"My Questionnaire is Too Long!" The assessments of motivational-affective constructs with three-item and single-item measures

Katarzyna Gogol [a,b,*], Martin Brunner [a,c], Thomas Goetz [d,e], Romain Martin [b], Sonja Ugen [b], Ulrich Keller [b], Antoine Fischbach [b], Franzis Preckel [f]

[a] Free University of Berlin, Berlin, Germany
[b] University of Luxembourg, Luxembourg, Luxembourg
[c] Berlin-Brandenburg Institute for School Quality, Berlin, Germany
[d] University of Konstanz, Konstanz, Germany
[e] Thurgau University of Teacher Education, Kreuzlingen, Switzerland
[f] University of Trier, Trier, Germany

ABSTRACT

Because testing time in educational research is typically scarce, the use of long scales to assess motivational-affective constructs can be problematic. The goal of the present study was to scrutinize the psychometric properties of short scales (with three items) and single-item measures for two core motivational-affective constructs (i.e., academic anxiety and academic self-concept) by conducting systematic comparisons with corresponding long scales across school subjects and within different subject domains (i.e., mathematics, German, French). Statistical analyses were based on representative data from 3879 ninth-grade students. All short forms possessed satisfactory levels of reliability (range: .75–.89) and substantial correlations with the long scales (range: .88–.97); correlational patterns with educational student characteristics (e.g., achievement, school satisfaction, gender, academic track, and socioeconomic status) were comparable to those obtained with the corresponding long scales (all average differences in correlations below .07). The correlational patterns between all single-item measures and the external criteria were similar to those obtained with the corresponding long scales (all average differences in correlations below .08), yet the single-item measures demonstrated low to modest score reliabilities (estimated with the model-based omega coefficient; range: .22–.72) and correlations with full scales (range: .50–.88). When long scales are not applicable, short forms and perhaps even single-item measures may represent psychometrically sound alternatives for assessing academic anxiety and academic self-concept for educational research purposes.

© 2014 Elsevier Inc. All rights reserved.

1. Introduction

Student learning is a complex process that can be understood only by investigating multiple constructs, for example, learning-related feelings and motivational factors as vital variables that affect students' cognition, learning, and performance (Linnenbrink & Pintrich, 2000). To obtain comprehensive insights into students' learning-related affect and motivation, it is necessary to assess multiple motivational-affective constructs and to analyze their multivariate relations. However, in educational research, testing time is typically scarce, particularly in large-scale assessment studies, in longitudinal studies with a measurement burst design, or in studies that use experience sampling as an ambulatory form of assessment. Although such study designs provide important insights into students' learning by including representative student populations or by providing information about intraindividual variability in ecologically valid settings, the very nature of such studies renders the assessment of many constructs with measures that include numerous items problematic, and in most cases, even impossible. The purpose of the present study was therefore to scrutinize the practice of using very short scales or even a single item to assess core motivational-affective constructs. To this end, we studied the psychometric properties of short scales (consisting of three items) and single-item measures for two constructs: academic anxiety and academic self-concept. Both constructs represent key motivational-affective student characteristics that have

a long tradition in educational science. Academic anxiety and academic self-concept are not only important with respect to students' learning, but are also considered to be vital learning outcomes themselves (e.g., Goetz, Cronjaeger, Frenzel, Lüdtke, & Hall, 2010; Marsh & O'Mara, 2008; Marsh, Trautwein, Lüdtke, Koller, & Baumert, 2005; Marsh & Yeung, 1997; Zeidner, 1998).

1.1. Academic anxiety and academic self-concept: Definitions and relations to important student characteristics

1.1.1. Academic anxiety

Academic anxiety refers to feelings of worry, nervousness, and uneasiness in achievement-related situations in the school context. Early research on academic anxiety conceived of it as a single, unidimensional, and domain-transcending construct (e.g., Mandler & Sarason, 1952). This proposition has been extended in several important ways: First, two key aspects of anxiety have been further differentiated: worry and emotionality (Liebert & Morris, 1967; Zeidner, 2007; for an alternative conceptualization of anxiety, see e.g., Scherer, 1984). The worry facet represents a cognitive component that refers to thoughts about one's performance and the expected consequences of failure. The emotionality facet represents an affective-physiological component that refers to the affective experience of anxiety and perceived physical arousal in related situations (Goetz, Preckel, Zeidner, & Schleyer, 2008; Hembree, 1988; Zeidner, 2007). Importantly, although the two facets are empirically distinct (Zeidner, 2007), they are highly correlated, which points to a substantial amount of common variance that may be attributed to a general factor representing the general level of anxiety. For example, Hembree (1988) reported a correlation of $r = .78$ between worry and emotionality in his meta-analysis. Second, in more recent educational research (dating back across the last 10–15 years), academic anxiety has been considered to be highly specific to subject domains (Goetz, Frenzel, Pekrun, Hall, & Lüdtke, 2007) or to typical educational settings, such as the experience of anxiety during exams (test anxiety) or lessons at school (class anxiety).

