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Debunking myths about giftedness: development and psychometric validation of the myths about giftedness scale in the Turkish cultural context

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Abstract

Background Myths about gifted education persist widely among educators, families, and society, often leading to misconceptions that hinder the accurate identification and appropriate support of gifted individuals. Such myths may negatively affect educational policies and psychological well-being of gifted students. Despite the critical role these beliefs play, there is a scarcity of culturally valid instruments currently exists in Türkiye to systematically assess prevalent myths about giftedness. Addressing this gap, the present study aimed to develop and psychometrically validate a scale for measuring myths related to giftedness within the Turkish cultural context. This contributes not only to educational psychology but also to cross-cultural research on cognitive biases and social perceptions.

Methods The study was conducted in two phases. In Study 1, exploratory factor analysis (EFA) was performed on data collected from 350 participants to explore the underlying factor structure of the scale. Study 2 involved confirmatory factor analysis (CFA) with 249 participants to verify the factor model identified in Study 1. The scale's internal consistency and reliability were examined using Cronbach's α , ordinal α , McDonald's ω coefficients, and corrected item-total correlations. Ethical approval was obtained and informed consent was secured from all participants.

Results EFA results supported a unidimensional factor structure comprising 25 items, accounting for a significant proportion of variance. CFA confirmed this structure with acceptable model fit indices ($\chi^2/df = 2.622$, CFI = 0.946, TLI = 0.941, GFI = 0.982, AGFI = 0.973, RMSEA = 0.081, 95% CI [0.074, 0.088], SRMR = 0.095). The scale demonstrated strong reliability (Cronbach's $\alpha = 0.884$; ordinal $\alpha = 0.920$; McDonald's ω coefficients ranging from 0.885 to 0.894). Item-total correlations ranged between 0.31 and 0.64, indicating good item discrimination.

Conclusions The Myths About Giftedness Scale is a psychometrically promising tool that can effectively identify prevalent misconceptions about giftedness among families, educators, and stakeholders. After examining the psychometric properties of the scale on a more homogeneous and random sample, its application can inform educational practices and policies, promote accurate identification of gifted individuals, and support psychological

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well-being. Moreover, the scale's cultural adaptation enables meaningful cross-cultural comparisons and advances research on social cognition related to giftedness.

Keywords Myths, Giftedness, Scale development, Psychometric validation, Turkish culture

Introduction

Treffinger [1] defined myths as “explanations of practices or beliefs which we often discover through scrutiny, to be more fanciful than truthful” (p. 3). Myths about giftedness can impact the social and emotional development of gifted students [2], as well as their identification and education [1, 3]. *Gifted Child Quarterly* (GCQ) addressed myths about gifted education in two special issues, first in 1982 and later in 2009. Treffinger [3] noted that, rather than decreasing, myths had proliferated. In this issue, 19 myths related to the assessment of creativity, the nature of giftedness, identification of giftedness and gifted education are discussed by experts in the field. Similarly, Winner [4] identified nine myths concerning the definition of giftedness, its heritability, psychological well-being, and societal perceptions. These myths shape public attitudes and influence policies related to gifted education. Cross [2] highlighted myths common among teachers, parents, gifted students, and administrators, particularly regarding social and emotional development. He stressed the need for research, counseling, and enriched learning environments to challenge these misconceptions. Galbraith and Delisle [5] outlined ten common myths based on their experiences, including beliefs that gifted children succeed without support, should excel in school, and are universally appreciated by teachers. Other misconceptions include that gifted students become arrogant if grouped together, struggle with friendships, and mature evenly across all areas.

Sheffield [6] explored myths about mathematical giftedness, emphasizing their potential to hinder students' progress. These include beliefs that mathematical ability is purely genetic, that only Asian or White males excel in math, and that math is not a creative field. Other myths suggest gifted math students develop independently and should always accelerate their coursework. These misconceptions parallel broader myths about giftedness. Overall, myths about giftedness influence perceptions, educational policies, and student experiences. Challenging these misconceptions through research, education, and advocacy is crucial to ensuring gifted students receive appropriate support and opportunities for growth.

Recent studies conducted both in Türkiye and internationally indicate that individuals continue to hold persistent myths about intelligence, giftedness and gifted education. For instance, Kaya et al. [7] found that Turkish pre-service teachers still endorsed various intelligence-related misconceptions. Similarly, Warne and Burton

[8] identified such myths among both teachers and the general public in the United States. Tuzgen [9] reported similar findings among a sample primarily composed of prospective psychological counselors, while Güçyeter [10] emphasized the prevalence of myths regarding giftedness, and their characteristics among counselor candidates.

In a newly published study from Türkiye conducted with preservice teachers, in-service teachers, and university lecturers in teacher education [11], descriptive statistics indicated that participants moderately rejected myths about giftedness. However, most of these studies employed open and/or close-ended questionnaires and/or interviews and typically reported findings on an item-by-item basis. This approach limits the ability to conduct comparisons across different groups. In order to make more effective progress in identifying and educating gifted and talented students, it is crucial to use a valid and reliable measurement tool that can assess the prevalence of myths about giftedness across various stakeholder groups, including teachers, pre-service teachers, students, and families.

Various questionnaires have been designed to investigate misconceptions, stereotypes and common beliefs about intelligence and giftedness. In this study, we focused on myths about giftedness and gifted education. For this reason, we examined detailed studies that used instruments specifically related to giftedness myths. For instance, Sak [12] developed a 12-item yes/no questionnaire to investigate misconceptions, dogmatic beliefs, and popular views on giftedness in Turkish culture. Expert opinions were obtained, and KR-21 reliability coefficients were 0.67 for the entire questionnaire, 0.91 for misconceptions, 0.89 for dogmas, and 0.87 for popular views. Similarly, Portešová et al. [13] used an 8-myth binary-coded questionnaire based on Bain et al. [14], but no additional reliability or validity information was provided.

Nakano et al. [15] developed a two-part questionnaire for psychologists and psychology students. The first part contained six open-ended questions, while the second part included 14 myths about giftedness, requiring participants to mark the statements they believed were true. However, no psychometric information was provided. Schmitt et al. [16] conducted a study to assess general knowledge about the brain, the prevalence of neuromyths, and understanding of giftedness through a questionnaire developed based on previous research on neuromyths. In addition to existing items, the authors

included nine newly developed statements specifically addressing brain-related knowledge and giftedness—five of which were scientifically accurate and four were scientifically inaccurate. The questionnaire consisted of two sections: the first section gathered demographic information, while the second comprised 32 items to be answered using a based on previous studies and 19 myths from a 2009 GCQ special issue. The non-standardized questionnaire consisted of demographic information, 39 Likert-type items (ranging from disagree to completely agree), and open- and closed-ended questions. The myths covered the concept, characteristics, identification, and education of gifted individuals.

