Personality and Individual Differences 124 (2018) 201–208

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Anxiety profiles and protective factors: A latent profile analysis in children

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ARTICLE INFO

Keywords:
General anxiety
Mathematics anxiety
Test anxiety
Self-concept
Resilience
Academic buoyancy

ABSTRACT

The current study investigated the presence of different anxiety profiles in schoolchildren in order to understand whether Mathematics and Test Anxiety are a manifestation of a general form of anxiety, or the expression of specific forms of anxiety. Moreover, we also examined the influence of personal protective factors. The results of a latent profile analysis, conducted on 664 children attending grades 3 to 6, clearly identified three different profiles distinguished on the basis of the level of general, test and mathematics anxiety. Protective factors, such as self-concept and resilience, were differently related to anxiety: the former was clearly lower when the risk profile was higher, whereas students were able to maintain a certain level of resilience up to an average risk of developing forms of anxiety. The implications of these findings may lead to the development of specific intervention programs aimed at reducing students' anxiety and fostering self-concept and resilience.

1. Introduction

Anxiety is an aversive motivational state that occurs in situations where the level of perceived threat to the individual is high (Eysenck & Calvo, 1992). Different forms of anxiety have been described in the literature but one of the most prominent is general anxiety (GA): this refers to an individual's disposition to worry about many different events, behaviors or personal abilities of everyday life, together with a difficulty in controlling these worries (Eysenck & Calvo, 1992). While GA refers to a general condition of anxiety, other more specific forms of anxiety have also been described and have received a great deal of attention in the literature. Specifically, math anxiety, commonly defined as a feeling of tension, apprehension, or fear which may interfere with one's performance of mathematical tasks (Richardson & Suinn, 1972), and test anxiety (TA), a psychological, physical, or behavioral reaction to worry cognitions regarding potential failure in achievement/school assessment situations (Zeidner, 1998).

In the extant literature, however, it is not clear whether MA and TA are a manifestation of a general form of anxiety, or the expression of specific forms of anxiety. As a consequence, mathematics anxiety (MA) and test anxiety (TA) have often been investigated separately. Their effects have been examined in relation either to academic performance (Hill et al., 2016; Putwain, Daly, Chamberlain, & Sadreddini, 2015; Roick & Ringeisen, 2017) or to other forms of anxiety, such as general anxiety (Carey, Devine, Hill, & Szűcs, 2017). To the best of our knowledge, different forms of anxiety and any factors protecting against it have not been investigated together, as part of the same study. Protective factors are conditions or attributes, such as strengths, resources, supports, that operate in different domains of functioning (i.e., individual, school, family) and help the individuals to foster competence, promote successful development, and mitigate all the conditions associated with a higher likelihood of negative outcomes, or risk factors (Dekovic, 1999).

In the present study, we considered personal protective factors (i.e., self-concept and resilience), and distinguished between their general and academic effects. To the best of our knowledge, this is the first contribution on the association of different forms of anxiety with personal protective factors in school-age children.

1.1. The relationship between general-, mathematics-, or test anxiety with personal protective factors

The results of previous meta-analyses suggest that GA is more closely related to TA than to MA (Hembree, 1988, 1990; Ma, 1999). Although the relationship between GA and MA is not particularly strong, GA seems to have a systematic effect on MA and on mathematics achievement. For example, Hill et al. (2016) found that partialling out the effect of GA reduced the significant negative relationship between MA and mathematics achievement in primary- and middle-school students. Regarding the relationship between GA with either self-concept or resilience in college students, previous studies revealed an association between negative affect responses to aversive situations and lower

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https://doi.org/10.1016/j.paid.2017.12.017
Received 4 October 2017; Received in revised form 9 December 2017; Accepted 11 December 2017
Available online 22 December 2017
0191-8869/

levels of self-esteem or self-concept (e.g., Moreland & Sweeney, 1984; Smith & Petty, 1995; see also Lowe, Papanastasiou, DeRuyck, & Reynolds, 2005; Lowe, Peyton, & Reynolds, 2007). Notably, in graduate students, the correlation between GA and self-concept was moderate and negative. Benetti and Kambouropoulos (2006), using path analyses, examined the influence of resilience and GA on self-concept in undergraduate students and investigated the mediating role of positive and negative effects. Their findings indicated that positive and negative affects significantly mediated the influence of resilience and GA on self-concept, respectively with any significant direct effects between GA, resilience and self-concept.

Coming to MA, an extensive body of literature documents that not only cognitive factors, but also low self-confidence in math or negative attitudes to math teachers, are related to poor performance in math classes (Ashcraft, Kirk, & Hopko, 1998; Ma, 1999; Maloney & Beilock, 2012; Mammarella, Caviola, Giofrè, & Borella, 2017; Mammarella, Hill, Devine, Caviola, & Szűcs, 2015). As for the role of personal protective factors, several studies have analyzed the relationship between academic self-concept and MA. In a cross-cultural study examining 15 years-olds from 41 countries, Lee (2009) found that MA and math self-concept are inversely related to one another. In a recent study, Justicia-Galiano, Martín-Puga, Linares, and Pelegrina (2017) investigated whether working memory and math self-concept mediate the relationship between MA and math performance among school-age children. Their results indicated that both working memory and math self-concept, as mediators, contributed to explaining the relationship between MA and mathematics achievement. Intriguingly, other researchers have suggested that MA is antecedent to self-concept and self-esteem (Ahmed, Minnaert, Kuyper, & van der Werf, 2012). This would mean that MA can promote negative academic self-concepts regarding math abilities (Ashcraft & Kirk, 2001; Wu, Barth, Amin, Malcarne, & Menon, 2012).

