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Revisiting the Academic Hardiness Scale: Revision and Revalidation

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Abstract

We used two studies to evaluate, modify, and provide initial validation for a revised Academic Hardiness Scale. First, 16 experts rated scale items for content validity, and identified two problematic questions. Second, confirmatory factor analyses with 300 Grade 10 students (46% boys, age range 14-17 years) identified a 17-item version to be the best fit. Construct validity was demonstrated by testing correlations between this revised scale and academic achievement (spelling, reading, and maths) and student self-evaluations (competencies, self-efficacy, and self-worth). Predictive validity was supported by showing that the scale differentiated between students who enrolled in academic and non-academic streams, and differentiated between students who completed their course and those who did not. We failed to identify a second-order factor for hardiness, suggesting (a) that hardiness should be interpreted at the subscale, rather than at the global level, and (b) that the hardiness construct might need to be reconsidered.

Keywords: academic hardiness, academic achievement, self-evaluations, spelling, reading, maths, general ability, reading self-efficacy, self perceptions of competence

Academic hardiness refers to the resilience of students to academic failure: hardy students display a willingness to engage in challenging academic work, commit to academic activities and pursuits, and perceive they have control over their academic performance and outcomes (Benishek & Lopez, 2001; Maddi, Harvey, Khoshaba, Fazel, & Resurreccion, 2009). The study of hardiness in academic settings is particularly relevant as the academic environment can be demanding and competitive for students. Practitioners and policy-makers have a vested interest in motivating and encouraging students to achieve to their potential, as students reaching their potential have implications for later occupational success and satisfaction (Maddi & Khoshaba, 2005). Benishek and Lopez (2001) devised a brief 18-item Academic Hardiness Scale to assess hardiness in students; however, the development of this scale was not straightforward. One of the subscales was very short and generated a low internal reliability coefficient, and the scale has not been evaluated independently of the authors. We report on two studies where we (a) tested the content validity of the items of the Academic Hardiness Scale, (b) suggested minor revisions, and (c) tested the structural, construct, and predictive validity of the revised items.

General Psychological Hardiness

The psychological hardiness construct was proposed by Kobasa (1979a, 1979b) to account for the human capacity to manage and survive during periods of change and stress. Hardiness is viewed as a personality style that influences the way people think, feel, and behave in the world: high levels of hardiness promote personal growth, resilience, and well-being; whereas low levels result in self-handicapping and distress. Hardiness is comprised of three, integrated cognitive appraisal processes: commitment, challenge, and control. *Commitment* refers to the individual's tendency to be involved, to have a sense of purpose, and to find meaning in one's activities and

environment. *Challenge* is the perception that change, rather than stability, is an expected part of life, and is a necessary ingredient for personal development. *Control* is the perception that the individual can manage important life events through the use of imagination, knowledge, skills, and choice. Hardiness ultimately leads to the development of broad coping responses and actions, which enables the individual to act purposefully, rather than being passive or feeling powerless in the face of stressful and changing situations (Bartone, Roland, Picano, & Williams, 2008).

Hardiness has been shown to be positively associated with satisfaction in retirees (Sharpley & Yardley, 1999), immigrants (Kuo & Tsai, 1986), athletes (Sheard & Golby, 2006), and HIV patients (Perry, Fishman, Jacobsberg, & Frances, 1992), and has been associated with better performance in military trainees (Bartone et al., 2008), and tertiary students (Ruthig, Hladkyj, Perry, & Hall, 2004). While the majority of studies has examined the correlates of hardiness in employed adults, more recent work has tested the associations in other settings, including the important academic setting, where hardiness is referred to as academic hardiness (Benishek & Lopez, 2001).

Academic Hardiness

Much of the research on academic hardiness has focused on its relationship with academic achievement in high school (e.g., Benishek & Lopez, 2001; Karimi & Venkatesan, 2009) and post-secondary school students (e.g., Lifton, Seay, McCarly, Olive-Taylor, Seeger, & Bigbee, 2006; Sheard & Golby, 2007). Studies typically find small, positive associations when total academic hardiness scores are used (e.g., Lifton, Seay, & Bushko, 2000), although the findings are less consistent when dimensional scores are used. For example, some studies have found significant relationships for commitment, but not for challenge or control (e.g., Sheard & Golby,

2007; Sheard, 2009), while others have found the main associations to be with challenge (e.g., Maddi & Khoshaba, 2005).

Academic hardiness has been investigated also as a correlate of students' self-evaluations. Cole, Field, and Harris (2004), for example, found overall hardiness scores to be positively associated with university student learning motivation, and Maddi et al. (2009) found higher levels of hardiness to be associated with academic self-efficacy and positive attitudes to university. Similar results have been found for high school students. For example, Benishek and Lopez (2001) found positive associations between academic hardiness and perceptions of academic self worth, interest in maths, maths anxiety, and maths efficacy in secondary school students. Typically, stronger associations have been found between hardiness and self-evaluations than between hardiness and actual academic performance.

Hardiness also has been found to predict persistence, longevity, and educational choice in student samples. Bartone et al. (2008) found that US Army Special Forces trainees with high hardiness scores were more likely to graduate from their course. Lifton et al. (2006) reported that university students who graduated in minimum time had above-average academic hardiness scores, whereas students who dropped out recorded the lowest hardiness scores. Eccles, Vida, and Barber (2004) have shown that high school students high on resilience, a construct similar to hardiness, which they defined as persistence in the face of academic difficulty, were more likely to choose more demanding courses in high school. These results support the predictive validity of hardiness, finding that hardiness is associated with "real world" outcomes.

