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Development and validation of the medical students' self-reported selfishness questionnaire (MSSSQ): a context-specific design for assessing selfish tendencies in medical education

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Abstract

Background Selfishness, defined as the prioritization of one's own interests at the expense of others, can significantly influence the career choices and professional behavior of medical students. Understanding the levels of selfish tendency and preemptively detecting possible manifestations of selfish intents among medical students is essential for developing educational strategies that foster ethical and responsible conduct within the medical profession. This study aimed to develop and validate the Medical Students' Self-Reported Selfishness Questionnaire (MSSSQ), specifically designed to assess selfish tendencies amongst medical students.

Methods Two studies were conducted to develop and validate the MSSSQ. Study 1 involved developing the initial MSSSQ items pool. Study 2 focused on developing and validating the factor structure of the MSSSQ. Additionally, the reliability (including Cronbach's alpha coefficient and test–retest reliability), measurement invariance, as well as the convergent, discriminant, and criterion-related validity of the MSSSQ were evaluated.

Results Through exploratory and confirmatory factor analyses, a 6-item, single-factor structure for the MSSSQ was established. The MSSSQ demonstrated strong internal consistencies (*Cronbach's alpha* = 0.80), convergent validity ($r = -.23$ $-.61$), discriminant validity ($r = -.28$ $-.34$), criterion-related validity ($r = -.27$ $-.47$), and test-retest reliability($r = .65$). Measurement invariance was confirmed across gender, locality, only child status, and college year distribution.

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Conclusions The MSSSQ can be utilized to identify medical students at risk of developing unethical behaviors, inform educational interventions, and contribute to the broader understanding of how medical training influences selfish tendencies. Ultimately, the MSSSQ represents a promising tool for enhancing the quality of medical education and promoting the development of professional values and ethical sensibilities among medical students.

Clinical trial number Not applicable.

Keywords Selfish tendency, Medical students, Questionnaire design, Medical ethics, Medical education

Introduction

Selfishness, defined as wanting or striving to benefit the self without regard for the well-being of others [1], is a complex psychological construct that has significant implications for interpersonal relationships [2], social behavior [3], and professional ethics [4]. In the context of medical education, understanding the levels of selfish tendency and detecting possible manifestations of selfish intent among medical students is particularly important. Medical education is not merely about acquiring technical skills and knowledge; it also involves the cultivation of professional values and ethical sensibilities [5, 6]. Medical students are expected to develop a strong sense of altruism, empathy, and responsibility towards their future patients [7–9] as emphasized in the Hippocratic Oath. These qualities are essential for providing compassionate and effective healthcare [10]. However, the demanding nature of medical training, including intense academic pressure, long working hours, and exposure to emotionally challenging situations [11, 12], can potentially exacerbate underlying selfish tendencies and/or intents. Assisting medical students in recognizing and preemptively addressing potential manifestations of selfish tendencies early on may aid them better understand the distinction between self-interest and selfishness. Striking a balance between selfish tendencies and medical ethics is vital for ensuring a healthy and fulfilling medical career. Despite the importance of this topic, there is a dearth of validated instruments specifically designed to measure selfish tendencies among medical students. Existing measures of selfishness often lack the contextual specificity needed to capture the unique experiences and pressures faced by medical students [13, 14]. To address this gap, the present study aims to develop and validate the Medical Students' Self-Reported Selfishness Questionnaire (MSSSQ), which is specifically designed to assess selfish tendencies among medical students, thereby contributing to the improvement of medical ethics education.

Conceptual framework of selfishness and related constructs

The literature on selfishness presents a diverse array of perspectives and definitions regarding the concept of "selfishness". Prior research has predominantly approached selfishness either as a stable personality trait or as a situational state [1, 2, 14, 15]. Diebels and colleagues conceptualize selfishness as the sixth factor within personality structure, which encapsulates behaviors that prioritize self-interest over the interests of others [15]. Similarly, Raine and Uh' s Selfishness Questionnaire (SQ) operationalizes this personality construct as a consistent focus on self-welfare, irrespective of the well-being of others [14]. Recent research, however, views selfishness as a situational state driven by situational motives, defining it as "striving to benefit oneself without regard for others' welfare" or as "acting to benefit oneself, in violation of social norms, while disregarding the desires of others [1, 2].

A more in-depth exploration of the construct of selfishness as a personality construct reveals several related concepts, including the Dark Triad traits—psychopathy, narcissism, and Machiavellianism—as well as low agreeableness and self-interest [15, 16]. While these concepts are conceptually linked to selfishness, they remain distinct in their characteristics. Narcissism is characterized by egotistical grandiosity and taking advantage of other people for one's own ends [16]. Whereas, psychopathy traits involve extreme self-interest whilst sharing a disregard for the rights and well-being of others [17], akin to the behavior of selfish individuals. Similarly, Machiavellianism, as a personality construct, shares certain similarities with selfishness; however, it is characterized specifically by the manipulation of others for personal advantage [18], rather than an outright disregard for the well-being of others. Furthermore, low agreeableness, as a dimension of the Big Five personality traits, is prevalent among selfish individuals. The similarities in negative emotions experienced—such as tendencies toward anger, criticism, or irritability—between selfish individuals and those exhibiting low agreeableness suggest that these negative emotions underlie both personality constructs. However, they differ in that selfishness is primarily characterized by self-interest, while low agreeableness may not necessarily be linked to self-interest or self-welfare [15].

Previous studies have characterized selfishness as a situational state driven by specific motives, with researchers primarily focusing on the underlying factors that contribute to selfish behaviors, particularly self-interest. Self-interest is a fundamental human motivation that

drives individuals to pursue their own goals, well-being, and personal growth [19]. It involves a focus on one's own needs and desires, but importantly, it does not necessarily entail disregard for others. Self-interest can be categorized into two distinct forms: normative self-interest and selfishness [15]. Normative self-interest, in particular, involves pursuing personal objectives while considering the interests and well-being of others [15]. This form of self-interest is essential for personal development and achievement, as it motivates individuals to set and achieve goals, develop skills, and seek opportunities for advancement. It underscores the importance of minimizing unnecessary harm or disadvantage to others and adhering to fundamental social and moral principles. In contrast, selfishness goes beyond normative self-interest by prioritizing personal gain at the expense of others [1]. Selfish individuals pursue their own desires without regard for the well-being or rights of others, often leading to behaviors that disadvantage or exploit those around them [15]. This disregard for others can escalate to harmful behaviors, and in extreme cases, selfishness may align more closely with psychopathy, characterized by a complete disregard for the rights and well-being of others [17].

The distinction between self-interest and selfishness is crucial, particularly in fields like medical education, where professionals must balance personal aspirations with ethical responsibilities. While self-interest can drive personal excellence and achievement, selfishness can undermine professional ethics and patient care. Recognizing and addressing selfish tendencies early in medical training can help students develop a balanced approach to their careers, fostering altruism, empathy, and ethical decision-making.

Assessment of selfishness

Recent research has initiated the development of measures and methodologies to assess selfishness. For instance, Raine and Uh introduced the Selfishness Questionnaire (SQ) to evaluate selfish behaviors and attitudes, which comprises three dimensions: egocentric, pathological, and adaptive selfishness [14]. The results indicate that the SQ possesses good reliability and validity. However, despite these strengths, the extensive length of the SQ may limit its applicability in contexts that require rapid data collection. Another scale, the Healthy Selfishness and Pathological Altruism Scale (HSPAS) [13], measures individual differences in healthy selfishness (i.e., normative self-interest) and pathological altruism. The confirmatory factor analysis (CFA) of this scale demonstrated a satisfactory fit for the two-factor model ($\chi^2(167) = 850.38$, $RMSEA = 0.07$; $CFI = 0.82$; $SRMR = 0.05$) and exhibited good internal consistency. However, there is limited evidence regarding other psychometric properties such as test-retest reliability and measurement invariance (MI), which may affect the scale's generalizability. Furthermore, the Self-Interest subscale of the Self- and Other-Interest Inventory (SOII), developed by Gerbasi and Prentice [20] examines individual differences in the motivation to act in one's own best interests at the level of self-beliefs.

