



# The development of a questionnaire on academic hardiness for late elementary school children

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## ABSTRACT

The purpose of the research was to develop a questionnaire to measure dimensions of academic hardiness in late elementary school children. Questionnaires were distributed to 1474 children. After a set of exploratory factor analyses in studies 1 and 2, the confirmatory factor analysis results provided support for the 9-factor solution which explained 55.15% of the total variance. Scale scores showed adequate internal consistency and 2-week test–retest reliability. The findings are largely supportive to hardiness theory. Each factor conceptually corresponds to one of the three characteristics of the original hardiness theory (commitment, control, and challenge). The results also confirm and strengthen the relation between hardiness and achievement goal orientation in student learning. The nine factors emerging from the factor analysis reflect the different ways in which late elementary school children try to cope with school failure. The findings are discussed in the context of the relevant literature.

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## 1. Introduction

Personality hardiness has emerged as a composite of interrelated attitudes of commitment, control and challenge that helps in managing stressful circumstances by turning them into growth-inducing rather than debilitating experiences (Maddi, 2005; Maddi & Kobasa, 1984). The attitudes of hardiness are a cognitive/emotional amalgam constituting a learned, growth-oriented, personality buffer (Maddi, 2006). If you are strong in commitment, you believe it is important to remain involved with the events and people around you, no matter how stressful things become. If you are strong in control, you want to continue to have an influence on the outcomes going around you, no matter how difficult this becomes. If you are strong in challenge, you see stresses as a normal part of living, and an opportunity to learn, develop, and grow in wisdom (Maddi, 2005). These hardy attitudes lead to hardy actions that are identified as the attitude-motivation mechanisms for dealing effectively with stressful circumstances in a manner than enhances health and performance (Maddi, 2006).

Given evidence that psychological hardiness helps insulate individuals from the effects of stress and predicts future well-being, questions naturally arise regarding its generability across contexts and its influence on outcomes other than health (Cole, Field, & Harris, 2004). The initial question was which might be the positive impact that hardiness may have in academic settings. Benishek and Lopez (2001) tried to make a correspondence between the hardiness attitudes and forms of behaviors that concern learning and performance in high school students and university undergraduates. The components of academic hardiness were defined as follows: commitment concerned students' reported willingness to expend consistent effort and to engage in personal sacrifices in order to achieve academic excellence, irrespective of the content or demands of individual courses, instructors or personal interests. Challenge was defined as the student's purposeful efforts to seek out

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difficult academic coursework and experiences and to justify such actions as inherently for personal learning. Control was defined as students' beliefs that they possessed in the capacity to achieve desired educational outcomes from personal effort and through effective emotional self-regulation in the face of academic stresses and disappointments (Benishek, Feldman, Shipon, Mecham, & Lopez, 2005).

This conceptualization guided the development of the initial version of the Academic Hardiness Scale (Benishek & Lopez, 2001) followed by a revised Academic Hardiness Scale (AHS) (Benishek et al., 2005). AHS has been used in few studies with high school students (Golightly, 2007; Karimi & Venkatesan, 2009) and undergraduates (Kinder, 2008). However, in most of the studies the factorial validity of the scale has not been explored (Kamtsios & Karagiannopoulou, 2012). Few recent studies (Golightly, 2007; Kamtsios & Karagiannopoulou, 2011) using both exploratory and confirmatory factor analysis, mentioned psychometric weakness of the AHS.

Although the AHS seems to be a useful tool (Benishek et al., 2005; Kinder, 2008) various researchers suggest that there is a need to develop a broader conceptualization of academic hardiness (Benishek et al., 2005; Golightly, 2007; Kamtsios & Karagiannopoulou, 2012) and examine its dimensions in different life stages, different groups, and in different cultural settings (Benishek et al., 2005; Chan, 2000; Green, Grant, & Rynsaard, 2007), as there are additional aspects of the construct that have yet to be identified (Benishek et al., 2005). Kamtsios and Karagiannopoulou (2012), using qualitative methodology (semi-structured interviews) to explore academic hardiness components, bring into question additional aspects of academic hardiness in late elementary school children (10–12 years) that have not been identified in the past. Given that the concept of academic hardiness has a dynamic feature (Benishek et al., 2005; Kinder, 2008), and the fact that new dimensions and elements of the concept have been identified (Kamtsios & Karagiannopoulou, 2012), which may be more or less relevant, or they may even play different roles throughout the learning process, we consider that it is important to explore the academic hardiness in late elementary school children. At this stage children experience less stress involved in performance goals in school setting compared to their high school counterparts.

The primary purpose of this research<sup>1</sup> is to develop a survey instrument to measure dimensions of academic hardiness in late elementary school age children (aged 10–12 years), and evaluate its psychometric properties; namely, its factor structure and reliability. In doing so standard instrument development procedures (Clark & Watson, 1995; DeVellis, 2003) were employed in Study 1 (Phases 1 and 2) and Study 2, to develop a psychometrically robust and conceptually sound measure for the dimensions of academic hardiness reported by late elementary school children.