To integrate these different conceptualizations of academic anxiety, it may be best to consider academic anxiety to be hierarchically organized where a general construct operates at the apex of the hierarchy and more specific facets (e.g., worry and emotionality as experienced in various educational settings) constitute lower hierarchical levels (see Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011). Further, this hierarchical conceptualization may be applied to understand students' experiences of anxiety across school subjects (i.e., academic anxiety is conceived to be a domain-general construct) or within a certain school subject. The distinction between domain-general and domain-specific conceptions of academic anxiety is particularly important when it comes to studying the relations between academic anxiety and other student characteristics. More specifically, the specificity matching principle (e.g., Swann, Chang-Schneider, & McClarty, 2007; see also Wittmann, 1988) predicts that general predictor variables (e.g., domain-general academic anxiety) will be most strongly related to general outcomes (e.g., general academic achievement), whereas more specific predictor variables (e.g., mathematics anxiety) will be more strongly related to (corresponding) specific outcomes (e.g., mathematics achievement). Finally, reports of academic anxiety may refer to the dispositional trait level or to the momentary state of anxiety (cf. Goetz, Bieg, Lüdtke, Pekrun, & Hall, 2013). In the present paper, we focused on the trait level.

A rich body of knowledge is available with regard to the relations between academic anxiety and other important student characteristics. There is strong empirical evidence that indicates negative associations between academic anxiety and academic performance (Hembree, 1988, 1990; Lee, 2009; Ma, 1999; Zeidner, 1998). Results

from meta-analyses and selected studies with representative student samples from large-scale assessment studies are presented in Table 1. Negative relations have also been documented for socio-affective variables such as subjective well-being and psychological health (Diener, 2000). With respect to differences related to specific groups, in his meta-analysis, Hembree (1988) found that girls reported higher levels of test anxiety than boys in general (similar results are reported for test anxiety in mathematics; Hembree, 1990) and that students with high socioeconomic status (SES) scored consistently lower on test anxiety than students with low SES (with an average correlation of $r = -.13$).

1.1.2. Academic self-concept

Academic self-concepts are mental representations of one's abilities in academic subjects (Brunner et al., 2010) that entail aspects of both self-description and self-evaluation (Brunner, Keller, Hornung, Reichert, & Martin, 2009; Marsh & Craven, 1997). Notably, current models of academic self-concept such as the Marsh/Shavelson Model (Marsh, 1990a) or the nested Marsh/Shavelson model (Brunner et al., 2010) conceive of the academic self-concept as a multidimensional construct with separate components for specific school subjects and a domain-general academic self-concept. Domain-specific academic self-concepts reflect an individual's impression of his or her ability in a specific academic domain, such as mathematics ("I am good at mathematics") or German ("I am good at German"), whereas the domain-general academic self-concept reflects an individual's evaluation of his or her academic abilities across subjects ("I am good at most school subjects").

Positive academic self-concepts are beneficial for many psychological and behavioral outcomes such as academic emotions (Goetz, Frenzel, Hall, & Pekrun, 2008), subsequent academic effort (Trautwein, Lüdtke, Schnyder, & Niggli, 2006), and success (Helmke & van Aken, 1995; Marsh & Yeung, 1997; Trautwein, Lüdtke, Marsh, Köller, & Baumert, 2006; Valentine, DuBois, & Cooper, 2004). The correlations between academic self-concepts and indicators of academic abilities (e.g., grades, standardized achievement tests) as typically found in empirical studies are presented in Table 1. Moreover, students' school satisfaction was found to be positively associated with their academic self-concepts (e.g., $r = .45$ in general, $r = .39$ for mathematics, and $r = .31$ for reading; Huebner, 1994). Regarding gender differences in academic self-concepts, the results have been inconclusive. Many studies have indicated no significant differences in the general academic self-concept (Brunner et al., 2009; Hergovich, Sirsch, & Felinger, 2004; Marsh, Smith, & Barnes, 1985; Skaalvik & Rankin, 1990), a higher self-concept in mathematics for boys, and a higher verbal self-concept for girls (Brunner et al., 2009; Hattie, 1992; Hergovich et al., 2004; Jackson, Hodge, & Ingram, 1994; Marsh, Smith et al., 1985; Preckel, Goetz, Pekrun, & Kleine, 2008; Skaalvik & Rankin, 1990). However, other studies have challenged these results by documenting a higher general academic self-concept for males (e.g., Chiam, 1987; Jackson et al., 1994), a higher general academic self-concept for females (e.g., Lau, Siu, & Chik, 1998), and no significant gender differences in mathematics self-concept (e.g., Ma & Kishor, 1997; Marsh, 1989; Marsh & Yeung, 1998). Furthermore, a positive relation has been found between socioeconomic status and academic self-concept (Marsh, 1987; Marsh & Parker, 1984), and children in higher academic tracks have been found to have slightly higher academic self-concepts than children who attend lower tracks (Marsh, 1987; Marsh, Kong, & Hau, 2000).

1.2. Measurement of academic anxiety and academic self-concept

Academic anxieties and academic self-concepts are not directly observable but are rather latent constructs. Thus, to assess