Addressing the gap in assessing selfish tendencies among medical students

While existing research has made significant strides in understanding and measuring selfishness, the literature concerning the assessment of selfishness—particularly regarding the levels of selfish tendencies and the detection of potential manifestations of selfish intent prior to the occurrence of selfish behaviors—remains insufficient. Furthermore, current assessment tools often lack the contextual specificity necessary to capture the unique experiences and pressures faced by medical students. As it stands, current assessments of selfishness tend to be overly broad and fail to adequately differentiate between selfish tendencies, selfish intents, and selfish behaviors. A crucial point currently understated in medical ethics education is the need to cultivate professional values and ethical sensibilities early on; in preparation for a healthy and fulfilling medical career. Therefore, the need to focus and develop assessment of selfish tendencies rather than selfish intents or selfish behaviors is particularly important.

Methodology

In this study, we utilized an exploratory mixed-method design to develop and validate the MSSSQ. This approach allowed us to integrate both quantitative and qualitative data, providing a comprehensive understanding of the phenomenon under investigation. The exploratory mixed-method design involved several steps [21]. First, we conducted a thorough literature review to identify existing theories and measures related to selfishness. This was followed by a qualitative phase, where we conducted semi-structured interviews with a subset of medical students to gain insights into their perceptions and experiences of selfish behaviors. The qualitative data were analyzed using thematic analysis to identify common themes and patterns.

Based on the findings from the qualitative phase, we developed an initial version of the MSSSQ. This questionnaire was then pilot-tested with a small group of medical students to assess its clarity and relevance. Feedback from the pilot test was used to refine the questionnaire. In the quantitative phase, the refined questionnaire was administered to a larger sample of medical students. By combining both qualitative and quantitative methods, this exploratory mixed-method design allowed us to

develop a robust and validated tool for measuring selfish tendencies amongst medical students.

The present study

For the present study, we operationally define selfishness as "wanting or striving to benefit the self without regard for the well-being of others." and define selfish tendency as "a persistent inclination to prioritize one's own interests and desires over those of others without regard for other's well-being as manifested in one's decision". Two studies were conducted to develop and validate the MSSSQ. Study 1 involved developing the initial MSSSQ items pool based on literature review, one-on-one interviews with the target sample, and assessment of existing scales for measuring selfishness. Study 2 focused on developing and validating the factor structure of the MSSSQ. Meanwhile, we also tested the reliability (including Cronbach's alpha coefficient and test–retest reliability), MI, as well as the convergent, discriminant, and criterion-related validity of the MSSSQ.

Study 1: item construction

The initial MSSSQ items pool was developed through one-on-one interviews regarding selfish behaviors in a medical context, a literature review on selfishness, and existing tools. Firstly, purposive sampling was used in the study. The participants were recruited from medical universities in Zhejiang, China. As in qualitative research, no absolute rules determine the estimated number of participants, sampling was continued until data were saturated and no new relevant knowledge emerging from interviews [22, 23]. The current study achieved saturation after conducting interviews with 22 participants. Additionally, a diverse range of personal characteristics was selected to ensure a comprehensive array of information, including age, gender, only-child status, family background and clinical internship or externship experience. Participants' ages ranged from 17 to 24 years ($M = 19.10$ years, $SD = 1.22$). Among them, 54.55% were female and 45.45% were male. Additionally, 40.90% of participants had no sibling, while 59.10% had sibling(s). In terms of family background, 36.36% of participants came from rural areas, whereas 63.64% were from urban areas. Furthermore, 45.45% had clinical internship or externship experience. Using the issue focus approach, we guided the dialogue by asking questions like "What do you think are the manifestations of selfish behaviors among medical students?" and recorded participant responses for further analysis. The data collected from these interviews informed the generation of items, such as the first item "Sometimes I would put down my classmates to secure better clinical rotations or academic honors", which was inspired by participant responses. Additionally, items were also generated through a literature review and examination of existing scales related to measuring selfishness. Specifically, four items from the Selfishness Questionnaire [14]. Two items from the Self- and Other-Interest Inventory [20]. Two items from the Healthy Selfishness and Pathological Altruism Scale [13]. In total, an initial pool of 16 items were created.

After initial development of item, experts in the field of personality psychology research were asked to assess the content validity. Four experts were consulted to rate the clarity and appropriateness of the items based on specific criteria outlined by DeVellis and Thorpe [24]: (a) How well it matches the target definition of selfishness tendencies? (b) How well formulated it is for participants to fill in? and (c) How well, overall, it is suited to the measure? Items were rated on a 4-point scale ranging from 1 (*not at all*) to 4 (*very well*). An average score was computed for each item and 8 items with an average score below 3 were excluded [25]. Furthermore, ten medical students assessed the readability of the items on a 5-point scale from 1 *(poor*) to 5 (*excellent*). Two items were revised for clarity, resulting in a total of 8 items retained for further analysis.

Study 2: questionnaire development and validation

The objectives of study 2 were as follows: (a) to examine the factor structure of the MSSSQ in medical students; (b) to validate the factor structure obtained from EFA in new independent samples, and assess MI of the factor model across participants' gender, locality, only child status, and college year distribution; (c) to evaluate the MSSSQ total scores for convergent, discriminant, and criterion-related validity by examining their correlation with various other variables; and (d) to evaluate the test-retest reliability of the MSSSQ. For convergent validity, it was anticipated that the new measure would demonstrate strong convergence with selfishness and its aspects, healthy selfishness, and materialism. According to previous studies [14, 17, 26], depression, anxiety, stress, and problematic gaming were used to assess discriminant validity of MSSSQ. The Diagnostic and Statistical Manual of Mental Disorders posits that anxiety and depression are disorders that do not contain elements of selfishness [17]. Moreover, previous assessments of selfish behaviors and attitudes [14] also employed anxiety and depression to evaluate the discriminative validity of the SQ ($rs = 0.11–0.33$). Likewise, previous studies observed that selfishness was related to digital game addiction ($r = .38$) but differ from selfishness [26]. Accordingly, depression, anxiety, stress, and problematic gaming were employed to assess the discriminant validity of the MSSSQ in study 2. According to previous research, selfishness is related to decreased compassion and subjective well-being [13, 27]. Therefore, compassion and subjective well-being was

included to assess criterion-related validity in the current study.

Method

Participants

A total of 10,055 college students (full sample) were enrolled from four medical universities or colleges in the province of Zhejiang, China. Due to the substantial sample size employed in this study, SPSS 27.0 was used to randomly divide the participants into two sample (sample 1 and sample 2).

Sample 1 consisted of 5,026 participants. Participants' ages ranged from 16 to 21 years ($M = 19.41$ years, $SD = 1.52$). Among the participants, 59.6% were female and 40.4% were male. Additionally, 40.8% participants had no sibling, while 59.2% participants had sibling(s). In terms of family background, 31.7% of participants came from rural areas, whereas 68.3% were from urban areas. The distribution of college years was as follows: 39.4% of respondents were freshmen, 35.0% were sophomores, and 25.6% were juniors. The sample 1 was used for item analysis and EFA.

Sample 2 consisted of 5,029 participants, with ages ranging from 16 to 21 years ($M = 19.43$ years, $SD = 1.64$). Among them, 60.5% were female, and 39.5% were male. 42.0% participants had no sibling, and 58.0% participants had sibling(s). Regarding family background, 31.6% participants were from rural areas, and 68.4% participants were from urban areas. College year distribution was as follow, 40.2% of respondents were freshmen, 33.8% of respondents were sophomore, and 26.0% of respondents were junior. Sample 2 was utilized for the CFA and MI.

