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Original Papers

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Test and Math Anxiety: A Validation of the German Test Anxiety Questionnaire

Abstract *The present study investigated the construct validity of the Test Anxiety Questionnaire (Prüfungsangstfragebogen PAF; Hodapp, Rohrmann, & Ringeisen, 2011), a revised and shortened version of the German Test Anxiety Inventory (TAI-G), by comparing it with math anxiety. A sample of German fifth- and sixth-grade students (N = 79; 61 % male) was analyzed. Math anxiety was measured by a German adaptation of the Math Anxiety Questionnaire (Fragebogen für Rechenangst FRA; Krinzinger et al., 2007). A significant but moderate correlation between test anxiety and math anxiety was found. In regression analyses, math anxiety predicted math performance whereas test anxiety explained additional variance for both math and overall performance. It can be concluded that math and test anxiety have overlaps, but do not constitute the same construct. Thus, the results support the construct validity of the PAF indicating its usefulness in practical application.*

Keywords: *test anxiety, math anxiety, PAF, construct validity*

As tests and evaluations are essential for peoples' careers, test anxiety is a widespread phenomenon in modern societies. Especially in school and in other educational environments people are exposed to numerous tests and exams. Therefore, even young students have to deal with such anxiety-inducing situations (McDonald, 2001).

Test anxiety can occur before, during or after test situations and is typically induced by two characteristics: when a person interprets the situation as personally threatening and when one thinks of one's own coping strategies as inefficient (I.G. Sarason, 1978).

Spielberger`s Trait-State-Theory of Anxiety (1972) divides general anxiety in state-anxiety on the one hand and trait-anxiety on the other hand. State-anxiety means a temporary emotional condition in a specific situation (for example in an evaluative situation) which is characterized by an increased physiological activity of the autonomic nervous system and subjective feelings of tension, uneasiness, worry, and nervousness. Trait-anxiety is characterized as a personality trait which represents the tendency to appraise a situation as threatening and to react with a rise of state-anxiety. For the assessment of anxiety this differentiation is very important. The trait-aspect can be of interest when comparing people`s general anxiety tendency or when correlating it with other psychological constructs. State-anxiety is typically assessed as an outcome variable after some sort of anxiety induction or in the context of an actual threatening situation. Nevertheless, trait- and state-anxiety are positively related to each other (Spielberger, 1972).

As a consequence, test anxiety can be seen as one specification of general anxiety which occurs only in evaluative situations (e. g. Dew, Galassi, & Galassi, 1983; Hembree, 1990; Zeidner, 1998) and can therefore be understood as a situation-specific personality trait (Spielberger & Vagg, 1995; Spielberger, Gonzales, Taylor, Algaze, & Anton, 1978). Besides situational influences, there is also evidence for a strong relationship to major dispositional factors, such as neuroticism (Chamorro-Premuzic, Ahmetoglu, & Furnham, 2008).

According to Zeidner (1998), the typical expression of test anxiety can be differentiated in cognitive, physiological, affective, and behavioral components.

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Worry, as the classical main cognitive mechanism (Liebert & Morris, 1967), is perceived in terms of *fear of failure* (Herrmann, 1990) and *self-criticism* (I. G. Sarason & Sarason, 1990; Wine, 1980). These cognitions often lead to a severe lack of confidence in one´s own ability to manage the evaluative situation and finally result in a phenomenon named *cognitive interference*. This means the presence of interfering cognitions during the test situation that cause a division of one´s attention into the self on the one hand and the task on the other hand (I. G. Sarason, 1987).

Physiologically, as indicated by the explanation of state-anxiety given above, experiencing high levels of test anxiety goes along with autonomic arousal (e. g. increased heart rate, increased respiration rate, gastric sensations, feelings of nausea, sweating, cold and clammy hands, need to pass urine, shaking and trembling; see Suinn, 1984). Interestingly, although the actual physiological pattern in low- vs. high-test-anxious individuals during an evaluative situation has been found to be similar, the interpretation of these body changes differs between the two groups (e.g. Holroyd, Westbrook, Wolf, & Badhorn, 1978). High-test-anxious subjects seem to perceive their high autonomic arousal as a manifestation of their worry, which in consequence leads to poorer performances. Low-test-anxious persons seem to pay less attention to their body changes (Krohne, 2010).

These maladaptive interpretations can be summed up in another dominant factor of test anxiety – the affective *emotionality*. High test anxious people tend to have feelings of nervousness, tension, dread and fear accompanying their physiological responses (Morris & Liebert, 1970).