Academic hardiness has been found to be positively associated with age, suggesting that it might emerge developmentally, possibly following transitions during the life course (Sheard, 2009; Tisdall, 2001). Also, some studies have found

academic hardiness to be associated with gender (Benishek & Lopez, 2001), but not all (e.g., Maddi, Harvey, Khoshaba, Lu, Persico, & Brow, 2006). Benishek and Lopez (2001) found high school girls to have higher commitment scores than boys. This is consistent with studies investigating psychological hardiness more generally, which have shown that men and women use the appraisal processes of commitment, challenge, and control in different ways (Vogt et al., 2008). Nevertheless, the literature is divided on the findings in relation to gender and hardiness.

Measuring Hardiness

Some researchers represent hardiness as a one-dimensional construct and operationalise it as a total hardiness score (e.g., Cole et al., 2004; Vogt et al., 2008). Others represent it as a multidimensional trait with separate measures for commitment, challenge, and control (e.g., Funk & Houston, 1987; Rhonewalt & Zone, 1989). The conceptual representation of hardiness as a single dimension has been criticized, as information is lost concerning the effect of the different components on any outcome variable (e.g., Carver, 1989; Sinclair & Tetrick, 2000). In an early review of the hardiness construct, Hull, van Treuren, and Virnelli (1987) reported that there were different associations between the three dimensions and the outcome variables examined, and that there was little evidence to support the single dimension conceptualization. This evidence suggests that the practice of summing the sub-domain scores to form a composite hardiness score is problematic, and should not be pursued, although some researchers persist with it (e.g., Cole et al., 2004).

The different measurement approaches used to assess academic hardiness might have contributed to the inconsistent results found when studies tested the associations between academic hardiness, academic achievement, and academic self-evaluations. There have been two general approaches to assessing academic hardiness: (a) tests

that measure hardiness as a global construct, such as the Personal Views Survey (Maddi, 1997; Maddi et al., 2009), and (b) tests that measure the three specific domains of challenge, commitment, and control (Benishek & Lopez, 2001; Benishek et al., 2005), although some studies using this approach only report an overall hardiness score (e.g., Karimi & Venkatesan, 2009).

The main tool available to assess the three domains of academic hardiness is the 18-item Academic Hardiness Scale developed by Benishek and Lopez (2001). Some researchers have adapted general measures of hardiness for student populations that were originally devised for adult populations (e.g., Cole et al., 2004), but these were not developed specifically for young people, and have not been able to reliably produce measures of academic commitment, challenge, and control. Benishek, Feldman, Wolf-Shipon, Mecham, and Lopez (2005) proposed a 4-factor version of academic hardiness, and attempted to develop a scale to assess the four dimensions. However, their study only found three factors, with the main factor containing a mixture of commitment and control variables. Additionally, this scale contains 40-items, and, thus, is not suitable for situations where a brief measure is required.

Benishek and Lopez's (2001) 18-item Academic Hardiness Scale was based on Kobasa's (1979a, 1979b) conceptualization of hardiness, and designed to assess overall academic hardiness and the individual components of commitment, challenge, and control. Commencing with an initial pool of 40 items, and using a sample of 481 US high school students (mean age = 16 years), the authors used item analysis (e.g., item-total correlations), exploratory factor analysis (principle axis), and confirmatory factor analysis to identify unsuitable items for removal.

The Academic Hardiness Scale can be criticised on a number of grounds. First, Benishek and Lopez (2001) identified two potential factor structures in their

exploratory factor analysis: two factors based on 18 items, and three factors based on 24 items (all items had factor loadings $> .40$). However, when they tested these solutions in a confirmatory factor analysis, they only used the 18 items from the 2-factor solution, despite eventually settling on three factors from these 18 items. Second, the control factor has only three items, which raises doubts about its stability (Hair, Black, Babin, & Anderson, 2010). Third, the internal reliability coefficient for the control subscale is unsatisfactory, at .64. Fourth, in the confirmatory factor analysis, one item cross-loaded on two factors, and one item was retained despite it not having a statistically significant factor loading.

Current Study

We sought to have a panel of experts rate the individual items of the Academic Hardiness Scale for content validity, and revise the scale based on this feedback, if required. We then sought to validate the 3-factor structure by testing it on a large sample of high school students using confirmatory factor analysis. Finally, we assessed the construct and predictive validity of the scale by testing the associations with academic achievement (reading, maths, spelling; convergent validity), general ability (divergent validity), self-evaluations (self-efficacy, self-perceptions of competencies, self-worth; convergent validity), and school progress (choice of academic stream, completion of academic program; predictive validity). In doing so, our aims were to validate the Academic Hardiness Scale as a reliable and valid scale that could be used to assess Kobasa's (1979a, 1979b) conceptualization of hardiness, and to contribute to the body of knowledge about academic hardiness, which might assist developing a better understanding of the variables that influence student academic and life outcomes, such as occupational success and fulfilment.

Study 1: Method

Participants

Expert raters were academic psychologists ($N = 6$) and psychology doctoral students ($N = 10$). There were equal numbers of men and women. As the content domains of hardiness have been well-defined (i.e., commitment, challenge, and control), we employed a wide range of experts, including those with backgrounds in development, educational, and clinical psychology, and psychometrics. No participant had particular expertise with the Academic Hardiness Scale.

Materials

Academic hardiness. The 18-item Academic Hardiness Scale (Benishek & Lopez, 2001) assesses the three components of academic hardiness - commitment, challenge, and control - which were proposed in Kobasa's (1979a, 1979b) theory of psychological hardiness. Commitment is measured by 10 items (e.g., "I work hard for my grades"), challenge by five items (e.g., "I enjoy the challenge of a difficult class"), and control by three items (e.g., "I become less motivated to study when I don't get the grades I want right away"). Students respond to items using a 4-point Likert-like scale, with end-points of 1 = *completely false* and 4 = *completely true*.

We made minor adjustments to some of the original items to suit an Australian sample (e.g., we replaced "course" with "subject", which is the term used by Australian students). We also replaced one of the challenge items, "I avoid enrolling in difficult courses", which had a factor loading of .75 in the original exploratory factor analysis reported by the authors. This was on the advice from the school, as Australian high school students have limited choice of subjects at Grade 10. We replaced this item with another challenge item, "I think difficult classes are the best way to improve knowledge", which was taken from the same exploratory factor analysis, and had a factor loading of .41.