Sample 3 consisted of 5,563 medical students. The participants' ages ranged from 16 to 21 years ($M = 18.29$ years, $SD = 0.69$). Among the participants, 58.2% were female, and 41.8% were male. 35.9% participants had no sibling, and 64.1% participants had sibling(s). Regarding family background, 25.2% participants were from rural areas, and 74.8% participants were from urban areas. Sample 3 was utilized to assess the convergent, discriminant, and criterion-related validity.

To evaluate test-retest reliability, a subset of participants from the full sample were asked to complete the MSSSQ again after 6 months. A total of 801 college students (sample 4) agreed to participate in the retest. The average age of the participants was 18.22 years (SD = 0.64), ranging from 16 to 21 years. Among the participants, 59.8% were female, and 40.2% were male. 37.8% participants had no sibling, and 62.2% participants had sibling(s). Regarding family background, 34.5% participants were from rural areas, and 65.5% participants were from urban areas.

Procedure

Data collection in this study was conducted electronically using the Wenjuanxing platform. The participants completed 8 items of the MSSSQ. It began with the instruction "*Please indicate the extent to which you agree or disagree with the following statements based on your current circumstances*". Each statement was rated on a five-point Likert scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree*, 5 = *strongly agree*). All questionnaires were administered to those who had given informed consent. Participation in this study was anonymous and voluntary. Participants were promised confidentiality. There was no compensation given for the participation. The procedure was approved of by the Ethics Committee for Scientific Research at the first author's affiliated institution (No: 2023-021) and in accordance with the declaration of Helsinki.

Measures

Selfish tendency The Medical Students' Self-Reported Selfishness Questionnaire (MSSSQ) was used to measure participants' selfish tendencies. The questionnaire consists of six items. Items were self-reported from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores indicate greater level of selfish tendencies. The internal consistency of the MSSSQ was 0.80. The complete Chinese and English version of the MSSSQ we attached in the Supplementary Material.

Convergent validity

Selfishness The Selfishness Questionnaire (SQ), developed by Raine and Uh, is a 24-item self-report tool designed to assess individuals' selfishness [14]. The SQ comprises three dimensions: egocentric selfishness (e.g., I don't give to charities), adaptive selfishness (e.g., I have no problem telling "white lies" if it will help me achieve my goals), and pathological selfishness (e.g., I have sometimes dumped friends that I don't need anymore). Participants are required to indicate their level of agreement with statements using a 3-point Likert-type scale ranging from 1 (*disagree*) to 3 (*agree*). Several studies have demonstrated the reliability of the SQ [13, 27, 28]. Internal consistency coefficients for the dimensions and overall scale were found to be 0.77, 0.71, 0.79, and 0.89, respectively.

Healthy selfishness The 10-item Healthy Selfishness subscales of Healthy Selfishness and Pathological Altruism Scale (HSPAS) was used to assess healthy selfishness [13]. Frequency of HSS is assessed on a 5-point scale from 1 (*never*) to 5 (*always*). Example item is "I have a lot of self-care". This measure has been reported as having adequate reliability and validity in previous study [13, 29]. The HSS demonstrated satisfactory internal consistency reliability in the present study ($\alpha = 0.92$).

Materialism The Material Values Scale (MVS) was used to assess participants' materialism [30, 31]. It consists of three dimensions: centrality (e.g., I like a lot of luxury in my life), happiness (e.g., I'd be happier if I could afford to buy more things), and success (e.g., "Some of the most important achievements in life includes acquiring material possessions"). The participants responded on a 5-point Likert scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). Higher self-reported scores reflect greater materialism levels. The Chinese version of the scale is suitable for college students [30]. In this study, the Cronbach's alpha for the scale was 0.80.

Discriminant validity

Problematic gaming Problematic gaming was evaluated by using the Problematizing Excessive Online Gaming Scale [32] which comprises five items (e.g., I sometimes lose sleep because of the time I spend playing online games.). The participants responded on a 5-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores indicate greater problematic gaming. The internal consistency reliability of the whole scale was 0.86 in the current study.

Depression, anxiety, and stress The Depression Anxiety Stress Scale-21 (DASS-21) was used to assess participants' depression, anxiety and stress [33]. The scale includes 21 items and three subscales: depression (e.g., I was unable to become enthusiastic about anything), anxiety (e.g., I felt scared without any good reason), stress (e.g., I tended to over-react to situation). Participants were required to indicate the presence of these symptom(s) over the past week on a 4-point Likert scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much*). The internal consistencies of three subscales in the present study were 0.88, 0.82, and 0.87, respectively.

Criterion-related validity

Subjective well-being Participants' subjective well-being was measured with the Subjective Happiness Scale (SHS) [34]. The scale comprises four items with seven-point answers (e.g., 1 = *not a very happy person* to 7 = *a very happy person*). Example item is "In general, I consider myself: not a very happy person/a very happy person". The mean of the items was calculated, with higher scores reflecting higher levels of subjective well-being. The SHS has been shown to be a valid and reliable measure of subjective well-being [35]. The reliability (α) in the current sample was 0.81.

Compassion The 4-item Compassion Subscale of Big Five Inventory-2 was used to measure compassion [36]. Items (e.g., I am compassionate and have a soft heart) were rated on a 5-point scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). The scale has been shown to be a valid and reliable measure of compassion [37]. he reliability (α) in the current sample was 0.73.

Statistical analyses

Descriptive statistics, Item analysis, and Pearson correlation analysis were calculated using SPSS 27.0. EFA, CFA, and MI were conducted in *Mplus* 8.3 using the Robust Maximum Likelihood Estimator (MLR).

Item analysis

The aim of item analysis was to quantitatively determine whether each item should be eliminated or retained. Critical ration (CR), Cronbach's alpha and the item-total correlation (corrected) were examined to determine the differentiation and consistency of items. To ensure that high-quality questionnaire items were retained, the established criteria for removing items were: (a) the value of CR not significant at $p < .05$; (b) item-total correlation (corrected) less than 0.45; (c) items that weakens overall Cronbach's alpha.

EFA

First, to determine whether the data were suitable for analysis, the Kaiser–Meyer–Olkin (KMO) index was used to assess sampling adequacy. Second, EFA with Geomin (oblique) rotation was conducted to reveal the factor structure of the initial MSSSQ. The number of factors to retain was determined by examining scree plots, eigenvalues, parallel analysis, and model fit indices. For item selection, factor loadings of 0.40 or higher were considered meaningful [38]. The chi-square statistic (χ^2), the Comparative Fit Index (CFI), Tucker-Lewis index (TLI), Root Mean Square Error of Approximation (RMSEA), and Root Mean Square Residual (SRMR) were used to evaluate model fit. A CFI ≥ 0.95 and TLI ≥ 0.90 and RMSEA and SRMR ≤ 0.08, indicate excellent model fit [39].

MI

A series of multi-group tests were used to examine the MI of the MSSSQ in sample 2. Comparisons were made between male and female, rural and urban areas, participants had no sibling and had sibling(s), as well as freshmen, sophomores and seniors. Three nested models were created for each comparison. The baseline model (M1) allowed all parameters to vary between groups. In subsequent models, constraints were imposed on the factor loadings (M2) and the intercepts (M3) across the groups. This process examined three levels of MI: configural invariance was evaluated by M1; metric invariance was tested by comparing M1 with M2; and scalar invariance was assessed by comparing M3 with M2. Since the Chi-square test is sensitive to sample size, small differences

can lead to significant results [40]. Therefore, differences in CFI and RMSEA indexes between models were used to evaluate MI. Specifically, a change of ≤ 0.010 in CFI, along with a change of ≤ 0.015 in RMSEA, indicated no significant difference between the unconstrained and constrained models [41].