All components of test anxiety mentioned above can finally enhance more or less severe behavioural deficits, such as problems in taking and organizing class notes or preparing for exams (Culler & Holahan, 1980; Kirkland & Hollandsworth, 1980), having a negative association with academic performance (Chapell et al., 2005; Hembree, 1990). Even so, research findings show that only the cognitive aspect of worrying has a consistent negative relationship to test performance, whereas results on the emotionality aspect of test anxiety are less consistent (Deffenbacher, 1978; Morris & Liebert, 1970; Wine, 1971).

Considering possible explanations for this negative association there are different theoretical models that have been discussed (Zeidner, 1998). The two major directions are interference models on the one hand and skills deficit models on the other hand. The interference approach postulates cognitive-attentional reasons for poor performance. That is, anxiety-induced task-irrelevant self-referred cognitions during an evaluative situation – such as worrying – interfere with the student´s ability to recall prior learning (Mandler & Sarason, 1952; I. G. Sarason, 1972; Wine, 1971).

Proponents of the skills deficit model propose a contrary effect, where anxiety arises as a consequence of the awareness of one´s own poor performance (Paulman & Kennelly, 1984). Several studies confirm that high test-anxious students have poorer ability and poorer study skills (Culler & Holahan, 1980; Kirkland & Hollandsworth, 1980; Lin & McKeachie, 1970; Wittmaier, 1972), especially in terms of poorer information processing abilities such as encoding and retrieval of learning material (Benjamin, McKeachie, Lin, & Holinger, 1981). Whether performance deficits occur or not might be dependent on the degree of the so-called *processing efficiency* (effective performance plus effort put into the task) proposed by M. W. Eysenck and Calvo (1992). If the effort is big enough, anxious people can perform as well as non-anxious people without deficits in effectiveness although with impaired overall processing efficiency.

Regarding the prevalence of test anxiety, the existing data suggest that 15 % (Hill & Wigfield, 1984) to 20% (H. J. Eysenck & Rachman, 1965, for German-speaking countries: Suhr & Döpfner, 2000) of all college students suffer from anxiety during evaluative situations. A consistent finding is that females typically report higher test anxiety than males (e.g. Helmke, 1983; Hodapp, 1991; Musch & Bröder, 1999; Wacker, Jaunzeme, & Jaksztat, 2008). The variance in occurrence of test anxiety can also be explained by the influence of several other predictors despite gender, such as ethnic and socio-economic background (Putwain, 2007). A cross-cultural perspective on test anxiety should also be considered (Bodas & Ollendick, 2005; Ringeisen, 2008).

To assess the degree of test anxiety, several questionnaires have been invented. A new approach is the German Test Anxiety Questionnaire (Prüfungsangstfragebogen PAF; Hodapp et al., 2011). It extends the measurement of the typical emotionality and worry aspects (Liebert & Morris, 1967) by also including interference which was already shown to be an important facet of test anxiety and lack of confidence which has not been considered yet in this field.

Whilst test anxiety can be seen as a situation-specific form of general anxiety, occurring only during evaluative situations, math anxiety can be described as a situation-specific form of test anxiety, occurring specifically during math related situations. Although, math anxiety does not only occur during evaluation situations, but also in other areas of life. It is defined as “feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations” (Richardson & Suinn, 1972, p. 551). In relation to academic contexts however, it can be described as a subject-specific manifestation of test anxiety (e.g. Dew et al., 1983; Hembree, 1990). Considering this, the theoretical assumptions for general test anxiety can also be applied for math anxiety. Thus, math anxiety is more often reported by female students (Hopko, 2003), it is composed of cognitive and affective dimensions (Bandalos, Yate, & Thorndike-Christ, 1995; Meece, Wigfield, & Eccles, 1990, Wigfield & Meece, 1988) and goes along with physiological arousal as well as poorer academic performance (Ashcraft & Moore, 2009). Despite the apparently close relationship between test and math anxiety, there is some evidence for the uniqueness of math anxiety. Studies have generated moderate correlations between test and math anxiety (Ashcraft, 2002: r = .52; Dew, Galassi, & Galassi, 1984: r = 31. to .56), indicating that the two constructs are related but not identical.