## 2. Study 1

### 2.1. Method

#### 2.1.1. Phase 1: item generation and content validity.

The purpose of phase 1 was to develop an extensive battery of items that reflected the theorized content domain of academic hardiness and its components (commitment, control and challenge) in late elementary school children. To accomplish this we drew information from 21 in-depth, semi-structures interviews (for details see: Kamtsios & Karagiannopoulou, 2012). Drawing from the interviews we developed a battery of items ( $n = 90$ ). A panel of experts on academic hardiness theory established the face validity, the content and the cultural appropriateness of the questionnaire. Any change was based on their suggestions. The finalized questionnaire was administered for a field test to a small sample of students ( $n = 20$ ) in the target population (10–12 years) who examined it for appropriateness of the questions, clarity, language suitability and wording. Minor changes were made at this point. The confirmation of common comprehension of items from all students who participated constituted a first important element of internal reliability of the scale (Byrne, 2001).

#### 2.1.2. Phase 2: factorial validity of the 90-item questionnaire

The purpose of phase 2 was to examine the factor structure and the reliability of the “Dimensions of Academic Hardiness Questionnaire”. Within this evaluation phase several different approaches to refining the “Dimensions of Academic Hardiness Questionnaire” and reducing the number of items were employed: principal components analysis and common factor analysis (using maximum likelihood method<sup>2</sup>) to investigate the relationships among items and reliability analysis to describe item-level measurement error. The use of factor analysis procedures is an important step in test construction and validation procedures (Clark & Watson, 1995). Our decision was to use the two most commonly known and studied factor extraction methods (Worthington & Whittaker, 2006), principal components analysis (PCA) and common factor analysis (FA) (such as maximum likelihood method – ML), although we are aware that there are distinct purposes of each technique. The purpose of PCA is to reduce the number of items while retaining as much of the original item variance as possible. The purpose of FA is to understand the latent factors or constructs that account for the shared variance among items (Costello & Osborne, 2005; Kahn, 2006; Worthington & Whittaker, 2006). Although there has been a protracted debate over the

<sup>1</sup> This research is a part of a larger psychometric study, which ended up, in the construction of the “Dimensions of Academic Hardiness Questionnaire” for late elementary school children.

<sup>2</sup> We use maximum likelihood method (ML) instead of principal axis-factoring because ML approaches are relatively equal in their capacities to extract the correct model (Worthington & Whittaker, 2006).

preferred use of PCA versus FA, as exploratory procedures', which has yet to be resolved (Gorsuch, 2003, cited in Worthington & Whittaker, 2006), we believe that the results of our factor analysis in the 90-item questionnaire would be more acute and valid if both methods produce similar results. In that way our analysis will confirm various statistical theorists who point out that there are almost no differences between PCA and FA (Arrindell & van der Ende, 1985; Guadagnoli & Velicer, 1988; Schonemann, 1990; Steiger, 1990; Velicer & Jackson, 1990, cited in Costello & Osborne, 2005).

To determine the number of factors to retain, five criteria were used. These followed to Benishek and Lopez (2001) and Pett, Lackey, and Sullivan (2003) suggestions: (1) factor structure coefficients of 0.40 or greater were considered to be significant and used to interpret factors (Stevens, 1992), (2) examination of the scree-plot, (3) factors with eigenvalues greater than 1.0, (4) the presence of correlation with other resulting factor, and (5) the conceptual meaningfulness of the factors.

### 2.1.3. Participants

The sample of this phase of the study consisted of 436 children (221 boys and 215 girls), aged 10–12 years recruited from 12 urban primary schools in north-west Greece. Children were selected based on age groups and gender.

### 2.1.4. Procedure

Children and their parents were provided with a letter informing them for the purpose of the study. The researchers administered the questionnaire in the classroom to pupils who returned a signed parent consent form. The children were given verbal instructions concerning the completion of the questionnaire. Any questions/clarifications were answered/provided before their response to the questionnaire. The completion of the questionnaires lasted 20–25 min. This phase of the study was conducted with the permission of the Greek Ministry of Education. The children participated voluntarily.

### 2.1.5. Measure

The 90-item "Dimensions of Academic Hardiness Questionnaire", representing a full range of children's experiences and actions in order to overwhelm in a school failure, was administered near the end of the 1st semester. The items of the questionnaire emerged from in-depth interviews (Kamtsios & Karagiannopoulou, 2012). Children responded in a 4-point Likert-type scale, ranging from 1 (*strongly disagree*) to 4 (*strongly agree*), rating the level of agreement with these statements. A high score on the 4-option Likert-scale indicated that the aspect being assessed by the question was perceived to occur frequently by the children.

