

# The association between achievement motivation and hardiness

Jian Zhou<sup>1\*</sup>, Rebecca Susan Dewey<sup>2</sup>

<sup>1</sup>Continuing Medical Education Center, Shanwei Second People's Hospital, Shanwei, Guangdong, 516600, China. <sup>2</sup>Sir Peter Mansfield Imaging Centre, School of Physics and Astronomy, University of Nottingham, Nottingham, UK.

**Correspondence:** Jian Zhou, Continuing Medical Education Center, Shanwei Second People's Hospital, Shanwei, Guangdong, 516600, China. [zhoujian.china@aliyun.com](mailto:zhoujian.china@aliyun.com)

## ABSTRACT

"Achievement motivation" and "hardiness" are not only important research topics in psychology but also topics of common interest to the public, because they have a profound impact on academic performance and professional achievement. In previous studies on achievement motivation and hardiness, the researchers have focused more on surveying these factors within various populations and the association between these and some other related personality traits. Few studies have focused on the association between achievement motivation and the hardiness themselves. In this study, 105 participants completed the Achievement Motivation and Undergraduate Hardiness Personality Scale (UHPS) questionnaires. This research finding, among the 84 aggressive participants, the distribution of scores for achievement motivation varied, 38 of them between 0 and 20. About stratification of undergraduate hardiness personality scale scores, there are 57 person's scores between 71-90 in the 105 participants. There was no correlation between demographic characteristics and achievement motivation scale (AMS) in the 105 participants; Further, no correlation was found between undergraduate hardiness personality scale scores and demographic variables. Data analysis confirmed a correlation between hardiness and the motivation for achievement.

**Keywords:** Achievement motivation, Hardiness, Relation, Questionnaire, College students

## Introduction

"Achievement motivation" and "hardiness" are not only important research topics in psychology but also topics of common interest to the public, because they have a profound impact on academic performance and professional achievement. Researchers' interest in achievement motivation began a hundred years ago when the German scholar Narziss Ach studied participants' achievement-related behaviors in the laboratory in 1910 and proposed the concept of "determining tendency". In 1938, Murray and colleagues tried to define the need for achievement and observed individual differences in motivation strength as measured using questionnaires [1]. Heinz also noted that "the method of measuring achievement motivation

developed by the research group of David C. McClelland represents a breakthrough" (p.2) in 1953. Since then, researchers have explored and studied the concept of achievement motivation, its theoretical structure, measurement methods, application effects, and many other aspects, and have made substantive progress [2-5].

There are a variety of different definitions of achievement motivation. Early researchers suggested that achievement motivation may be defined as one's capability to strive to increase or maintain as high a standard as possible in all activities. This effort seeks a maintained standard of excellence. No matter how different the standard of excellence is, it is evident that one represents success and the opposite represents failure [1]. Atkinson (1957) noted that achievement motivation is considered a psychological tendency to strive for success, and also a tendency to avoid failure; or, as Winterbottom said, achievement motivation is an ability to pursue satisfaction [6]. Hustinx, Kuyper, van der Werf and Dijkstra (2009) stated that McClelland (1954) reported there to be two types of achievement motivation [7, 8]. One type originates from early childhood and is manifest as spontaneous, operant, and often unconscious behaviors. The other type originates from conscious learning and is manifest in responses to specific, culturally

### Access this article online

Website: [www.japer.in](http://www.japer.in)

E-ISSN: 2249-3379

**How to cite this article:** Zhou J, Dewey RS. The association between achievement motivation and hardiness. *J Adv Pharm Educ Res.* 2024;14(2):50-7. <https://doi.org/10.51847/XsYAMPBZc>

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

defined, achievement-related situations. Nygård and Gjesme (1973) stated that achievement motivation can be viewed as a personality trait, the ability to predict pleasure or pain in the pursuit of achievement [4]. This means that one can distinguish between two aspects of achievement motivation based on the impact of expectations: the motivation to pursue success (coupled with the expectation of positive effects); and the motivation to avoid failure (coupled with the expectation of avoiding negative effects), both of which are relatively stable personality traits. Hangen and Elliot (2020) give a concise definition [9]: "Achievement motives are appetitive and aversive dispositions toward competence/incompetence." (p.21) Researchers' definitions of achievement motivation have been shown to vary along with their different perspectives and writing styles, but the basic understanding of the nature of achievement motivation is similar. In particular, Nygård and Gjesme's definition is both complete and clear and has since been widely cited [10-13].

