure of the APBS using EFA, which was tested in the present study on a new sample of pre-service teachers using CFA. Consistent with

the preceding validation study, the following four hypotheses were examined in the first part of the present study: Responses to the APBS items are indicators of the four attitudinal dimensions unconditionality, empathic understanding, trust, and genuineness in pre-service teachers (*Hypothesis 1*). The four APBS scales assess aspects of an overarching person-centered attitude (*Hypothesis 2*). The APBS scales reliably assess the respective intended constructs (*Hypothesis 3*). The APBS test scores can differentiate between pre-service teachers with different levels of the intended constructs (*Hypothesis 4*).

The second goal of the present study was to gather new empirical evidence based on *relationships with external variables* (AERA et al., 2014, p. 16). In this regard, it is essential that the test scores of a newly developed instrument exhibit a pattern of relationships with specific external variables that aligns with theoretical expectations (McCoach et al., 2013, p. 210). Accordingly, based on the theoretical model presented in chapter 2, the following four hypotheses were examined in the second part of this study: Pre-service teachers' APBS are significantly associated with their attachment representations in romantic relationships. More precisely, for the dimensions of attachment anxiety and avoidance, low to moderate negative associations are expected, with avoidance anticipated to exhibit slightly stronger negative associations. For the care dimension, no significant association is expected, at least without controlling for anxiety and avoidance (*Hypothesis 5*). Pre-service teachers' APBS are significantly associated with their empathy. More precisely, for both the cognitive and affective empathy dimensions, low to moderate positive associations are expected, with affective empathy anticipated to demonstrate slightly stronger positive associations (*Hypothesis 6*). Pre-service teachers' APBS are significantly positively related to their relational competence with regard to students, at least on a moderate level (*Hypothesis 7*). Pre-service teachers' APBS significantly mediate the associations between the two predictors (attachment representation; empathy) and the relational competence criterion (*Hypothesis 8*).

6 Method

6.1 Sample

A sample of 1284 pre-service teachers (79.8% female; 19.8% male; 0.4% non-binary) from 34 German universities in 14 (out of 16) federal states participated in the study. The average age was 23.3 years ($SD=5.2$; range=17 to 51). Eight participants did not provide information about their gender, four participants did not provide information about their university, and two participants did not provide information about their age. The university phase of teacher education in Germany typically takes the form of a five-year program that leads to either a state exam (ten semesters) or a bachelor's (six semesters) and master's (four semesters) degree, depending on the federal state. In this study, 47.2% of pre-service teachers were in the state examination program ($M_{semester}=4.9$; $SD_{semester}=3.3$), 31.2% were in the bachelor's program ($M_{semester}=3.0$; $SD_{semester}=2.2$), and 21.6% were in the master's program ($M_{semester}=2.4$; $SD_{semester}=1.8$). Eight participants did

not provide information about their semester of study, and three participants did not provide information about their program of study. A total of 34.3% of the sample were enrolled in the primary school teaching program (German: “Grundschule”), 14.7% in the lower-track secondary school teaching program (German: “Oberschule/Sekundarschule/Realschule/etc.”), 39.2% in the upper-track secondary school teaching program (German: “Gymnasium”), 7.9% in the special education school teaching program (German: “Förderschule”) and 3.9% in the vocational school teaching program (German: “Berufsschule”). Two participants did not provide information on the school type.

6.2 Procedure

Pre-service teachers from universities in all German federal states were invited to participate in the study. The pre-service teachers were initially provided with information about the study either through a brief email (distributed by university lecturers and teacher education centers) or live by the researcher in digital lectures. They were then asked to complete the questionnaire including the APBS instrument, instruments to measure the three external variables, as well as demographic questions. Due to the COVID-19 pandemic, the survey was conducted exclusively online and took approximately half an hour to complete. The participation was anonymous and voluntary. Pre-service teachers had the option to withdraw from the questionnaire at any point without consequences and without providing reasons. Between October 2020 and February 2021, 1969 pre-service teachers participated in the survey: 1316 participants completed the questionnaire in its entirety, while 653 participants prematurely discontinued the survey. The incomplete questionnaires were excluded from the study due to a high number of missing values. Additionally, 32 fully completed questionnaires were excluded from participants who had already taken part in the previous validation study ($n=29$), did not belong to the target group of pre-service teachers ($n=2$), or showed signs of inattentive response behavior ($n=1$). This resulted in a final sample of 1284 pre-service teachers. The final dataset contained a total of 337 missing values (0.18%), distributed among 345 out of 1284 cases and among 19 out of 149 variables. The missing values were exclusively related to demographic information.

6.3 The APBS instrument

The attitudes on person-centered behavior toward students (APBS) were measured using the most recent APBS test version (Teistler, 2022), which consisted of 44 items and four scales. The *unconditionality* scale assesses the extent to which pre-service teachers are in favor of or disfavor unconditionally appreciating students’ individuality (twelve items, e.g., Treating students with respect, even if they do not follow the rules; $M=5.31$; $SD=0.50$; $\alpha=.90$; $\omega=.91$). The *empathic understanding* scale captures the extent to which pre-service teachers are in favor of or disfavor cognitively and emotionally empathizing with students’ mental state (eleven items,

e.g., Trying to comprehend what led students to behave the way they did; $M=5.20$; $SD=0.56$; $\alpha=.92$; $\omega=.94$). The *trust* scale refers to the extent to which pre-service teachers are in favor of or disfavor trusting in students' abilities and treating them as person of equal value to themselves (eleven items, e.g., Provide comprehensible reasons for demands made of students; $M=5.05$; $SD=0.53$; $\alpha=.88$; $\omega=.90$). The *genuineness* scale measures the extent to which pre-service teachers are in favor of or disfavor being congruent and authentic in their interactions with students (ten items, e.g., Presenting oneself to students as a person with strengths and weaknesses; $M=4.66$; $SD=0.62$; $\alpha=.83$; $\omega=.85$). The pre-service teachers indicated their level of favorability or unfavorability toward the person-centered behaviors in interactions with students, using a bipolar item-specific rating scale (Rauthmann, 2011; Saris et al., 2010) ranging from 1 = extremely negative to 6 = extremely positive. Further results of descriptive and internal consistency analyses for the four APBS scales are provided in the online supplementary material (online resource 2, p. 2).

6.4 Instruments for validation

The pre-service teachers' *attachment representations* were measured using the Bielefeld Partnership Expectations Questionnaire (BFPE; Höger & Buschkämper, 2002; Höger et al., 2008) The BFPE is based on the person-centered approach and assesses attachment-related expectations and experiences in romantic partnerships. The German-language questionnaire consists of 30 items and three scales: The *acceptance problems* scale (referred to as "anxiety" in other instruments assessing attachment representation) measures the expectation of being rejected by one's partner as a person (eleven items, e.g., I sometimes think that my partner only likes me to the extent that I meet his/her expectations; $M=1.02$; $SD=0.74$; $\alpha=.92$; $\omega=.93$). *Willingness to self-disclose* (referred to as "avoidance" in other instruments assessing attachment representation) refers to the expectation of being able to emotionally open up to one's partner (eleven items, e.g., It is easy for me to talk to my partner about my feelings; $M=3.05$; $SD=0.64$; $\alpha=.91$; $\omega=.93$). The *need for care* scale assesses the consciously perceived need to receive attention and affection from one's partner (eight items, e.g., Especially when I'm feeling bad, I rely a lot on my partner giving me special attention and being there for me; $M=1.80$; $SD=0.65$; $\alpha=.80$; $\omega=.85$). Answers were provided on a five-point scale ranging from 0 = does not apply at all to 4 = applies completely. To include individuals without a romantic partner, the instruction included the passage "If you are currently not in a romantic relationship, please fill out the questionnaire based on what would apply to you most in a partnership". Further results of descriptive and internal consistency analyses for the three scales are provided in the online resource 3 (p. 3).