Research questions

In order to demonstrate the construct validity of the PAF (Prüfungsangstfragebogen PAF; Hodapp et al., 2011), its relation to general anxiety measures as well as to even more specific measures should be considered. In the present study the focus was on the relationship between test and math anxiety. These two constructs were compared in a sample of German high school students. The following questions were addressed: (a) Are test anxiety and math anxiety associated with each other? If so, which aspects of general test anxiety and specific math anxiety are related to each other? (b) Are there gender differences in the degree of test and math anxiety? If so, do those gender differences predict school performance in math and languages? (c) Are test and math anxiety associated with school performance in math and languages? If so, is test anxiety a better predictor for overall school performance (operationalized by recent grades in both math and languages) than math anxiety?

Method

Participants

The sample consisted of 79 fifth- and sixth-grade students of a German high school. 61 % were male and the mean age was 12.0 years (SD = 0.93). Participants were recruited by a graduate student. Recruitment was done by personal approach to two form teachers of 4 fifth- and sixth-grade classes of a big German city. All students in the accordant classes participated in the study. Since the participants were underage, permission of the parents was obtained. Participants were not compensated for their contribution.

Measures

Participants were asked to state their age, gender, grade level and their most recent grades in Math, German and English. In addition, they completed the following scales:

General test anxiety was assessed by the German Test Anxiety Questionnaire (Prüfungsangstfragebogen PAF; Hodapp et al., 2011), a revised and shortened version of the German Test Anxiety Inventory (TAI-G; Hodapp, 1991). The instruction was adapted to typical students` evaluation situations. This 20-item scale measures possible emotions and thoughts during test situations and is composed of four subscales: *Emotionality* (emotional and physiological strain; e. g. "I feel anxious."), *Worry* (situational cognitions, thoughts about failure, self-doubt; e. g. "I think about how important the test is to me."), *Interference* (distraction from task by irrelevant thoughts; e. g. "Suddenly thoughts cross my mind which inhibit me."), and *Lack of Confidence* (low confidence, low self-worth; e. g. "I trust in my performance." [item inverted]). Ratings are given on a 4-point scale, indicating the frequency of occurrence (1 = hardly ever, 4 = almost always). Cronbach´s Alpha coefficients in the present study are satisfactory (.71-.86).

Specific math anxiety was measured by a German adaptation of the Math Anxiety Questionnaire (Fragebogen für Rechenangst FRA; Krinzinger et al., 2007) which was originally developed by Thomas and Dowker (2000). This 36-item questionnaire is composed of four different dimensions: Scale A: *Self-Perceived Performance* (a personal estimate about one's own performance in math; e. g. "How good are you at…?"), Scale B: *Attitudes* (attitudes towards math; e. g. "How much do you like…?"), Scale C: *Poor-Performance Unhappiness* (sadness after a bad performance in math; e. g. "How happy or unhappy are you if you have problems with…?"), Scale D: *Anxiety* (anxiety about bad performance in math; e. g. "How worried are you if you have problems with…?"). These dimensions assess both cognitive (Self-Perceived Performance, Attitudes, Anxiety) and affective aspects (Poor-Performance Unhappiness) of math anxiety. The questions refer to different math-related situations: math in general, written calculations, mental calculations, easy calculations, difficult calculations, math homework, and listening and understanding during math lessons. Ratings are given on a 5-point scale, varying for each subscale as regards content (*Self-Perceived Performance*: 1 = very good, 5 = very bad; *Attitudes*: 1 = very much, 5 = not at all; *Poor-Performance Unhappiness*: 1 = very happy, 5 = very unhappy; *Anxiety:* 1 = not at all, 5 = very worried). For the present sample, internal consistencies (Cronbach´s Alpha) range from .84 to .88 depending on the subscale.

Some other questionnaires assessing basic personality constructs were given so that the students were not fully aware of the focus on math and test anxiety.

Procedure

The study was conducted at the end of the school year during school hours. Data were group-administered by a graduate student consecutively on one day. Standardized instructions were given and the response format was explained. Students were informed that the study purpose was to assess basic personality traits in school children and were assured that no individual test score would be handed out to their teachers or parents. Then, students were asked to complete a set of questionnaires that were given in a fixed order, where the PAF and the FRA were not presented one after the other to avoid confounding effects. First, the PAF was assessed, secondly, the other personality questionnaires were measured, and thirdly, the FRA was given. The test period was 30 minutes on average. At the end, students were informed about the focus of the study on math and test anxiety and asked if they agreed upon the use of their data. All students agreed.