Benishek and Lopez (2001) reported internal reliability coefficients of .85 (commitment), .78 (challenge), .64 (control), and .84 (composite score). They assessed validity using factor analysis, and by testing associations between the subscales and a proposed nomological net. They found weak associations among the subscales, weak associations between the subscales and social desirability, and moderate associations with academic self-concept and high school GPA. Also, the challenge subscale was able to differentiate between college-bound and non-college-bound students, and between those who continued with maths and those who did not.

We also included one additional hardiness control item, “If I get behind in my school work, I panic and feel ill”. This item was created by Benishek and Lopez (2001) as a control item, and loaded on their hardiness control factor, with a loading of .33. The item was included to bolster the 3-item control scale, as three items are considered too few to provide a robust representation of a construct (Hair et al., 2010).

Expert rating questionnaire. We developed the questionnaire to be used by the group of experts to rate the academic hardiness items. This contained 19 items: the 18 Academic Hardiness Scale items plus the additional control item. In the preamble to the 19 items, the three constructs of academic commitment, challenge, and control were defined, and instructions were provided to the experts to (a) identify which construct each item measured, (b) rate how well each item measured that construct (using a 10-item rating scale with end-points of 1 = *does not measure the construct at all* and 10 = *completely measures the construct*), and (c) rate the purity of each item in measuring its nominated construct (using a 10-point rating scale with end-points of 1 = *not at all independent* and 10 = *completely independent* of the other constructs).

Procedure

The study assessed the content validity of the Academic Hardiness Scale items. Expert raters were asked to read the 19 items, indicate the construct assessed, rate how well an item assessed the construct, and rate how independent the item was from the other two constructs. This methodology is commonly used to assess content validity (Gregory, 2010). The experts completed the exercise in their own time and returned the completed questionnaires to the researchers.

Study 1: Results and Discussion

The results of the expert ratings on the 19 items are reported in Table 1. When asked to indicate the domain assessed by each item, the consensus was that most items were satisfactory measures: 7 of the 10 commitment items were rated by $\geq 88\%$ as assessing the commitment domain; 4 of the 5 challenge items were rated by $\geq 81\%$ as assessing the challenge domain; and 4 of the 4 control items were rated by $\geq 88\%$ as assessing the control domain. Three commitment items had low ratings, of 69% (“Regardless of the class, I do my best”), 56% (“Dedicated student”), and 13% (“Work only as hard as I need to pass”), with the latter item considered problematic. Additionally, one challenge item was problematic (“Enrol in classes in which I can do well”), with ratings for commitment (50%) or control (50%), but not challenge.

The experts also rated how well the items assessed their respective domains. All items scored above the scale mean (of 5.0) for representativeness: mean ratings were 7.3 for commitment (range 5.5 to 8.9), 7.9 for challenge (range 6.7 to 9.1 for the 4 items rated for challenge), and 8.3 for control (range 7.9 to 8.8). As well, the experts rated how independent the items were of the other domains. All ratings were at or above the scale mean (5.0), with a mean of 6.2 for commitment (range 5.8 to 6.9), 6.5 for challenge (5.0 to 8.1; 4 items), and 7.4 for control (range 6.5 to 7.9).

We included the item, “I think difficult classes are the best way to improve knowledge”, as a replacement for one of the original challenge items. This item was rated by 100% of reviewers as assessing challenge, and was seen as a strong (rating = 8.9) and independent measure (7.6). We also included an additional control item, “If I get behind I panic and feel ill”. This item was rated by 100% as assessing control, and was seen as strong (rating = 8.4) and independent (7.9). The control item, “If I do poorly, I doubt my ability as a student”, was originally devised by Benishek and Lopez (2001) as a measure of commitment, but loaded on the control factor in both their exploratory and confirmatory factor analyses. In our study, all expert raters (100%) classified it as a measure of control, with high ratings for strength (7.9) and independence (7.2). All evidence suggests that this item assesses control.

Based on the content validity analyses, we retained the replacement challenge item (Table 1, Item 15: “I think difficult classes are the best way to improve knowledge”) and the additional control item (Table 1, Item 19: “If I get behind I panic and feel ill”), and flagged two items that were considered problematic, one commitment (Table 1, Item 7: “Work only as hard as I need to pass”), and one challenge item (Table 1, Item 14: “Enrol in classes in which I can do well”), for possible deletion in Study 2.

Study 2 - Method

Participants

There were 300 Grade 10 students from one State high school in Queensland, Australia. The school was located in a large regional area and drew students with low to middle socio-economic backgrounds. There were no significant ethnic groupings, reflecting the cultural composition of the regional area. There were 420 Grade 10 students in the school; thus, our sample represented 71.4% of those available. There were 153 boys and 147 girls aged between 14 and 17 years ($M = 15$, $SD = .42$).

Materials

The survey contained demographic questions and scales assessing academic hardiness, self-perception, self-worth, and reading-efficacy. Additionally, spelling, reading, maths, and general ability were assessed. At a later date, the school provided program choice details on the students at the beginning of the following year (Grade 11), and provided retention details at the end of their final year (end of Grade 12).

Academic hardiness. Academic hardiness was measured using the 19 items devised by Benishek and Lopez (2001) and slightly modified as reported in Study 1. See Table 1.