## 2.2. Results

### 2.2.1. Results from principal components analysis

Initially, with the use of a series of exploratory factor analyses (EFA) we intended to reduce the number of items included in the "Dimensions of Academic Hardiness Questionnaire". Also we used internal consistency analyses to indicate which individual items should be eliminated. Internal consistency was evaluated by computing coefficient  $\alpha$  for each scale, split half for each factor as well as item-total correlations. After inspection of these values in conjunction with the PCA, several scales'  $\alpha$ s was increased by eliminating one or more items. After 11 EFA, the results from PCA (using varimax rotational criteria to simplify identification of the components) revealed eight factors with eigenvalues exceeding 1.00. The number of factors (8) was also confirmed with the visual inspection of the scree-plot, indicated a sudden drop in the scree beginning with the eight factor. All item loadings exceed .40 on their factor. These eight factors accounted for 54.35% of the total variance. From the initial 90 items, 55 items did not cluster with any meaningful factors and their loadings were less than .30. These items were rejected from the analysis. The final version of the questionnaire emerging from this phase of study contains 35 items. Their factor structure coefficients and factors labels are presented in Table 1.

**2.2.1.1. Reliability.** The internal consistency of the overall questionnaire was .89. The Cronbach's alpha for the eight factors ranged from .61 to .85. The average item-total correlation was .49 and ranged from .33 to .72. As a result the questionnaire was judged to be internally consistent and therefore reliable. The number of items, means, eigenvalues, percentage of total variance,  $\alpha$ -Cronbach and split half are summarized in Table 2.

### 2.2.2. Results from common factor analysis (using maximum likelihood method)

After 5 EFA, the results from maximum likelihood method revealed eight factors with eigenvalues exceeding 1.00. These eight factors accounted for 34.01% of the total variance. 53 items were clustered on two or more factors and their loadings were less than .40. These items were rejected from the analysis. The final version of the questionnaire in this phase of the research contains 37 items. Their factor structure coefficients and factor labels are presented in Table 3.

**2.2.2.1. Reliability.** The internal consistency of the overall questionnaire with the ML method was .89. The Cronbach's alpha for the eight factors ranged from .54 to .85. For two factors the Cronbach-alpha coefficients were not accepted. The average item-total correlation was .45, ranging from .31 to .72. The number of items, means, eigenvalues, percentage of total variance,  $\alpha$ -Cronbach and split half are summarized in Table 4.

**Table 1**

Factor pattern coefficients for the eight factor promax solution for the “Dimensions of Academic Hardiness Questionnaire” for late elementary school children, using principal components analysis.

No.	Questions	Factor loadings								$h^2$
		1	2	3	4	5	6	7	8	
52	I do my best at school so as my marks to be higher than those of my classmates.	.82								.71
70	I want do better than my classmates in order to get a higher mark.	.79								.68
22	I do my best at the schoolwork because I want not only to get a good mark but also to be among the best pupils of my class.	.68								.54
8	I do my best at school in order to achieve the marks I want and to be better than my schoolmates.	.66								.52
14	I try to have good marks because I don't want my friends to make fun of me.	.64								.50
80	I do care about getting a good mark in order my parents to feel pleased/satisfied.	.60								.41
50	I do my best at the schoolwork to prove to my parents that I can make it.	.60								.46
84	Though my good performance I can prove to my teacher that I can make it at school.	.46								.46
63	When I get a low mark I try to “unblock” and think rationally.		.66							.52
65	When my performance at school in not good, I try to find ways to face the problem.		.61							.52
62	Getting a low mark is something unpleasant, but I believe that if I try a lot/I can make it.		.59							.51
54	I try not only to calm down, when my performance at school is not so satisfying, but also to think about what I can do so as to improve it.		.58							.46
77	Getting a low mark is something unpleasant for me but trying more can lead me to a better result.	.41								.43
72	I try to be really attentive to my schoolwork as some of the subjects taught may be handfull/useful later in my life.		.76							.66
67	I believe that everything taught and learnt at school now can be also used in both secondary and high school.			.61						.47
74	Even if I get a low mark in a test, I try to learn from the mistakes I made.			.56						.47
86	It is very important for me personally to get a good mark.			.49						.52
40	I study my lessons carefully/thoroughly because the knowledge acquired can benefit my life in the long term.			.40						.39
47	I find interest in my school subjects even though they may be difficult.				.74					.58
27	I find interest in the content even of those lessons considered as difficult.				.71					.57
36	I try my best, even at the difficult subjects/lessons, through daily revisions.				.68					.43
55	I spend time in after school activities (e.g. playing out with my friends) only after I have finished with my school homework.					.75				.64
28	I do my homework first and then I play with my friends.					.59				.52
83	I try to finish with my homework first before I spend time with my friends.					.59				.53
59	I try very hard as far as my schoolwork is concerned through studying more and organising my time properly.					.53				.52
13	When I have difficulties with my schoolwork I ask for my parents' help.						.80			.71
25	I ask for my parents' help when I have questions/difficulties.						.80			.70
69	When I have difficulties, I prefer asking for an adult's help.						.69			.58
5	My concern about my parents' potential reaction to a low mark makes me try more.							.69		.54
23	My concern about my teacher's reaction to a possible failure makes me study more.							.63		.59
17	I try not to get a low mark so as to avoid feeling disappointment and shame.							.61		.54
49	I do my homework because, if I get a low mark, I may feel bad/unpleasant.							.41		.58
24	I don't feel disappointed when I get a low mark. On the contrary I try more to improve myself.								.67	.56
43	Failing a test doesn't disappoint me, but it makes me try more.								.65	.51
6	Getting a low mark makes me try more in order to get a higher one the next time.								.64	.46