Results

Descriptive statistics and intercorrelations between variables are displayed in Table 1. In the first research question, it had been assumed that math anxiety and test anxiety are related constructs. All correlations between the PAF and the FRA scales ranged between −.08 and .56. Considering the overall score, a significant but moderate correlation between test anxiety and math anxiety was found (r = .45, p < .01). Considering the subscale intercorrelations to find out about the specific related aspects of test and math anxiety, interesting results could be revealed. *Lack of Confidence* was highly associated with a judgment of *Self-Perceived Performance* that indicates poor performance. Furthermore, *Anxiety* (FRA) was associated with both typical aspects of test anxiety (*Emotionality* and *Worry*), indicating a closeness of these constructs. In contrast, no significant correlations between *Anxiety (FRA)* and both *Interference* and *Lack of Confidence* were found. Finally, negative *Attitudes (FRA)* were strongly related to *Interference*.

To address the research question about gender differences in the degree of test and math anxiety, a t-test for independent samples was conducted. Results revealed significant differences in boys and girls (see Table 2). There was a trend for higher test anxiety in girls. In math anxiety, they had significantly higher degrees than boys.

To find out whether these gender differences have an impact upon the relationship between test and math anxiety and school performance in math and languages (operationalized by the recent school grade in the respective classes, higher scores indicating poorer performance), first a t-test for independent samples was conducted. School grades

Table 1

Descriptive Statistics and Intercorrelations of the PAF Scales and the FRA Scales and School performance

Variable	*M*	*SD*	α	1	2	3	4	5	6	7	8	9	10	11	12
FRA scales															
1. Self-perceived performance[a]	2.41	0.79	.84	–											
2. Attitudes[b]	2.89	1.01	.86	.59**	–										
3. Poor-performance unhappiness	3.36	0.82	.88	.04	.24*	–									
4. Anxiety	2.95	0.93	.87	.06	−.10	.44**	–								
5. Total FRA score	2.90	0.89	.88	.65**	.69**	.67**	.55**	–							
PAF scales															
6. Emotionality	2.12	1.01	.87	.24*	.25*	.06	.30**	.34**	–						
7. Worry	2.77	0.95	.72	−.31**	−.28*	.08	.28*	−.08	.23	–					
8. Interference	2.21	0.94	.78	.38**	.43**	.16	.14	.44**	.66**	.13	–				
9. Lack of confidence	2.28	0.87	.82	.56**	.27*	.18	.12	.43**	.10	−.39**	.26*	–			
10. Total PAF score	2.35	0.95	.82	.35**	.26*	.19	.35**	.45**	.84**	.39**	.84**	.38**	–		
School performance															
11. Math performance	2.80	0.89	–	.49**	.34**	−.14	−.06	.24*	.19	.00	.24*	.35**	.31**	–	
12. Language performance	2.89	0.81	–	.17	.10	−.18	−.18	−.04	.19	−.13	.24*	.31**	.24*	.51*	–

Note. FRA = Fragebogen für Rechenangst (Math Anxiety Questionnaire); PAF = Prüfungsangstfragebogen (Test Anxiety Questionnaire).

[a] High scores indicate a negative self-perceived performance. [b] High scores indicate a negative attitude towards math.

* p < .05; ** p < .01; two-tailed.

Table 2
Gender Differences in Test Anxiety and Math Anxiety

Variable	Males (n = 47)		Females (n = 30)		
	M	*SD*	*M*	*SD*	*t*
Test anxiety	2.31	0.46	2.38	0.41	−0.65⁺
Math anxiety	2.79	0.42	3.08	0.37	−3.11**
Math grade	2.76	0.85	2.86	0.95	−0.84
Language grade	3.07	0.83	2.54	0.67	2.93**

Note. ⁺ $p < .10$; ** $p < .01$; two-tailed.

were compared between girls and boys (see Table 2). For math grade, no significant differences could be found. For languages (German and English), girls had significantly better grades than boys.

The relationship between the degree of test and math anxiety and school performance in math and languages was examined by correlational and regression analyses.

Correlational analyses showed that math anxiety was solely associated with math performance (r = .24; p < .05) and not with language performance (r = −.04; n.s.). The subscales of FRA also only correlated with math performance, but there were differences between the scales: Only the two subscales *Self-Perceived Performance* (r = .49; p < .01) and *Attitudes* (r = .34; p < .01) were related to math performance (see Table 1). On the other hand, test anxiety was clearly related to both math performance (r = .31; p < .01) and language performance (r = .24; p < .05). With regards to the subscales of the PAF only *Interference* and *Lack of Confidence* showed substantial relationships to both math and language performance (see Table 1). Considering the overall school performance, corresponding results were found. Test anxiety yielded significant correlations (r = .29; p < .05) whereas math anxiety did not (r = .07; n.s.).