Convergent, discriminant, and criterion-related validity

To assess convergent, discriminant and criterion-related validity, we calculated the Pearson correlation coefficients between MSSSQ and validation criteria. Specifically, convergent validity was assessed by examining the correlation between the MSSSQ and other measures of selfishness, healthy selfishness, and materialism. Discriminant validity was established by examining the degree to which MSSSQ was related to anxiety, depression, stress, and problematic gaming. Criterion-related validity was established by examining correlations between MSSSQ total scores and compassion and subjective well-being.

Results

Descriptive statistics and item analysis

The descriptive statistics of the MSSSQ items indicated that the skewness values ranged from 0.12 to 1.25, and kurtosis values ranged from − 1.04 to 0.94. The Cronbach's alpha value of 0.90 suggested excellent internal consistency for the MSSSQ. The item analysis revealed statistically significant CR values ranging from 54.63 to 104.30 ($p < .001$), with item-total correlations greater than 0.45 for all items. Finally, the eight items were selected for further statistical analysis.

EFA

The sample for the EFA had a KMO of 0.91, suggesting excellent sampling adequacy. The scree plots of the parallel analyses suggested that single-factor structure should be retained (see Supplemental Figures S1). The initial EFA found one factor with eigenvalues above 1. We examined the potential fit of the factor structures, but observed several fit indices were suboptimal ($\chi^2(20) = 2036.820$, $CFI = 0.893 < 0.95$, $TLI = 0.851 < 0.90$, $SRMR = 0.048 < 0.08$, $RMSEA = 0.142 > 0.10$, *90% CI [0.136, 0.147]).* Based on the above criteria, 2 items were excluded from subsequent factor analyses because their factor loadings were less than 0.40. Thereafter, we reran EFA on the remaining 6 items. Fit indices of the EFA showed that single-factor structure had excellent fit indices $\chi^2(9) = 378.928$, $CFI = 0.966 > 0.95$, $TLI = 0.944 > 0.90$, $SRMR = 0.029 < 0.08$, $RMSEA = 0.090 < 0.10$, *90% CI [0.083, 0.098]).* The final EFA identified a single factor with an eigenvalue of 3.64, explaining 60.68% of the total variance. The factor loadings ranged from 0.69 to 0.86, meeting the criteria for retaining all six items (see Table 1).

Table 1 Exploratory factor analysis of the Medical Students' Self-reported Selfishness Questionnaire (MSSSQ)

Items	Factor loading
1. When securing a scholarship or personal honor, I belittle my classmates to highlight my own strengths.	0.73
2. When making decisions, I prioritize my own needs without considering possible negative impacts on my classmates.	0.68
3. When the interests of my classmates conflict with my personal interests, I prioritize self-interest over group-interest.	0.84
4. When my classmates become potential competitors, I am reluctant to share resources or information I exclusively possess with others.	0.69
5. When classmates ask for my assistance, I often promise to help but rarely take action.	0.86
6. When I decide to help others, I consider whether I can acquire equal or greater benefits in return with little regards to the Hippocratic oath.	0.86
Eigenvalue	3.64
% Variance	60.68

CFA

The KMO index for the CFA was 0.91, indicating excellent sampling accuracy for conducting CFA in sample 2. The internal consistency of the MSSSQ was 0.87. Fit indices for the structure models of the MSSSQ showed that single-factor structure had excellent fit indices $\chi^2(9) = 402.123$, $CFI = 0.966 > 0.95$, $TLI = 0.943 > 0.90$, $SRMR = 0.030 < 0.08$, $RMSEA = 0.093 < 0.10$, *90% CI* [0.086, 0.101] (see Fig. 1) and supported the factor structure yielded from EFA.

Furthermore, a CFA was conducted again in sample 3 to confirm the new 6-item model structure identified in sample 2. The KMO index for the CFA was 0.84, indicating excellent sampling accuracy for conducting CFA in sample 3. The internal consistency of the MSSSQ was 0.80. Meanwhile, CFA indicated that the 6-item univariate model have an above average fit to the data: $\chi^2(9) = 393.165$, $CFI = 0.940 \approx 0.95$, $TLI = 0.900 > 0.90$, $SRMR = 0.033 < 0.08$, $RMSEA = 0.088 < 0.10$, *90% CI* [0.080, 0.095] (see Fig. 2).

MI

A series of multigroup tests provided evidence the MI of the MSSSQ between male and female, rural and urban areas, participants had no sibling and had sibling, as well as freshmen, sophomores and seniors. As shown in Table 2, there was no significant change in model fit ($\Delta CFI < 0.01$, $\Delta RMSEA < 0.015$) between the unconstrained and contained models across gender, locality, only child status, and college year distribution groups. These results suggested that selfish tendencies were measured equivalently among participants with different gender, locality, only child status, and college year distribution.

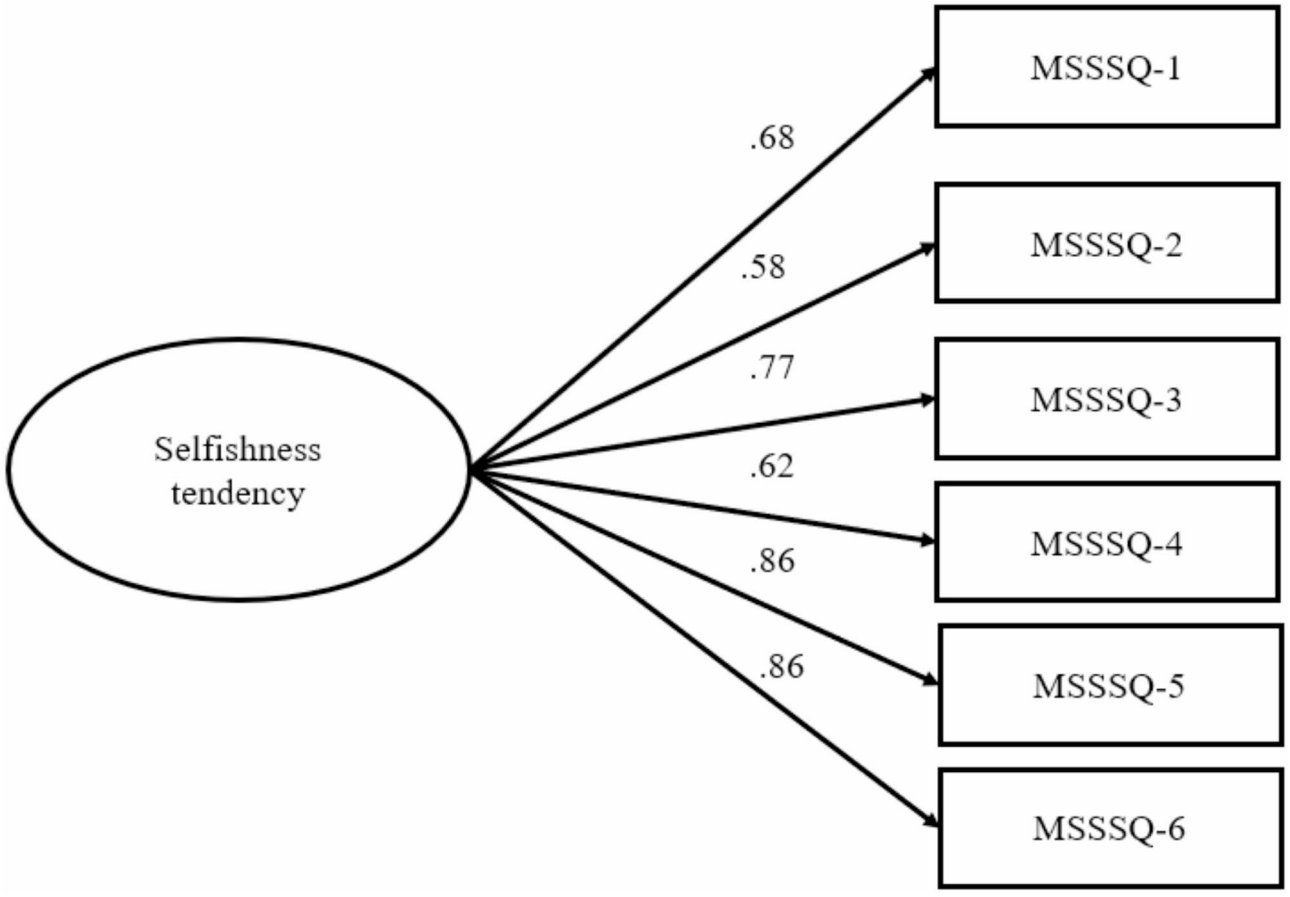

Fig. 1 Path diagram for the Medical Students' Self-reported Selfishness Questionnaire (MSSSQ) in sample 2