K.M.O. = .89; Bartlett test of sphericity = 4754.17,  $p < .001$ .

Notes: Factor 1: commitment: comparing oneself with the peers and acceptance from the peers and the teacher; factor 2: control: use of effective coping strategies; factor 3: commitment: knowledge utility; factor 4: challenge: dealing positively with hard subjects; factor 5: commitment: regulating priority to learning versus enjoyment; factor 6: commitment: looking for help contributing to learning; factor 7: control: attempt to avoid unpleasant feelings; and factor 8: challenge: dealing with failure in a constructive way.

**Table 2**

Number of items, means, eigenvalues and % of total variance,  $\alpha$ -Cronbach and split-half of the “Dimensions of Academic Hardiness Questionnaire” for late elementary school children (Study 1, Phase 2).

Factors	Number of items	Mean [std]	Eigenvalues	% of total variance	$\alpha$ -Cronbach	Split-half
1	8	2.92 [.58]	4.1	11.28	.85	.80
2	5	3.23 [.43]	2.5	7.2	.71	.68
3	5	3.41 [.42]	2.5	7.19	.70	.62
4	3	3.09 [.49]	2.4	6.67	.71	.59
5	4	3.35 [.49]	2.2	6.25	.70	.70
6	3	2.93 [.63]	1.9	5.51	.72	.61
7	4	2.95 [.56]	1.8	5.18	.63	.59
8	3	3.30 [.53]	1.8	5.07	.61	.46

**Table 3**

Factor pattern coefficients for the eight factor promax solution for the “Dimensions of Academic Hardiness Questionnaire” for late elementary school children, using factor analysis-maximum likelihood method.

No. Questions	Factor loadings								$h^2$
	1	2	3	4	5	6	7	8	
52 I do my best at school so as my marks to be higher than those of my classmates.	.80								.68
70 I want do better than my classmates in order to get a higher mark.	.76								.65
8 I do my best at school in order to achieve the marks I want and to be better than my schoolmates.	.62								.44
22 I do my best at the schoolwork because I want not only to get a good mark but also to be among the best pupils of my class.	.61								.42
14 I try to have good marks because I don't want my friends to make fun of me.	.60								.42
50 I do my best at the schoolwork to prove to my parents that I can make it.	.55								.39
80 I do care about getting a good mark in order my parents to feel pleased/satisfied.	.53								.32
84 Though my good performance I can prove to my teacher that I can make it at school.	.43								.39
73 Having in mind that a possible failure in a test can disappoint my teacher, I do my best so as to avoid it.	.41								.33
63 When I get a low mark I try to “unblock” and think rationally.		.54							.42
62 Getting a low mark is something unpleasant, but I believe that if I try a lot/I can make it.		.54							.33
54 I try not only to calm down, when my performance at school is not so satisfying, but also to think about what I can do so as to improve it.		.50							.41
65 When my performance at school in not good, I try to find ways to face the problem.		.41							.28
81 If I get a low mark, I try to do something, in order to forget about what happened for a while before I make a decision about my next step.		.40							.39
77 Getting a low mark is something unpleasant for me but trying more can lead me to a better result.		.40							.19
75 I try to calm down and realise what went wrong in order to do something about that.		.37							.32
72 I try to be really attentive to my schoolwork as some of the subjects taught may be handful/useful later in my life.			.54						.19
40 I study my lessons carefully/thoroughly because the knowledge acquired can benefit my life in the long term.			.44						.42
74 Even if I get a low mark in a test, I try to learn from the mistakes I made.			.44						.37
7 I make an effort for all the lessons all the lessons taught can help me in my future life.			.41						.23
79 I try as much as I can, studying with more attention and being more careful in the class.			.41						.40
21 Some lessons are useful for our everyday life.			.39						.33
47 I find interest in my school subjects even though they may be difficult.				.67					.56
36 I try my best, even at the difficult subjects/lessons, through daily revisions.				.59					.44
27 I find interest in the content even of those lessons considered as difficult.				.53					.39
13 When I have difficulties with my schoolwork I ask for my parents' help.					.75				.31
25 I ask for my parents' help when I have questions/difficulties.					.64				.26
69 When I have difficulties, I prefer asking for an adult's help.					.56				.48
55 I spend time in after school activities (e.g. playing out with my friends) only after I have finished with my school homework.						.59			.37
83 I try to finish with my homework first before I spend time with my friends.						.44			.60
28 I do my homework first and then I play with my friends.						.39			.51
59 I try very hard as far as my schoolwork is concerned through studying more and organising my time properly.						.37			.40
43 Failing a test doesn't disappoint me, but it makes me try more.							.60		.29
24 I don't feel disappointed when I get a low mark. On the contrary I try more to improve myself.							.47		.38
17 I try not to get a low mark so as to avoid feeling disappointment and shame.								.50	.23
9 A low mark makes me feel sad but if I study more, this is not going to happen again.								.43	.50
23 My concern about my teacher's reaction to a possible failure makes me study more.								.36	.32