As early as 1953, McClelland and colleagues began to measure achievement motivation using the classical projective measurement technique. Myers (1965) devised an achievement motivation scale [14]. In the 1970s, Nygård and Gjesme compiled the Achievement Motivation Scale (AMS) to measure the achievement motivation of research participants. Later, the AMS was revised and translated into Chinese by Ye and Hagtvet (1992) [15], which has since been widely used in China [16, 17]. Regarding the measurement method of achievement motivation, Jonas and Stefan (2006) set about to reduce the length of the AMS by reducing the number of items, and finally proposed a streamlined version with only 10 items [18]. In the field of applied research, it has been shown that achievement motivation measures can predict the subsequent education and achievement of a child. The measurement shows moderate stability over time; however, this stability decreases with the length of the measurement interval [7].

In a study of reemployment willingness in the elderly, it was found that achievement motivation plays a partial intermediary role in the relationship between self-efficacy and reemployment willingness and that it is possible to effectively increase the reemployment willingness of the elderly by improving achievement motivation [19]. The results of a correlation analysis were used to demonstrate that 21 of the 24 positive psychological qualities were positively correlated with achievement motivation, and showed a significant negative correlation with the motivation to avoid failure, indicating that the positive psychological qualities of college students were closely related to their achievement motivation [20]. Social support for college students has been shown to directly affect achievement motivation [13]. A significant correlation was found between emotional intelligence and achievement motivation for higher vocational students [21]. It was shown [22] that the self-concept of teenagers is related to their motivation for achievement. The relationship between self-concept and achievement motivation in teenagers was found to be positive, in which the more positive the self-concept, the higher the motivation for achievement. Conversely, the more negative the self-concept, the lower their motivation for

achievement.

The scientific community has been studying "hardiness" for more than forty years. In the 1970s, Kobasa (1979) reported that when faced with the same stressful environment, some people get sick, while others don't [23]. He found that those who did not easily get sick exhibited a hardy personality, and those who lacked a hardy personality were more likely to get sick in stressful situations. The term "hardiness" was proposed as a personality trait comprising three dimensions: commitment, control, and challenge. Aleksandrova (2004) defined hardiness as a measure of one's ability to withstand stress while maintaining an internal balance and without reducing the success of the activity [24]. Subsequent research has gone on to describe hardiness as a specific set of individual attributes and behavioral responses, allowing one to constructively address a difficult life situation [25]. Kobasa *et al.* (1982) also describes the dimensions of hardiness as follows [26]: commitment was described as the belief that someone can control or influence the events of their experience; control is an ability to feel deeply involved in or committed to the activities of their lives; and challenge is the anticipation of change being an exciting challenge to further development. Kobasa's findings have since been confirmed and supported [27-29].

Nineteen research tools have been used to make comprehensive measurements of hardiness [30]. Of those nineteen tools, twelve scales became the original hardiness scales, which later came to be known as the first generation of hardiness measures. The second generation of instruments included the Unabridged Hardiness Scale, the 36-item Revised Hardiness Scale, and the 20-item Abridged Hardiness Scale. The third generation of instruments included the Personal Views Survey and the Dispositional Resilience Scale. The fourth generation of instruments included the Cognitive Hardiness Scale, the Personal Views Survey III-R, the 15-item Dispositional Resilience Scale, and a six dimensions hardiness instrument developed by Sinclair *et al.* In addition, researchers have also developed several measurement instruments related to hardiness, including the Health-Related Hardiness Scale [31], the Revised Academic Hardiness Scale [32], the Hardiness-Resilience Gauge [33], the Resilience in Midlife Scale [34], the Military Hardiness Scale [35], and the Children's Hardiness Scale [36]. Among these instruments, the most commonly used is the Personal Views Survey III-R, which has been translated into multiple languages and used around the world. In 2008, Lu revised and translated the Personal Views Survey III-R to compile a Chinese version of the Undergraduate Hardiness Personality Scale [37].

Over the decades, much progress has been made in the application of the hardiness scales, with the scope of application consequently expanding. A report by Kevin states that hardiness was negatively associated with stressors and strains and positively associated with social support and satisfaction with social support, as well as performance at school and work. May, Sowa and Niles (1993) found that hardiness is positively associated with self-efficacy [38]. Studies have shown that hardiness is negatively associated with depression, anxiety, and hostility [39]. Hardiness was found to be positively associated with adaptive coping and

negatively associated with maladaptive coping [40]. Hardiness was found to noticeably affect learning motivation [41]. Hardiness was shown to be negatively associated with loneliness [42]. A close correlation was found between hardiness, self-esteem, and competition attitude [43].