Cheung et al. [17] developed a 10-item instrument called the Teacher Knowledge Scale, based on common myths about gifted children and school-based gifted education policies in Hong Kong. Each item on the scale is answered using one of three response options: True, false, or not sure. Of the 10 items, four statements are correct and six are incorrect. Participants received one point for each correct response, while no points were awarded for incorrect or not sure responses. The authors stated that higher total scores indicated greater knowledge about gifted education and the characteristics of gifted students. Content validity of the scale was established through expert review by a panel of scholars specializing in gifted education. The internal consistency reliability, calculated using the Kuder-Richardson 20 (KR-20) formula, was reported as 0.44 for the pretest and 0.52 for the posttest. No additional validity or reliability evidence was provided in the study.

Pérez et al. [18] investigated social representations of giftedness including myths and stereotypes, identifying the most and least changeable elements using item response theory. Their questionnaire, based on a previous instrument [19], included 34 Likert-scale items (strongly disagree to strongly agree). Content validity was ensured through expert judgment, and Cronbach's α was 0.899. EFA results supported unidimensionality (RMSEA = 0.071, CFI = 0.934), and McDonald's ω was 0.913, indicating strong reliability. Their item response theory analysis suggested that myths about giftedness varied in modifiability.

In a recent study by Ercan and Ziegler [20] developed the Rapid Assessment Test of Individual Misconceptions about Giftedness (RATIMAG), a 20-item knowledge-based measure derived from scientific articles on common myths about giftedness, particularly those published in the 2009 special issue of GCQ. After generating the item pool, the authors sought feedback from accessible article authors and additional experts in the field, followed by an expert review that finalized the items using a 5-point rating scale. The psychometric properties of the scale were examined with a pilot sample of 494 Turkish

participants, including pre-service teachers, teachers and university researchers. The dataset was split for EFA and CFA. EFA retained items with loadings ≥ 0.45 and yielded a three-factor structure explaining 63% of the variance, representing: (1) characteristics and needs of the gifted, (2) assessment and achievement, and (3) personality and social-emotional aspects. Internal consistency was high for the total scale ($\alpha = 0.931$) and acceptable to excellent across subscales ($\alpha = 0.949$, $\alpha = 0.855$, and $\alpha = 0.747$, respectively). CFA supported the factorial structure, demonstrating satisfactory model fit ($\chi^2/df = 1.995$, AGFI = 0.852, GFI = 0.885, NFI = 0.907, CFI = 0.951, IFI = 0.952, TLI = 0.943, RMSEA = 0.063). This study can be considered a pioneering effort in the field, as it developed a measurement instrument on giftedness myths and examined its psychometric properties in a comprehensive manner. It may also encourage similar scale-development studies in the future. Because this study focused on the 19 myths presented in the GCQ special issue, the myths addressed here can be regarded as broader in scope.

Collectively, these studies reveal that while questionnaires are widely employed to investigate myths about giftedness, many suffer from insufficient psychometric evaluation. The use of valid and reliable instruments is vital for accurately identifying which aspects of giftedness are most misunderstood and how these misconceptions relate to educational and psychological variables. Systematic measurement of myths can elucidate how diverse stakeholders—including educators, parents, and policymakers—perceive giftedness and gifted education, facilitating the development of informed interventions and policies. Advanced statistical analyses can further clarify relationships between myths and other psychological and educational constructs.

In response to these needs, the present study aims to develop and validate a measurement tool designed to assess myths related to the concept of giftedness and the characteristics of gifted individuals. Given the demonstrated persistence of these misconceptions in both professional and lay populations [e.g., 7,9,12], a psychometrically sound scale is essential for advancing research, improving identification procedures, informing educational planning, and promoting the psychological well-being of gifted students. As a preliminary investigation, the study focuses on a narrower set of myths—those specifically related to the nature of giftedness and the characteristics of gifted individuals—before extending future work to myths concerning the education and assessment of gifted students, as well as domain-specific areas of ability. This study is designed to address the identified gap through the following research question:

What are the psychometric properties of a scale developed to assess myths related to the concept of giftedness and the characteristics of gifted individuals?

Method

Study design

In this study, the steps suggested by Boateng et al. [21] and Worthington and Whittaker [22] were taken into consideration in the scale development process. One of the quantitative research methods, the correlational research method was conducted to examine the psychometric characteristics of the scale. In correlational models, the relationships between variables are investigated [23].

Scale development process

The scale development process followed best practices outlined in the literature [21, 22], including conceptualization, item generation, expert review for content validity, pilot testing, exploratory and confirmatory factor analyses, and reliability assessments. Initially, a comprehensive literature review was conducted to identify common myths about intelligence, giftedness and gifted children. Related myths on websites such as National Association for Gifted Children [24], Hoagies' Gifted Education Page [25], myths in various articles [26] especially in the 1982 and 2009 special issues of GCQ [1, 3] and myths in books [e.g., 2,4,5,27] were examined. In line with these myths, the researchers produced 45 items.

Since the purpose of the research was more focused on examining the myths about the nature of the concept of giftedness and the characteristics of gifted children, the myths that may be related to these two concepts were taken as the basis. The researchers tried to write as many items as possible, taking into account the myths in the literature in order to create a large, comprehensive pool before sending expert views. The decision to start with 45 items was guided by recommendations in scale development literature, which suggest generating more items than ultimately needed to allow for refinement based on expert feedback and statistical analysis [21]. This number also allowed us to represent multiple content domains without overburdening participants during the initial administration. The item pool was created by directly translating myth expressions from the literature into Turkish, dividing some myths into multiple items to ensure clearer and more comprehensive expression in Turkish, and deriving new items based on those myths.

A 5-point Likert-type response format was employed. Content validity was evaluated in two stages. In the first stage, five Turkish language experts assessed the items for clarity, grammar, and comprehensibility. Based on their feedback, several revisions were made. In the second stage, three measurement and evaluation experts and

five gifted education experts evaluated whether the items effectively measured the intended construct. Items were classified as "appropriate," "inappropriate," or "should be corrected." Based on the experts' feedback, nine items were removed, and some were merged, resulting in a final pool of 36 items. Items were randomly reordered using RStudio. To ensure transparency in item generation, Table 1 presents the final 36 items along with the corresponding sources from the literature.

Two rounds of pilot testing were conducted. In the first round, five participants, including four PhD graduates (aged 34 to 41) and one 13-year-old 6th-grade middle school student, were purposefully selected based on criterion sampling. The primary inclusion criterion was sufficient literacy to comprehend the scale items. This group was asked to review the draft scale for clarity and estimated completion time. One participant noted that the items seemed to reflect general beliefs rather than personal views. As a result, the phrase "I think" was added to the beginning of each item to emphasize subjective belief.

In the second round, ten participants purposefully selected using criterion sampling evaluated the revised scale. These participants were chosen to ensure a wide range of educational and demographic diversity, with the primary inclusion criterion being the ability to comprehend the scale items. The group included individuals aged between 17 and 64 years, with educational backgrounds ranging from primary education to doctoral degrees, thereby ensuring the clarity and accessibility of the items across various respondent profiles. Based on their feedback, the term "psychomotor" in one item was replaced with "bodily," and minor wording issues were resolved. Completion times ranged from 5 to 15 min. Following these revisions, the scale was digitized using Google Forms and administered to a large sample ($N=649$). The dataset was used for item analysis, exploratory and confirmatory factor analyses, reliability estimation, and validation procedures, finalizing the development of the scale.