Tests can trigger another type of academic anxiety, called test anxiety. Classic measures of TA have used “worry” and “emotionality” to distinguish between its cognitive and affective-physiological aspects, respectively (Morris, Davis, & Hutchings, 1981). More recent measures have considered other features of TA too, such as specific autonomic bodily reactions of anxiety, social evaluation and cognitive interference (Benson, Moulin-Julian, Schwarzer, Seipp, & El-Zahhar, 1992; Lowe, Grumbein, & Raad, 2011; Wren & Benson, 2004). Several studies have attested to the relationship between TA and protective factors like academic self-concept and self-esteem, which describe the individual's self-perceived ability in academic situations, with a strong impact on a student's TA (Goetz, Preckel, Zeidner, & Schleyer, 2008; Hembree, 1988). Research has identified poor self-directed competence beliefs as a major cause of TA (Bong & Skaalvik, 2002; Putwain & Daniels, 2010). Bandalos, Yates, and Thorndike-Christ (1995) also found that academic self-concept was negatively related to TA, and mediated the link between prior experience and anxiety in undergraduate students. The relationship between resilience and TA has been examined too. According to Martin and Marsh (2006), resilient pupils can perform better under pressure, in anxiety-inducing testing situations, by maintaining a strong belief in their ability (which supports their effort and persistence), or by controlling worries likely to interfere with their performance. Putwain, Nicholson, Connors, and Woods (2013) examined whether TA mediated the relations between resilience and performance in a high-stake tests, after controlling for prior abilities in students attending grade 6. They found a significant indirect relationship between resilience and test performance, that was mediated by TA. A particular form of resilience, called academic buoyancy, also seems to be related to TA. Academic buoyancy is a relatively new construct emerging from the resilience literature, and defined as the student's response to academic challenges and pressures (Martin & Marsh, 2006, 2008a, 2008b, 2009). Academic buoyancy is associated with positive academic outcomes, including lower levels of TA and higher levels of persistence and confidence (Martin, Colmar, Davey, & Marsh, 2010; Putwain, Connors, Symes, & Douglas-Osborn, 2012). According to the self-referral model of TA devised by Zeidner and Matthews (2005), academic buoyancy could be seen as a factor protecting against maladaptive forms of coping and avoidance. For instance, buoyant students may have experienced failure in the past, or may expect to fail in the future, but this does not give rise to attributions likely to reduce their effort or motivation simply to protect themselves. Putwain et al. (2012) also found that academic buoyancy explained a significant portion of the variance in all components of TA (ranging from $R^2 = 0.13$ to $R^2 = 0.23$), and was inversely related thereto.

1.2. The present study

Earlier research tended to study the effects of GA, TA, or MA in isolation, with scarce consideration for the effects of personal protective factors such as self-concept and resilience. Carey et al. (2017) recently assessed different forms of anxiety by conducting a latent profile analysis on students in grade 4, or in grades 7 and 8. They identified four profiles in grade 4, ranging from low to high anxiety. This four-group solution also emerged on students in grades 7 and 8, but the profiles appeared more specific in this case, and were described as: low anxiety; general anxiety; academic anxiety (i.e., MA and TA); and high anxiety. Studying such latent profiles, it is interesting to see how distinct but related forms of anxiety appear within a population. Unlike simple correlations, latent profiles help us to identify heterogeneous subgroups that express certain anxiety patterns. For these reasons, in the present study we conducted a latent profiles analysis on a large group of 3rd- to 6th-grade primary-school children, considering their scores on GA, TA and MA. Our first aim was to test whether specific latent profiles of anxiety emerged between 3rd- and 6th-graders in order to better understand whether MA and TA emerged as unique forms of a more general apprehension (GA) or specific expressions of different form of anxiety, at least for these particular age groups. We expected to find different profiles of anxiety derived by the combination of GA, TA and MA, in agreement with the results of meta-analytical studies which showed moderate correlations among these variables (Hembree, 1988, 1990; Ma, 1999). We focused on a wide age range to shed more light on whether it is already possible to distinguish between different forms of anxiety (mainly general and academic) even in younger children. However, given that previous studies shown that TA and MA peak around grades 9 to 10, and do not change thereafter (Ashcraft & Moore, 2009; Hembree, 1990), we did not expect strong age-differences in our sample.

Another aim of our study was to test the role of personal protective factors such as self-concept and resilience in relation to latent profiles of different forms of anxiety. As mentioned previously, academic self-concept and resilience, or academic buoyancy, both seem to be inversely related to TA. While previous studies mainly investigated the relationship between academic self-concept or academic buoyancy and anxiety (and TA in particular), here we distinguished between general and academic personal protective factors. This is because we assumed that, just as it seems important to distinguish between general and academic forms of anxiety, so too could a distinction between general and academic personal protective factors help to clarify their potential relationship between different latent profiles of anxiety. We, thus, expected that general and academic personal protective factors would have a different influence on latent profiles of anxiety, in agreement with previous studies showing a negative relation between TA and academic buoyancy (Martin et al., 2010).

2. Method

2.1. Participants

The study originally involved 666 children. However, some of the data from two children were missing and we decided to exclude these