Adolescent self-perceptions. The 45-item Self-Perception Profile for Adolescents (Harter, 1988) measures self-perceptions of competence across eight domains (social, athletic, physical appearance, scholastic, conduct, employment, close friendships, and romantic appeal; 40 questions), and provides an assessment of global self-worth (5 questions). Students are asked to select between two statements (e.g., “Some students feel they are just as bright, or brighter, than most people”, BUT “Some students wonder if they are as bright”; self-perceived competence), and, after deciding what kind of person they perceive themselves to be, to indicate how true this was of them (*Really true for me* or *Sort of true for me*). We used the total score of the self-perception items, which gave a potential range of 40-160, and the total score of the global self worth subscale: potential range = 4-20. Higher scores reflect more perceived competence and self worth, respectively. The scale has been widely used, and shown to have sound psychometric properties (Muris, Meesters, & Fijen, 2003). Internal reliability for the self-perception items was .81, and .67 for global self worth.

Reading Self-efficacy. The 11-item Reading Self-Efficacy Questionnaire (Wheeler, 2006) assesses students’ confidence that they have the literacy skills

required for high school. Students are asked to respond to questions such as, “I can read most literature if I put in the necessary effort”, on a 4-point Likert-like scale with endpoints of *Not at all true* and *Exactly true*. Scores on the 11 items were summed, with higher scores representing greater confidence. Wheeler (2006) reported an internal reliability of .83, and provided initial assessment of validity by examining associations with actual reading achievement. Alpha for the current sample was .81.

Spelling, Reading, and Maths. The Wide Range Achievement Test (WRAT-3; Wilkinson, 1993) is a widely used measure of academic achievement across the literacy and numeracy domains. The test has three scales, assessing single word reading skills, spelling skills, and maths skills. The reading test measures word recognition. It contains 42 words, out of context, and of increasing difficulty. Students read the word list, and continue until they make 10 consecutive errors. Raw scores can range from 4-57. The spelling test requires students to spell a list of 40 words, which are read aloud to them. Raw scores can range from 1-52. The maths test includes a variety of mathematics problems, which involve counting, reading number symbols, solving oral problems, and doing written computations. There is a 20 minute time limit. Raw scores can range from 1-52. As all students were approximately the same age and in the same year level at school, we based all analyses on the raw score totals. Wilkinson (1993) reports median internal reliability coefficients across the three tests of .85 to .95, and cites age differences, for example, in support of validity.

General ability. Raven’s (1939) Standard Progressive Matrices is a widely used test of non-verbal reasoning ability, which largely taps fluid intelligence (Carroll, 1993). The 60-item test uses an analogous problem solving approach. Each item is a complex diagram, which has one part missing. The task is to choose one of the provided options to complete the diagram. We used the 20-minute timed procedure,

and conducted all analyses using total raw scores. The test has a potential range of 0-60, with higher scores representing higher ability. There is voluminous data on the Standard Progressive Matrices attesting to its reliability and validity, including its use with high school students (e.g., Pind, Gunnarsdottir, & Johamnesson, 2003).

School status. The school provided education outcome information on the students twice. First, it supplied the status of students at the beginning of Grade 11: students were either enrolled in the academic stream ($N = 158$), enrolled in the non-academic stream ($N = 87$), or did not return to school ($N = 55$). Those in the academic stream take courses that prepare them for tertiary studies; those in the non-academic stream take courses that have a vocational orientation (e.g., lead to apprenticeship training or enrolment in a technical college). We conducted analyses using the two groups who returned to school, as it was not possible to know what happened to those who did not return (e.g., they might have entered the labour market, or continued their education at another school). Second, the school provided information on the status of the 158 academic students at the end of their final (Grade 12) year: those who completed the academic stream ($N = 128$), and those who dropped out ($N = 30$).

Procedure

Following approval from the university human research ethics committee, parents provided written consent for their child to participate, and the children themselves consented to take part. Students attended two group testing sessions of approximately 40 minutes each, and one individual session, of about 15 minutes. Two researchers were present during each group administration, and one of the researchers administered the individual reading test in a room away from the home classroom.

Study 2 - Results

Factor Structure of the Academic Hardiness Scale

We used confirmatory factor analysis (CFA) to test four plausible models for the Academic Hardiness Scale: (a) the original, 18-item, 3-factor model proposed by Benishek and Lopez (2001), (b) a modification of this 18-item model based on the 17 items identified in Study 1, (c) a 3-factor model with loadings on an over-arching, 2nd-order factor, and (d) a single-factor model (18- and 17-item versions). These were conducted using maximum likelihood estimation available in AMOS 19. A CFA tests the adequacy of a hypothesized structure to fit the obtained data. Model fit was assessed using the χ^2 statistic, Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA; Byrne, 2010). The χ^2 and CFI indices compare the specified model to one with complete independence: a non-significant χ^2 and CFI values greater than .9 to .95 reflect a good model fit. The RMSEA estimates error due to the approximate fit of the model: values below .05 to .08 reflect a good fit. As the χ^2 statistic is sensitive to sample size (the more participants, the higher the χ^2 value) and should be used with caution, we also considered a χ^2 value two to three times greater than the degrees of freedom as acceptable (Hair et al., 2010).

For (a) the original, 18-item, 3-factor model, the 10 commitment items were allowed to load freely onto one latent factor, the five challenge items were allowed to load freely on a second factor, and the three control items were allowed to load freely on a third factor. The correlations among the three latent variables were also freely estimated. The fit statistics for this analysis were less than satisfactory, $\chi^2(127) = 248.97$, $p < .001$, $\chi^2/df = 1.96$, GFI = .92, CFI = .89, RMSEA = .06 (PCLOSE = .14). Challenge Item 14 (“Enrol in classes in which I can do well”) did not load significantly on the challenge latent variable ($-.09$, $p = .18$), and there were three significant cross-loadings identified. The commitment Item 7 (“Work only as hard as I need to pass”) and the challenge Item 13 (“Don’t see the purpose of taking a class if I

am not confident I will do well”) cross-loaded onto the control latent variable, and the control Item 17 (“Difficult to bounce back from academic disappointment”) cross-loaded onto the commitment latent variable.