Sample

The entire sample consists of 649 participants. Participants were selected using criterion sampling, a subtype of purposive sampling, which involves selecting participants who meet a predefined condition [33]. In this study, literacy sufficient to comprehend the items was used as an inclusion criterion. Children in the younger age group who lacked the literacy required to respond to the scale were excluded. Participation in the study was entirely voluntary, and participants did not receive any compensation for their participation. In this context, the age distribution of the 649-person sample ranged from 8 to 70 years old.

Table 1 Final 36 items of the scale and their theoretical sources

Item No	Items	Source(s)
1	I think gifted individuals have the same characteristics.	[25, 28]
2	I think gifted children will become eminent adults in the future.	[4]
3	I think that gifted individuals are often seen as students who are constantly studying at school.	[4, 25]
4	I think that gifted individuals get the highest grades in exams.	[5]
5	I think gifted individuals are psychologically healthier than their peers.	[4, 29]
6	I think that those who show high achievement in various sports compared to their peers are not gifted but highly talented.	[4]
7	I think that gifted individuals do not need encouragement for a task or job.	[25]
8	I think that giftedness is completely formed by environmental influences.	[4, 26]
9	I think that those who have a disability/handicap cannot be gifted.	[24]
10	I think that most gifted individuals in society are male.	[27]
11	I think that gifted individuals only come from families with high socioeconomic status.	[30]
12	I think that gifted individuals are better than their peers in everything they do.	[5]
13	I think gifted individuals do not need special education services.	[5, 31]
14	I think gifted individuals are more adaptable than their peers.	[5, 24]
15	I think that gifted individuals have a very high level of success in every job.	[25]
16	I think gifted individuals are physically healthier than their peers.	[4]
17	I think that giftedness can only emerge in the arts.	[4]
18	I think that gifted individuals do not get low grades in exams.	[24]
19	I think that only a very small percentage of society (1–5%) is gifted.	[32]
20	I think gifted individuals are happier than their peers.	[24]
21	I think that giftedness is determined solely by IQ test scores.	[4]
22	I think that teachers want to have gifted students in their classes.	[5]
23	I think gifted individuals are more moral than their peers.	[4]
24	I think that giftedness is entirely hereditary (innate).	[2, 4]
25	I think that individuals with higher creativity than their peers are gifted.	[4, 25]
26	I think that gifted individuals can learn everything on their own.	[5, 24]
27	I think that most of the gifted individuals in society are women.	[27]
28	I think that every child is gifted.	[2, 24, 26]
29	I think that gifted individuals are lonelier than their peers.	[4, 25]
30	I think that those who have higher achievement in academic subjects than their peers are gifted.	[4]
31	I think that gifted individuals do not need help with a task or job.	[5, 24]
32	I think gifted individuals are more popular than their peers.	[24]
33	I think that giftedness is only related to academic achievement.	[4]
34	I think that those who achieve higher success than their peers in various art disciplines are not gifted but highly talented.	[4]
35	I think that giftedness is the result of an intensive education.	[4, 5, 27]
36	I think that a gifted individual develops simultaneously in cognitive, social-emotional and physical development areas.	[5, 25]

The total sample was divided into two independent subsamples with RStudio (with sample function): study 1 for EFA and study 2 for CFA and reliability analysis. According to Wegener and Fabrigar [34], dividing a sample into two halves allows researchers to conduct EFA and CFA without the need to collect additional data from a separate group. This strategy enhances both efficiency and methodological rigor. In this study, an unequal but purposeful random division was performed. Specifically, 400 participants were randomly assigned to the EFA sample (study 1), and 249 participants were randomly assigned to the CFA sample (study 2). This decision was driven by methodological considerations.

The initial item pool of the scale consisted of 36 items. To meet commonly recommended guidelines of at least 10 participants per item [35], a larger sample was needed

for the EFA stage. Allocating 400 participants ensured that, even after identifying and removing outliers, the remaining sample size would be adequate for reliable factor extraction. Tabachnick and Fidell [35] suggest that for the CFA stage, a sample size of 200–250 is generally considered adequate, especially when the final version of the scale contains fewer items following item reduction. Therefore, 249 participants were randomly allocated to the CFA sample. The demographic characteristics of participants in Study 1 and Study 2 are presented below.

Sample of study 1

Since 50 participants were identified as univariate and multivariate outliers (see the Data Analysis of Study 1 section) during the preliminary checks before conducting EFA, 350 participants were included in Study 1. The ages

of the 350 participants in the study 1 sample range from 8 to 70 years, with a mean age of 33.79. Among the participants, 70.9% are female, and 29.1% are male. Regarding educational background, 1.7% of the participants have a primary education, 7.4% have a secondary education, 16.3% have completed high school, 9.1% hold an associate degree, 46.6% have an undergraduate degree, 11.7% have a master's degree, and 7.1% have a postgraduate degree.

Sample of study 2

The ages of the 249 participants in the study 2 sample range from 10 to 68 years, with a mean age of 35. Among the participants, 65.5% are female, and 34.5% are male. Regarding educational background, 1.6% of the participants have a primary education, 7.6% have a secondary education, 18.1% have completed high school, 10% hold an associate degree, 42.6% have an undergraduate degree, 12.4% have a master's degree, and 7.6% have a postgraduate degree.

Measures and data collection procedure

In this study, we developed and used a myth scale, along with a demographic form that included items on age, gender, and education level. Following ethical approval, data were collected online via Google Forms. Participants were informed about the study's purpose, researchers' contact details, voluntary participation, confidentiality, and the option to withdraw. Informed consent was obtained. To encourage honest responses, the study was presented as an exploration of giftedness characteristics. The Google Form had two sections: the first for demographic details and the second for the 36-item scale.

Data analysis

Data analysis of study 1

Data analysis was conducted using IBM SPSS Statistics (Version 26.0) for EFA and RStudio (Version 4.3.2) for parallel analysis with the *psych* package [36]. First, data suitability was assessed in a sample of 400 participants. Erroneous data entries and missing values were checked in SPSS with frequency analysis, confirming the absence of data entry errors and missing values.

Second, evidence of validity for the scale was examined. Preconditions for EFA, including missing data, outliers, normality, sphericity, and sample size, were assessed. Frequency distributions for all items were examined to confirm the absence of missing data. Standardized z scores were calculated for the scale's 36 items to identify univariate outliers. Upon examination, 32 participants were identified as univariate outliers, as their data fell outside the range of -3.29 to $+3.29$, as recommended by Tabachnick and Fidell [35]. Multivariate outliers were then assessed using Mahalanobis distance values. The

criterion for identifying multivariate outliers was set at $p < .001$. The critical value for Mahalanobis distance was determined using the χ^2 distribution and appropriate degrees of freedom. With a critical value of $\chi^2(36) = 67.505$, 18 participants were identified as multivariate outliers because their values exceeded this threshold and were subsequently excluded from the analysis.