Convergent, discriminant, and criterion-related validity

The correlational analyses conducted in the present study revealed significant associations between the total score of the MSSSQ and all other scales (see Table 3). The MSSSQ total scores yielded significant positive correlations with selfishness and its aspects, materialism, problematic gaming, depression, anxiety, and stress (r =.28 to 0.61, p <.001). On the contrary, significant negative correlations were observed with subjective well-being, compassion, and healthy selfishness (r = –.47 to –0.23, p <.001).

Test-retest reliability

Pearson correlation coefficients between the MSSSQ total scores at time 1 and the MSSSQ total scores at time 2 were calculated to examine the test-retest reliability. The results indicated a positive and statistically significant correlation between the MSSSQ total scores at time 1 and the MSSSQ total scores at time 2 (r =.65, p <.001), indicating that the MSSSQ has acceptable test-retest stability.

Our study included medical students from different years, specifically from freshmen to fifth year. For freshmen through junior students (who have not yet had clinical internship or externship experience), the primary focus is on academic learning, and most interactions occur among classmates. Therefore, for these students, we used the term "classmates" in the questionnaire. In contrast, for senior and fifth-year students (who have completed clinical internships or externships), we used the term "patients" in the questionnaire. Given that combining two distinct groups in a single item could be misleading and calls into question the validity of the entire instrument. To address this, we conducted separate analyses for two groups: freshmen through juniors and seniors and fifth-year students, based on the respective versions of the questionnaire. Given that both versions of the questionnaire (one for classmates and the other for patients) yielded robust results for their respective groups, we present the findings from the classmates' version in the manuscript. The results from the patient version are included in the supplementary materials.

Discussion

This study aimed to develop and validate the MSSSQ, specifically designed to assess selfish tendencies amongst medical students. The result shows that the MSSSQ has good internal reliability, test–retest reliability, convergent

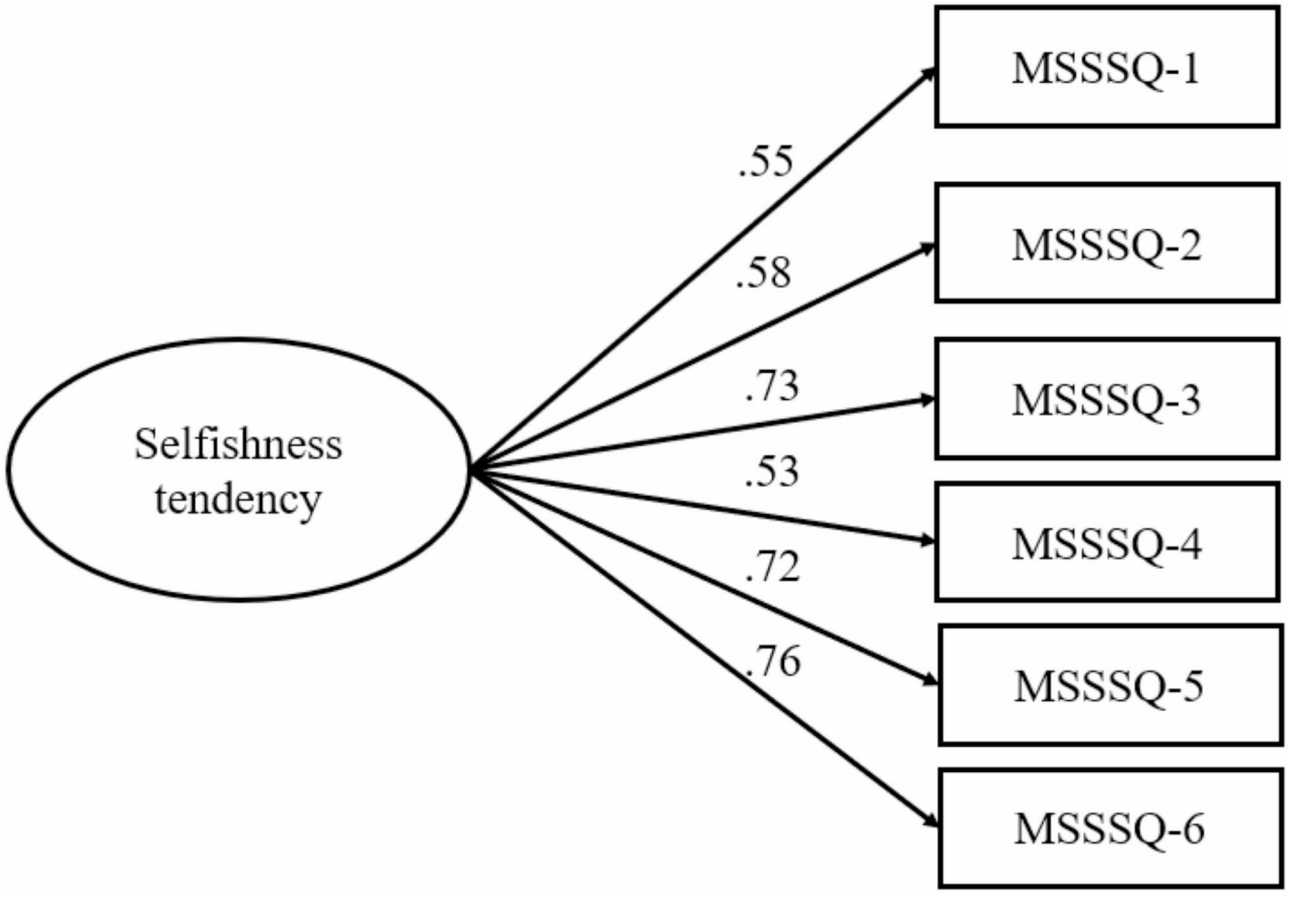

Fig. 2 Path diagram for the Medical Students' Self-reported Selfishness Questionnaire (MSSSQ) in sample 3

Table 2 Tests for measurement invariance

	χ^2(df)	CFI	TLI	RMSEA	SRMR	△CFI	△RMSEA
Gender							
M1	22.56	0.966	0.943	0.093	0.030		
M2	19.13	0.963	0.952	0.085	0.035	−0.003	−0.008
M3	18.00	0.958	0.955	0.082	0.036	−0.005	−0.003
Locality							
M1	23.22	0.965	0.942	0.094	0.030		
M2	19.14	0.964	0.953	0.085	0.032	−0.001	−0.009
M3	16.24	0.963	0.961	0.078	0.032	−0.001	−0.007
Only child status							
M1	22.81	0.965	0.942	0.093	0.030		
M2	18.49	0.965	0.954	0.083	0.030	0.000	−0.010
M3	15.56	0.964	0.962	0.076	0.031	−0.001	−0.007
College year distribution							
M1	15.66	0.966	0.943	0.094	0.031		
M2	12.63	0.963	0.955	0.083	0.037	−0.003	0.006
M3	13.88	0.947	0.950	0.088	0.051	−0.016	0.005