For (b) the 3-factor model based on the 17 items identified in Study 1, there were nine commitment items, four challenge items, and four control items. The fit statistics were, $\chi^2(108) = 176.52$, $p < .001$, $\chi^2/df = 1.63$, GFI = .94, CFI = .94, RMSEA = .04 (PCLOSE = .69), indicating a satisfactory fit for this model. All items loaded significantly on their respective latent variables (range = .34 to .73), although one significant cross-loading remained: the control Item 16 (“If I do poorly, I doubt my ability as a student”) also loaded significantly, but weakly (.22), on commitment. The correlations among the three latent variables were .63 ($p < .001$; commitment and challenge), -.16 ($p = .05$; commitment and control) and .10 ($p = .27$; challenge and control). The internal reliability for the subscales were .79 (commitment), .68 (challenge), and .72 (control). As the reliability for challenge was below what is desired, we tested the corrected item-total correlations, all of which were above .33, suggesting no problematic items. Also, as some researchers use the total scale (Benishek & Lopez, 2001), we calculated the internal reliability coefficient for the full scale (17 items). This was .77; however, three of the four control items had corrected item-correlations $< .3$ (range = .08 to .25), indicating that control is a weak contributor when the scale is used in this manner (mean corrected item-total correlation for commitment = .42, for challenge = .42, and for control = .20).

Potentially, only the 3-factor, 17-item version could be assessed for fitting a 2nd-order model; however, as not all of the correlations among the three latent factors were significant, the three latent variables did not meet the assumption for a hierarchical CFA, and a 2nd-order model was not be assessed.

Finally, we tested (d) two single-factor models based on the 18- and 17-item versions above. The fit statistics for these were, $\chi^2(130) = 316.24$, $p < .001$, $\chi^2/\text{df} = 2.43$, GFI = .89, CFI = .83, RMSEA = .07 (PCLOSE = .00), for the 18-item version, and, $\chi^2(115) = 372.89$, $p < .001$, $\chi^2/\text{df} = 3.24$, GFI = .87, CFI = .78, RMSEA = .09 (PCLOSE = .00), for the 17 items; neither of which was satisfactory.

Of the models tested (original, 18-item, 3-factor model; 17-item model identified in Study 1; 17-item model with 2nd-order factor; 18- and 17-item single-factor models), only the 17-item model identified in Study 1 produced a satisfactory fit. Thus, this model was accepted as the best representation of the 3-factor academic hardiness construct.

Construct Validity of the 17-Item Academic Hardiness Scale

We assessed construct validity by testing correlations with the other study variables. Construct validity refers to the degree of fit a construct has within its nomological net (Cronbach & Meehl, 1955). First, based on previous findings that all three components of academic hardiness were positively associated with student GPA (Benishek & Lopez, 2001), we tested the relationship between academic hardiness and measures of academic achievement (spelling, reading, and maths).

Second, we tested the association between academic hardiness and participant self-evaluations (competencies, self-worth, and self-efficacy). Previous studies found that attitudes to learning (Benishek & Lopez, 2001), learning motivation (Cole et al., 2004), self-efficacy, and satisfaction with education (Maddi et al., 2009) were positively associated with total hardiness scores, and Benishek and Lopez (2001) found positive associations between all three hardiness sub-scales and academic self-worth and efficacy. This literature suggests a consistent, though modest, relationship

between academic hardiness (and its sub-components) and self-evaluations; one stronger than the relationship between hardiness and actual achievement.

Third, we tested the association between academic hardiness and ability (the Standard Progressive Matrices test). Few studies have directly assessed this relationship, and where this has occurred, no relationship was identified. Schwinger, Steinmayr, and Spinath (2009), for example, found positive associations between perceptions of control and self-management strategies, but found no relationship with general ability. This is consistent with hardiness theory, which defines hardiness as a protective personality disposition (Gentry & Kobasa, 1984).

Fourth, we tested the relationship between hardiness and gender. Some studies have found an association (e.g., high school girls have higher levels of commitment than boys; Benishek & Lopez, 2001; Sheard, 2009); however, most studies have failed to find gender differences (e.g., Benishek et al.; Cole et al., 2004; Maddi et al., 2006). Finally, while age differences have been identified (Sheard, 2009; Tisdall, 2001), we expected no relationship as the age range of participants in our study was very narrow.

We found significant, positive associations between academic hardiness and academic achievement and self-evaluations, and found no association with general ability (See Table 2). For academic achievement, there were significant, positive, though weak, correlations between the total score and spelling, reading, and maths. There were no associations for control. Commitment was associated with maths only, and challenge was associated with spelling and maths.

There were stronger correlations with the self-evaluation variables. The total hardiness score was moderately, positively, associated with reading self-efficacy, perceptions of competence, and global self worth. The associations between the subscales and the self-evaluation variables were in the expected directions, although

control was not significantly associated with reading self-efficacy, and commitment and challenge were not significantly associated with global self worth. These results, which parallel earlier research with the hardiness construct, provide support for convergent validity. Neither the total score, nor any of the subscales, were significantly associated with general ability. Gender was uncorrelated with hardiness, except that there was a weak, significant association for the control subscale, and there were no associations with age, which supports the divergent validity of the scale.

The results for the convergent and divergent analyses suggest that the subscales are differentially related to the other variables in the hardiness nomological net. For example, commitment and challenge, but not control, were significantly associated with academic achievement; whereas, control, but not commitment and challenge, was significantly associated with global self worth. Variability was also found for the associations between the subscales and the total score. Both sets of results suggest that a finer-grained understand of associations between hardiness and other variables will be obtained when the subscales scores are examined.

We also used multiple regression analyses to assess the multivariate associations between hardiness and the validity measures where multiple bivariate correlations were identified: with maths, reading self-efficacy, and self-perceptions of competency. In all regression analyses, the validity measures were included, in turn, as outcome measures, and the hardiness subscales that were bivariately associated with the outcome measure were included as predictors. See Table 3. When the multivariate effects were considered, challenge, but not commitment, was associated with maths, challenge and control, but not commitment, were associated with perceived competencies, and both commitment and challenge remained correlated

with reading self-efficacy. These results reinforce the value of considering the subscales in concert, rather than using the total score alone.