The analysis continued with data from 350 participants. Normality was confirmed for all but three items, with skewness and kurtosis values falling within the acceptable range (-1.5 to $+1.5$) [35]. Specifically, item I9 showed skewness = 2.049 and kurtosis = 3.302, item I11 showed skewness = 1.938 and kurtosis = 2.479, and item I17 showed skewness = 1.620 and kurtosis = 1.961. Although these values exceed the threshold suggested by Tabachnick and Fidell [35], Kline [37] notes that skewness values between -3 and $+3$ and kurtosis values between -10 and $+10$ do not indicate severe deviations from normality. Therefore, these three items were retained in the analysis rather than being removed.

Bartlett test indicated that sphericity was met, $\chi^2(630) = 3,671.54$, $p < .001$. The sample size was evaluated based on the criterion of ideally 10 participants and minimum 5 participants per item, as recommended by Tabachnick and Fidell [35], and further assessed using the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy. Although the criterion of 360 participants (for 36 items) was not fully met, the final sample of 350 participants closely approximated this recommendation. Additionally, sample adequacy was confirmed with a KMO value of 0.86, exceeding the recommended threshold of 0.60 [35]. Finally, EFA was conducted on the 36-item scale, as detailed in the Results section.

Data analysis of study 2

Data analysis was conducted using Jamovi (Version 2.6.17.0) for CFA and reliability analysis, carried out in two stages. First, CFA was performed on a sample of 249 participants. The parameter estimation method was selected based on an examination of item distributions, which revealed that six items had skewness and kurtosis values outside the acceptable range (-1.5 to $+1.5$) [35]. Additionally, the scale items were measured using a 5-point Likert-type ordinal scale. In ordinal scales where multivariate normality cannot be assumed, unweighted least squares (ULS) and diagonally weighted least squares (DWLS) are recommended as parameter estimation methods instead of maximum likelihood (ML) when performing CFA. Additionally, ULS has been found to yield better results than DWLS in small samples of around 250 participants [38–40]. Therefore, ULS was used as the estimation method. Secondly, reliability analysis was conducted on the validated model. Cronbach's α , ordinal α , McDonald's ω , and item-total correlations were

examined. The results the CFA and reliability analyses are provided in the Results section.

Results

Results of study 1

EFA was conducted with 350 participants to examine the factor structure of the 36-item scale using the principal axis factoring method without rotation. The number of factors was determined using the Kaiser criterion, Cattell's scree test, and parallel analysis conducted with the *psych* package in RStudio. The Kaiser criterion identified 10 factors with eigenvalues greater than 1.0. The scree plot suggested a three-factor structure, as the curve flattened after the fourth component [35]. Parallel analysis indicated a five-factor structure, as the first five eigenvalues from the actual data exceeded those from simulated data. Figures 1 and 2 illustrate these results.

Although the results obtained from different techniques for determining the number of factors varied, the final decision regarding the factor structure was based on statistical analyses, as there is no established theoretical consensus in the literature on whether myths about giftedness are unidimensional or multidimensional. Despite the lack of direct theoretical justification for a single- or multifactor structure, the myths addressed in this study predominantly relate either to the concept of giftedness itself or to its individual manifestations. Therefore, the authors initially hypothesized that the scale could plausibly exhibit either a one- or two-factor structure.

Supporting this view, a recent study by Perez et al. [18] developed a 34-item scale based on myths identified in the literature and found evidence for a unidimensional structure through EFA. Specifically, the eigenvalue of the first factor was substantially higher (7.70) than those of the second (2.57) and third (2.02) factors, with the first factor explaining a significantly larger portion of the total variance. The difference between the first and second eigenvalues (2.99 times greater) indicates a sharp drop, suggesting a dominant underlying construct. Such a steep decline in eigenvalues supports the plausibility of a unidimensional solution [41, 42].

When deciding which items to exclude from the single-factor structure, the 0.30 factor loading criterion proposed by Tabachnick and Fidell [35] was used. Accordingly, items with factor loadings of 0.30 or higher were retained in the scale, while those below this threshold were excluded. In single-factor structures, an explained variance of 30% or higher is considered acceptable [43]. In the present study, the explained variance was found to be 29.152%. This value is very close to the acceptable threshold. This resulted in a single-factor structure consisting of 25 items, which was named Myths About Giftedness Scale (MAGS). The results are presented in Table 2.

Result of study 2

Study 2 involved two stages: CFA and reliability analysis of the MAGS, both conducted with 249 participants. Model fit in the CFA was evaluated using χ^2/df , CFI, TLI,