K.M.O. = .88; Bartlett test of sphericity = 8328.97,  $p < .001$ .

Notes: Factor 1: commitment: comparing oneself with the peers and acceptance from the peers and the teacher; factor 2: control: use of effective coping strategies; factor 3: commitment: knowledge utility; factor 4: challenge: dealing positively with hard subjects; factor 5: commitment: looking for help contributing to learning; factor 6: commitment: regulating priority to learning versus enjoyment; factor 7: challenge: dealing with failure in a constructive way; and factor 8: control: attempt to avoid unpleasant feelings.

**Table 4**

Number of items, means, eigenvalues and % of total variance,  $\alpha$ -Cronbach and split-half of the “Dimensions of Academic Hardiness Questionnaire” for late elementary school children (Study 1, Phase 2).

Factors	Number of items	Mean [Std]	Eigenvalues	% of total variance	$\alpha$ -Cronbach	Split-half
1	9	2.93 [.56]	4.3	7.07	.85	.72
2	7	3.21 [.40]	3.6	5.93	.72	.70
3	6	3.41 [.38]	3.3	5.56	.75	.70
4	3	3.02 [.63]	2.5	4.10	.71	.59
5	3	2.93 [.63]	1.8	3.04	.72	.61
6	4	3.35 [.49]	1.6	2.97	.69	.69
7	2	3.22 [.62]	1.5	2.77	.59	.59
8	3	3.10 [.54]	1.3	2.57	.54	.54

Both ML and the PCA yielded almost similar results. 30 of the items appeared in both methods (PCA and ML). The PCA revealed five new questions and the ML method revealed seven new items.

### 3. Study 2

#### 3.1. Method

A further study on another convenience sample of the same age was carried out to specify the factor loadings obtained in study 1 (using the PCA and ML) (phases 1 and 2).

##### 3.1.1. Participants

In total, 1018 children volunteered to participate in study 2. In line with study 1, children in this study were in grades 5 and 6 (10–12 years) (493 males and 525 females). They emanated from 20 urban primary schools from north-west Greece.

##### 3.1.2. Procedures

The procedure concerning the administration of the “Dimensions of Academic Hardiness Questionnaire” to elementary school children, and the parental and student consent are as described in the previous section (study 1).

##### 3.1.3. Measure

The preliminary version of “Dimensions of Academic Hardiness Questionnaire” for late elementary school children (42 items) presented in study 1 (phase 2) has been used in the present study.

##### 3.1.4. Data analysis

Both CFA and EFA are recommended for scale development (Netemeyer, Bearden, & Sharma, 2003). In order to perform both EFA and CFA, the sample was randomly divided into two equal subsamples using SPSS version 16. The two samples did not differ significantly on age ( $t_{(509)} = 2.35, p = .80$ ), gender ( $\chi^2 = .767, p = .381$ ) and total scores on the “Dimensions of Academic Hardiness Questionnaire” ( $t_{(509)} = 3.04, p = .75$ ). Initially, the Kaiser–Meyer–Olkin’s measure (K.M.O) for sampling adequacy (acceptable level  $> .50$ ; Kaiser, 1970) and Bartlett’s test of sphericity (Bartlett, 1950) were calculated to verify the appropriateness of both CFA and EFA. The K.M.O. was .90 and Bartlett’s test of sphericity was statistically significant (10.071,  $p < .05$ ) supporting the factorability of the correlation matrices.

#### 3.2. Results from EFA

EFA was used to select items that would later be evaluated via CFA. Principal components EFAs were carried out with data from 509 participants, employing to both oblique and varimax solutions. The initial EFAs yielded a 9-factor solution, accounted for the 55.15% of the total variance, with eigenvalues for all factors exceeding 1.8. All item loadings exceed .40 on their factor. The questionnaire contains 36 items and its factor structure coefficients are presented in Table 5.