Because of the study design, we were able to run a second series of regression analyses that mirrored the first set, but which controlled for general ability. See Table 4. The important conclusion from these was that academic hardiness remained significantly associated with all outcome variables (maths, reading self-efficacy, and perceived competencies) after the effect of general ability was controlled.

Predictive Validity of the 17-Item Academic Hardiness Scale

First, we assessed if, at the start of Grade 11, the 158 academic students differed from the 87 non-academic students on academic hardiness, which was assessed during Grade 10. As the decision to enroll in the academic or non-academic stream might be influenced by ability level, we controlled for general ability in these analyses. The academic group reported significantly higher total academic hardiness scores than the non-academic group, $F(1, 242) = 17.01, p < .001$ ($M = 48.57$ and 45.31 , respectively). The academic group also reported higher commitment, $F(1, 242) = 10.29, p = .002$ ($M = 27.39$ and 25.79), and challenge, $F(1, 242) = 14.68, p < .001$ ($M = 10.57$ and 9.42), but not control. No significant effect was found for general ability in these analyses.

Second, we assessed if the 128 academic students who completed Grade 12 differed on hardiness from the 30 academic students who dropped out of the program. Again, we controlled for general ability. The completing group reported significantly higher total scores than the drop-out group, $F(1, 155) = 6.01, p = .015$ ($M = 49.11$ and 46.32 , respectively), and reported higher levels of commitment, $F(1, 155) = 8.42, p = .004$ ($M = 27.93$ and 25.92). There was a significant effect for general ability for commitment, $F(1, 155) = 8.61, p = .004$, but not for total hardiness.

Discussion

In Study 1, there was consensus among the sixteen expert raters that most of the nineteen items considered were satisfactory measures, and were specific to their respective academic hardiness domains. Two items were considered problematic: one commitment and one challenge item. The replacement challenge item that we included was rated highly and retained, as was the additional control item, which was included to bolster the 3-item control subscale. This was the first formal test of the content validity of the items of the Academic Hardiness Scale, which confirmed, with two exceptions, that the items do tap the three domains of commitment, challenge, and control, and should give confidence to test users that the items are measuring Kobasa's (1979a, 1979b) theorised construct of hardiness.

In Study 2, the original 18-item Academic Hardiness Scale (Benishek & Lopez, 2001) did not factor as expected when tested using confirmatory procedures. The two items identified as problematic in Study 1 also proved problematic in the confirmatory factor analysis. Consistent with our findings, Benishek and Lopez (2001) found that the same commitment item cross-loaded (.30) on the challenge subscale. Collectively, these results suggest that the commitment item ("Work only as hard as I need to pass") should not be used to assess commitment. Also, we found several cross-loadings on the control subscale, which, together with the control subscale having only three items, is likely to account for the low internal reliability found. The results of the content analysis in Study 1 and the confirmatory factor analysis in Study 2 lead us to recommend that the original 18-item version of the scale not be used in situations where it is planned to decompose the hardiness construct into its three constituent parts of commitment, challenge, and control.

Study 2 found support for a revised 17-item Academic Hardiness Scale based on nine commitment, four challenge, and four control items. This version does not

include the two problematic items identified in Study 1 (“Work only as hard as I need to pass”, and “Enrol in classes in which I can do well”), but includes the additional control item (“If I get behind I panic and feel ill”). Confirmatory factor analysis demonstrated three clear factors based on these items, with only one significant, but weak, cross-loading item. All internal reliability coefficients were acceptable, although the challenge subscale was marginally below .70, and needs to be tested to determine how it performs on other samples.

Importantly, while the revised 17-item Academic Hardiness Scale was shown to be a satisfactory measure of the three sub-domains of commitment, challenge, and control, it did not work well when considered as a global measure. First, the internal reliability for the whole scale (.77) was less than for one of its constituent parts (.79, commitment). Second, when the subscale inter-correlations were assessed, the correlations between commitment and control, and between challenge and control, were not significant; and third, because of this, we were not able to demonstrate that the three subscales loaded onto a 2nd-order hardiness factor. When considered as a global measure, the control items were poor contributors to the construct.

These results imply that measuring academic hardiness based on a summation of the commitment, challenge, and control items might not reflect the construct of hardiness that was articulated by Kobasa (1979a, 1979b), and that the three subscales should be interpreted individually, not as a total score. These results might also have implications for how academic hardiness is conceptualised; that is, should it be viewed as being represented by these three sub-domains, or should there be fewer, or more, domains considered. Benishek et al. (2005), for example, proposed that academic hardiness might comprise four dimensions (they separated control into control of affect and control of effort). Adolescence is a period of significant

developmental change, including the development of self-reflection and abstract thinking (Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002), and it might be that the sub-domains that describe adult hardiness might not adequately represent hardiness in younger people (e.g., control).

When we assessed the construct validity of the revised 17-item Academic Hardiness Scale, we found significant, albeit weak, bivariate correlations between the total score and spelling, reading, and maths achievement, and found similar strength correlations between commitment and maths, and between challenge and spelling and maths. We found no bivariate associations with control. When commitment and challenge were tested together in the regression analysis, only challenge explained unique variance. These results are consistent with previous studies examining the association between hardiness and academic achievement, which found weak (Benishek & Lopez, 2001; Cole et al., 2004; Maddi & Khoshaba, 2005) or no associations (Sheard & Golby, 2007; Sheard, 2009; Sinclair & Tetrick, 2000), and support the construct validity of the 17-item scale, as this operated similarly to the 18-item original scale and to other global scales. When all studies are considered together, overall academic hardiness appears not to have a strong association with academic achievement. Additionally, the effects were different for the total and subscale scores, and different among the subscale scores, reaffirming that the use of the total score is not recommended as underlying associations might be masked.