The pre-service teachers' *empathy* was measured using the Interpersonal Reactivity Index (IRI; Davis, 1980, 1983). The German version of the IRI (SPF; Paulus, 2009) assesses cognitive and affective components of empathy with four scales and 16 items: The *perspective-taking* scale reflects the cognitive dimension of empathy and measures the tendency to adopt the perspective or viewpoint of others (four items, e.g., I believe that there are two sides to every question and try to look

at them both; $M=3.76$; $SD=0.65$; $\alpha=.83$; $\omega t=.88$). The *empathic concern* scale refers to the first of three affective empathy components and captures the tendency to experience feelings of warmth, compassion, and concern for individuals undergoing negative experiences (four items, e.g., I often have tender, concerned feelings for people less fortunate than me; $M=3.85$; $SD=0.59$; $\alpha=.69$; $\omega t=.73$). The *fantasy* scale reflects the second component of affective empathy and measures the tendency to immerse oneself in the emotional world of characters in novels or movies (four items, e.g., When I am reading an interesting story or novel, I imagine how I would feel if the events in the story were happening to me; $M=3.63$; $SD=0.73$; $\alpha=.77$; $\omega t=.83$). The *personal distress* scale refers to the third component of affective empathy and measures self-focused feelings such as unease and anxiety when witnessing the negative experiences of others (four items, e.g., Being in a tense emotional situation scares me; $M=2.69$; $SD=0.70$; $\alpha=.74$; $\omega t=.77$). Items were each rated on a five-point scale from 1 = does not describe me well to 5 = describes me very well. As the personal distress scale exhibited poor psychometric properties (e.g., low internal consistency, weak correlations with other empathy scales, poor model fit in CFA) in previous studies (Cliffordson, 2001; Fernández et al., 2011; Paulus, 2014, 2021), this empathy scale was excluded from further statistical analyses in the present study. Further results of descriptive and internal consistency analyses for the remaining three empathy scales are provided in the online resource 3 (p. 3).

The pre-service teachers' *relational competence* was measured using the Test of Regulation in and Understanding of Social Situations in Teaching (TRUST; Aldrup et al., 2020). The German-language TRUST is a theory-based situational judgment test that assesses two central facets of (pre-service) teachers' social-emotional competence: emotion regulation skills and relationship management skills. The present study utilized the unidimensional relationship management subtest ($\alpha=.64$; $\omega t=.71$), which measures (pre-service) teachers' abilities to create a positive climate and consider students' academic and social-emotional needs or behavioral problems. The pre-service teachers were initially confronted with eight short scenarios that are relevant to the quality of TSRs. For each scenario, four reactions were provided, resulting in a total of 32 items. The pre-service teachers were then asked to rate the effectiveness of each alternative in building a positive TSR on a five-point scale ranging from 1 = very ineffective to 5 = very effective. An example scenario is provided in Aldrup et al. (2020). Based on the pre-service teachers' responses, a total score was calculated for each participant, theoretically ranging from 0 to 38 points, with a higher score indicating a greater proficiency in relationship management skills. In the present study, the participants obtained a mean score of 25.51 points ($SD=4.67$). Further results of descriptive and internal consistency analyses are also provided in the online resource 3 (p. 3).

6.5 Data analysis

6.5.1 Internal structure (Hypotheses 1 and 2)

The first step of data analysis aimed to re-examine the internal structure of the APBS identified by Teistler (2022) with a new sample. For this purpose, the methodological literature suggests comparing competing theoretically plausible models with the factor model revealed by EFA using CFA (Gäde et al., 2020, p. 652; McCoach et al., 2013, p. 113). Following these guidelines, in addition to the first-order four-factor model revealed by Teistler (2022) using EFA, two rival nested models that were also theoretically plausible were tested in this study using CFA: (1) a first-order single-factor model and (2) a second-order single-factor model with four lower-order factors. Since Mardia tests for multivariate normality (Mardia, 1970) indicated that the data were not multivariate-normally distributed (all $p < .001$), the mean- and variance-adjusted diagonally weighted least squares estimator (WLSMV) based on polychoric correlations was used, which is recommended for conducting CFAs with non-normally distributed ordinal data (Finney & DiStefano, 2006; Rhemtulla et al., 2012). For all three CFAs, the latent APBS variables were standardized using the fixed factor method, in which their variances were set to one. Additionally, each item was allowed to load only on its theoretically expected factor. To assess the fits of the three competing models, scaled chi-square statistics and various scaled fit indices (CFI, TLI, RMSEA, SRMR and chi-square/df ratio) were calculated (for recommended thresholds see Gäde et al., 2020, p. 649; Hair et al., 2014, p. 584; Schermelleh-Engel et al., 2003). Next, Satorra-Bentler scaled chi-square difference tests were conducted to compare the three nested models and thus identify the best-fitting model (Satorra & Bentler, 2001). In the final step of test structure analysis, the modification indices (MIs) of the best-fitting model were examined to identify potential misspecifications and to optimize the model fit by implementing corresponding modifications (Hair et al., 2014, pp. 621–622; McCoach et al., 2013, p. 153). The modified APBS model was then cross-validated by dividing the sample ($N = 1284$) randomly into two halves, with the modifications defined in the first split sample (S1) and then tested on the second split sample (S2) (Bühner, 2021, p. 502). The two split samples consisted of 642 pre-service teachers each (S1: 79.3% female, 20.4% male, 0.3% non-binary; S2: 80.3% female, 19.2% male, 0.5% non-binary). The average age was 23.3 years in S1 ($SD = 5.0$; range = 17 to 47) and 23.4 years in S2 ($SD = 5.4$; range = 17 to 51). Using an iterative procedure, significant misspecifications were progressively identified in S1, tested in S2, and, if model fit improved, applied to S1 (McCoach et al., 2013, p. 153). Misspecifications were deemed meaningful if they were theoretically plausible and, based on the method by Saris et al. (2009), simultaneously statistically significant. This procedure was repeated until statistically significant misspecifications were no longer theoretically defensible. The resulting APBS model served as the basis for subsequent statistical analyses.

6.5.2 Reliability (Hypothesis 3)

The second data analysis step focused on examining the extent to which the APBS scales reliably capture the intended constructs. Internal consistency analysis is one of the most commonly used reliability procedures (Hair et al., 2014, p. 123; McCoach et al., 2013, p. 249). To estimate the internal consistencies of the APBS scales, Cronbach's alpha, Bollen's omega total, hierarchical and subscale, mean inter-item correlations and corrected item-total correlations were calculated (Briggs & Cheek, 1986; Hair et al., 2014, p. 123; Schermelleh-Engel & Gade, 2020, p. 365).

6.5.3 Discriminative ability (Hypothesis 4)

To evaluate the discriminative ability of the APBS instrument, descriptive item and scale statistics were computed, involving measures of central tendency (median, mean), measures of dispersion (standard deviation, range), measures of symmetry (skewness, kurtosis), and item difficulties (Kelava & Moosbrugger, 2020a, 2020b).

6.5.4 Relations to external variables (Hypotheses 5 through 8)

The last data analysis step aimed to investigate the associations between the APBS test scores and the three external variables following a two-step structural equation modeling (SEM) approach (Hair et al., 2014, p. 641; McCoach et al., 2013, p. 221): Since SEM should only be conducted based on variables with at least acceptable measurement models, first the adequacy of the measurement models for the three external variables, including their correlational relationships, was examined using CFA. In a second step, the theoretically hypothesized structural relationships between the latent variables were analyzed using multi-step regression analysis through SEM (Preacher & Kelley, 2011). To test the corresponding mediation hypotheses, significance tests for all latent indirect effects were performed using the Sobel test (Sobel, 1982) and bias-corrected and accelerated bootstrap (BCa) 95% confidence intervals (Efron, 1987). Since Mardia tests (Mardia, 1970) indicated that the data were not multivariate-normally distributed (all $p < .001$), the WLSMV estimator was used for all CFAs and SEMs. To assess the adequacy of the measurement and structural models, the same scaled fit indices were calculated as in the first step of data analysis.

6.5.5 Software for data analyses

Data were analyzed using R, version 4.0.2 for Windows (R Core Team, 2020). To conduct the CFAs and SEMs, the lavaan package, version 0.6–7 (Rosseel, 2012) was used.

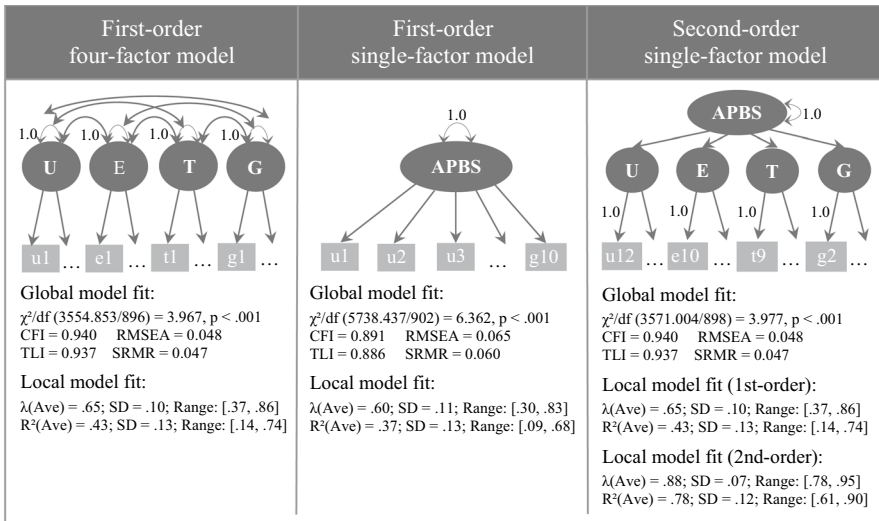


Fig. 2 CFA: APBS model comparisons (44 Items). *Note.* $N = 1284$. U = unconditionality, E = empathic understanding, T = trust, G = genuineness, $APBS$ (middle graph) = APBS test scores on the first-order single-factor. $APBS$ (right graph) = APBS test scores on the second-order single-factor. $\lambda(Ave)$ = average of all item loadings. $R^2(Ave)$ = average of all R^2 . Standardized estimates are shown

7 Results

7.1 Internal structure (Hypotheses 1 and 2)

First, CFA was performed to test whether the 44 APBS items reflect the four latent constructs identified in the previous study (Teistler, 2022), namely unconditionality, empathic understanding, trust, and genuineness. Based on global fit indices (chi-square/df ratio, CFI, TLI, RMSEA, SRMR) and local fit indices (loadings, variances, inter-factor correlations), the *first-order four-factor model* with correlated factors demonstrated an acceptable to good fit to the sample data. The respective fit indices are presented in Fig. 2 (left graph).