Hierarchical regression analyses were conducted to examine the effects of gender, test anxiety and math anxiety upon math and language grades. A first analysis was conducted with gender, test anxiety and math anxiety as predictors (see Table 3). As indicated by correlational analyses, gender was no significant predictor for math grade, but for overall school performance. Overall school performance could only be predicted by test anxiety, not by math anxiety. Surprisingly, math anxiety was not even a significant predictor for math performance. Even math per-

Table 3
Hierarchical Multiple Regression Analysis Predicting Math and Overall Performance at School (Math & Languages) from Gender, Test Anxiety and Math Anxiety

Predictor	Math Performance		Overall performance at school	
	Δ R^2	β	Δ R^2	β
Step 1	.00		.05⁺	
Gender		.03		−.22⁺
Step 2	.09*		.10**	
Gender		.00		−.26*
Test anxiety		.31*		.32**
Step 3	.02		.00	
Gender		−.05		−.27*
Test anxiety		.25⁺		.31*
Math anxiety		.15		.04
Total R^2	.11*		.15*	

Note. N = 74. ⁺ $p < .10$; * $p \le .05$; ** $p < .01$; two-tailed.

Table 4
Hierarchical Multiple Regression Analysis Predicting Math and Overall Performance at School (Math & Languages) from Gender, Math Anxiety and Test Anxiety

Predictor	Math Performance		Overall performance at school	
	Δ R^2	β	Δ R^2	β
Step 1	.00		.05⁺	
Gender		.03		−.22⁺
Step 2	.06⁺		.02	
Gender		−.06		−.28*
Math anxiety		.26⁺		.17
Step 3	.05⁺		.08*	
Gender		−.05		−.27*
Math anxiety		.15		.04
Test anxiety		.25⁺		.31*
Total R^2	.11*		.15*	

Note. N = 74. ⁺ $p < .10$; ** $p < .01$; *** $p < .001$; two-tailed.

formance could best be predicted by general test anxiety. Thus, general test anxiety was the best predictor for both specific math performance and overall school performance. Math anxiety could not explain additional variance.

In the second analysis (see Table 4), the order of test and math anxiety in the equation was changed. Math anxiety was now able to predict math performance by trend, but did not predict overall performance. Test anxiety could explain additional variance for overall performance and for math performance by trend.

The correlational pattern of the subscales of FRA and performance measures showed that none of the FRA subscales correlated with language performance and only *Self-Perceived Performance* and *Attitudes* were related to math performance. The PAF subscales on the other hand showed a similar correlational pattern for both language and math performance. Both performance measures were highly related to *Interference* and *Lack of Confidence*, but not to *Emotionality* and *Worry*.

Testing for multicollinearity, all regression analyses showed no substantial collinearity between math and test anxiety (Tolerance ranging from .70 until .99).

Testing the incremental explained variance of curvilinear relationships between test anxiety and performance by adding the squared PAF score into the regression analysis in the fourth step, no significant effects were found ($\Delta R^2 = .03$; $p < .05$).

Discussion

The present data showed, that test and math anxiety are related, but not identical constructs. It can be concluded that math and test anxiety have overlaps, but do not constitute the same construct. This finding is consistent with current research findings (Ashcraft, 2002; Dew et al., 1984). Thus, the results support the discriminant validity of the PAF.

Examining the underlying relations of test and math anxiety, interesting results were revealed. There was a relatively strong relationship between *Lack of Confidence* and *Self-Perceived Performance*. People with low confidence and self-worth obviously tend to perceive their performance in math worse. Furthermore, *Anxiety (FRA)* is associated with both the cognitive dimension of *Worry* and the affective aspect of test anxiety (*Emotionality*), whereas no relationship to the other two dimensions (*Lack of confidence* and *Interference*) was found. In addition, students with very negative attitudes toward math stated high degrees of interfering thoughts during test situations. The lacking interest for the subject (in this case math) could lead to more distracting instead of task-relevant thoughts. These results can be interpreted as support for convergent and discriminant validity of the PAF, indicating overlaps in these two measures.

Furthermore, results indicate that general test anxiety can predict overall school performance better than math anxiety does. The closer relationship between test anxiety and school performance than between math anxiety and school performance suggests that the PAF is a useful instrument to detect performance-relevant deficits. Solely math performance could be predicted by math anxiety, indicating the criterion validity of the FRA. Studies using other math anxiety measures also found effects on math performance (e.g. Dew et al., 1984; Hembree, 1990).