We found no bivariate associations between academic hardiness and general ability, and when included in the multiple regression analyses, general ability did not mediate the effects of hardiness on achievement or self-evaluations. These results are consistent with previous studies (Schwinger et al., 2009), consistent with how hardiness is defined (Gentry & Kobasa, 1984), and support the divergent validity of

the 17-item academic hardiness measure. Also, supporting divergent validity, we found no consistent relationship with gender (there was a weak association with control), which replicates previous studies using the other hardiness scales (e.g., Benishek et al., 2005; Cole et al., 2004; Maddi et al., 2006).

Using the 17-item scale, we found larger correlations between academic hardiness and self-evaluations than we did between hardiness and achievement. The hardiness total scores were significantly, positively associated with reading efficacy, perceptions of competence, and global self-worth, and there were significant, positive associations between the subscales and efficacy (commitment and challenge), competence (commitment, challenge, and control were bivariately associated) and global self-worth (control only). These results are consistent with previous studies, which have tested the associations with attitudes to learning (Benishek & Lopez, 2001), learning motivation (Cole et al., 2004), self-efficacy, education satisfaction (Maddi et al., 2009), and academic self worth and efficacy (Benishek & Lopez (2001), where the relationships, by-and-large, are stronger than with actual achievement. The results support the value of the 17-item hardiness scale, but again point to the risk of interpreting the total, rather than the subscale, scores: efficacy was associated with commitment and challenge, competencies and self-worth were associated with control only (based on the regression analysis for competencies).

Finally, when we tested predictive validity, we found that hardiness scores collected during Grade 10 were able to differentiate, first, between students who selected the academic stream at the start of Grade 11 from those who chose the non-academic stream (the academic group had higher total, commitment, and challenge scores), and second, differentiate between academic completers and non-completers at the end of Grade 12 (completers had higher total and commitment scores). In both

cases, there were significant differences for hardiness, even after general ability was controlled. These results are consistent with Benishek and Lopez (2001) and Betz and Serling (1993) in relation to high school students, and Perry (2003), Ruthig et al. (2004), and Sheard and Golby (2007) in relation to university students, and suggest higher levels of hardiness are associated with choosing a more demanding educational pathway and with tenacity in school completion. Both results support predictive validity of the hardiness scale, and highlight again the differences in outcomes for the total score, vis-à-vis the subscale scores (e.g., there was no effect for control).

In sum, there were significant, weak correlations between total academic hardiness scores and spelling, reading, and maths achievement, significant, weak to moderate correlations with literacy self-efficacy, perceptions of competencies, and self-worth, and no significant correlations with general ability or gender. Additionally, there were significant differences on total scores between those who chose the academic stream and those who did not, and total score differences between those who completed their academic course and those who did not. The picture is messier when the hardiness subscales are considered, with no consistent correlations between the hardiness subscales and academic achievement, and different associations for the subscales and self-evaluations, academic choice, and persistence.

One explanation for the inconsistent findings among the subscales is that commitment and challenge were much more highly correlated with one another (.49) than they were with control (-.02 and .13, respectively), meaning that commitment and challenge tend to operate in a similar fashion, but that control performs differently from the other two (e.g., commitment and challenge had more consistent associations with other study variables than did control). These differences, identified in our study using the 17-item Academic Hardiness Scale, but also found in other studies that have

examined subscale scores, have implications for hardiness theory. Some authors, for example, Maddi (2002), suggest that individuals high in hardiness need to score in the high range on all three sub-domains, which, given these associations, might be difficult, and apply to only a very small proportion of the population. Multi-dimensional constructs, like hardiness, need to be sufficiently correlated to be grouped together to form a higher order construct (Judge, Locke, & Durham, 1997), which was not possible in our study. Because of this uncertainty about the hardiness construct, our recommendation, which is consistent with other authors (e.g., Carver, 1989; Hull et al., 1987), is that unless each component is examined separately then it is not possible to accurately interpret the findings.

In conclusion, our study was conducted using a sample of predominantly Caucasian, English speaking, high school students enrolled in Years 10 and 12 in an urban Australian high school. Thus, the 17-item scale, and the conclusions of the study, needs to be tested on other student populations. However, if a hardiness scale is required for student populations, then we recommend the use of the revised 17-item Academic Hardiness Scale, which we have shown to be psychometrically robust, rather than the original 18-item version, which has content and factorial validity weaknesses. Finally, for hardiness scales that are composed of component parts (i.e., commitment, challenge, and control), we recommend that these be interpreted at the subscale rather than at the total score level. Understanding academic hardiness in this detail has the potential to assist students cope better with the stresses and strains of studying and surviving in academic institutions by informing interventions and influencing policy.

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Table 1

Expert Ratings of the 18-item Academic Hardiness Scale and the Additional Control Item; N = 16 Experts