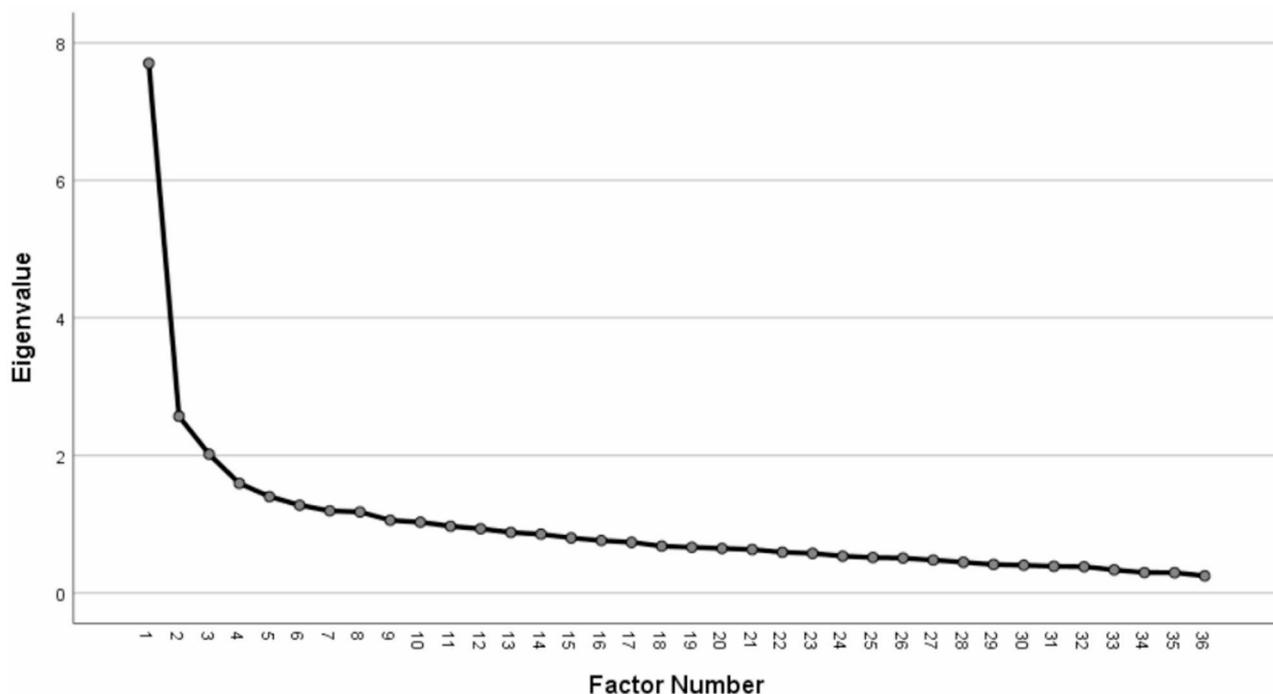


Fig. 1 Cattell Scree Plot

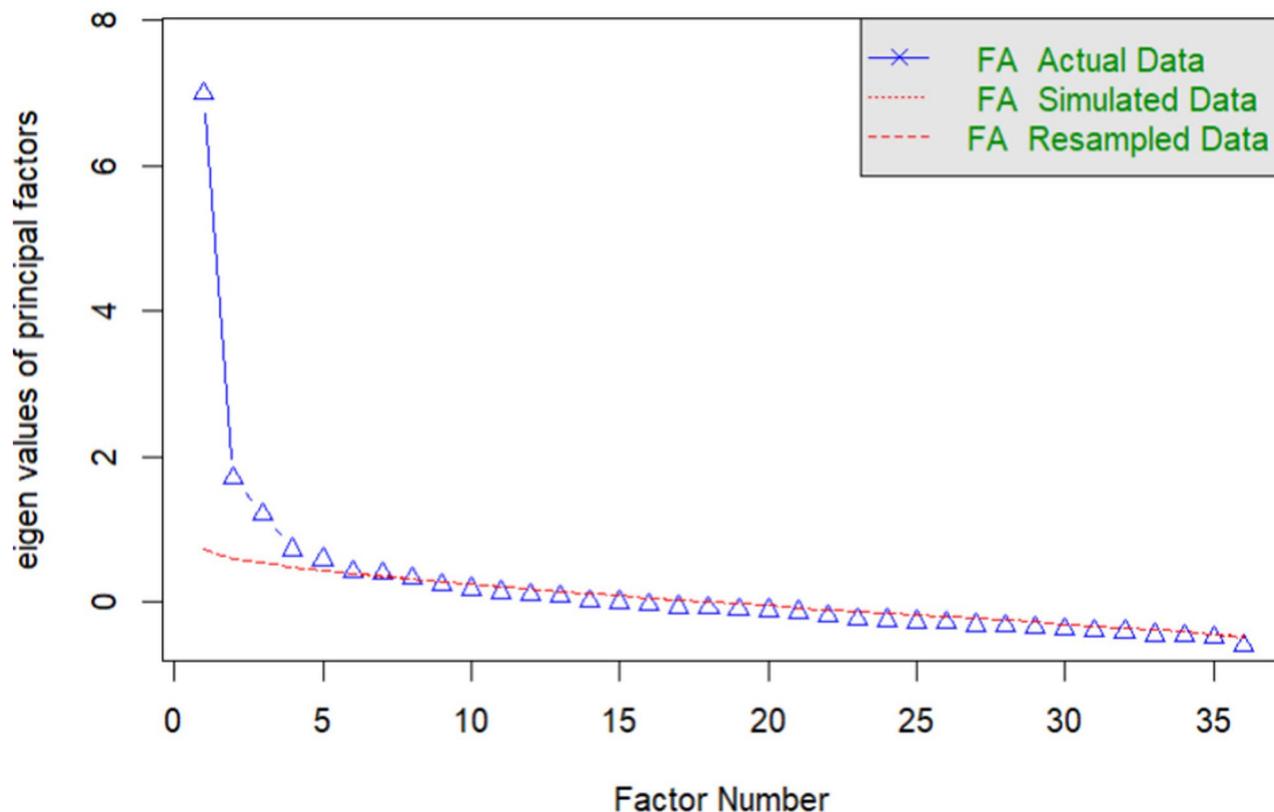


Fig. 2 Parallel Analysis Scree Plot

GFI, AGFI, RMSEA, and SRMR. According to Kline [37] and Tabachnick and Fidell [35], values above 0.90 for CFI, TLI, GFI, and AGFI indicate acceptable fit, whereas values above 0.95 reflect good fit. For RMSEA and SRMR, values below 0.05 represent good fit, and values up to 0.08 are considered acceptable. The results were as follows: $\chi^2/df = 2.622$ (acceptable fit), CFI = 0.946 (acceptable fit), TLI = 0.941 (acceptable fit), GFI = 0.982 (good fit), AGFI = 0.973 (good fit), RMSEA = 0.088 (95% CI [0.074, 0.088]; unacceptable fit), and SRMR = 0.095 (unacceptable fit).

Considering all indices together, the model demonstrated partially adequate but not unequivocally strong fit. These results suggest that while several indices support the model, some caution is needed due to the RMSEA and SRMR values, which point to areas where the model may be improved. The contributions of the items to the CFA model were examined using standardized β coefficients and p values. Tabachnick and Fidell [35] state that the items with β coefficients of 0.30 and higher and $p < .05$ make a significant contribution to the model. The path diagram showing the standardized β coefficients is presented in Fig. 3, whereas the standardized β coefficients, 95% confidence intervals, z values, and p values are reported in Table 3. Accordingly, all items made a significant contribution to the CFA model.

The reliability of the MAGS was examined by Cronbach's α , ordinal α , McDonald's ω , and item-total correlations. Internal consistency values higher than 0.70 indicate good reliability [44]. Pallant [45] states that item-total correlations should be 0.30 and higher. According to reliability analysis results, Cronbach's $\alpha = 0.884$, ordinal $\alpha = 0.920$, McDonald's $\omega_1 = 0.894$, $\omega_2 = 0.894$, $\omega_3 = 0.885$, and item-total correlations (ranging from 0.31 to 0.64) were sufficient. The results indicated that the MAGS had satisfactory construct validity and reliability. Since the scale was developed within the scope of the present study, the final English version of the MAGS is provided in Supplementary File 1.