Note. M1 = configural invariance, M2 = weak invariance, M3 = strong invariance

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Table 3 Correlations between the Medical Students' Self-reported Selfishness Questionnaire (MSSSQ) and other measures

Variable	M	SD	MSSSQ
Stress	8.18	7.79	0.35***
Anxiety	6.76	6.52	0.32***
Depression	4.86	6.41	0.34***
Problematic gaming	8.00	3.56	0.28***
Compassion	15.14	2.65	−0.47***
Subjective well-being	5.22	1.04	−0.27***
Egocentric selfishness	14.63	3.21	0.58***
Adaptive selfishness	17.94	3.02	0.42***
Pathological selfishness	13.75	3.46	0.61***
Selfishness	46.32	8.58	0.61***
Healthy selfishness	40.10	5.73	−0.23***
Materialism	38.06	6.78	0.37***

Note. MSSSQ = Medical Students' Self-Reported Selfishness Questionnaire

*p <.05; **p <.01; ***p <.001

validity, discriminant validity, and criterion-related validity. Furthermore, results indicate the MSSSQ is a robust measurement tool that functions uniformly across gender, locality, only child status, and college year distribution.

The results of study 2 confirmed the six-item, single-factor structure of the SQ through exploratory and confirmatory factor analyses conducted on different samples, providing strong support for its validity. Moreover, the MSSSQ demonstrated convergent validity by showing a significant correlation with selfishness and its aspects (r =.42 –.61), healthy selfishness (r = –.23), and materialism (r =.37), consistent with previous research on selfishness [1, 14]. For example, Li and his colleagues revealed that there is a strong correlation (r =.40) between selfishness and materialism [42]. Additionally, weak associations were found between MSSSQ scores and anxiety (r =.32), depression (r =.34), stress (r =.35), and problematic gaming (r =.28), indicating good discrimination validity. Results of our study are also in line with those of Raine and Uh (2018), which suggest that weak and positive correlations were found between selfishness and depression (r =.33) and anxiety (r =.19). Criterion-related validity was documented by the significant associations between the MSSSQ scores and subjective well-being (r = –.27)and compassion (r = –.47), aligning with previous findings linking selfishness to reduced compassion and well-being [13, 27].

In study 2, the test-retest reliability of the MSSSQ was also assessed by retesting a subset of participants from the full sample. The test-retest reliability of the MSSSQ was found to be 0.65 six months later. While a cut-off of 0.70 is often considered indicative of acceptable test–retest reliability, it's important to note that this criterion is not absolute [43]. As noted by Crocker and Algina (1986), it is difficult to set a fixed acceptable standard for test–retest reliability as it is affected by factors such as interval time and sample type [44]. In this study, the longer test-retest interval (6 months) may account for the slightly lower reliability. Therefore, the test-retest reliability was deemed acceptable under the conditions of this study.

Furthermore, previous research has developed some tools to assess selfishness, such as Selfishness Questionnaire [14] and Healthy Selfishness and Pathological Altruism Scale [13]. However, those tools often lack the contextual specificity needed to capture the unique experiences and pressures faced by medical students. In the present study, we develop and validate the MSSSQ, which is specifically designed to assess selfish tendencies among medical students, thereby contributing to the improvement of medical ethics education. Furthermore, selfish behaviors may be situational and influenced by external factors, making them less reliable indicators of an individual's true disposition. In contrast, selfish tendencies are more stable and can provide a more accurate assessment of a medical students' propensity for selfishness. The development of a tool (MSSSQ) designed to assess selfish tendencies through context-specific items that reflect moral dilemmas in medical education scenarios enhances the ecological validity of existing assessments of selfishness among medical students.

In line with previous findings [13], our results revealed a negative correlation between MSSSQ score and healthy selfishness score. Healthy selfishness (normative self-interest) refers to a healthy respect for one's own health, growth, happiness, joy, and freedom, which can have a positive impact both on the self and on others [13]. The literature on positive attributes such as self-esteem, self-belief, self-confidence, and self-reliance mostly report observing a negatively correlation to selfishness [45–47]. When individuals experience emotions such as satisfaction and pleasure, they tend to exhibit less selfish behavior [46]. For example, some studies have found that when individuals are in a state of good self-feeling or self-worth satisfaction, they will be more sensitive to the needs of others, so they are more inclined to help others [46, 47]. Similarly, Tsai and colleagues revealed that lower levels of incidental confidence led individuals to exhibit greater selfishness in their money allocation decisions [45].

Implications for medical education

Medical students encounter a significant moral dilemma. On the one hand, they are expected to develop a strong sense of altruism, empathy, and responsibility toward future patients [7–9]. On the other hand, the fierce competitive environment forces them to prioritize their own performance and interests [48], which increases the pressure they experience from academics, internships, and career development. Thus, understanding the levels and

early manifestations of selfish tendencies among medical students has significant implications for medical education. Selfish tendencies reflect underlying attitudes and motivations that may not always manifest in observable behaviors but can still influence decision-making and ethical considerations. The MSSSQ can be utilized to identify students who may be at risk of developing unethical behaviors. By identifying and addressing these tendencies early on, educational interventions can be more effective in fostering altruism, empathy, and ethical decision-making to cultivate professional values and ethical sensibilities among medical students. Furthermore, the MSSSQ can enhance our understanding of how the demanding nature of medical training influences the emergence of selfish tendencies. By evaluating selfish tendencies at various stages of medical education, researchers and educators can gain valuable insights into the factors that either exacerbate or mitigate selfish behaviors. This knowledge can subsequently inform the design of curricula and support systems aimed at promoting the development of professional values and ethical sensibilities. Additionally, this tool serves as an effective educational resource, presenting medical students with the challenges they will encounter in their forthcoming medical careers. Lastly, a tool that resonates with medical students can facilitate counseling and potential educational interventions aimed at helping them achieve a balance between self-interest and professional ethics.

In the context of medical ethics education, it is essential to conduct further investigations on positive attributes of self, such as self-esteem, self-belief, and self-confidence and selfish tendencies in future studies. High levels of self-esteem, self-efficacy belief, and self-confidence, are known to enhance medical students' academic achievement [49], academic performance [50] as well as attitudes towards patient-centredness [51] respectively. The aforementioned medical student learning outcomes have been repeatedly reported to contribute to a successful future medical career. Yet, the relationship between the positive attributes of self and selfish tendencies remains unknown and warrants further investigation to distinguish the relationships, similarities, and differences between positive (i.e. self-esteem, self-belief, and self-confidence) and negative (i.e. selfish tendency) facets of self. Distinction of concepts related to self is crucial in the context of medical ethics education, to acquire a clearer understanding of underlying drives and motives amongst medical students that may facilitate their development of altruism, empathy, and ethical decision-making.

Strengths, limitations and future research

This study possesses several notable strengths. First, the large sample size provides substantial statistical power and enhances generalizability. Second, the adoption of a robust multi-phase validation process—such as exploratory and confirmatory factor analyses—ensures strong psychometric properties. Third, this study offers context-specific insights into selfishness among Chinese medical students, which can be valuable for future cross-cultural comparisons. Finally, the brevity of the MSSSQ, consisting of only six items, makes it highly practical for educational settings where quick assessments are essential.