Scale Item ^a	Domain	% Experts selecting domain	Item strength <i>M (SD)</i>	Item independence <i>M (SD)</i>
1. Take my work as a student seriously	Com	94	7.4 (2.1)	6.0 (2.5)
2. Dedicated student	Com	56 Com ^b	7.3 (2.6)	6.2 (2.1)
		44 Cont	6.6 (1.9)	4.1 (1.7)
3. Work hard for grades	Com	100	8.0 (1.2)	5.9 (2.0)
4. Involved in all my classes	Com	100	7.5 (1.3)	5.7 (1.7)
5. Regardless of the class, I do my best	Com	69 Com ^c	7.3 (1.4)	6.2 (1.6)
		31 Cont	7.2 (1.3)	6.2 (2.5)
6. Make personal sacrifices to get good grades	Com	94	8.9 (0.9)	7.1 (1.6)
7. Work only as hard as I need to pass	Com	13 Com ^d	5.5 (3.5)	6.0 (4.2)
		31 Chall	7.8 (1.3)	6.0 (2.9)
		56 Cont	7.9 (1.4)	5.8 (2.3)
8. Grades aren't important to me	Com	88	7.0 (2.4)	6.1 (2.4)
9. Doing well is as important to me as to my parents	Com	94	6.1 (2.9)	5.8 (2.2)
10. More involved, interested in outside activities	Com	94	8.0 (1.9)	6.9 (2.1)
11. Avoid classes that require extra work	Chall	88	7.0 (1.8)	5.1 (2.5)
12. Enjoy challenge of difficult class	Chall	94	9.1 (1.0)	8.1 (1.7)
13. Don't see the purpose of taking a class if I am not confident I will do well	Chall	81	6.7 (1.5)	5.0 (1.7)
14. Enrol in classes in which I can do well	Chall	50 Cont ^e	8.4 (0.7)	7.3 (1.4)
		50 Com	8.1 (1.7)	5.5 (1.9)
15. Difficult classes are the best way to improve one's knowledge	Chall	100	8.9 (1.2)	7.6 (2.0)
16. If I do poorly, I doubt my ability as a student	Cont	100	7.9 (1.7)	7.2 (1.9)
17. Difficult to bounce back from academic disappointment	Cont	100	8.8 (1.5)	7.9 (1.9)
18. Become less motivated to study when I don't get the grades I want right away	Cont	88	7.9 (1.4)	6.5 (1.8)
19. If I get behind I panic and feel ill ^f	Cont	100	8.4 (1.5)	7.9 (1.9)

^a original wording and order from Beneshek and Lopez (2001); ^b 56.3% of experts rated item as assessing commitment domain, and 43.7% rated as assessing control; ^c 69% rated as commitment, 31% as control; ^d 13% rated as commitment, 31% as challenge, and 56% as control; ^e 50% rated as control, 50% and commitment; ^f additional control item.

Table 2

Summary Data and Bivariate Correlations Among Hardiness Scales, Spelling Achievement, Reading Achievement, Reading Self-Efficacy, Global Self Worth, Age, and Gender; N = 300.

Variable	<i>M</i>	<i>SD</i>	2	3	4	5	6	7	8	9	10	11	12	13
1. Hardiness: Total	46.82	6.12	.84***	.74***	.43***	.13*	.12*	.15**	.08	.31***	.24***	.21***	-.07	.01
2. Hardiness: Commitment	26.49	4.11	-	.49***	-.02	.05	.09	.12*	.07	.27***	.14*	.11	-.08	.07
3. Hardiness: Challenge	10.02	2.18		-	.13*	.14*	.09	.17**	.10	.25***	.19**	.08	.03	.00
4. Hardiness: Control	10.31	2.44			-	.10	.07	.03	.00	.08	.19**	.26***	-.07	-.16*
5. Spelling	36.58	4.70				-	.47***	.34***	.11	.26***	.07	.02	-.02	.04
6. Reading	42.64	6.72					-	.39***	.15**	.34***	.14*	.14*	-.05	.03
7. Maths	35.01	4.07						-	.32***	.21***	.16**	.07	-.01	.04
8. Ability	41.96	6.36							-	.15*	.23***	.21***	-.05	.15*
9. Reading self-efficacy	34.02	4.71								-	.42***	.35***	-.04	-.04
10. Self-perceptions	109.00	12.28									-	.67***	-.08	-.02
11. Global self worth	13.83	2.87										-	-.10	-.13*
12. Age	15.16	0.42											-	-.03
13. Gender ^a	-	-												-

^a Spearman's correlations used for gender analyses. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 3

Regression Analyses Predicting Maths, Reading Self-efficacy, and Perceived Competencies; N = 300.

Variables	Maths			Reading Self-efficacy			Competencies		
	B	SE(B)	β	B	SE(B)	β	B	SE(B)	β
Hardiness: Commitment	.05	.07	.05	.22	.07	.20**	.26	.19	.09
Hardiness: Challenge	.26	.12	.14*	.34	.14	.16*	.72	.37	.13*
Hardiness: Control	-	-	-	-	-	-	.91	.29	.18**

For maths, $R^2 = .03$, $F(2, 297) = 4.58$, $p = .011$; for reading self-efficacy, $R^2 = .09$, $F(2, 297) = 15.18$, $p < .001$; for perceived competencies, $R^2 = .07$, $F(3, 294) = 7.59$, $p < .001$. * $p < .05$, ** $p < .01$.

Table 4

Hierarchical Regression Analyses Predicting Maths, Reading Self-efficacy, and Perceived Competencies, while Controlling for General Ability; N = 300.

Variables	Maths			Reading Self-efficacy			Competencies		
	B	SE(B)	β	B	SE(B)	β	B	SE(B)	β
Step 1									
General ability	.20	.04	.31***	.11	.04	.15**	.44	.11	.23***
Step 2									
General ability	.19	.04	.30***	.09	.04	.12*	.41	.11	.21***
Hardiness: Commitment	.05	.06	.05	.22	.07	.19**	.24	.19	.08
Hardiness: Challenge	.21	.12	.11	.31	.14	.14*	.61	.36	.11
Hardiness: Control	-	-	-	-	-	-	.91	.28	.18**

For maths, R^2 at Step 1 = .10, $F(1, 298) = 32.15$, $p < .001$, ΔR^2 at Step 2 = .02, $F(2, 296) = 3.35$, $p = .037$; for reading self-efficacy, R^2 at Step 1 = .02, $F(1, 298) = 6.68$, $p = .01$, ΔR^2 at Step 2 = .09, $F(2, 296) = 14.12$, $p < .001$; for perceived competencies, R^2 at Step 1 = .05, $F(1, 296) = 16.34$, $p < .001$, ΔR^2 at Step 2 = .06, $F(3, 293) = 7.01$, $p < .001$. * $p < .05$, ** $p < .01$, *** $p < .001$.