The Student–Teacher Relationship Scale revisited: Testing factorial structure, measurement invariance and validity criteria in German-speaking samples

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ABSTRACT

The Student–Teacher Relationship Scale (STRS) is widely used for research in kindergarten and school. The increasing number of applications inside and outside of the U.S. stresses the need to investigate STRS properties, accordingly. The present study used the STRS in German-speaking countries, examining whether (a) the original factor structure is appropriate for a German version, (b) whether applications of a German STRS are invariant across contexts (kindergarten, first and second grade) as well as gender, and (c) whether construct and criterion validity are met. The original STRS was translated into German and filled out by 368 kindergarten and 503 elementary school teachers in Germany and Austria. Observations in kindergartens, student reports in schools, and teacher reports of students' characteristics served as validity criteria. Results of confirmatory factor analyses (CFAs) did not confirm the original STRS factor structure. Subsequent exploratory factor analyses on training samples resulted in significant item reductions, followed by further CFAs on validation samples. The bootstrapped results yielded an adjusted three-factor model with subscales indicating satisfying alphas and invariance across context and gender. Construct and criterion validity were met for all subscales of the German STRS based on various criteria from both, observations and reports.

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The Student–Teacher Relationship Scale (STRS; Pianta, 2001) has been widely used to assess student–teacher relationship qualities in kindergarten and school, as well as to explore the impact of student–teacher relationships on a large variety of social, emotional (Baker, 2006; Birch & Ladd, 1998; Hamre & Pianta, 2001) and academic (Birch & Ladd, 1997; Hughes & Cavell, 1999; Palermo, Hanish, Martin, Fabes, & Reiser, 2007) outcomes in students (Davis, 2003; Roorda, Koomen, Spilt, & Oort, 2011). This empirical research has emerged over the last 20 years (Bretherton, 1992; Pianta, 1999; Pianta, Hamre, & Stuhlman, 2003) extending the traditional focus in attachment research on mother–child relationships to

relationships of students toward their teachers (Hamilton & Howes, 1992; Howes & Matheson, 1992; Pianta, 1992). Whereas earlier studies within this research field linked student–teacher relationships to students' later development, later investigations explored kindergarten and school contexts (Davis, 2003; Pianta & Nimetz, 1991; Pianta & Steinberg, 1992; Pianta, Steinberg, & Rollins, 1995) and provided more insight into how children develop relationships toward their teachers differently from those to their parents (Ahnert, Pinquart, & Lamb, 2006).

The items of the STRS capture the student–teacher relationship quality (Pianta, 2001) with the use of three subscales, namely, closeness, conflict and dependency. Closeness refers to warmth and affection, conflict characterizes negativity and unpredictability and dependency concerns a student's degree of autonomy (reversed rated) within the relationship. Closeness has been shown to have positive associations with school adjustment (Arbeau, Coplan, & Weeks, 2010; Baker, 2006; Buyse, Verschueren, Verachtert, & van Damme, 2009; Pianta et al., 1995), prosocial behaviors

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(Hughes & Cavell, 1999; Palermo et al., 2007), effectiveness of task performance (Ahnert, Milatz, Kappler, Schneiderwind, & Fischer, 2013), levels of academic performance (Birch & Ladd, 1997; Peisner-Feinberg et al., 2001; Spilt, Hughes, Wu, & Kwok, 2012) as well as stress-regulation (Ahnert, Harwardt-Heinecke, Kappler, Eckstein-Madry, & Milatz, 2012). In contrast, conflict has been associated with social withdrawal, antisocial behaviors, school maladjustment, and deficits in math and language skills (Birch & Ladd, 1998; Buyse et al., 2009; Hamre & Pianta, 2001; Murray, Murray, & Waas, 2008; Palermo et al., 2007; Rudasill & Rimm-Kaufman, 2009). Dependency has been positively linked to behavior problems (Pianta, 2001) and there have been negative associations with school adjustment and mastery motivation (Birch & Ladd, 1997; Birch & Ladd, 1998; Hamre & Pianta, 2001; Pianta, 2001).

Overall, good student–teacher relationships facilitate learning by providing emotional support and assistance for students' exploration (Booth, Kelly, Spieker, & Zuckerman, 2003; Hamilton & Howes, 1992; Pederson & Moran, 1995). Good relationships are, in general, characterized by closeness, by which the student accepts the teacher as an important emotional and cognitive resource (Mashburn & Pianta, 2006; Pianta, Nimetz, & Bennett, 1997; Pianta, 1992). Thus, the teacher serves as a secure-base which is a core element within the attachment theory framework. Although the secure base concept was originally thought of as universal in social relations, which suspends cross-cultural differences in establishing close relationships (Posada et al., 1995; van IJzendoorn & Sagi, 2008), recent research in cross-cultural psychology has been discovering different cultural pathways, at least for mother-child relationships. For example, cultural contexts focusing on the independence of individuals appreciate autonomy and limit the formation and maintenance of relationships, whereas cultural contexts focusing on interdependence are oriented toward relatedness and thus promote relationships among individuals, especially if commitment and obedience receive high social value (Greenfield, Keller, Fuligni, & Maynard, 2003). Thus, these cultural influences on relationships might be also discovered when applying the STRS in different countries. Not surprisingly, closeness and conflict of the STRS correlated negatively across applications in the US, Greece, Norway and the Netherlands (ranging from −.34 to −.62), even though dependency revealed cultural differences. In Greece, for example, dependency was positively associated with closeness ($r = .35$) and was unrelated to conflict (Gregoriadis & Tsigilis, 2008) which stands in contrast to the American studies (Pianta, 2001; Webb & Neuharth-Pritchett, 2011) in which dependency was positively related to conflict ($r = .28$) and barely associated with closeness ($r = .13$). This weak correlation is similar to the Dutch study which showed a correlation of closeness and dependency of $r = 05$. Thus, dependency might be viewed as something desirable in Greece, whereas in the US and the Netherlands, a student's salient need for interaction with their teachers might be perceived as inappropriate and even aggressive (Coplan & Prakash, 2003; Sroufe, 2005; Sroufe, Fox, & Pancake, 1983).

