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Validation of the Maher Multidimensional Talent Assessment Scale (MMTA) for Secondary School Students

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A B S T R A C T

Purpose: The present study aimed to validate the Maher Multidimensional Talent Assessment (MMTA) self-report scale for male and female students in the first stage of secondary education.
Methodology: This study employed a descriptive design and was quantitative in nature, categorized as a psychometric research study. It was applied in terms of purpose and utilized a survey method for data collection. From a methodological perspective, it was an assessment tool development study that incorporated correlation methods, goodness-of-fit studies, factor analysis, reliability analysis, and the extraction of standardized scores to examine the degree of correlation and alignment between questionnaire variables and theoretical foundations, as well as to standardize the questionnaire. The statistical population included all students aged 10 to 12 years in the first stage of secondary education from public and non-profit schools in District 1 of the Tehran Department of Education. From this population, a total of 200 female and 200 male students participated in the study. Data analysis methods included Pearson correlation, exploratory and confirmatory factor analysis, Cronbach's alpha analysis, and standard score calculations.
Findings: Findings from exploratory factor analysis, conducted using principal component analysis with Varimax rotation on the 52 items of the MMTA scale, identified five distinct factors. Based on the results of standardized path coefficients, the first factor, "Abilities and Skills," included 12 items with a path coefficient of 0.65. The second factor, "Valuable Goals," consisted of 10 items. The third factor, "Personal Capabilities," comprised 10 items with a path coefficient of 0.36. The fourth factor, "Interest and Enthusiasm," included 8 items with a path coefficient of 0.35. The fifth factor, "Preferred Professions," consisted of 12 items with a path coefficient of 0.58. These findings were statistically significant at the 0.005 level ($P < 0.005$). The reliability results for the MMTA scale for male and female secondary school students showed that the Cronbach's alpha coefficient for the overall scale was 0.92. The Cronbach's alpha values for the subscales were as follows: 0.91 for abilities and skills, 0.89 for valuable goals, 0.93 for personal capabilities, 0.88 for interest and enthusiasm, and 0.89 for preferred professions. Additionally, test-retest correlation coefficients for the overall test were 0.79.
Conclusion: The findings indicate that the MMTA scale, with its five components, is a suitable tool for assessing students' talents.
Keywords: *Validation, Maher Multidimensional Talent Assessment (MMTA) Scale*

1. Introduction

One of the most significant variables in the field of education that has attracted substantial research is the concept of talent and talent identification (Roghani et al., 2024; Saadati Shamir & Mousavi Fazli, 2023). Many theorists in the field of education believe that the best path to societal progress and development is the identification and education of talented individuals within that society. These individuals, possessing high cognitive capacities, have the ability to create positive and efficient changes in the educational system and can accelerate the development process of a society (Jha, 2020; Jowsey & Visser, 2021; Kajbaf et al., 2013).

To date, no suitable model for talent identification among students has been developed in Iran. As previously mentioned, all talent identification programs currently implemented in schools fail to accurately recognize students' true talents. Another issue in the process of talent identification and academic guidance is the lack of reliable and scientifically validated indicators for different professions. Furthermore, as Song and Cai (2024) have noted, individuals who enter various professions in the future without selecting their careers based on their true talents are unlikely to achieve high productivity, efficiency, or effectiveness in their chosen fields (Song & Cai, 2024).

Sternberg is one of the few cognitive psychologists who has conducted extensive research on intelligence theories and methods of talent assessment. According to Sternberg, talented individuals share three common characteristics, which align with his analytical definition of intelligence (Saadati Shamir & Zahmatkesh, 2022; Seadatee Shamir et al., 2010; Seadatee Shamir & Mazbohi, 2018; Seadatee Shamir et al., 2018). These characteristics include analytical intelligence, which refers to the ability to analyze and evaluate one's own ideas and those of others; creative intelligence, which refers to the ability to generate one or more original and high-quality ideas; and practical intelligence, which refers to the ability to persuade others of the value and applicability of ideas. According to Sternberg (1990), individuals have both strengths and weaknesses, although their patterns of strengths may change over time. Many tasks require the use of all three types of thinking, but this does not mean that all individuals, even those who are talented, possess equal proficiency in all three areas. Rather, talented individuals utilize their strengths and compensate for or improve their weaknesses (Roghani et al., 2024). Sternberg (1996) has also noted that individuals may exhibit different patterns of skills and talents at various stages of their lives (Seadatee Shamir & Mazbohi, 2018; Seadatee Shamir et al., 2018; Seadatee Shamir & Sanee'i Hamzanlouyi, 2017; Seadatee Shamir et al., 2017).