In conclusion, despite the progress in developing these psychological theories, the measurement and applications of achievement motivation and hardiness and the relationship between the two have not received sufficient attention, and no relevant findings have been reported in these areas. Psychological research findings tell us that achievement motivation is an important part of human motivation. For the public, achievement motivation not only relates to an individual's career development, career performance, and life goals but also to the academic performance and future vocational development prospects of their children. At the same time, previous research on hardiness has shown that it is closely related to dealing with stress in work and life, reducing the risk of illness, and promoting academic and professional performance. Achievement motivation and hardiness do appear to have some intersection in terms of their functions, but the relationship between them is as yet unclear. This study aims to describe the distribution of achievement motivation and hardiness among Chinese college students using a questionnaire survey, and then explore the association between achievement motivation and hardiness, and ultimately, define this relationship.

## Materials and Methods

### *Participants*

The study participants were medical college graduates who sat the resident training entrance examination at a large hospital in China between February 1 and July 28, 2021.

### *Ethics*

Students were informed that their participation in the study was entirely voluntary and gave informed oral consent. Researchers assured the students that their information would remain confidential. The study protocol was granted ethical approval (reference: 20210203).

### *Setting and instrument*

A total of 128 people from 8 medical schools accepted our invitation and participated in the test after completing the informed consent process. The questionnaire comprised two sections. The first is relevant demographic information (gender, age, and level of education completed), family background (birth order, guardianship, paternal educational attainment, maternal educational attainment, paternal occupation, maternal occupation, family financial situation, and place of residence). The second section comprised the AMS and the Chinese version of the Undergraduate Hardiness Personality Scale (UHPS). The version of the AMS used, revised by Ye and Hagtvet, was adopted to measure the participants' achievement motivation. This was a

30-item questionnaire, with the items scored using a four-point Likert scale ranging from 1 (completely inconsistent) to 4 (completely consistent). The AMS comprises two dimensions: motivation to pursue success (termed "aggressive" in the AMS) and motivation to avoid failure (termed "escape" in the AMS). Example items of aggressive terms include "I like to persevere on problems I'm not sure I can solve", while example escape items include "I feel anxious when I encounter problems that I cannot understand immediately." In the present study, the reliability was found to be 0.838 ( $p < 0.01$ ), with validity 0.823 ( $p < 0.01$ ) (using SPSS version 19.0, IBM). The UHPS was a 27-item questionnaire, with the items scored using a four-point Likert scale ranging from 1 (completely inconsistent) to 4 (completely consistent). The UHPS (Lu) comprises four dimensions: tenacity, control, commitment, and challenge. Example items for each of these dimensions include "Breaking the rules will inspire me to learn" (tenacity), "The busy pace of life makes me feel full" (control), "I prefer to do important jobs" (commitment), and "In case of difficulties, I always try to find solutions" (challenge). In the present study, Cronbach's alpha coefficient representing the reliability of each scale, with a 95% confidence interval, was 0.679 for the AMS, and 0.843 for the UHPS.

### *Procedure*

Data were collected between February 1 and July 26, 2021. The research procedure was as follows: first, participants completed the demographic and family background questionnaires; second, participants completed the AMS and the UHPS; third, the research team collated the data, removed invalid responses, confirmed that the responses were complete and valid, and input the data into the computer before performing the data analysis.

### *Data analysis methods*

Data were analyzed using SPSS (Statistical Package for the Social Science) version 19.0 between August 2 and October 16, 2022. Descriptive statistics were used to characterize the distribution, variability, and range of the data, describe the total score and scores along the two dimensions of the AMS, show the stratified status of aggressive scores, record the total score and distribution of scores on the UHPS, as well as the scores and distributions of scores along the four dimensions of the UHPS. Associations between demographic variables and AMS and UHPS scores, associations between family background factors (FBF) and AMS and UHPS scores, and associations between AMS and UHPS scores were each assessed separately using bivariate correlation (Pearson) analyses. These associations were assessed using AMOS (Analysis of Moment Structures) (version 22.0, IBM). There were two observational variables in the AMS, namely "AggressiveScores" and "EscapeScores". These were converted into the composite variable: "Comp\_AMS". There were four observed variables in the UHPS, namely "Tenacity", "Challenge", "Commitment" and "Control", which were converted into two composite variables: "Comp\_Ten\_Cha" (tenacity and challenge) and "Comp\_Con\_Com" (commitment and control). Finally, the pathway analysis was performed using AMOS.