The substantial latent correlations between the four factors ($r = .66$ to $.86$) suggested low discriminant validity of these dimensions and the possibility that another theoretically plausible but more parsimonious solution could be attained (Gäde et al., 2020). Therefore, in the next step, both a first-order single-factor model and a second-order single-factor model with four lower-order factors were tested. The global and local fit statistics of the *first-order single-factor model* (Fig. 2, middle graph) indicated a substantially poorer fit to the sample data compared to the first-order four-factor model. The differences between the two models were statistically significant (Sattora-Bentler- $\Delta\chi^2 = 490.529$, $\Delta df = 6$, $p < .001$). The *second-order single-factor model* with four lower-order factors, depicted in Fig. 2 (right graph), demonstrated a similar fit to the data as the first-order four-factor model (Sattora-Bentler- $\Delta\chi^2 = 9.292$, $\Delta df = 2$, $p = .0096$). When competing theoretically plausible models demonstrate nearly identical fit, the methodological literature recommends

choosing the more restricted and parsimonious model with fewer freely estimated parameters, which in this case corresponded to the second-order factor model (McCoach et al., 2013, p. 151).

Subsequent examination of the *MI*s of the second-order factor model yielded 1128 potential misspecifications, out of which 140 were identified as statistically significant in the iterative cross-validation process. Only 14 of the 140 misspecifications were theoretically defensible. A table of these 14 *MI*s, including corresponding item wordings, theoretical rationales and modification decisions, is provided in online resource 4 (p. 4–7). Based on the 14 *MI*s, the second-order factor model with 44 items was re-specified as follows: Item ver11 of the trust factor was reassigned to the genuineness factor and correlated error covariances between items ver9 and ver10 (trust factor), ev2 and ev10 (empathic understanding factor), and ech3 and ver11 (genuineness factor) were freely estimated. Items bed2, bed5, and bed8 from the unconditionality factor were removed, as well as items ev6, ev7, and ev8 from the empathic understanding factor, items ver2 and ver6 from the trust factor, and items ech4 and ech5 from the genuineness factor. These 14 modifications, identified as theoretically and statistically significant in S1, were tested in S2 and subsequently applied in S1. Since most of the 14 adjusted models were not nested, model fits were compared by interpreting global fit indices (Urban & Mayerl, 2014, p. 222), which are presented in online resource 5 (p. 8–9), in chronological order, for S1 and S2. Although the last five modifications did not lead to model fit improvement in S2, they were still applied in S1 due to their theoretical significance.

The *respecified second-order factor model* consisted of 34 items and included three correlated error covariances. To maximize accuracy of the final parameter estimates, the model was tested on the data from the entire sample ($N=1284$). The model demonstrated a good fit (χ^2/df (1504.868/520)=2.894, $p < .001$; CFI=0.968; TLI=0.965; RMSEA=0.038 (90% CI=0.036, 0.041); SRMR=0.039). The first-order factor loadings, shown in Table 1, ranged from .36 (item ech6) to .86 (item ev1) and were statistically significant (all $p < .001$). Weak loadings below .50 were observed for three out of the 34 items (ech6 and ech10 from the genuineness factor; bed7 from the unconditionality factor). The average loading was .64 ($SD=.11$), indicating that the four first-order factors explained an average of 41.0% of the variance in the 34 items. The second-order factor loadings ranged from .81 (genuineness factor) to .94 (trust factor) and were statistically significant (all $p < .001$). The average loading was .89 ($SD=.06$), suggesting that the second-order factor explained an average of 79.8% of the variance in the four first-order factors. The three newly specified correlated error covariances were statistically significant (all $p < .001$) and ranged from .13 to .24.

After respecification of the APBS factor model, the *factor definitions* resulting from the previous validation studies (Teistler, 2021, 2022) were slightly adapted to align with the model modifications. Additionally, the wording was optimized. The adjusted final factor definitions are presented in online resource 6a in English (p. 10–11) and 6b in German (p. 12–13). The final APBS questionnaire in the German language, along with instructions, is available in online resource 7 (p. 14–15).

Table 1 CFA—APBS second-order factor model (34 Items): factor loadings

Item ID	Item wording	λ	SE	z	95% CI	R ²
<i>First-order factor 1: Unconditionality (9 Items)</i>						
bed1/ wsach4	Positively acknowledging students' individual personalities	.77*	.02	44.16	[.73, .80]	.59
bed3/ wsbed1	Not measuring students' worth by their academic performance	.64*	.02	25.82	[.59, .69]	.41
bed4/ wsbed3	Treating students with respect, even if they do not follow the rules	.65*	.02	32.65	[.61, .69]	.43
bed6/ wsbed6	Appreciating students, even if they do not behave in accordance with one's expectations	.66*	.02	34.13	[.62, .70]	.44
bed7/ wsbed7	Not making ironic comments when students do not understand lesson content	.49*	.03	18.08	[.44, .54]	.24
bed9/ wsakz4	Taking students' fears seriously, even if one personally thinks they are exaggerated	.67*	.02	32.39	[.63, .71]	.45
bed10/ wsakz6	Respecting students' attitudes, even if they are contrary to one's own	.54*	.02	21.78	[.49, .58]	.29
bed11/ wsakz8/	Taking students as they are	.54*	.03	21.19	[.49, .59]	.29
bed12/ verwert5	Acknowledging students' feelings in a non-judgmental way.	.71*	.02	37.30	[.67, .75]	.50
Factor average						
<i>First-order factor 2: Empathic understanding (8 Items)</i>						
ev11/ wsfuer1	Paying attention to how students feel	.86*	.01	78.08	[.83, .88]	.73
ev2/ wsfuer4	Offering support to students when they are having personal difficulties	.62*	.02	28.05	[.58, .66]	.38
ev3/ verint5	Showing interest in students' personal experiences	.73*	.02	43.90	[.70, .76]	.53
ev4/ verint7	Encouraging students to talk about their feelings	.74*	.02	44.27	[.70, .77]	.54
ev5/ verunt2	Resolving conflicts that affect the entire class before continuing with teaching	.52*	.02	21.46	[.48, .57]	.28
ev9/ vereinf5	Trying to comprehend what led students to behave the way they did	.77*	.02	47.13	[.73, .80]	.59
ev10/ vereinf6	Empathizing with students when they are not feeling well	.73*	.02	43.42	[.69, .76]	.53
ev11/ vereinf8	Trying to empathize with how students feel in class	.84*	.01	67.52	[.81, .86]	.70
Factor average						
<i>First-order factor 3: Trust (8 Items)</i>						
ver1/ wsakz7	Taking students' protests seriously	.72*	.02	41.66	[.69, .76]	.52
ver3/ wsglet5	Provide comprehensible reasons for demands made of students	.66*	.02	32.17	[.62, .70]	.43
ver4/ wsver1	Trusting students to make good use of the liberties they are given	.67*	.02	35.45	[.63, .71]	.45
ver5/ wsver6	Letting students decide for themselves how to do things as often as possible	.61*	.02	28.59	[.57, .65]	.37
ver7/ verint9	Encouraging students to express openly how they find the lessons	.69*	.02	37.65	[.66, .73]	.48
ver8/ verunt3	Giving students the opportunity to express their personal views on the topics taught in lessons	.58*	.02	26.34	[.54, .63]	.34
ver9/ koerf3	Using students' ideas and suggestions as a stimulus to change how lessons are taught	.62*	.02	28.47	[.58, .66]	.39

Table 1 (continued)