Discussion and conclusions

In this study, we aimed to develop a valid and reliable scale to assess myths about giftedness and the characteristics of gifted individuals. According to the EFA results, a single-factor scale consisting of 25 items, named MAGS was developed, and CFA confirmed its structure. Cronbach's α , ordinal α , and McDonald's ω , indicated strong internal consistency, supporting the scale's reliability. The results showed that the RMSEA and SRMR values slightly exceeded the acceptable cutoff of 0.08. However, χ^2/df , GFI, AGFI, CFI, and TLI values provided strong evidence for the structural validity of the MAGS [35, 37]. Internal

Table 2 EFA results of MAGS

Item No	Items	Loadings
15	I think that gifted individuals have a very high level of success in every job.	0.701
16	I think gifted individuals are physically healthier than their peers.	0.681
20	I think gifted individuals are happier than their peers.	0.641
31	I think that gifted individuals do not need help with a task or job.	0.627
12	I think that gifted individuals are better than their peers in everything they do.	0.621
26	I think that gifted individuals can learn everything on their own.	0.599
14	I think gifted individuals are more adaptable than their peers.	0.598
5	I think gifted individuals are psychologically healthier than their peers.	0.594
7	I think that gifted individuals do not need encouragement for a task or job.	0.520
18	I think that gifted individuals do not get low grades in exams.	0.510
4	I think that gifted individuals get the highest grades in exams.	0.505
33	I think that giftedness is only related to academic achievement.	0.495
30	I think that those who have higher achievement in academic subjects than their peers are gifted.	0.492
23	I think gifted individuals are more moral than their peers.	0.484
32	I think gifted individuals are more popular than their peers.	0.483
11	I think that gifted individuals only come from families with high socioeconomic status.	0.463
17	I think that giftedness can only emerge in the arts.	0.463
13	I think gifted individuals do not need special education services.	0.444
27	I think that most of the gifted individuals in society are women.	0.432
9	I think that those who have a disability/handicap cannot be gifted.	0.414
35	I think that giftedness is the result of an intensive education.	0.409
8	I think that giftedness is completely formed by environmental influences.	0.386
36	I think that a gifted individual develops simultaneously in cognitive, social-emotional and physical development areas.	0.350
28	I think that every child is gifted.	0.343
25	I think that individuals with higher creativity than their peers are gifted.	0.318

KMO = .898, Bartlett's Test of Sphericity ($\chi^2_{(300)}=2804.253, p < .001$), Total Variance Explained = %29.152, Cronbach's α in study 1 sample = 0.890, *English translated versions of the items

consistency reliability values for the scale were above the recommended 0.70 threshold, and item total correlations were above the recommended 0.30, confirming the scale's reliability [44, 45].

The current study employed rigorous statistical methods including exploratory and confirmatory factor analyses to establish construct validity. The model fit indices obtained in Study 2 indicate that the scale adequately represents the latent construct. It is important to clarify that although participants initially completed the 36-item form, the CFA was conducted only on the 25 items retained after the EFA. Therefore, the fit indices and factor loadings reported in this study represent the finalized 25-item structure of the MAGS. However, because the Study 2 sample responded within the context of the original 36-item administration, the shortened scale was not administered independently. Although this does not undermine the overall validity evidence obtained, the results should be interpreted with caution, and the model fit should be viewed as preliminary until the shortened version is tested directly in a confirmatory framework.

Many existing instruments designed to assess myths about giftedness [e.g., 12,17] lack comprehensive psychometric validation, often relying solely on expert review without reporting detailed reliability or validity evidence. One notable exception is the study by Pérez et al. [18], which provided acceptable construct validity indicators through EFA; however, their study did not incorporate CFA to further test the factorial structure. Another exception is the study conducted by Ercan and Ziegler [20], which successfully validated the factor structure of the scale using both EFA and CFA methods, similar to the current study.

The present study, by employing both EFA and CFA, contributes to addressing this methodological gap. Moreover, unlike most earlier tools, which primarily used binary (e.g., true/false or yes/no) response formats, the current scale adopts a 5-point Likert-type structure, allowing for more nuanced measurement of participants' myth endorsement levels. This design aligns with contemporary psychometric recommendations for capturing psychological constructs [21, 22].

The MAGS demonstrates strong internal consistency, with reliability coefficients that are comparable to or exceed those reported in prior studies assessing similar constructs. Specifically, Cronbach's α , ordinal α , and McDonald's ω coefficients reflect excellent reliability. These values exceed those reported by Sak [12], whose subscale alphas ranged between 0.87 and 0.91, but whose overall scale alpha was 0.67, and far surpass those reported by Cheung et al. [17], whose KR-20 values ranged from 0.44 to 0.52. The reliability indices reported by Pérez et al. [18] ($\alpha = 0.899$; $\omega = 0.913$) and Ercan and Ziegler [20] ($\alpha = 0.931$) are high, similar to those found in this study.

Importantly, several studies [e.g., 13,15,16] did not report any reliability coefficients, limiting their utility in research or practice. In addition to internal consistency,

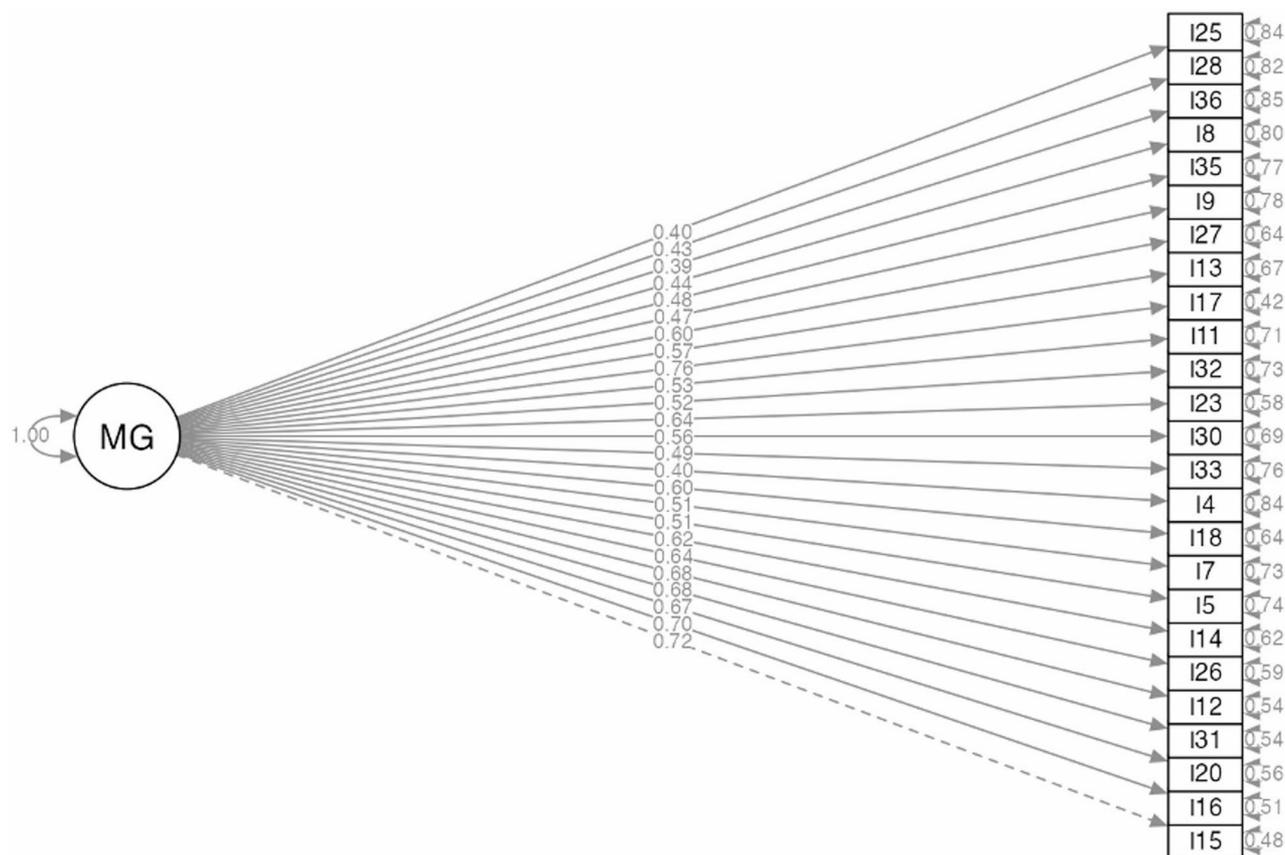


Fig. 3 Path Diagram Showing the Standardized β Coefficients for MAGS. Note. MG = Myths about Giftedness