## Results and Discussion

### Demographic information

A total of 105 subjects participated in this study, of whom, 54 (51.4%) were men and 51 (48.6%) were women. The average

age was 23.9 years, and the median was 24 years. The highest level of education completed was as follows: 2 (1.9%) had master's degrees, 84 (80.0%) had undergraduate degrees and 19 (18.1%) had graduated from junior college.

*FBF*: The FBF of participants is shown in **Table 1**.

**Table 1. Participants' Family background factors (n=105)**

BIOR		GUAR			PAEA				MAEA				PAOC			MAOC			FAFS			PLLI							
OC	OS	MS	GP	GG	GS	UD	JC	HS	JH	PS	IL	UD	JC	HS	JH	PS	IL	WC	BC	FA	WC	BC	FA	PO	LI	MI	HI	CI	TR
8	30	67	84	14	7	2	4	34	47	18	0	0	4	13	31	55	2	12	28	65	4	32	69	20	70	13	2	27	78

Note:

BIOR = birth order

GUAR = guardianship

PAEA = paternal educational attainment

MAEA = maternal educational attainment

PAOC = paternal occupation

MAOC = maternal occupation

FAFS = family financial situation

PLLI = place of living

OC = only children OS = one sibling MS = multiple siblings

GP = growing up with their parents GG = growing up with their grandparents GS = growing up in a single-parent family

UD = undergraduate degrees JC = junior college HS = high school JH = junior high PS = primary school IL = illiterate

WC = white collar BC = blue collar FA = farmhand

PO = poor (an annual family income of less than USD12520)

LI = low income (an annual income of USD14085-USD23475)

MI = middle income (an annual income of USD25040-USD78250)

HI = high income (an annual income of more than USD79815)

CI = city TR = township or rural

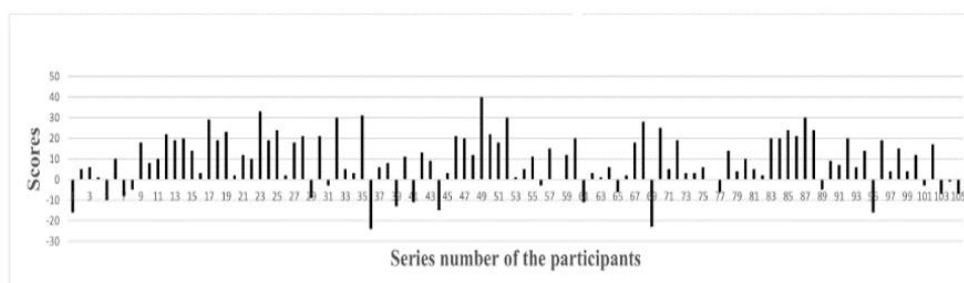
### AMS scores and distribution

The scoring method of the AMS is as follows: (1) the Aggressive dimension is the summed score of items 1 to 15, and (2) the Escape dimension is the summed score of items 16 to 30, and (3)

the total score is the sum of items (1) and (2). The higher the total score, the stronger the achievement motivation. Participants' AMS score frequencies are shown in **Table 2**. Participants' AMS scores and the distribution of these scores are shown in **Figure 1**.

**Table 2. The AMS and UHPS scores frequency (n=105)**

	AMStotalScores	AggressiveScores	EscapeScores	UHPScores	Tenacity	Control	Commitment
Mean	71.13	40.01	31.12	76.70	16.99	22.26	17.30
Median	71.00	40.00	31.00	78.00	18.00	22.00	18.00
Std.Deviation	10.89	8.20	8.59	15.63	3.64	4.76	3.68
Minimum	46.00	15.00	15.00	35.00	7.00	10.00	6.00
Maximum	107.00	55.00	57.00	106.00	24.00	32.00	24.00



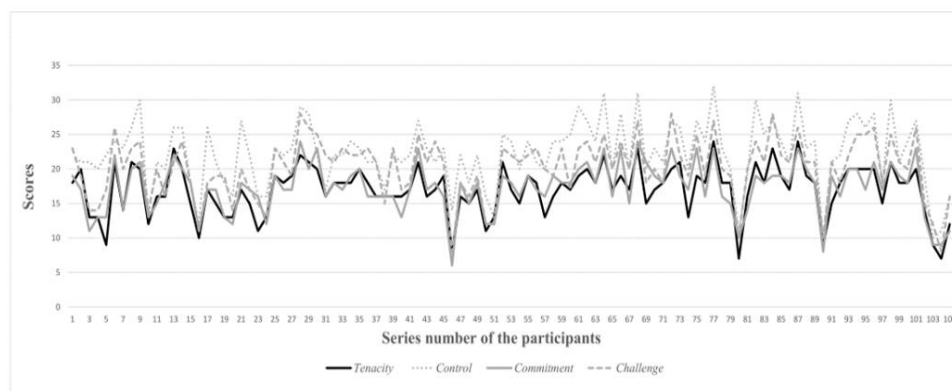
**Figure 1. The AMS scores and distribution**

As shown in **Figure 1**, 21 (20%) of the 105 participants were the Escape type, i.e., their achievement motivation was relatively weak, while 84 (80%) were the Aggressive type, i.e., they had a stronger motivation for achievement. Among the 84 Aggressive participants, the distribution of scores for achievement motivation varied, mostly falling between 0 and 20, with a few between 30 and 40.