Because the subscales of the STRS seem to have been perceived differently across western countries where cross-cultural differences are rather small, the present paper aims to investigate how far a German application of the STRS and its subscales resemble or deviate the original and other language versions. Regarding the educational systems in Europe, it is important to note, that differences in some cases are considerable. For instance, students in the Netherlands stay in basic school from age four to eight, whereas the German speaking students stay in kindergarten until the age of six and enter primary school thereafter. The German speaking kindergarten setting is less structured than the German speaking school setting and thus comprises different relationship structures between students and teachers whose understanding of their roles and functions differ. Whereas kindergarten teachers are focused on providing emotional climates of acting and learning, elementary school teachers see themselves more as instructors who provide cognitive challenges and didactic elaborated teaching.

Surprisingly few European studies have explored whether the factorial structure of the STRS remained the same when used in the respective countries, applying the STRS in their native language. Italian and Greek applications of the STRS in kindergarten revealed the original three factor structure (Fraire, Longobardi, & Sclavo, 2008; Gregoriadis & Tsigilis, 2008) based on Principal Component Analysis (PCA).

Recently and independent from our work presented here, a German kindergarten teacher–child relationship measure was proposed in a study of Mayr (2012) including a translation of the original STRS and 17 further items (five items from the Parent-Child Reunion Inventory of Niederhofer (2000) and 12 self-developed items). Mayr' scale is hardly comparable with the original STRS by Pianta (2001), above all because Mayr' measure was specifically developed to capture the kindergarten context which is reflected in his translations of the STRS items and the new items included. A German translation capturing both, the kindergarten and school context, for which the original STRS was designed, is still lacking today. Especially for longitudinal research, such a measurement tool is needed. Furthermore, no validity criteria or psychometric analysis, such as invariance tests across these contexts were presented in Mayr's work. Also, one might criticize methodological issues, as missing data were substituted by mean values and the analysis of the factor structure of the German childcare teacher–child relationship measure (Mayr, 2012) has been based on PCA statistics only.

Whereas PCAs, however, do not reveal the underlying latent factor structure of an item set (Widaman, 1993), an Exploratory Factor Analysis (EFA) is considered to explore the factorial structure appropriately, and a Confirmatory Factor Analysis (CFA), examines a proposed factorial structure on its empirical foundation (Bryant & Yarnold, 1995). When the CFA framework was applied for the STRS recently used in American and Dutch kindergartens, as well as in Dutch and Norwegian schools, the original item set had to be reduced (Koomen, Verschueren, van Schooten, Jak, & Pianta, 2012; Webb & Neuharth-Pritchett, 2011). Due to model fit problems in Norway (Drugli & Hjemdal, 2013), a CFA even supported the short original STRS version with 15 items, involving the two subscales: Conflict and closeness (see also Tsigilis & Gregoriadis, 2008). These short versions, however, had been easily accepted (Baker, 2006; Howes, Hamilton, & Philipsen, 1998; O'Connor & McCartney, 2006; Spilt et al., 2012) as dependency had been frequently criticized due to its low alpha ($\alpha = .64$; Pianta, 2001), and less often exploited than closeness and conflict, whose alphas ranged between .86 and .92.

Growing research on different trajectories for children's gender, age, or ethnicity raises the question as to whether STRS applications across these variations are comparable (Buyse et al., 2009; Spilt et al., 2012). Above all, researchers in early childhood research applying the STRS are interested in longitudinal learning processes. Thus, a measurement tool whose factors can be meaningfully interpreted over time is of great importance (Birch & Ladd, 1998; Hamre & Pianta, 2001; Howes, 2000; Ladd & Price, 1987; Pianta & Stuhlman, 2004). However, measurement invariance, which assures that comparable factors among different groups or time points are captured (Meredith, 1993; Millsap, 2011), can be tested by including stepwise equality constraints to the model: Configural invariance is given when the same measurement model holds true across groups; weak factorial invariance when factor loadings are also equal; strong factorial invariance when additional intercepts are equal across groups; and strict factorial invariance can be assumed when residual variance is held equal across groups (Widaman & Reise, 1997).