Item ID	Item wording	λ	SE	z	95% CI	R ²
ver10/koerf4	Viewing students' critiques of lessons as an impetus for one's own professional development	.69*	.02	37.12	[.65, .72]	.47
Factor average		.66				.43
<i>First-order factor 4: Genuineness (9 items)</i>						
ech1/koech1	Presenting oneself to students as a person with strengths and weaknesses	.64*	.02	28.07	[.59, .68]	.41
ech2/koech2	Showing oneself to students as one really is	.60*	.02	25.56	[.55, .64]	.36
ech3/koech4	Avoiding acting as an all-knowing expert toward students	.57*	.03	22.38	[.52, .62]	.33
ech6/koech7	Avoiding pretending to be in a good mood in front of students when one is actually not feeling well	.36*	.03	12.54	[.30, .41]	.13
ech7/kotra1	Not lying to students	.51*	.03	18.96	[.45, .56]	.26
ech8/kotra6	Admitting to students when one feels hurt by what they say	.62*	.02	26.08	[.57, .66]	.38
ech9/kotra7	When making demands of students, referring not only to generally accepted norms and rules, but also to personal wishes and boundaries	.59*	.03	23.36	[.54, .64]	.35
ech10/kotra8	Talking to students when one feels uncomfortable in their classroom	.48*	.03	19.03	[.43, .53]	.23
ver11/kotra3	Telling students openly when one doesn't know something	.53*	.03	19.90	[.48, .58]	.28
Factor average		.54				.30
<i>Second-order factor: APBS (4 first-order factors)</i>						
Unconditionality		.91*	.01	80.86	[.89, .93]	.83
Empathic understanding		.92*	.01	87.71	[.90, .94]	.84
Trust		.93*	.01	90.65	[.91, .95]	.87
Genuineness		.81*	.02	49.81	[.77, .84]	.65
Factor average		.89				.80

$N = 1284$. λ = standardized factor loading estimate, SE = standard error, z = value of z-statistic, $95\% CI$ = 95% confidence interval estimated by the bias-corrected and accelerated bootstrap method (BCa) simulating 1000 random samples. R^2 = squared multiple correlation. * indicates $p < .001$. For purposes of comparison, item IDs are provided for the current study (1st ID) and the previous study (2nd ID). English item wordings do not meet the guidelines for psychological test translation; they are provided solely for the purpose of interpreting the study results. German item wordings are provided in online resource 7

Table 2 APBS internal consistency reliability (34 Items)

Scale	α	ω_t^*	ω_h^*	ω_s^*	MIC	CITC (<i>SD</i>)
Unconditionality	.86	.86	.70	.16	.40	.58 (.07)
Empathic understanding	.90	.90	.76	.14	.52	.68 (.10)
Trust	.86	.85	.75	.10	.43	.60 (.04)
Genuineness	.79	.81	.51	.30	.30	.48 (.07)
APBS	.95	.95	.79	.16	.34	.57 (.10)
Minimum threshold	.70	.70	.50	.30	.10–.50	.50

$N=1284$. Coefficients based on polychoric correlations. α =Cronbach's alpha; ω_t^* =Bollen's omega total; ω_h^* =Bollen's omega hierarchical; ω_s^* =Bollen's omega subscale; *MIC* = mean inter-item correlation, *CITC* = scale average of corrected item-total correlations. Information on the threshold values is derived from Briggs and Cheek (1986); Hair et al., (2014, p. 123) and Schermelleh-Engel and Gåde (2020, p. 365)

7.2 Reliability (Hypothesis 3)

To examine the reliability of the APBS scales, internal consistency analyses were performed. As shown in Table 2, all scales demonstrated high internal consistencies, as the values for Cronbach's alpha, Bollen's omega total and hierarchical, as well as the mean inter-item correlation and average corrected item-total correlation mostly exceeded the recommended minimum thresholds by a wide margin. Corrected item-total correlations for the 34 items ranged from .40 (item ech6) to .81 (item ev1); they are provided in online resource 8 (p. 16–17). Values for Bollen's omega subscale mostly did not reach the recommended threshold, indicating insufficient subscale-specific variance independent of the second-order scale (Schermelleh-Engel & Gåde, 2020). That is, the true score variances of the APBS scales (ω_t^*) can be largely attributed to the second-order scale (ω_h^*). Accordingly, the corresponding subscale-specific variance proportions (ω_s^*) were low, at 19% (.16/.86=.186) for the unconditionality subscale, 16% (.14/.90=.156) for the empathic understanding subscale, 12% (.10/.85=.118) for the trust subscale, and 37% (.30/.81=.370) for the genuineness subscale, albeit all still statistically significant (all $p < .001$).

7.3 Discriminative ability (Hypothesis 4)

To evaluate the discriminative ability of the APBS instrument, descriptive item and scale statistics were calculated. The results for the APBS scales are provided in Table 3. The results for the 34 APBS items are shown in online resource 8 (p. 16–17). Additionally, the test score distributions of the scales are graphically presented in online resource 9 (p. 18). The means and item difficulties were mostly relatively high, accompanied by relatively low standard deviations. Furthermore, the relatively low range values indicated that respondents did not utilize the full breadth of the response scale for all items. More precisely, only 19 of the 34 items achieved the maximum range of five, while the remaining 15 items had a range of four, as scores on them ranged from two to six. Skewness and kurtosis

Table 3 APBS descriptive scale statistics (34 Items)

Scale	Mdn	Mean (<i>SD</i>)	Range	Skew	Kurtosis	Diff (<i>SD</i>)
Unconditionality	5.33	5.28 (0.51)	2.78–6	– 0.83	0.78	.88 (.04)
Empathic understanding	5.38	5.29 (0.55)	2.50–6	– 0.76	0.53	.88 (.01)
Trust	5.00	5.03 (0.55)	2.50–6	– 0.38	0.05	.84 (.06)
Genuineness	4.67	4.68 (0.61)	2.44–6	– 0.26	–0.01	.78 (.08)
APBS	5.09	5.07 (0.47)	2.96–6	– 0.45	0.29	.84 (.07)

N=1284. Six-point rating scale: 1=extremely negative; 6=extremely positive. *Diff*=scale average of item difficulties

values indicated that the score distributions of items and scales were mostly left-skewed and slightly peaked. In summary, the descriptive analyses showed that the majority of pre-service teachers held positive attitudes on person-centered behavior toward students. Only a very small percentage exhibited negative attitudes, with the proportion of respondents with test scores between 1.00 and 3.50 ranging from 0.39% for unconditionality to 2.96% for genuineness.

7.4 Relations to external variables (Hypotheses 5 through 8)

The next aim was to examine whether the APBS test scores exhibit a pattern of relationships with specific external variables, namely attachment representation, empathy and relational competence, that aligns with theoretical expectations. Figure 3 illustrates the corresponding hypothesized relationships in the *structural model*. No paths were defined between the four first-order APBS scales and the scales measuring the external variables because the analysis of the internal structure revealed a higher-order APBS factor. Higher-order models allow for reducing the number of relationships in the structural model, such that the external variables are directly connected to the higher-order factor instead of having relationships with the first-order factors (Sarstedt et al., 2019). The theoretical derivations also did not require connections at the level of the first-order factors because the same patterns of associations with the external variables were hypothesized for the four subscales. Furthermore, in the structural model, based on various research findings (e.g., Henschel et al., 2020; Joireman et al., 2002), paths were defined between the six scales of the two predictors.

7.4.1 Measurement models of external variables

Before examining the relationships in the structural model, the adequacy of the measurement models for the three external variables was tested using CFAs. The corresponding model fit indices are provided in online resource 10 (p. 19). The models for empathy and relational competence exhibited good to acceptable fit to the sample data, while the model for attachment representation demonstrated

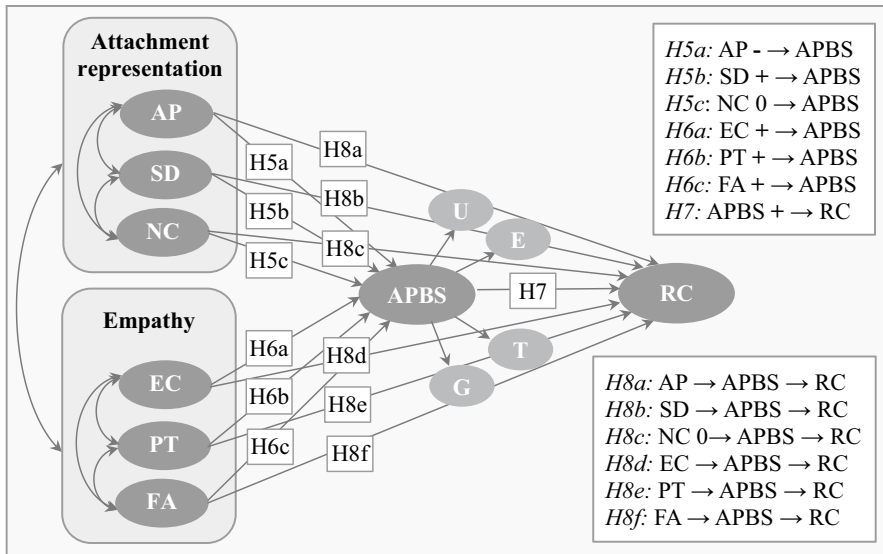


Fig. 3 Structural model with hypotheses. *Note.* AP = acceptance problems, SD = willingness to self-disclose, NC = need for care, EC = empathic concern, PT = perspective-taking, FA = fantasy, APBS = APBS test scores on the second-order scale, U = unconditionality, E = empathic understanding, T = trust, G = genuineness, RC = relational competence

unacceptable to acceptable fit in terms of global fit indices and good fit in terms of local fit indices.