While the present study provides initial evidence for the validity of the MSSSQ, several limitations must be acknowledged. Firstly, one limitation of the current study is that the MSSSQ does not incorporate existing tools that assess different facets (especially the positive attributes) of "selves". Future research should explore the incorporation of items related to positive attributes, such as self-esteem and self-confidence, or introduce established scales like the Rosenberg Self-Esteem Scale [52] for combined use, which would provide a more holistic understanding of selfishness. Secondly, the sample in this study comprised Chinese medical students, which may limit its applicability in other cultural contexts. Cross-cultural and cross-institutional validation studies are needed to ensure that the MSSSQ is applicable across different educational contexts and cultural backgrounds. Thirdly, reliance on self-report measures may introduce social desirability bias [53], potentially underestimating selfish behaviors. To enhance the validity of findings, future studies could consider incorporating additional data sources such as behavioral assessments (e.g., dictator game) and peer ratings [54]. Fourthly, the cross-sectional design used in this study limits conclusions. Longitudinal studies are necessary to assess changes in selfish tendencies over time and to explore potential causal relationships between selfish tendencies and other variables. Fifthly, while the questionnaire used in our study is well-validated, we acknowledge that additional behavioral assessments could have provided further corroboration for the self-reported data. This would have enhanced the robustness of our findings. In future research, we plan to include both self-reported measures and behavioral assessments to triangulate our data and strengthen the validity of our results. Sixthly, while the current version of the MSSSQ is designed for practicality and ease of use, we recognize the importance of further refinement and expansion. Future research could focus on developing subscales that capture different dimensions of selfishness, such as egocentric, adaptive, and pathological selfishness [14]. This would allow for a more comprehensive assessment of the construct and provide deeper insights into its various manifestations. Finally, to enhance the practicality and transparency of the MSSSQ, it is necessary to establish norms in future studies. Developing these norms will provide researchers with a benchmark, enabling comparisons between individual scores

and group performance to better facilitate preemptively addressing potential manifestations of selfish tendencies early on. Helping medical students strike a balance between selfish tendencies and medical ethics, ensuring healthy and fulfilling medical career.

Conclusion

In conclusion, the MSSSQ serves as a promising instrument for evaluating selfishness among medical students. By offering a context-specific measure of selfish tendencies, the MSSSQ can aid in the development of more effective educational interventions and support systems within medical education. Medical education should equally value the acquisition of technical skills and knowledge; as well as the cultivation of professional values and ethical sensibilities. Understanding the levels and early manifestations of selfish tendencies among medical students is essential for cultivating a strong sense of altruism, empathy, and responsibility towards future patients, thereby enhancing the overall quality of healthcare. Therefore, developing and validating the MSSSQ is an essential first step in addressing the needs to advance medical ethics education moreover an invaluable tool for future research and educational practice to facilitate medical students' ability to make thoughtful choices when faced with ethical dilemmas in a medical context.

Abbreviations

EFA	Exploratory factor analysis
CFA	Confirmatory factor analysis
MI	Measurement invariance
KMO	Kaiser-meyer-olkin
MSSSQ	The medical students' self-reported selfishness questionnaire

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12909-025-07111-z.

Supplementary Material 1

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Author contributions

Li Chen designed the study, Xudong Yang and Sijia Mei conducted the data analysis, Xudong Yang and Sijia Mei completed the first draft of this article. Liujun Wu, Zheru Dai, and Jiahui Huang participated in study design and coordination. Li Chen and Wei Wang revised the manuscript and made valuable suggestions. Yawen Zheng, Juan Fang, and Jiayi Tang participated in data clean. All authors have read and approved the final manuscript.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical approval and consent to participate

This study was approved by the local ethics committee on human research and Institutional Review Board of the Wenzhou Medical University (No:2023-021). We confirmed that all procedures were performed in accordance with the Declaration of Helsinki, which was included in the ethical approval. Informed consent was obtained from all the participants and/or their legal guardians.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. Crocker J, Canevello A, Brown AA. Social motivation: costs and benefits of selfishness and otherishness. Annu Rev Psychol. 2017;68(1):299–325. https://doi.org/10.1146/annurev-psych-010416-044145
2. Carlson RW, Adkins C, Crockett MJ, Clark MS. Psychological selfishness. Perspect Psychol Sci. 2022;17(5):1359–1380. https://doi.org/10.1177/17456916211045692
3. Anderson C, Sharps DL, Soto CJ, John OP. People with disagreeable personalities (selfish, combative, and manipulative) do not have an advantage in pursuing power at work. P Natl Acad Sci Usa. 2020;117(37):22780–22786. https://doi.org/10.1073/pnas.2005088117
4. Rios IC. The contemporary culture in medical school and its influence on training doctors in ethics and humanistic attitude to the clinical practice. Int J Ethics Educ. 2016;1(2):173–182. https://doi.org/10.1007/s40889-016-0012-0
5. Linn Z, Tashiro Y, Morio K, Hori H. Peer evaluations of group work in different years of medical school and academic achievement: how are they related? Bmc Med Educ. 2022;22(1):102. https://doi.org/10.1186/s12909-022-03165-5
6. Muramatsu T, Nakamura M, Okada E, Katayama H, Ojima T. The development and validation of the Ethical Sensitivity Questionnaire for nursing students. Bmc Med Educ. 2019;19(1):215. https://doi.org/10.1186/s12909-019-1625-8
7. Voultsos P, Chatzinikolaou F, Papana A, Deliligka A. Reliability of Greek version of the Toronto Empathy Questionnaire in medical students and associations with sociodemographic and lifestyle factors. Bmc Psychol. 2022;10(1):113. https://doi.org/10.1186/s40359-022-00824-6
8. Yang X, Gao L, Zhang S, Zhang L, Zhang L, Zhou S, et al. The professional identity and career attitude of Chinese medical students during the COVID-19 pandemic: a cross-sectional survey in China. Front Psychiatry. 2022;13:774467 https://doi.org/10.3389/fpsyt.2022.774467
9. Hendelman W, Byszewski A. Formation of medical student professional identity: categorizing lapses of professionalism, and the learning environment. Bmc Med Educ. 2014;14(1):139. https://doi.org/10.1186/1472-6920-14-139
10. Ebenau A, Groot M, Visser A, van Laarhoven HWM, van Leeuwen R, Garssen B. Spiritual care by nurses in curative oncology: a mixed-method study on