### UHPS scores and distribution

the frequency of UHPS scores is shown in **Table 2**. The UHPS dimension scores and the distribution of these scores are shown in **Figure 2**. About stratification of UHPS scores, among the 105 participants, mostly (57 persons) falling between 71 and 90

scores.



**Figure 2.** The UHPS dimension scores and distribution

*Associations between demographic variables and AMS scores*

After Pearson correlation analysis, there is no correlation between the two.

*Associations between demographic and UHPS scores*

After Pearson correlation analysis, there is no correlation between the two.

*Associations between FBF and AMS scores*

After Pearson correlation analysis, there is no correlation between the two.

*Associations between FBF and UHPS scores*

After Pearson correlation analysis, there is no correlation between the two.

*Associations between AMS scores and UHPS scores*

The associations between AMS scores and UHPS scores are shown in **Table 3**.

**Table 3.** The associations between AMS scores and UHPS scores (Pearson)

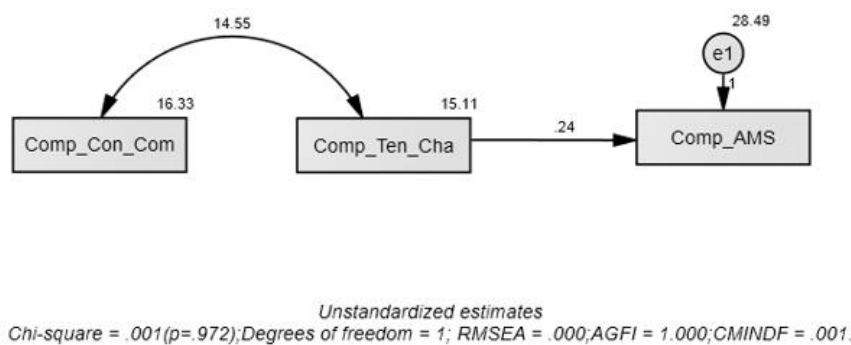
	1	2	3	4	5	6	7	8
1. AMS total scores	-							
2. Aggressive scores	.627**	-						
3. Escape scores	.669**	-.160	-					
4. UHPS scores	.170	.397**	-.164	-				
5. Tenacity	.177	.398**	-.156	.951**	-			
6. Control	.139	.380**	-.186	.947**	.872**	-		
7. Commitment	.175	.343**	-.105	.939**	.865**	.844**	-	
8. Challenge	.159	.381**	-.162	.951**	.878**	.850**	.866**	-

Note: \* p < .05.; \*\* p < .01.

*Pathway analysis of UHPS and ASM*

As shown in **Table 3**, there is a significant association (p<0.01) between UHPS and ASM. This association was also evident between each of the four observed variables of the UHPS, as converted into the two composite variables, and each of the two

observed variables of the AMS converted into one composite variable. A path analysis was conducted for the UHPS and AMS. The fit status of the model was: CMIN = 0.001, RMR = 0.012, GFI = 1.000, NFI = 1.000, AIC = 10.001, BCC = 10.401, NCP = 0.000, and CN>200. The results of the path analysis are shown in **Figure 3**.



**Figure 3.** The pathway analysis of UHPS and ASM

This study of 105 college students investigated the distribution of achievement motivation and hardiness across the sample, exploring the associations between achievement motivation and hardiness, and between these two measures and the FBFs captured, to determine the association between achievement motivation and hardiness.

To measure achievement motivation, we used the AMS questionnaire survey. The results show that the distribution of AMS scores among college students was generally consistent with previous studies [44]. Meanwhile, few previous studies report the score distribution of aggressive-type participants. We found (**Figure 2**) that in 80% of the aggressive participants, 38 (45%) scored from 0 to 10, while only three (4%) had a high aggressive score (31-40). Participant hardiness was measured using the UHPS, and the score distribution (**Figure 3**) was consistent with the results of past studies [45]. Interestingly, we analyzed the stratification of scores among the 105 participants, dividing the range of scores into four levels from the lowest score (30) to the highest score (110). We found that 57 (54%) people scored between 71 and 90 scores, while only 8 (8%) scored at the lowest level (31-50).