Interesting results were found when changing the order of predictors in the regression equation. It was revealed that test anxiety is a broader indicator for performance than math anxiety. When controlling for test anxiety, math anxiety did not explain any substantial variance of performance, not even solely for math performance. The relationship between math anxiety and math performance could fully be explained by the broader operationalization of test anxiety. As shown by the switched order of predictors, math anxiety could predict math performance, but test anxiety was again an increment in prediction. In summary, everything which seemed to be specific for the relationship between math anxiety and math performance is captured by PAF, but not vice versa.

Only cognitive components of test anxiety (*Interference* and *Lack of Confidence*) were related to performance whereas affective components such as *Emotionality* and *Poor-Performance Unhappiness* were not. An unexpected finding, though, is the not significant correlation between *Worry* and *Anxiety* and performance. Especially the worry component has been consistently found to be related to performance in previous research (Deffenbacher, 1978; Morris & Liebert, 1970; Wine, 1971).

Considering gender differences in test and math anxiety, girls reported higher levels of both test and math anxiety. The difference was greater for math than for test anxiety. Also, girls had slightly better language grades than boys. No difference was found in math grades. Besides test anxiety, gender served as an important predictor for overall school performance, but not for math performance.

A typical finding confirmed by meta-analyses is that girls state more math anxiety (e.g. Hembree, 1990), but that there is no robust effect of gender on school performance (e.g. Friedman, 1989). Explanations for the found gender differences in math anxiety are multiple. There is some evidence that boys compared to girls have problems to admit their felt anxiety (e.g. Meece, Parsons, Kaczala, Goff, & Futterman, 1982). Since nowadays the role clichés of men and women are so softened, alternative explanations than socialization effects should be considered. Richardson and Woolfolk (1980) assume that negative experience with math rather than gender is the predisposing factor in the development of math anxiety. The result of a greater test anxiety in females than in males is consistent with the literature (e.g. Helmke, 1983; Hodapp, 1991; Musch & Bröder, 1999; Wacker, Jaunzeme, & Jaksztat, 2008).

Limitations

Although test anxiety was a significant predictor for both math and overall school performance, the amount of explained variance was rather low. Further research should take into account other relevant predictors for school performance that were not assessed in this study.

Another limitation can be seen in the small number of participants. Also, the sample was not a random one. Thus, the results should be replicated with a larger sample size and different sample groups.

It was tried to prevent that students´ had full insight in the purpose of the study by embedding the PAF and the FRA in other personality questionnaires. Nevertheless, it is possible that the results are biased, because some participants might have figured out the purpose and might therefore have answered not truthfully. To prevent this bias in further research, it would be recommendable to keep this in mind and explicitly ask the participants about their suggestions.

With respect to construct validity of the PAF, we did find supportive data for the discriminant validity since it could be shown that test and math anxiety are only related moderately. Although, to fully prove the construct validity of the PAF further research should address the question, if test anxiety measured by the PAF can explain variance beyond general anxiety.

A remark about the theoretical foundation of the FRA shall be given at the end. The scales do not assess affective or cognitive reactions during an evaluative situation like the PAF does. They rather try to capture self-evaluations and feelings under the premise of bad performance in math. Anyhow, the correlational patterns of FRA and PAF subscales with math performance were alike indicating a similarity in the subscales. Only cognitive components (*Self-Perceived Performance* and *Attitudes* in the FRA; *Interference* and *Lack of Confidence* in the PAF) were significantly related to performance. *Worry* (PAF) as well as *Anxiety* (FRA) could not predict performance. Further research should address the question, if other measures of math anxiety show comparable results with respect to test anxiety as measured by the PAF.

Conclusions

The findings suggest that both an overall measurement of test anxiety by instruments like the PAF and a more specific assessment of math anxiety are useful. Of course, the use of such instruments depends on the purpose. For math teachers for instance, it might be of more use to identify children who have problems especially within the math classes than to know their overall test anxiety. Considering that situation-specific instruments have higher predictive value for those situations than tests with a more diverse content (Endler & Hunt, 1966), the use of the FRA could be helpful.

As the data show, math anxiety can be seen as one facet of test anxiety, which occurs only in math-related situations. Consequently, math anxiety can also be reduced by treating general test anxiety of a person by intervention methods indicated by the PAF. In summary, it can be concluded that the construct validity of the PAF could be shown by the present data.

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