7.4.2 Correlational relationships with external variables

Next, the adequacy of the measurement model including all variables (APBS second order scale and external variables) was tested using CFA. The model demonstrated acceptable to good fit to the data (χ^2/df (8249.960/3367)=2.450, $p < .001$; CFI= 0.921; TLI= 0.918; RMSEA=0.034 (90% CI=0.033, 0.035); SRMR=0.054). To examine whether the four APBS subscales exhibited the same patterns of association with the external variables as the APBS second-order scale, an additional measurement model was tested, specifying the APBS model with four correlated first-order factors. This model also showed acceptable to good fit to the data (χ^2/df (8124.957/3344)=2.430, $p < .001$; CFI= 0.922; TLI= 0.919; RMSEA=0.033 (90% CI=0.032, 0.034), SRMR=0.052). The standardized parameter estimates for the correlational relationships between the APBS scales and the scales of the external variables are presented in Table 4. The results indicated that the paths between the APBS second-order scale and the scales of the external variables were in accordance with expectations in terms of significance, direction, and strength of the relationships. Furthermore, nearly all four first-order APBS scales exhibited identical correlational patterns of association with the external variables, as expected. Only for the attachment scale need for care were there slight differences in terms of significance and direction of the associations across the APBS subscales. In summary, the

Table 4 Latent zero-order correlations between APBS and external variables

Ext. Variable	APBS Scale	Hypothesis	<i>r</i>	<i>SE</i>	<i>z</i>	<i>p</i>	95% CI
AP	APBS	- ↔	-.13	.03	-4.35	<.001	[-.19, -.07]
	U	- ↔	-.10	.03	-3.17	.002	[-.17, -.04]
	E	- ↔	-.07	.03	-2.34	.019	[-.14, -.01]
	T	- ↔	-.12	.03	-3.76	<.001	[-.18, -.06]
	G	- ↔	-.21	.03	-6.66	<.001	[-.27, -.15]
SD	APBS	+ ↔	.25	.03	8.89	<.001	[.19, .30]
	U	+ ↔	.20	.03	6.74	<.001	[.14, .26]
	E	+ ↔	.25	.03	8.61	<.001	[.19, .31]
	T	+ ↔	.20	.03	6.74	<.001	[.14, .26]
	G	+ ↔	.23	.03	7.60	<.001	[.17, .29]
NC	APBS	0 ↔	.00	.03	0.02	.986	[-.06, .06]
	U	0 ↔	-.01	.03	-0.30	.763	[-.08, .06]
	E	0 ↔	.08	.03	2.58	.010	[.02, .15]
	T	0 ↔	-.05	.03	-1.35	.177	[-.11, .02]
	G	0 ↔	-.06	.03	-1.72	.086	[-.12, .01]
EC	APBS	+ ↔	.42	.03	13.70	<.001	[.36, .48]
	U	+ ↔	.39	.03	11.38	<.001	[.32, .46]
	E	+ ↔	.47	.03	15.35	<.001	[.41, .53]
	T	+ ↔	.31	.03	9.18	<.001	[.25, .38]
	G	+ ↔	.30	.03	8.68	<.001	[.23, .37]
PT	APBS	+ ↔	.32	.03	11.09	<.001	[.26, .37]
	U	+ ↔	.28	.03	9.02	<.001	[.22, .34]
	E	+ ↔	.31	.03	10.38	<.001	[.25, .36]
	T	+ ↔	.28	.03	9.20	<.001	[.22, .33]
	G	+ ↔	.27	.03	8.72	<.001	[.21, .33]
FA	APBS	+ ↔	.25	.03	7.65	<.001	[.19, .31]
	U	+ ↔	.22	.03	6.24	<.001	[.15, .29]
	E	+ ↔	.30	.03	9.34	<.001	[.24, .36]
	T	+ ↔	.20	.03	5.76	<.001	[.13, .26]
	G	+ ↔	.14	.04	4.02	<.001	[.07, .21]
RC	APBS	+ ↔	.56	.03	19.06	<.001	[.50, .61]
	U	+ ↔	.56	.03	17.93	<.001	[.50, .63]
	E	+ ↔	.52	.03	16.99	<.001	[.46, .58]
	T	+ ↔	.48	.03	15.02	<.001	[.42, .55]
	G	+ ↔	.41	.03	11.95	<.001	[.34, .47]

N=1284. *AP* = acceptance problems, *SD* = willingness to self-disclose, *NC* = need for care, *EC* = empathic concern, *PT* = perspective-taking, *FA* = fantasy, *APBS* = APBS test scores on the second-order scale, *RC* = relational competence, *U* = unconditionality, *E* = empathic understanding, *T* = trust, *G* = genuineness, *r* = standardized covariance estimate, *SE* = standard error, *z* = value of z-statistic, 95% *CI* = 95% confidence interval estimated by the bias-corrected and accelerated bootstrap method (BCa) simulating 1000 random samples. Bold values are significant at the .05 level

results indicated that the correlational relationships between the APBS second-order scale and the external variables seemed to be equally attributable to all four APBS first-order scales. Consequently, in the subsequent statistical analyses, the more parsimonious structural model with the APBS second-order factor was used.

7.4.3 Structural relationships with external variables

After examining the correlational relationships in the measurement model, the structural relationships were investigated using SEM. The standardized structural path estimates, including fit statistics, of the tested structural models are presented in Table 5. In the *first model*, the structural relationships between attachment

Table 5 Latent regression analyses with APBS and external variables

Model	Predictor	Criterion	β	<i>SE</i>	<i>z</i>	<i>p</i>	95% CI
1	AP	APBS	.06	.06	0.91	.363	[−.07, .18]
	SD		.29	.05	5.52	< .001	[.18, .39]
	NC		−.06	.05	−1.11	.269	[−.16, .04]
Model fit: χ^2 /df=3.080; CFI= 0.925; TLI= 0.922; RMSEA=0.040; SRMR=0.059; R^2 = .063							
2	EC	APBS	.38	.05	6.99	< .001	[.27, .48]
	PT		.18	.03	5.59	< .001	[.12, .25]
	FA		−.04	.05	−0.71	.475	[−.13, .06]
Model fit: χ^2 /df=2.613; CFI= 0.958; TLI= 0.955; RMSEA=0.035; SRMR=0.043; R^2 = .210							
3	AP	APBS	−.02	.06	−0.38	.700	[−.14, .10]
	SD		.12	.05	2.17	.030	[.01, .21]
	NC		− .12	.05	−2.17	.030	[−.22, −.01]
	EC		.40	.07	6.15	< .001	[.27, .53]
	PT		.15	.04	4.22	< .001	[.08, .22]
	FA		−.04	.05	−0.76	.446	[−.15, .06]
Model fit: χ^2 /df=2.743; CFI= 0.919; TLI= 0.916; RMSEA=0.037; SRMR=0.057; R^2 = .239							
4	APBS	RC	.56	.03	19.04	< .001	[.50, .61]
Model fit: χ^2 /df=2.513; CFI= 0.964; TLI= 0.962; RMSEA=0.034; SRMR=0.039; R^2 = .309							
5	AP	RC	−.03	.07	−0.40	.686	[−.16, .10]
	SD		.08	.06	1.41	.158	[−.03, .20]
	NC		−.08	.06	−1.42	.155	[−.20, .03]
	EC		.24	.08	2.98	.003	[.08, .41]
	PT		− .08	.04	−2.16	.031	[−.16, −.01]
	FA		−.04	.06	−0.70	.483	[−.16, .07]
	APBS		.47	.03	12.06	< .001	[.39, .54]
Model fit: χ^2 /df=2.450; CFI= 0.921; TLI= 0.918; RMSEA=0.034; SRMR=0.054; R^2 = .355							

$N=1284$. AP = acceptance problems, SD = willingness to self-disclose, NC = need for care, EC = empathic concern, PT = perspective-taking, FA = fantasy, APBS = APBS test scores on the second-order scale, RC = relational competence, β = standardized regression estimate, SE = standard error, z = value of z-statistic, 95% CI = 95% confidence interval estimated by the bias-corrected and accelerated bootstrap method (BCa) simulating 1000 random samples. Bold values are significant at the .05 level

representation and APBS test scores were examined. The three attachment scales explained a total of 6.3% of the variance in APBS test scores. The SEM results further showed that, in comparison to the measurement model, the acceptance problems scale was no longer significantly associated with APBS test scores, while the associations with the self-disclosure and need for care scales remained nearly identical. In the *second model*, the structural relationships between empathy and APBS test scores were investigated. The three empathy scales accounted for a total of 21.0% of the variance in APBS test scores, with continued significant positive relationships found for empathic concern and perspective-taking, but no longer for fantasy. In the *third model*, the relationships between both predictors and APBS test scores were examined in a combined structural model. Attachment representation and empathy together accounted for 23.9% of the variance in APBS test scores. The structural relationships between APBS test scores and the scales of the predictor variables remained largely identical in terms of significance and direction of associations, but were mostly weaker than in the first and second model. In the *fourth model*, the structural associations between APBS and relational competence were examined, with the APBS test scores explaining a total of 30.9% of the variance in the relational competence criterion. Finally, a combined model with all three predictors and the relational competence criterion was tested (*model five*), with all predictors together accounting for 35.5% of the variance in the criterion. In both models, the APBS test scores were positively associated with relational competence, with the association in the combined structural model slightly weaker.