Regarding the correlation between AMS scores and demographic variables, in agreement with previous studies [46]. Further, no correlation was found between UHPS scores and demographic variables, which conflicts with the previous findings of Liu (2020), who found UHPS scores of college students to be associated with gender [47].

Associations between achievement motivation, hardiness, and their association with individual family background factors have been studied in personality psychology, and some research findings have been reported. When discussing the influence of parenting style on the achievement motivation of children, the parents of high-achievement-motivated children are more task-oriented, rather than giving more specific guidance to children who were more likely to refuse parental help [48]. Although Hubert's research investigated parenting styles, these are in turn associated with family background factors, such as parental education and occupation, and family economic status. On the associations between FBFs and AMS scores, we found no correlation, in agreement with the findings of Weiser and Riggio (2010) [49]. Concerning the associations between FBFs and UHPS scores, we found weak correlations only, with the tenacity and challenge dimensions found to be associated with paternal

occupation ( $p < 0.05$ ).

Previous studies on achievement motivation and hardiness have focused more on surveying achievement motivation and hardiness at the population level, as well as exploring associations between these two traits and other related personality traits. Few studies have focused on the relationship between achievement motivation and hardiness. The present study represents a novel assessment of the relationship between achievement motivation and hardiness. First, we performed a Pearson correlation analysis using the AMS and UHPS questionnaire data in 105 participants. **Table 3** shows not only the total UHPS score but also the tenacity, control, commitment, and challenge dimensions to be highly correlated with the aggressive dimension of the AMS ( $p < 0.01$ ). Although the association between each dimension of the UHPS is with the aggressive dimension of the AMS, this dimension is an important dimension for understanding achievement motivation levels. Therefore, the direct association between UHPS and AMS scores is supported by the data. Second, to further explore the relationship between AMS and UHPS scores, we conducted a pathway analysis, showing that the total effect size of the association between UHPS and AMS was 0.24 and the direct effect was 0.24 (**Figure 3**). Consequently, it can be concluded that there is a reliable association between hardiness and achievement motivation.

In conclusion, this study reports the detailed findings of a survey using the AMS and UHPS questionnaires in 105 participants. The results of the AMS survey showed that 84 people were aggressive-type participants, scoring between 0 and 40. Of these, 38 scored between 0 and 10 points, i.e., nearly half of the aggressive-type participants had a low aggressive score. Responses to the UHPS questionnaire ranged between 31 and 110, with 57 individuals scoring between 71 and 90. Neither AMS nor UHPS scores showed any association with demographic or family background factors. Of particular concern is the reliable correlation between achievement motivation and resilience. Therefore, it is suggested that future research should use the UHPS measure when investigating achievement motivation. Those interested in cultivating achievement motivation should also consider working to improve hardiness, to more effectively cultivate achievement motivation.

### *Limitations and future research*

As a questionnaire study, this study has a limited sample size and did not use a random sampling method, which may lead to bias in the study findings. Although this study provides a detailed analysis of the correlation between achievement motivation and hardiness, this is only a theoretical self-consistency. Follow-up empirical studies are needed to verify this conclusion.

## Conclusion

This study reports stratified statistics of achievement motivation and hardiness in a student population, showing associations between aggressive-type scores and UHPS scores, and providing valuable new reference data for future studies. This study confirms the relevance of achievement motivation to the trait of hardiness and suggests that future achievement motivation measurement and cultivation studies could consider addressing and assessing hardiness concurrently with achievement motivation.

**Acknowledgments:** As the first author of this paper, Jian Zhou thanked his grandson Dakun Xi for spending a happy time with him.

**Conflict of interest:** None

**Financial support:** None

**Ethics statement:** Students were informed that their participation in the study was entirely voluntary and gave informed oral consent. Researchers assured the students that their information would remain confidential. The study protocol was granted ethical approval (reference: 20210203).