the present study examined item-total correlations, further supporting the internal homogeneity of the scale. The inclusion of multiple reliability indices (α , ω , ordinal α , item-total correlations) adds methodological robustness [46, 47], in contrast to earlier tools that often relied on a single index or none at all [e.g., 11,15,16, 20]. Taken together, these results suggest that the MAGS provides stronger and more comprehensive psychometric evidence than most previous measures developed to assess misconceptions or myths about giftedness. By addressing both construct validity and internal consistency in a methodologically rigorous manner, this study fills a critical gap in the literature.

Although the present findings support a unidimensional structure, this does not imply that myths about giftedness are conceptually homogeneous. Rather, the single-factor solution may reflect a shared cognitive belief system, within which diverse myths related to identification, characteristics, and education are organized around a common underlying misconception framework. In this sense, conceptual diversity is not contradicted by the unidimensional structure but is integrated within a general factor of myth endorsement.

Limitations, and recommendations for further research

In this study, we employed criterion sampling; however, efforts were made to include participants from various demographic backgrounds, such as age, education level, and gender. Despite this effort, the use of nonrandom sampling limits the generalizability of the results. Future studies should aim to replicate the MAGS's validity and reliability using random sampling methods to enhance external validity. Another limitation concerns the sample composition. The age range (8–70 years) was considerably broad, might raising the possibility that younger participants may not process or interpret the concept of giftedness myths in the same manner as adults. Such age-related developmental differences could influence item comprehension and factor loadings.

The overall sample included a wide age range; however, the mean ages of the subsamples used for factor analyses indicate that the MAGS was primarily validated with adult participants (Study 1 sample: $M = 33.79$; Study 2 sample: $M = 35.00$). Accordingly, the current form of the scale is most appropriate for use with literate adults, including educators, parents, and other stakeholders involved in gifted education. The applicability of the MAGS to younger populations should therefore be considered preliminary. Future research is strongly

Table 3 Measurement model

Items	Estimate	SE	95% CI Lower	95% CI Upper	β	95% CI Lower	95% CI Upper	z	p
I15	1.000	0.0000	1.000	1.000	0.719	0.673	0.765	21.1	<0.001
I16	0.977	0.0463	0.886	1.068	0.702	0.656	0.748	20.6	<0.001
I20	0.926	0.0449	0.838	1.014	0.665	0.620	0.711	20.8	<0.001
I31	0.945	0.0454	0.856	1.034	0.679	0.633	0.725	20.8	<0.001
I12	0.945	0.0454	0.856	1.034	0.679	0.633	0.725	20.2	<0.001
I26	0.891	0.0440	0.804	0.977	0.640	0.595	0.685	19.9	<0.001
I14	0.862	0.0433	0.777	0.947	0.620	0.574	0.665	17.9	<0.001
I5	0.709	0.0397	0.631	0.787	0.510	0.465	0.554	18.0	<0.001
I7	0.716	0.0399	0.638	0.795	0.515	0.470	0.560	19.6	<0.001
I18	0.833	0.0426	0.750	0.917	0.599	0.554	0.644	15.2	<0.001
I4	0.558	0.0366	0.486	0.630	0.401	0.357	0.445	17.4	<0.001
I33	0.680	0.0391	0.603	0.757	0.489	0.444	0.533	18.8	<0.001
I30	0.775	0.0412	0.694	0.856	0.557	0.512	0.602	20.3	<0.001
I23	0.897	0.0442	0.811	0.984	0.645	0.599	0.690	18.1	<0.001
I32	0.725	0.0401	0.646	0.803	0.521	0.476	0.566	18.4	<0.001
I11	0.744	0.0405	0.664	0.823	0.535	0.490	0.579	21.9	<0.001
I17	1.061	0.0485	0.966	1.156	0.762	0.716	0.808	19.1	<0.001
I13	0.797	0.0417	0.715	0.878	0.573	0.527	0.618	19.5	<0.001
I27	0.830	0.0425	0.747	0.914	0.597	0.552	0.642	17.0	<0.001
I9	0.657	0.0386	0.581	0.733	0.472	0.428	0.517	17.2	<0.001
I35	0.667	0.0388	0.591	0.744	0.480	0.435	0.524	16.3	<0.001
I8	0.615	0.0377	0.541	0.689	0.442	0.398	0.487	15.0	<0.001
I36	0.545	0.0364	0.473	0.616	0.391	0.347	0.436	15.9	<0.001
I28	0.593	0.0373	0.520	0.666	0.426	0.382	0.471	15.1	<0.001
I25	0.550	0.0365	0.478	0.621	0.395	0.351	0.439		<0.001

encouraged to conduct age-specific validation studies, including confirmatory factor analyses and measurement invariance testing across developmental groups, to ensure that the scale functions equivalently in adolescent and child samples.

Additionally, because participants were recruited via purposive online sampling, the sample is not representative of the broader population [48]. While the use of an online platform such as Google Forms facilitated rapid, cost-effective, and geographically diverse participation, it also introduced certain methodological constraints. Online administration depends on participants' access to digital devices and internet connectivity and may increase variability in response conditions, such as differences in attention levels, environmental distractions, or the possibility of careless responding [48]. These potential sources of bias should be considered when interpreting the results. These situations should be taken into account when interpreting the results, and future studies could conduct the scale within more homogeneous age groups and with probability sampling techniques.

The data collection process itself introduces another methodological consideration. Although the initial dataset was split into two subsamples to conduct EFA and CFA, the final version of the scale was reduced to 25 items after EFA. However, participants in the second group completed the original 36-item form rather than the refined 25-item version. This inconsistency could have influenced their response patterns and thus represents a methodological limitation. Future studies are encouraged to re-assess the construct validity of the finalized 25-item version using new, independent samples in CFA.

Regarding the factor structure, although the EFA supported a unidimensional solution, the level of explained variance was modest. While an explained variance of around 30% is considered acceptable for single-factor structures in social sciences [43], the value obtained in this study fell slightly below this threshold. Therefore, this could be viewed as a methodological limitation. Future researchers are encouraged to replicate the study and the analysis using larger samples or alternative item formulations, which may help achieve higher levels of explained variance and further strengthening the construct representation. In addition, future studies may benefit from testing bifactor or hierarchical models to examine whether specific myth domains coexist with a general misconception factor, which may help explain the modest level of explained variance observed in the present study.