7.4.4 Mediation effects

In order to examine the structural mediation effects, significance tests were performed for all latent indirect effects. The results are provided in Table 6. The corresponding structural model exhibited acceptable to good fit to the data (χ^2/df (8249.960/3367)=2.450, $p < .001$; CFI= 0.921; TLI= 0.918; RMSEA=0.034 (90% CI=0.033, 0.035); SRMR=0.054).

As expected, significant indirect effects were found for the attachment scale of self-disclosure as well as for the empathy scales of empathic concern and perspective-taking. Contrary to expectations, but in line with the results of the previous regression analyses, a significant indirect effect was also found for the need for care scale, while the indirect effects for the acceptance problems and fantasy scales were not significant. To facilitate interpretation of the results, all associations between the key theoretical constructs are presented in Fig. 4.

Finally, it was examined whether the revealed structural relationships remained when controlling for gender and age. This model ($N=1269$) demonstrated a similar fit statistic to the structural model without control variables (χ^2/df (8577.507/3531)=2.429, $p < .001$; CFI= 0.913; TLI= 0.914; RMSEA=0.034 (90% CI=0.033, 0.034); SRMR=0.052). The structural path estimates and indirect effects remained nearly identical in terms of significance, direction, and strength.

Table 6 Latent mediation analysis: total, direct and indirect effects

Hypothesis	Effect type	β	<i>SE</i>	<i>z</i>	<i>p</i>	95% CI	%
H8a: AP → APBS → RC	DE	−.03	.07	− 0.40	.686	[− .16, .10]	N/A
	IE	−.01	.03	− 0.39	.699	[− .07, .05]	N/A
	TE	−.04	.07	− 0.53	.594	[− .18, .10]	N/A
H8b: SD → APBS → RC	DE	.08	.06	1.41	.158	[− .03, .20]	57.14
	IE	.06	.03	2.12	.034	[.00, .10]	42.86
	TE	.14	.06	2.21	.027	[.02, .26]	100.00
H8c: NC 0 → APBS → RC	DE	−.08	.06	− 1.42	.155	[−.20, .03]	57.14
	IE	− .06	.02	− 2.14	.032	[− .10, .00]	42.86
	TE	− .14	.06	− 2.17	.030	[− .26, −.01]	100.00
H8d: EC → APBS → RC	DE	.24	.08	2.98	.003	[.08, .41]	55.81
	IE	.19	.03	5.71	<.001	[.12, .25]	44.19
	TE	.43	.08	5.35	<.001	[.27, .59]	100.00
H8e: PT → APBS → RC	DE	− .08	.04	− 2.16	.031	[− .16, −.01]	N/A
	IE	.07	.02	3.78	.000	[.03, .11]	N/A
	TE	−.01	.04	− 0.32	.750	[− .10, .07]	N/A
H8f: FA → APBS → RC	DE	−.04	.06	− 0.70	.483	[− .16, .07]	N/A
	IE	−.02	.02	− 0.75	.455	[− .07, .03]	N/A
	TE	−.06	.06	− 0.94	.345	[− .19, .06]	N/A

N = 1284. *AP* = acceptance problems, *SD* = willingness to self-disclose, *NC* = need for care, *EC* = empathic concern, *PT* = perspective-taking, *FA* = fantasy, *APBS* = APBS test scores on the second-order scale, *RC* = relational competence, *DE* = direct effect, *IE* = indirect effect, *TE* = total effect, β = standardized regression estimate, *SE* = standard error, *z* = value of z-statistic, 95% *CI* = 95% confidence interval estimated by the bias-corrected and accelerated bootstrap method (BCa) simulating 1000 random samples. % = Percentage of effects. Bold values are significant at the .05 level

8 Discussion

Person-centered teacher behavior is associated with students' learning outcomes and well-being (e.g., Cornelius-White, 2007). The effectiveness of such behavior is supposed to be determined by underlying attitudes (Rogers, 1951, pp. 25–26). For this reason, the APBS instrument was developed, which is a theory-based self-report questionnaire to assess person-centered attitudes in pre-service teachers. The aim of this study was to replicate the factor structure found in the previous validation study (Teistler, 2022) on a new sample as well as to gather empirical evidence based on the relationships with external variables.

8.1 Results

8.1.1 Internal structure (Hypotheses 1 and 2)

The examination of the APBS' internal structure using CFA revealed that the first-order four-factor model with correlated factors found by Teistler (2022) exhibited

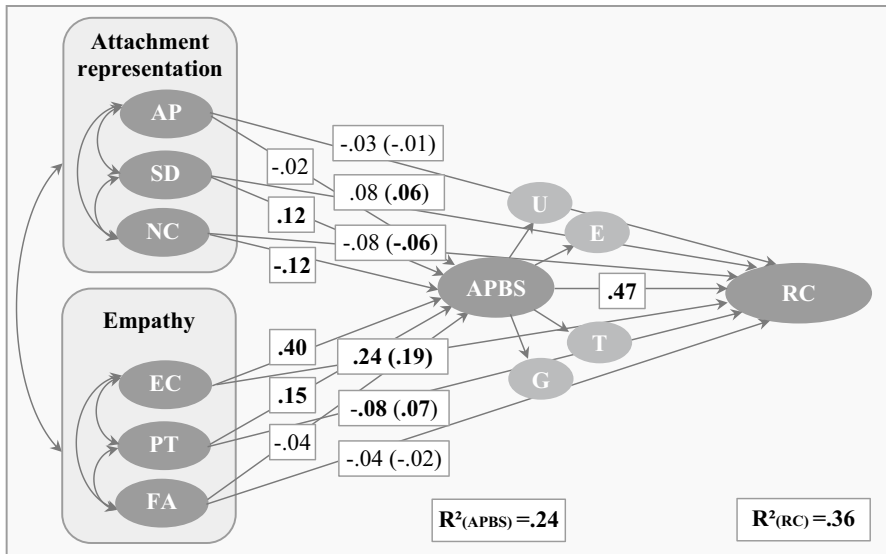


Fig. 4 Latent mediation analysis: associations of key constructs. *Note.* $N = 1284$, *AP* = acceptance problems, *SD* = willingness to self-disclose, *NC* = need for care, *EC* = empathic concern, *PT* = perspective-taking, *FA* = fantasy, *APBS* = APBS test scores on the second-order scale, *U* = unconditionality, *E* = empathic understanding, *T* = trust, *G* = genuineness, *RC* = relational competence, Standardized regression estimates are shown. Indirect effects are in parentheses. Bold values are significant at the .05 level

acceptable to good fit to the data. The factors were strongly correlated with each other, as expected, but a one-factor solution was clearly inferior to the model with four distinct factors, supporting H1. At the same time, the high factor intercorrelations suggested that the four factors represent aspects of an overarching person-centered attitude. The results of the subsequent model comparison largely supported this assumption (H2). Although the second-order model with four first-order factors exhibited a nearly identical model fit to the first-order four-factor model, it was the more restricted, parsimonious model (McCoach et al., 2013, p. 151). Additionally, the second-order solution better represents the assumptions of the person-centered approach. Rogers postulated a system of attitudes composed of interconnected aspects, culminating in a "humanistic orientation", a "philosophy of human relationships" that expresses a general attitude toward the personal worth and significance of each individual human being (Rogers, 1951, pp. 29–34). This means that the APBS higher-order factor reflects this humanistic orientation in pre-service teachers, composed of the four subordinate aspects of unconditionality, empathic understanding, trust, and genuineness. Finally, the second-order solution was slightly respecified based on MIs. The resulting final higher-order model with 34 items and three correlated error covariances exhibited good fit to the data.