Based on the content of the survey questions, factors were labeled as: (1) commitment: comparing oneself with the peers and acceptance from the peers, (2) control-awareness: use of effective coping strategies, (3) commitment: adults’ acceptance (parents and teacher), (4) commitment: knowledge utility, (5) control-awareness: attempt to avoid unpleasant feelings, (6) commitment: regulating priority to learning versus enjoyment, (7) challenge: dealing positively with hard subjects, (8) commitment: looking for help contributing to learning, and (9) challenge: dealing with failure in a constructive way.

#### 3.3. Confirmatory factor analysis (CFA)

Confirmatory factor analysis (CFA) was conducted using the EOS 6.1 statistical package (Bentler, 2004). CFA was carried out for the purpose of validating and confirming the goodness of fit of the “Dimensions of Academic Hardiness Questionnaire” for late elementary school children. The CFA measurement model was developed based on the factor loadings reported in the exploratory factor analysis. Because data appeared to be fairly univariately and multivariately normally distributed (Mardia’s coefficient = 1.2) maximum likelihood (ML) estimation was used to address the possibility of non-normal distribution (Cantoni & Ronchetti, 2006) and to estimate the model parameters and the fit indices. ML has been found to produce more accurate fit indices and less biased parameters than generalized square estimation (Olsson, Foss, Troye, & Howell, 2000). Three models were tested: a structural 9-factor correlated model, assuming that the “Dimensions of Academic Hardiness” factors were correlated to each other, a model assuming that the nine factors were not correlated to each other and a model of eight correlated factors as resulted from study 1. Both absolute and incremental fit indices were used to evaluate the models tested. Items were specified to load on only one factor each. Following recommended procedures, multiple fit indices were used to determine the appropriateness of each model (Hu & Bentler, 1998), including model Chi-square, normed fit index (NFI), non-normed fit index (NNFI), comparative fit index (CFI), goodness of fit index (GFI), adjust goodness of fit index (AGFI), standardized root mean squared residual (SRMR), and root mean square error of approximation (RMSEA). An RMSEA value of less than .06 and an SRMR value of less than .08 indicate a good fit (Hu & Bentler, 1999). CFI values of .90 and .93 represent an acceptable and a good fit, respectively (Byrne, 1994; Hayle & Panter, 1995).

**Table 5**

Factor pattern coefficients for the nine factor promax solution for the “Dimensions of Academic Hardiness Questionnaire” for late elementary school children.

No.	Questions	Factor loadings									$h^2$
		1	2	3	4	5	6	7	8	9	
1	I do my best at school so as my marks to be higher than those of my classmates.	.82									.74
2	I do my best at the schoolwork because I want not only to get a good mark but also to be among the best pupils of my class.	.80									.73
3	I do my best at school in order to achieve the marks I want and to be better than my schoolmates.	.78									.68
4	I try to have good marks because I don't want my friends to make fun of me.	.60									.53
5	When I get a low mark I try to “unblock” and think rationally.		.67								.54
6	When my performance at school is not good, I try to find ways to face the problem.		.61								.46
7	I try not only to calm down, when my performance at school is not so satisfying, but also to think about what I can do so as to improve it.		.54								.48
8	Getting a low mark is something unpleasant, but I believe that if I try a lot/I can make it.		.47								.47
9	If I get a low mark, I try to do something, in order to forget about what happened for a while before I make a decision about my next step.		.46								.35
10	I try to calm down and realise what went wrong in order to do something about that.		.46								.45
11	I do care about getting a good mark in order my parents to feel pleased/satisfied.			.70							.62
12	I do my best at the schoolwork to prove to my parents that I can make it.			.68							.63
13	Having in mind that a possible failure in a test can disappoint my teacher, I do my best so as to avoid it.			.67							.58
14	Though my good performance I can prove to my teacher that I can make it at school.			.65							.58
15	I try to be really attentive to my schoolwork as some of the subjects taught may be handfull/useful later in my life.			.67							.54
16	I believe that everything taught and learnt at school now can be also used in both secondary and high school.			.60							.48
17	I study my lessons carefully/thoroughly because the knowledge acquired can benefit my life in the long term.			.58							.50
18	It is very important for me personally to get a good mark.			.48							.45
19	I make an effort for all the lessons. All the lessons taught can help me in my future life.			.48							.44
20	A low mark makes me feel sad but if I study more, this is not going to happen again.				.66						.58
21	I try not to get a low mark so as to avoid feeling disappointment and shame.				.57						.48
22	My concern about my parents' potential reaction to a low mark makes me try more.				.53						.50
23	My concern about my teacher's reaction to a possible failure makes me study more.				.53						.50
24	I do my homework because, if I get a low mark, I may feel bad/unpleasant.				.40						.49
25	I spend time in after school activities (e.g. playing out with my friends) only after I have finished with my school homework.					.74					.62
26	I try to finish with my homework first before I spend time with my friends.					.69					.57
27	I do my homework first and then I play with my friends.					.64					.58
28	I find interest in my school subjects even though they may be difficult.						.72				.62
29	I find interest in the content even of those lessons considered as difficult.						.67				.57
30	I try my best, even at the difficult subjects/lessons, through daily revisions.						.62				.51
31	When I have difficulties with my schoolwork I ask for my parents' help.							.83			.72
32	I ask for my parents' help when I have questions/difficulties.							.81			.70
33	When I have difficulties, I prefer asking for an adult's help.							.75			.61
34	Failing a test doesn't disappoint me, but it makes me try more.								.68		.60
35	I don't feel disappointed when I get a low mark. On the contrary I try more to improve myself.								.68		.56
36	Getting a low mark makes me try more in order to get a higher one the next time.								.55		.52