The absence of a measurement invariance analysis is another limitation. Such analyses are crucial for making valid socio-demographic comparisons in Turkish culture [49]. Therefore, future research should investigate whether the MAGS functions equivalently across

different groups (e.g., gender, education level, or age cohorts). Additionally, criterion-related validity was not examined in this study. In future research, external measures such as the myth scale RATIMAG [20], developed in a new study to assess the criterion validity of MAGS, may be used. Another methodological limitation is the use of classical test theory (CTT), which is based on group-level statistics and may mask individual item-level functioning. In contrast, item response theory (IRT) allows for a more detailed evaluation of item characteristics and respondent traits [50, 51]. For instance, Pérez et al. [18] applied IRT to identify which myths about giftedness were more or less malleable. A similar approach in the Turkish context may yield deeper insights into the cultural dynamics of myths about giftedness.

Moreover, due to item characteristics and distributional properties, the CFA in this study utilized ULS estimation. While this approach is suitable under certain conditions, future studies with larger samples and multivariate normality could apply ML estimation to compare the performance and predictive accuracy of ULS and ML models. The current MAGS was developed specifically for use within Turkish culture and has not yet been adapted for cross-cultural applications. This presents another limitation. Future research should focus on translating and culturally adapting the scale to different languages and populations, accompanied by measurement invariance analyses, to enable meaningful cross-cultural comparisons of myths about giftedness. In summary, future studies should therefore (a) replicate the factor structure using independent samples, (b) examine measurement invariance across age groups and stakeholder populations, and (c) conduct cross-cultural adaptation and invariance testing to establish the broader generalizability of the MAGS.

Finally, although the MAGS targets myths related to the nature and characteristics of gifted individuals, the literature indicates the presence of myths in other areas such as gifted education in schools, identification, and talent domains [e.g., 3,6,9,24]. There remains a need to develop valid and reliable myths scales addressing these broader dimensions. Building on the myth categories highlighted in the literature, developing new, psychometrically robust scales that capture these additional domains would not only address this gap but also provide more comprehensive tools for assessing misconceptions, which would contribute significantly to the field of gifted education and policy development.

Implications for practice

The findings of this study have broad and significant implications for various stakeholders involved in the education and psychological support of gifted individuals, including educators, school counselors, psychologists,

teacher educators, policy makers, and families. The development of the MAGS as a valid and reliable instrument provides a systematic means to identify, assess, and monitor prevalent misconceptions about giftedness within different cultural and educational contexts.

Cheung et al. [17] demonstrated the practical utility of myth-based assessment tools by integrating them into holistic professional development programs for teachers of gifted students in Hong Kong. Using similar approaches, the MAGS can serve as a valuable instrument to evaluate and enhance professional development programs targeting educators of gifted and talented students in the Turkish context. It enables the measurement of cognitive (knowledge), affective (attitudes), and behavioral changes regarding giftedness, facilitating data-driven adjustments to training programs.

Beyond its role in professional development, the MAGS offers versatile applications across a wide array of educational settings. It can be employed to identify myth endorsement tendencies among families of gifted children, classroom teachers, subject-matter teachers, teacher candidates, school administrators, psychologists, and other stakeholders. As both a pretest and post-test tool in educational interventions and experimental research, the MAGS allows for the assessment of shifts in myth beliefs over time, thereby informing the design of targeted and effective educational programs aimed at dispelling persistent misconceptions about giftedness.

In teacher education programs, the MAGS provides insights into pre-service teachers' existing beliefs, enabling curriculum developers and instructors to tailor course content to directly address and challenge those misconceptions. Within schools and gifted education programs, its application facilitates the identification of dominant myths among stakeholders, supporting the planning and implementation of focused training sessions and awareness initiatives. This targeted approach can contribute to improving educational practices, differentiation, and support for gifted learners.

From a research perspective, the MAGS's promising psychometric properties enable its use as a quantitative variable in cross-sectional, correlational, and group comparison studies. Researchers can explore differences in myth endorsement across demographic groups (e.g., teachers vs. families, experienced vs. novice educators) and professional roles, advancing a more nuanced understanding of how myths influence identification, educational practices, and student experiences. The scale's capacity for cross-cultural adaptation also opens avenues for international comparative studies, broadening the knowledge base on how giftedness is socially constructed in diverse educational systems.

Moreover, the MAGS holds promise beyond educational psychology, extending into clinical and counseling

psychology. Psychologists and counselors working with gifted individuals may use the scale to identify internalized myths that affect psychological well-being, motivation, and identity development. Therapeutic interventions can then target these misconceptions to foster resilience, self-efficacy, and a positive self-concept among gifted clients. Importantly, the cultural adaptation of the MAGS underscores the necessity of considering socio-cultural factors in assessing beliefs about giftedness. Practitioners and researchers should be attentive to cultural variations in myth prevalence and expression, tailoring interventions and research designs accordingly to enhance relevance and effectiveness.

In summary, the MAGS is not only a psychometrically sound measurement tool but also a practical instrument with wide-ranging applications. It can inform policy development, guide professional learning and practice, support targeted educational and clinical interventions, and contribute to the well-being and academic success of gifted individuals. The scale's adaptability for future cross-cultural validation further enhances its value as a tool for advancing gifted education research and practice internationally. Taken together, the modest explained variance and the partially adequate CFA fit indices indicate that the MAGS should be regarded as a preliminary instrument, providing initial evidence of validity rather than a finalized psychometric tool.

Abbreviations

CFA	Confirmatory factor analysis
CTT	Classical test theory
DWLS	Diagonally weighted least squares
EFA	Exploratory factor analysis
GCQ	Gifted child quarterly
IRT	Item response theory
KR-20	Kuder-Richardson 20
MAGS	Myths about giftedness scale
ML	Maximum likelihood
RATIMAG	Rapid assessment test of individual misconceptions about giftedness
ULS	Unweighted least squares

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s40359-026-04060-0>.

Supplementary Material 1.

Acknowledgements

This study was presented at "The 18th Asia-Pacific Conference on Giftedness" with scholarship support from TÜBİTAK 2224-A Programme in August 2024.

Authors' contributions

ŞG conceptualized the topic of the manuscript and drafted the Introduction and Discussion sections. MA refined the research questions, drafted the Method section, conducted the data analysis, prepared the Results section, and contributed to the writing of the Discussion section. ŞG and MA jointly conducted data collection and obtained expert opinions during the scale development process. Both authors reviewed and edited all sections of

the manuscript after the initial draft was completed and approved the final version for submission.

Funding

No specific funding was received for this work.

Data availability

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

Declarations

Ethics approval and consent to participate

The Ethics Committee for Scientific Research and Publication of the Uşak University's Social and Human Sciences approved the present study on July 04, 2024 (Decision No: 2024 – 159). All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments. All participants provided informed consent prior to participation.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Received: 13 August 2025 / Accepted: 23 January 2026

Published online: 04 February 2026

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