8.1.2 Reliability (Hypothesis 3)

Both the APBS second-order scale and the four subscales demonstrated satisfactory internal consistencies, supporting H3. The results are comparable to the findings of the previous validation study (Teistler, 2022). However, the high hierarchical omegas combined with low subscale-specific omegas suggested that the high proportions of explained true score variances are primarily attributed to the APBS higher-order scale rather than the individual subscales, which has implications for test score calculation in practical applications of the APBS questionnaire. Specifically, the results support the calculation of a total test score and question the utility of calculating subscale test scores (Schermelleh-Engel & Gåde, 2020). Nevertheless, the additional calculation of subscale-specific test scores is recommended for the following reasons: (1) The subscale omegas were mostly below the recommended threshold, but were significantly different from zero. In particular, the genuineness scale exhibited a substantial omega subscale value (Schermelleh-Engel & Gåde, 2020). (2) The validation of the APBS test score interpretation is an ongoing process and does not end with this study (AERA et al., 2014, p. 11). Future studies should gather more empirical evidence based on relationships with external variables in order to examine whether the four attitude dimensions potentially play different roles in predicting teacher behavior or student outcomes. If this were the case, calculating subscale test scores would provide additional information. (3) When using the APBS in teacher education, the subscale scores provide both test-takers and test administrators with information on whether and to what extent a total APBS score is actually determined by the four subscale scores in individual cases (Bornovalova et al., 2020).

8.1.3 Discriminative ability (Hypothesis 4)

The descriptive item and scale statistics showed that very few of the surveyed pre-service teachers rated person-centered behavior in interaction with students as negative. This finding is comparable to the results of the previous validation study (Teistler, 2022). One possible explanation for the skewed test score distribution is flawed test construction (e.g., response scale, instructions, or item content), resulting in a lack of discriminative ability (Kelava & Moosbrugger, 2020b, p. 163). That is, the APBS instrument may not optimally differentiate between pre-service teachers with positive and negative attitudes. However, the skewed distribution can also be an indicator for socially desirable response behavior or selection bias (Elston, 2021). In particular, selection bias is likely in the present study because the online survey format allowed pre-service teachers to completely self-select into participation. In turn, willingness to participate in a study can be associated with characteristics (e.g., interests, personality) that influence response behavior, making the participants an unrepresentative sample (Elston, 2021). Therefore, self-selection may have led to pre-service teachers with negative attitudes not participating in the survey or dropping out early due to a lack of interest in the research topic. Another explanation could be that the observed test score distribution corresponds to the actual distribution in the population of pre-service teachers (Kelava & Moosbrugger, 2020b,

p. 163). This means that there may indeed be very few pre-service teachers with negative attitudes. This assumption is supported by studies examining (pre-service) teachers' relationship-enhancing characteristics, such as relational competence (Borremans & Spilt, 2022) or closeness behavior (Milatz et al., 2014) using self-assessments. These studies also found skewed distributions with high means and low standard deviations. In summary, the question of whether the APBS instrument exhibits inadequate discriminative ability, requiring a rejection of H4, cannot be conclusively answered based on this study's results and would need to be examined in future studies.

8.1.4 Relations to external variables (Hypotheses 5 through 8)

Based on the measurement model results, it can be concluded that pre-service teachers' attachment representations and empathy are associated with APBS test scores to a weak to moderate extent, while their relational competence is strongly associated with APBS test scores. This means that the found correlational relationships between the variables support hypotheses H5a through H5c, H6a through H6c, and H7. However, the SEM results showed different patterns of associations with the APBS test scores due to mostly moderate to high intercorrelations between the predictor variable scales (see online resource 11, page 20, for latent correlations among all study variables), which have implications for hypothesis testing.

With regard to *attachment representation*, the self-disclosure scale remained weakly to moderately positively associated with APBS test scores in the SEMs, supporting H5b. However, the other two attachment scales (acceptance problems and need for care) did not show the expected associations with APBS test scores in the SEMs. The acceptance problems scale was no longer significantly negatively associated with APBS scores when the other two attachment scales were included, leading to the rejection of H5a. This finding is consistent with studies that have examined the impact of teachers' attachment representations on their emotional support they provide students (Sher-Censor et al., 2019) and students' school adjustment (Lifshin et al., 2020). These studies' regression analyses primarily showed significant associations with avoidance (called self-disclosure here) but not anxiety (called acceptance problems here). A possible explanation for these findings comes from attachment theory research, which suggests that self-disclosure (independent of the feelings of insecurity and anxiety triggered by acceptance problems) is associated with prosocial feelings and caring behaviors toward interaction partners (Mikulincer & Shaver, 2016). Therefore, it is possible that the relationship between acceptance problems and APBS test scores is moderated by self-disclosure. This means that potential negative effects of acceptance problems on TSRs could be offset by a high level of self-disclosure. The need for care scale was significantly negatively associated with APBS test scores after including the empathy scales, contradicting the initial assumption and leading to the rejection of the null hypothesis H5c. This result could be attributed to individuals with a high need for care potentially being overly focused on their own needs for closeness (Höger & Buschkämper, 2002; West & Sheldon-Keller, 1994). Particularly in conjunction with a lack of empathy, this

may lead to demands for attention and affection that do not align with the needs of the interaction partner. That is, a high attachment-related need for care among pre-service teachers does not necessarily have negative effects on their APBS. However, when combined with a lack of empathy, it can lead to subordinating students' needs to their own, potentially resulting in more negative attitudes toward person-centered behavior in interaction with students. In summary, regarding attachment representation, it can be concluded that self-disclosure is positively associated with APBS test scores while the significance of acceptance problems and need for care appears to be determined by other personal characteristics of pre-service teachers.

Regarding *empathy*, the affective empathy scale empathic concern and the cognitive empathy scale perspective-taking were weakly to moderately positively associated with APBS test scores in all structural models, supporting H6a and H6b. However, the second affective empathy scale of fantasy was no longer significantly associated with APBS test scores when the other two empathy scales were included, leading to the rejection of H6c. The high latent correlation between empathic concern and fantasy ($r = .65$) may have caused a spurious latent correlation between fantasy and APBS in the measurement model. Several studies have shown that empathy for real people is highly similar to empathy for fictional characters, indicating low discriminant validity between the two empathy dimensions (Nomura & Akai, 2012). Davis and Oathout (1987) also suggested that the tendency to identify with fictional characters is less relevant to shaping real relationships compared to the other empathy scales.

With regard to pre-service teachers' *relational competence*, all models showed the expected moderate to strong positive associations with APBS test scores, supporting H7. These associations were notably stronger than the relationships between APBS test scores and the two predictors in both the measurement and structural models. One possible explanation for this could be that both relational competence and APBS represent professional teacher characteristics, whereas the predictors are personal teacher characteristics (see Fig. 1). This explanation is based on the assumption that performance in a specific context is best predicted by variables related to the same context (Ajzen & Fishbein, 1977; Weinert, 2001). Furthermore, the strength of the association between APBS test scores and relational competence is comparable to findings in attitude research, such as Glasman and Albaracín's (2006) meta-analysis on the predictive power of attitudes for future behavior. This similarity in the strength of associations indicates that APBS test scores could potentially predict pre-service teachers' future interpersonal behavior toward students to a significant extent.

Finally, the *indirect effects* in the structural mediation model were examined. The significant total effects between the predictor scales self-disclosure, need for care and empathic concern with the relational competence criterion were each mediated to a significant extent by APBS test scores, indicating partial mediation effects (Preacher & Kelley, 2011) and thus supporting H8b and H8d, but rejecting the null hypothesis H8c. In line with the results from the structural regression analyses, no significant indirect effects were found for the acceptance problems and fantasy

scales, leading to a rejection of H8a and H8f. Furthermore, the indirect effect for the perspective-taking scale was found to be significant, supporting H8e. However, this result indicated a suppressor effect, with the overall null effect between perspective-taking and relational competence consisting of a negative direct and a positive indirect effect (Preacher & Kelley, 2011). That is, perspective-taking was positively associated with APBS test scores but negatively with relational competence. The seemingly counterintuitive relationship between perspective-taking and relational competence is indeed consistent with theoretical assumptions and studies focusing on the impact of cognitive empathy for prosocial behavior. Individuals with high perspective-taking ability tend to be skilled at putting themselves in the mental state of others, thus having a good cognitive understanding of their thoughts, feelings, and needs (Decety & Jackson, 2004). This means that pre-service teachers with high perspective-taking ability may hold the belief that person-centered behavior is effective because it aligns with students' needs and desires, leading to more positive APBS. However, whether the ability to recognize others' feelings and needs actually results in prosocial behavior or is utilized to manipulate them for personal goals or self-gratification largely depends on specific social and antisocial personality traits, such as affective empathy or narcissism (Brazil et al., 2023; Wai & Tiliopoulos, 2012). Therefore, it is possible that the association between perspective-taking and relational competence among pre-service teachers is moderated by their empathic concern. This means that potential positive effects of perspective-taking may be diminished by a low level of affective empathy.