### 3.3.1. Results from CFA

CFA results are presented in Table 6. Using criteria recommended by Hu and Bentler (1999), examination of the fit indices indicated that the first model provided a good fit to the data, although  $\chi^2$  is a statistical significance.  $\chi^2$  is a problematic fit index, since it is sensitive to sample size and violations of normality (Joreskog, 1969). These findings suggest that the factorial validity of the “Dimensions of Academic Hardiness Questionnaire” for late elementary school children is supported. Two important conclusions can be reached. First, the fit of the first model is supported (CFI: .90, SRMR: .07, and RMSEA: .05) and second the 9-factor model fits significantly better than all alternative models, with none of them showing adequate fit indices.

**3.3.1.1. Reliability.** The internal consistency of the overall questionnaire was .91. The Cronbach's  $\alpha$  for the nine factors ranged from .63 to .83. The test–retest reliability was assessed with intra-class correlation coefficients–ICC (Koch, 1982). The ICC for the nine factors ranged from .61 to .81 suggesting moderate to good stability more than 2 weeks. The numbers of items, means, eigenvalues, percentage of total variance,  $\alpha$ -Cronbach and split half are summarized in Table 7.

## 4. Discussion

The aim of the present study was to develop a survey instrument to measure dimensions of academic hardiness in late elementary school children (10–12 years). The creation of the initial item pool and the technical item refinement procedures



**Table 6**

Goodness-of-fit indices for the 3 hypothesized models.

Fit indices	Model 1	Model 2	Model 3
Sattora Bentler scales $c^2/df$	1496.79/568	3529.56/585	1824.94/552
$p$	.000	.000	.000
NFI	.84	.61	.61
NNFI	.90	.62	.66
CFI	.90	.65	.69
GFI	.91	.74	.76
AGFI	.90	.70	.72
RMR	.05	.09	.09
SRMR	.07	.18	.17
RMSEA	.05	.07	.07

Notes: NFI, normed fit index; NNFI, non-normed fit index; CFI, comparative fit index; GFI, goodness of fit index; and AGFI, adjust goodness of fit index. SRMR, standardized root mean squared residual; RMSEA, root mean square error of approximation.

**Table 7**Number of items, means, eigenvalues and % of total variance,  $\alpha$ -Cronbach and split-half of the “Dimensions of Academic Hardiness Questionnaire” for late elementary school children (Study 2).

Factors	Number of items	Mean [Std]	Eigenvalues	% of total variance	$\alpha$ -Cronbach	Split-half
1	4	2.91 [.71]	2.9	7.49	.83	.81
2	6	3.26 [.40]	2.7	6.94	.75	.71
3	4	3.10 [.62]	2.6	6.72	.77	.73
4	5	3.53 [.39]	2.5	6.64	.73	.74
5	5	3.13 [.51]	2.2	5.81	.69	.72
6	3	3.50 [.49]	2.2	5.71	.66	.60
7	3	3.12 [.56]	2.2	5.65	.66	.54
8	3	3.00 [.65]	2.1	5.41	.76	.65
9	3	3.39 [.52]	1.8	4.78	.63	.59

(presented in phases 1 and 2 in study 1), followed the “steps” suggested in the psychometric literature (Byrne, 1994; Clark & Watson, 1995; Costello & Osborne, 2005). Interviews presented in another study (Kamtsios & Karagiannopoulou, 2012) lent support to the representativeness of the items selected.

A set of EFA (study 1 and study 2) was used to investigate the structure of items underlying responses to the “Dimensions of Academic Hardiness Questionnaire” for late elementary school children. Results provided preliminary support for the 9-factor structure of the scale. The 9-factor solution was chosen because it resulted in the most robust factor structure with stronger item loadings and factor internal consistency. The final scale contains 36 items. The number of items in each factor meets the minimum number of three items for best practice in factor analysis (Costello & Osborne, 2005; Velicer & Fava, 1998). In study 2 CFA – which is essential in the development of a new scale (Ding, Velicer, & Harlow, 1995; Hinkin, 1998) – was carried out and tested the fit of the factor model of the 36-item questionnaire. Results from CFA indicated an adequate fit according to a range of indices. The accepted to high level internal consistency coefficients, based on the total sample indicate that the survey instrument and its subscales are reliable and can be use in late elementary school children.