## References

- Heinz H. The anatomy of achievement motivation. In Brendan A. Maher (Eds.), *Personality and psychopathology: A series of texts, monographs, and treatises*. Academic Press; 1967.
- David C, McClelland DC. *Human motivation*. Cambridge University Press; 1988. doi:10.1017/CBO9781139878289.001
- Wigfield A, Eccles JS. *Development of achievement motivation*. Academic Press; 2002.
- Nygård R, Gjesme T. Assessment of achievement motives: Comments and suggestions. *Scand J Educ Res*. 1973;17(1):39-46. doi:10.1080/0031383730170104
- Quirin M, Loktyushin A, Küstermann E, Kuhl J. The achievement motive in the brain: BOLD responses to pictures of challenging activities predicted by implicit versus explicit achievement motives. *Front Psychol*. 2022;13:845910. doi:10.3389/fpsyg.2022.845910
- Atkinson JW. Motivation determinants of risk-taking behavior. *Psychol Rev*. 1957;64(6):360-4.
- Hustinx PW, Kuypers H, van der Werf MP, Dijkstra P. Achievement motivation revisited: New longitudinal data to demonstrate its predictive power. *Educ Psychol*. 2009;29(5):561-82. doi:10.1080/10443410903132128
- McClelland DC, Atkinson JW, Clark RA, Lowell EL. *The achievement motive*. Appleton. 1953.
- Hangen EJ, Elliot AJ. Achievement motives. In: Zeigler-Hill, V., Shackelford, T.K. (eds). *Encyclopedia of Personality and Individual Differences*. Springer, Cham; 2020. doi:10.1007/978-3-319-24612-3-487
- Nasser FM. Structural model of the effects of cognitive and affective factors on the achievement of Arabic-speaking pre-service teachers in introductory statistics. *J Stat Educ*. 2004;12(1). doi:10.1080/10691898.2004.11910717
- Bjørnebekk G. Psychometric properties of the scores on the behavioral inhibition and activation scales in a sample of Norwegian children. *Educ Psychol Meas*. 2009;69(4):636-54. doi:10.1177/0013164408323239
- Yang J, Yan FF, Chen L, Xi J, Fan S, Zhang P, et al. General learning ability in perceptual learning. *Proc Natl Acad Sci*. 2020;117(32):19092-100. doi:10.1073/pnas.2002903117
- Liu HJ, Zheng YF, Yang XX. The relationship between social support and achievement motivation: The intermediary role of positive psychological qualities. *J Pingxiang Univ*. 2021;38(5):93-6.
- Myers AE. Risk taking and academic success and their relation to an objective measure of achievement motivation. *Educ Psychol Meas*. 1965;25(2):355-63. doi:10.1177/001316446502500206
- Ye RM, Hagtvet KA. Measurement and analysis of the achievement motivation. *Psychol Dev Educ*. 1992;8(2):14-6.
- Wang D, Guo D, Song C, Hao L, Qiao Z. General self-efficacy and employability among financially underprivileged Chinese college students: The mediating role of achievement motivation and career aspirations. *Front Psychol*. 2022;12:719771. doi:10.3389/fpsyg.2021.719771
- Zhao K, Chen N, Liu G, Lun Z, Wang X. School climate and left-behind children's achievement motivation: The mediating role of learning adaptability and the moderating role of teacher support. *Front Psychol*. 2023;14:1040214. doi:10.3389/fpsyg.2023.1040214
- Lang JW, Fries S. A revised 10-item version of the Achievement Motives Scale. *Eur J Psychol Assess*. 2006;22(3):216-24. doi:10.1027/1015-5759.22.3.216
- Liu S, Hong ZJ, Zhou W, Fang YF, Zhang L. Job-search self-efficacy and reemployment willingness among older adults: Roles of achievement motivation and age. *BMC Geriatr*. 2021;21:683. doi:10.1186/s12877-021-02645-5
- Liu HJ, Song X. Study on the relationship between college students' positive psychological quality and achievement motivation. *Sci Technol Inf*. 2021;20(16):195-8. doi:10.16661/j.cnki.1672-3791.2104-5042-7946