In summary, the SEM results showed that the predictor scales self-disclosure, empathic concern, and perspective-taking as well as the relational competence criterion were substantially positively associated with APBS test scores across all models. In other words, the willingness to communicate with relationship partners about one's own feelings and needs and the ability to take relationship partners' perspective combined with emotional concern are significantly related to pre-service teachers' APBS. This means that pre-service teachers with a high willingness to self-disclose and empathic abilities tend to have higher APBS test scores compared to those with a low willingness to self-disclose and empathic abilities. High APBS test scores in turn, increase the likelihood that pre-service teachers will act competently (i.e., relationship-enhancing) in interactions with students. Additionally, APBS test scores mediate the associations between pre-service teachers' personal characteristics (attachment representation and empathy) and their relational competence to a significant degree, which is in line with theoretical TSR models (e.g., Nickel, 1976; Pianta et al., 2003), in which teachers' personal characteristics are supposed to determine their behavior toward students indirectly through attitudes and beliefs.

8.2 Implications

The study results largely support the hypotheses, allowing for preliminary acceptance of the intended APBS test score interpretation. Thus, the APBS questionnaire is now suitable for various applications in teacher education and TSR research. First,

the APBS can be used as a *teaching and self-exploration tool* in teacher education courses to help pre-service teachers actively engage with their attitudes toward interaction with students. Attitude research has shown that reflecting on one's attitudes is an important factor in facilitating attitude change (e.g., Fives & Buehl, 2012; Haagenzen et al., 2020). Therefore, use of the APBS in teacher education could also contribute to promoting person-centered attitudes among pre-service teachers—although this would need to be empirically examined. To maximize the APBS' benefits as a self-exploration tool, it is important for instructors to provide appropriate guidance on test evaluation and result interpretation (Tausch & Tausch, 1963/1998, pp. 374–398). For example, instructors should convey the underlying theoretical approach, enabling pre-service teachers to develop a solid understanding of the significance of person-centered attitudes and behaviors in students' learning and development processes. Additionally, a trusting and appreciative learning climate should be fostered that allows teacher education students to openly discuss their personal attitudes. This facilitates deeper reflection among course participants and promotes learning and development in person-centered attitudes and behaviors (Tausch & Tausch, 1963/1998, pp. 374–398). Furthermore, instructors should handle teacher education students' test results with sensitivity. The APBS questionnaire presents an image of the "ideal" teacher, which could trigger uncertainties and doubts among some pre-service teachers about their attitudes and career choice. Sensitivity and support provided by instructors can help teacher education students address their uncertainties and facilitate positive, constructive engagement with their test results (Tausch & Tausch, 1963/1998, pp. 374–398). The present study's findings also demonstrated that APBS test scores are associated with pre-service teachers' attachment representations and empathy. This underscores the theoretical assumption that personality development is crucial for shaping person-centered attitudes and behaviors (Tausch & Tausch, 1963/1998, pp. 374–398). Accordingly, exploration of and reflection on one's own personality, including interpersonal experiences, should be a central component when using the APBS in teacher education.

Second, the APBS can be used as an *evaluation tool* in teacher education to better tailor the curriculum to the needs of pre-service teachers (Pajares, 1992). By incorporating the APBS into their courses, teacher educators can gather information about their students' person-centered attitudes, which can help identify relevant course content and justify its usefulness. For example, it could be revealed that course participants have concerns about engaging in genuine, authentic behavior toward students. This would serve as an indication for instructors to place stronger emphasis on topics such as personality development. Furthermore, the APBS instrument could be employed to examine the effectiveness of teacher education courses promoting person-centered attitudes. However, studies on attitude change among (pre-service) teachers have yielded mixed results depending on the interventions employed (e.g., design of training programs; Fives & Buehl, 2012). Therefore, the design of interventions aimed at fostering person-centered attitudes among pre-service teachers should adhere strictly to theoretical assumptions and empirical findings regarding the promotion of person-centered attitudes and behaviors (for an overview see Tausch & Tausch, 1963/1998).

Besides its use in teacher education, the APBS can also serve as a *research instrument* in the TSR field. Scholars assume that attitudes influence teachers' interpersonal behavior and thus indirectly impact the quality of TSRs and various student outcomes. (e.g., Nickel, 1976; Pianta et al., 2003; Tausch & Tausch, 1963/1998). These theoretical assumptions can now be empirically examined using the APBS instrument. For example, a longitudinal design could be employed to investigate the influence of pre-service teachers' APBS on their future interactions with students. Furthermore, it is of great importance to investigate the formation of person-centered attitudes, as such insights could be utilized in teacher education to promote such attitudes. On the one hand, associations with other personality traits believed to influence the development of person-centered attitudes (e.g., self-esteem, Big Five; Tausch & Tausch, 1963/1998) could be examined. On the other hand, it would be insightful to further investigate the relationships among attachment representation, empathy and APBS, as the results of this study suggested moderating effects of attachment and empathy dimensions.

8.3 Limitations

In addition to the potentially inadequate discriminative ability of the APBS instrument (see Sect. 8.1.3), the following limitations should be considered when interpreting the study results or using the APBS in research and teacher education. (1) The first limitation concerns the *cross-validation procedure* to optimize the fit of the APBS second-order factor model. For this purpose, the study sample was randomly divided into two halves. With large samples, this method may be appropriate (Bühner, 2021, p. 502). However, it should be noted that a re-specified factor model ideally should be cross-validated on a new, independent sample (Hair et al., 2014, p. 622). Therefore, it would be advisable to examine the fit of the final APBS model on a new sample of pre-service teachers. This would ensure that the model structure is not limited by random variations in the present sample. (2) The *measurement models of the external variables* only acceptably fit the sample data in most cases. This can lead to biased or unreliable results regarding structural relationships with these variables (Hair et al., 2014, p. 643; McCoach et al., 2013, p. 227). Therefore, caution should be exercised when interpreting the SEM results in this study. (3) The *impact of APBS test scores* remains vague. Despite the strong associations found between APBS test scores and relational competence, there is currently a lack of evidence regarding the effects of person-centered attitudes on interpersonal teacher behavior or the TSR quality. To better understand the relevance and utility of APBS test scores in educational practice, further validity evidence based on relationships to external variables is needed (AERA et al., 2014). (4) *Interpretation of APBS test scores* is based solely on the response scale used and the corresponding factor definitions (Goldhammer & Hartig, 2020). This means that test-takers have no information on how their APBS test score compares to a representative reference group or how it relates to an external psychological criterion. To overcome this limitation, data from a representative sample of pre-service teachers are needed

to establish a reference group norm. Additionally, relevant external criteria, such as TSR quality from the perspective of students or observers, should be analysed in further studies. Results from these studies could contribute to determining a threshold indicating at which APBS test score a test-taker meets the set criterion and thus is likely to possess the necessary skills to establish positive TSRs. (5) Testing for *measurement invariance* would be crucial to ensure that the interpretation of APBS test scores is fair and reliable for all pre-service teachers (Gäde et al., 2020). Factors such as gender or school type may influence APBS test scores (Pianta et al., 2003; Spilt et al., 2011), resulting in systematic differences in test score distribution or factor structure across different groups of pre-service teachers. To assess the APBS' measurement invariance, further studies should examine whether the test score distribution and factor structure remain consistent across different groups. (6) The APBS' psychometric properties have only been examined among pre-service teachers from German universities. Therefore, it is unclear whether the APBS can reliably measure person-centered attitudes among other *target groups*, such as practicing teachers. Further studies validating the interpretation of APBS test scores in other target groups and languages could contribute to expanding the applicability of the APBS and examining its psychometric properties (AERA et al., 2014).

8.4 Conclusion

The study's findings largely support the hypotheses regarding the internal structure of the APBS instrument and its relationships with external variables. This suggests that the intended interpretation that APBS test scores reflect pre-service teachers' attitudes on person-centered behavior toward students in line with Carl Rogers' theoretical approach can be tentatively accepted. The APBS can now be used for various purposes in teacher education and TSR research. However, the validation process remains ongoing. Further studies on the APBS instrument's discriminative ability, standardization, and measurement invariance are necessary, as well as additional validity evidence based on relationships with external variables, particularly pre-service teachers' behavior in interactions with students. This is crucial for better understanding the relevance of APBS test scores to educational practice and providing test-takers and administrators with a reliable interpretation of the test results.

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Data availability The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Conflicts of interest None.

Ethical approval All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

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