The two studies presented in this paper drew from the established psychometric procedures in the relevant literature, concerning the development of an instrument to support the reliability and validity of the questionnaire. To our knowledge, this is the first study aiming to develop a measure of academic hardiness for school children. The development of such a questionnaire for this age group expands the existing literature as it suggests components contributing to the three manifestations (commitment, control, and challenge) of hardiness. The current findings are largely supportive to the academic hardiness theory. Each factor corresponds conceptually to one of the three characteristics of the original academic hardiness theory (commitment, control, and challenge). The first factor of the questionnaire is composed of items that indicate “children’s commitment: comparing oneself with the peers-acceptance from the peers”. This finding strengthens and expands the commitment construct. Such an attitude will make students more assiduous and willing to spend more time in order to achieve their academic goals, which are performance oriented. The second factor, “control and awareness”, is about the effectiveness of different strategies in order for the children to achieve mastery orientation goals. More specifically, the questions of the second factor concern the choice, organization and implementation of cognitive processes that determine children’s behavior and their actions in a specific occasion, school failure (e.g. “I’m thinking of various ways in order to face the problem when my performance in school is not as good as I expected”). Also the questions that constitute the second factor concern one’s control and awareness of feelings. This refers to strategies adopted by children in order to control and regulate their feelings following a school failure (e.g. “When I take a low grade I try to “unblock” and to think logically”).

The third factor includes items indicating that children recognize what is of value and importance for others (e.g. parents and teacher) and appear committed to them in order to get the others’ acceptance; namely: adopt performance goals for



social reasons. Factor four reported children's commitment to study further recognizing the usefulness of knowledge for the next years of school life and also the long-term positive influence of knowledge in future adult life. This finding depicts children's expectations for success possibly derived from mastery-orientation concerning the short-term and long-term learning goals. The fifth factor involves items that refer to control-children appear aware that they need to act appropriately to avoid the unpleasant feelings after a school failure. The negative feelings, for which children are aware, act as a motive for them to enhance their effort on study. The sixth factor concerns priority of study/learning vs. enjoyment, indicating commitment to academic tasks and time management.

Factor seven refers to challenge: "dealing positively with hard subjects". This factor is in line with the significance of the component of challenge, suggested by Maddi (2006). Challenge concerns individuals' perceptions of stressors as stimuli that motivate them. In the case of academic hardiness, failure is perceived as an experience that leads them to put more effort on study. Factor eight involves children seeking support when they face difficulties and do not do well in school subjects. This factor contributes to the theoretical discussion of the significance of commitment in motivation and learning (Schunk, Pintrich & Meece, 2008). Social support is expected to enhance their effort in order to overcome a particular difficulty with learning (Berry & West, 1993; Hammand, 2004). The last factor includes items that refer to challenge and dealing with failure in a constructive way. This factor is conceptually constituted from children's attitude to insist on their effort no matter how difficult the learning experience becomes for themselves (e.g. getting a bad grade). Children do not seem to become disappointed by the failure. In reverse, they try to turn the failure on advantage. Children's mastery oriented motive is revealed as they insist in their studies even if they face difficulties and experience disappointment.

The nine factors included in the questionnaire reflect the different ways in which late elementary school children cope with the school failure. The organization and the conceptual content of the nine factors although not in consistency with the initial academic hardiness questionnaire, appear in line with the academic hardiness theory (Benishek et al., 2005). The nine factors confirm and strengthen the relation between academic hardiness and achievement goal orientation in student learning (Cole et al., 2004). The conceptual orientation of each factor to mastery or performance goals is demonstrated. This is an important finding as a variety of studies have shown the positive effects of different goal orientations on students' cognitive and behavioral reactions as well as on educational performance (Ames, 1992; Linnenbrink, 2005; Midgley, Kaplan, & Middleton, 2001). The study (factors 2 and 5) expands the academic hardiness theory revealing the contribution of awareness to the control dimension. Awareness refers to students' ability to recognize the reasons for which they experience negative feelings and also the knowledge and the effective use of strategies in order to cope with failures in the school environment (Lambie, 2007).

In summary, findings from the two studies presented in this paper provide preliminary evidence for the initial factorial validity of the "Dimensions of Academic Hardiness Questionnaire" for late elementary school children. The newly developed scale demonstrates psychometrically sound measure of academic hardiness that is applicable to an academic setting and is suitable to be used in further research. Clearly, future studies should expand and replicate these findings. However, given that validation is an ongoing process where evidence needs to be collected from a number of sources and samples to strengthen and support the validity of scale scores (Messick, 1995), more studies should be conducted to examine additional validity aspects of the scale.

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