21. Li RT. An empirical study on emotional intelligence and achievement motivation of higher vocational students. *J Weifang Eng Voc Coll.* 2020;33(6):78-83. doi:10.3969/j.isn.1009-2080.2020.06.013
22. Fasti Rola, S.Psi. Relation between adolescent self-concept and achievement motivation. [Unpublished course paper]. Universitas Sumatera Utara; 2006.
23. Kobasa SC. Stressful life events, personality, and health: An inquiry into hardiness. *J Pers Soc Psychol.* 1979;37(1):1.
24. Aleksandrova LA. To the concept of resilience. In M.M. Gorbatova, A.V. Sery, M.S. Yanitsky (Eds.), *Siberian psychology today: A collection of scientific papers* (pp.147-154). Kuzbasvuzizdat; 2004.
25. Mitina, ID, Vasyakin BS, Pozharskaya EL, Berezhnaja MS, Khudyakova TL, Kovaleva NB. The development of psychological and pedagogical support for the student's social and professional self-determination system. *Mod J Lang Teach Methods.* 2017;7(12):275-85.
26. Kobasa SC, Maddi SR, Kahn S. Hardiness and health: A prospective study. *J Pers Soc Psychol.* 1982;42(1):168-77.
27. Lindsey E, Hills M. An analysis of the concept of hardiness. *Can J Nurs Res Arch.* 1992;24(1):39-50.
28. Maddi SR. The personality construct of hardiness: I. Effects on experiencing, coping, and strain. *Consult Psychol J: Pract Res.* 1999;51(2):83-94.
29. Eschleman KJ, Bowling NA, Alarcon GM. A meta-analytic examination of hardiness. *Int J Stress Manag.* 2010;17(4):277-307. doi:10.1037/a0020476
30. Oliver CM. Hardiness, well-being, and health: A meta-analytic summary of three decades of research. Portland State University; 2009.
31. Pollock SE, Duffy ME. The health-related hardiness scale: Development and psychometric analysis. *Nurs Res.* 1990;39(4):218-22.
32. Benishek LA, Feldman JM, Shipon RW, Mecham SD, Lopez FG. Development and evaluation of the revised academic hardiness scale. *J Career Assessment.* 2005;13(1):59-76. doi:10.1177/1069072704270274
33. Kamtsios S, Bartone P. Preliminary evaluation of the psychometric properties of the "Hardiness-Resilience Gauge" in an undergraduate sample. *Hell J of Psychol.* 2021;18(3):287-310. doi:10.26262/hjp.v18i3.8205
34. Ryan L, Caltabiano ML. Development of a new resilience scale: The resilience in midlife scale (RIM Scale). *Asian Soc Sci.* 2009;5(11):39-51.
35. Dolan CA, Adler AB. Military hardiness as a buffer of psychological health on return from deployment. *Mil Med.* 2006;171(2):93-8.
36. Soheili F, Hosseinian S, Abdollahi A. Development and initial validation of the children's hardiness scale. *Psychol Rep.* 2021;124(4):1932-49. doi:10.1177/0033294120945175
37. Lu G. The relationship between tough personality and stress and psychosomatic reaction. [Unpublished doctoral dissertation]. Tianjin Normal University; 2008.
38. May KM, Sowa CJ, Niles SG. Family environments as predictors of personality hardiness and self-efficacy. *Fam J.* 1993;1(2):131-5.
39. Maddi SR, Harvey RH, Khoshaba DM, Fazel M, Resurreccion N. The personality construct of hardiness, IV: Expressed in positive cognitions and emotions concerning oneself and developmentally relevant activities. *J Humanist Psychol.* 2009;49(3):292-305. doi:10.1177/0022167809331860
40. Williams PG, Wiebe DJ, Smith TW. Coping processes as mediators of the relationship between hardiness and health. *J Behav Med.* 1992;15(3):237-55.
41. Liu S, Yang Y. College students' tenacious personality, attribution mode, and learning motivation. *China J Health Psychol.* 2014;22(8):1228-30. doi:10.13342/j.cnki.cjhp.2014.08.043
42. Wang LS, Zhu RQ. The relationship among the hardiness, interpersonal trust and loneliness of undergraduates. *J Shaoguan Univ (Social Science).* 2017;38(10):100-3.
43. Wang YY, Cai TS, Yao Y, Zuo JS. A correlation research between hardiness and self-esteem, competition attitude. *Chin J Clin Psychol.* 2012;20(3):395-6. doi:10.16128/j.cnki.1005-3611.2012.03.005
44. Jia I, Qu JL, Niu J, Wu JL, Tian GX. Social support, achievement motivation and subjective happiness of college students. *China J Health Psychol.* 2018;26(9):1370-4. doi:10.13342/cnki.cjhp.2018.09.025
45. Zhang M, Zhang J. Study on college students' self-management ability under tough personality. *Hei Sci.* 2023;14(1):150-2.
46. Xie LN. Analysis of achievement motivation of college students. *J Tonghua Norm Univ.* 2010;31(6):85-7.
47. Liu MQ. Research on the relationship between college student tenacity and parenting style. *J Wuhan Coll Voc Technic.* 2020;19(3):81-5.
48. Hermans HJ, Ter Laak JJ, Maes PC. Achievement motivation and fear of failure in family and school. *Dev Psychol.* 1972;6(3):520-8.
49. Weiser DA, Riggio HR. Family background and academic achievement: Does self-efficacy mediate outcomes? *Soc Psychol Educ.* 2010;13:367-83. doi:10.1007/s11218-010-9115-1