patients' perspectives and experiences. Scand J Caring Sci. 2020;34(1):96–107. https://doi.org/10.1111/scs.12710
11. Yu W, Yao W, Chen M, Zhu H, Yan J. School climate and academic burnout in medical students: a moderated mediation model of collective self-esteem and psychological capital. Bmc Psychol. 2023;11(1):77. https://doi.org/10.1186/s40359-023-01121-6
12. Zeng W, Chen R, Wang X, Zhang Q, Deng W. Prevalence of mental health problems among medical students in China: a meta-analysis. Med. 2019;98(18):e15337. https://doi.org/10.1097/md.0000000000015337
13. Kaufman SB, Jauk E. Healthy selfishness and pathological altruism: measuring two Paradoxical forms of selfishness. Front Psychol. 2020;11:1006. https://doi.org/10.3389/fpsyg.2020.01006
14. Raine A, Uh S. The Selfishness Questionnaire: egocentric, adaptive, and pathological forms of selfishness. J Pers Assess. 2018;101(5):503-514. https://doi.org/10.1080/00223891.2018.1455692
15. Diebels KJ, Leary MR, Chon D. Individual differences in selfishness as a major dimension of personality: a reinterpretation of the sixth personality factor. Rev Gen Psychol. 2018;22(4):367–376. https://doi.org/10.1037/gpr0000155
16. Paulhus DL, Williams KM. The dark triad of personality: narcissism, machiavellianism, and psychopathy. J Res Pers. 2002;36(6):556–63. https://doi.org/10.1016/S0092-6566(02)00505-6
17. American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-5. Washington, DC. 2013. https://doi.org/10.1176/appi.books.9780890425596
18. Wilson DS, Near D, Miller RR, Machiavellianism: a synthesis of the evolutionary and psychological literatures. Psychol Bull. 1996;119(2):285–99. https://doi.org/10.1037/0033-2909.119.2.285
19. Cropanzano R, Folger R. Self-interest: defining and Understanding a human motive. J Organ Behav. 2005;26:985–991. https://doi.org/10.1002/job.353
20. Gerbasi ME, Prentice DA. The self-and other-interest inventory. J Pers Soc Psychol. 2013;105(3):495 -514. https://doi.org/10.1037/a0033483
21. Zeighami M, Malakoutikhah A, Shahrbabaki PM, Al-Oliamat K, Dehghan M. Development and validation of the Nurses Sexual Harassment Scale in Iran. Bmc Nurs. 2024;23(1):107. https://doi.org/10.1186/s12912-024-01759-6
22. Zeighami M, Mangolian Shahrbabaki P, Dehghan M. Iranian nurses' experiences with sexual harassment in workplace: a qualitative study. Sex Res Social Policy. 2023;20(2):575–588. https://doi.org/10.1007/s13178-022-00688-w
23. Malterud K. Qualitative research: standards, challenges, and guidelines. Lancet. 2001;358(9280):483–8. https://doi.org/10.1016/s0140-6736(01)05627-6
24. DeVellis RF, Thorpe CT. Scale development: theory and applications. Sage 2022. https://doi.org/10.1111/peps.12499
25. Di Malta G, Cooper M, Bond J, Raymond-Barker B, Oza M, Pauli R. The Patient-Perceived Helpfulness of Measures Scale: development and validation of a scale to assess the helpfulness of using measures in psychological treatment. Assessment. 2023; 31(5):994-1010. https://doi.org/10.1177/10731911231195837
26. Karaoglan Yilmaz FG, Yilmaz R. Understanding the relationship between digital game addiction, academic motivation, classroom engagement and selfishness. J Psychol Couns Sch. 2023;34(2):153-165. https://doi.org/10.1177/20556365231210971
27. Dinić BM, Bodroža B. COVID-19 protective behaviors are forms of prosocial and unselfish behaviors. Front Psychol. 2021;12. https://doi.org/10.3389/fpsyg.2021.647710
28. David J, Visvalingam S, Norberg MM. Why did all the toilet paper disappear? Distinguishing between panic buying and hoarding during COVID-19. Psychiat Res. 2021;303:114062 https://doi.org/10.1016/j.psychres.2021.114062
29. Bakalım O, Soysal FSÖ. The Healthy Selfishness and Pathological Altruism Scale: adaptation into Turkish and validity and reliability study. Anadolu Univ J Educ Fac. 2023;7(1):160–174. https://doi.org/10.34056/aujef.1196150
30. Li J, Lu M, Xia T, Guo Y. Materialism as compensation for self-esteem among lower-class students. Pers Indiv Differ. 2018;131:191–196. https://doi.org/10.1016/j.paid.2018.04.038
31. Richins ML, Dawson S. A consumer values orientation for materialism and its measurement: scale development and validation. J Consum Res. 1992;19(3):303–316. https://doi.org/10.1086/209304
32. Kardefelt-Winther D. Problematizing excessive online gaming and its psychological predictors. Comput Hum Behav. 2014;31:118–122. https://doi.org/10.1016/j.chb.2013.10.017
33. Wang K, Shi H, Geng F, Zou L, Tan S, Wang Y, et al. Cross-cultural validation of the Depression Anxiety Stress Scale–21 in China. Psychol Assess. 2016;28(5):e88 -e100. https://doi.org/10.1037/pas0000207
34. Lyubomirsky S, Lepper HS. A measure of subjective happiness: preliminary reliability and construct validation. Soc Indic Res. 1999;46(2):137–55. https://doi.org/10.1023/A:1006824100041
35. Jiang W, Luo J, Guan H. Gender difference in the relationship of physical activity and subjective happiness among Chinese university students. Front Psychol. 2021;12. https://doi.org/10.3389/fpsyg.2021.800515
36. Zhang B, Li YM, Li J, Luo J, Ye Y, Yin L, et al. The big five Inventory–2 in China: a comprehensive psychometric evaluation in four diverse samples. Assessment. 2021;29(6):1262–84. https://doi.org/10.1177/10731911211008245
37. Tao Y, Liu X, Hou W, Niu H, Wang S, Ma Z, et al. The mediating role of emotion regulation strategies in the relationship between big five personality traits and anxiety and depression among Chinese firefighters. Front Public Health. 2022;10. https://doi.org/10.3389/fpubh.2022.901686
38. Fabrigar LR, Wegener DT, MacCallum RC, Strahan EJ. Evaluating the use of exploratory factor analysis in psychological research. Psychol Methods. 1999;4(3):272–299. https://doi.org/10.1037/1082-989X.4.3.272
39. Lt H, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct Equ Model. 1999;6(1):1–55. https://doi.org/10.1080/10705519909540118
40. Van de Schoot R, Lugtig P, Hox J. A checklist for testing measurement invariance. Eur J Dev Psychol. 2012;9(4):486–492. https://doi.org/10.1080/17405629.2012.686740
41. Chen FF. Sensitivity of goodness of fit indexes to lack of measurement invariance. Struct Equ Model. 2007;14(3):464–504. https://doi.org/10.1080/10705510701301834
42. Li D, Wang L, Wang H, Ma W, Zou C, Wu W. The applicability of the Chinese version of the Selfishness Questionnaire among college students. Chin J Clinl Psy. 2024;32(6):1388–1391. https://doi.org/10.16128/j.cnki.1005-3611.2024.06.036
43. Wang Y, Hawk S. Development and validation of the Child and Adolescent Flexible Expressiveness (CAFE) scale. Psychol Assess. 2020;32: (4):358-373. https://doi.org/10.1037/pas0000795
44. Crocker L, Algina J. Introduction to classical and modern test theory. 1986.
45. Tsai C, Xie J. How incidental confidence influences self-interested behaviors: a double-edged sword. J Behav Decis Mak. 2017;30 (5):1168-1181. https://doi.org/10.1002/bdm.2032
46. Zhang Q, Li W, Zhang M, Zhao K, Liu R, Ma C. Internet altruistic behavior among Chinese early adolescents: exploring differences in gender and collective efficacy using a latent growth modeling. Curr Psychol. 2024;43(6):5007–50019. https://doi.org/10.1007/s12144-023-04660-8
47. Zheng X, Gu H. Personality traits and interntruistic behavior: the mediating effect of self-esteem. Chin J Spec Educ. 2012;2:69–75. (in Chinese)
48. Wong A, Tjosvold D, Yu Z-y. Organizational partnerships in China: self-interest, goal interdependence, and opportunism. J Appl Psychol. 2005;90(4):782–791. https://doi.org/10.1037/0021-9010.90.4.782
49. Niroumand E, Keshavarzi F, Khoshay A. The relationship between self-esteem and academic achievement in pre-clinical and clinical medical students. Med Educ J. 2015;3(1):32–38.
50. Edgar S, Carr SE, Connaughton J, Celenza A. Student motivation to learn: is self-belief the key to transition and first year performance in an undergraduate health professions program? Bmc Med Educ. 2019;19(1):111. https://doi.org/10.1186/s12909-019-1539-5
51. McNair R, Griffiths L, Reid K, Sloan H. Medical students developing confidence and patient centredness in diverse clinical settings: a longitudinal survey study. Bmc Med Educ. 2016;16(1):176. https://doi.org/10.1186/s12909-016-0689-y
52. Rosenberg M. Society and the adolescent self-image. Princeton University Press. 1965.
53. An W. You said, they said: A framework on informant accuracy with application to studying self-reports and peer-reports. Soc Networks. 2022;70:187–197. https://doi.org/10.1016/j.socnet.2021.12.006
54. Bardsley N. Dictator game giving: altruism or artefact? Exp Econ. 2008;11(2):122–133. https://doi.org/10.1007/s10683-007-9172-2

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