Studies have stated that after three decades of research, Sternberg continues to encounter unanswered questions regarding the nature of superior intelligence and why some talented individuals make a positive impact on the world while others do not (Ackerman, 2022). To explore this issue, Sternberg studied individuals such as Gandhi, Martin Luther King Jr., and Mother Teresa, comparing them with Stalin and Hitler. He found that their intelligence levels were not significantly different; rather, their differences lay in wisdom. Sternberg (1998) proposed the Balance Theory of Wisdom, defining wisdom as the application of intelligence, creativity, common sense, and individual knowledge in alignment with positive moral values to achieve shared positive goals. According to this theory, wisdom is developed over time through the recognition and cultivation of intrapersonal, interpersonal, and extrapersonal interests to facilitate adaptation to the environment, the shaping of new environments, and the selection of optimal environments. Sternberg argues that wise decisions require not just intelligence and absolute knowledge but also implicit knowledge gained through experience (Saadati Shamir & Zahmatkesh, 2022; Shah Mohammadi et al., 2018).

Researchers have stated that, based on Sternberg's theory, wisdom entails personal understanding of balance and adaptation, equilibrium between different tendencies, anticipation and evaluation of both immediate and long-term consequences, and appropriate environmental responses. According to this theory, wisdom requires a rational balance between intrapersonal interests, extrapersonal interests, and environmental responses. Importantly, these interests and tendencies are not assessed equally. Wisdom involves identifying a common goal and persuading others to commit to the values underlying that goal (Kaufman et al., 2022; Morad Kioumarth et al., 2022; Saadati Shamir & Zahmatkesh, 2022; Sternberg, 2020).

There is a general consensus among researchers regarding the characteristics of highly talented students. Fraser and Passow (1994), in a comprehensive review of research on gifted and highly talented students from diverse backgrounds, identified "common characteristics of giftedness"—attributes, talents, and behaviors consistently observed in all talented students. They found that fundamental elements of giftedness are similar across cultures, although not all characteristics are present in every

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student. These elements include motivation, advanced interests, communication skills, problem-solving abilities, enhanced memory, research capabilities, insight, reasoning, imagination/creativity, a sense of humor, and advanced proficiency in handling symbolic systems. However, each of these common characteristics may manifest differently in different students, and care must be taken when identifying these traits in students from diverse backgrounds. For example, motivation may be demonstrated differently by a Spanish-speaking urban student who speaks English as a second language compared to a student from a high socioeconomic background belonging to the cultural majority (Dehghan Tarzjani & Banshi, 2018; Mir Arabshahi et al., 2022; Nazarian et al., 2020; Yaqoubi & Davoodi, 2018).

Overall, numerous studies and a variety of talent assessments with different conditions and methodologies exist, making them applicable in different contexts. However, in order to develop a suitable and culturally relevant test for Iranian students, it appears necessary to validate an indigenous test tailored to Iran's cultural conditions. Therefore, the research question of this study is whether the Maher Multidimensional Talent Assessment (MMTA) scale is an appropriate tool for assessing the talents of male and female students in the first stage of secondary education.

2. Methods and Materials

2.1. Study Design and Participants

The present study falls within the category of descriptive research and, in terms of research design and implementation, is classified as a psychometric study. The researcher aims to standardize a scale in District 1 of Tehran and determine its cut-off scores, validity, and reliability for use within the country. Therefore, this research is descriptive and falls under the psychometric category. Additionally, the study is applied in nature. From the perspective of data collection, it is a survey-based study and, methodologically, is considered a test-development study conducted within a broader descriptive research framework.

In this study, correlation methods, goodness-of-fit analysis, factor analysis, reliability analysis, and standardized score extraction were used to examine the degree of correlation and alignment between the questionnaire variables and theoretical foundations, as well as to standardize the questionnaire.

The statistical population consisted of all students aged 10 to 12 years in the first stage of secondary education from public and non-profit schools in District 1 of the Tehran Department of Education, totaling approximately 16,000 students. Given the psychometric nature of the research design and using the Krejcie and Morgan (1976) table, a sample of 550 students aged 10 to 12 years was selected through convenience sampling from District 1 of Tehran. Among these, 200 female and 200 male students participated in the study. Since the statistical population in the present study was considered unlimited, based on the sample size formula for an unlimited population with $\alpha = 0.01$, a total of 400 students were selected as the study sample, and the test was administered individually, followed by data analysis.

2.2. Instruments

This test was developed and designed by Sa'adati Shamir and Zahmatkesh (2022) to assess the talents of adolescents aged 7 to 18 years and adults. The test comprises three forms: (1) preliminary talent assessment, (2) intermediate talent assessment, and (3) advanced talent assessment (Saadati Shamir & Zahmatkesh, 2022).

The preliminary talent assessment form includes five core components of talent assessment: (1) abilities and skills, (2) valuable goals, (3) personal capabilities, (4) interests and preferences, and (5) preferred professions.

For scoring, the test initially requires participants to identify and rank their top five talents in order of importance. Each talent within the five components is separately evaluated, and the participant's status in each talent is determined based on the corresponding questions and indicators. The five components contain 12, 10, 10, 8, and 12 questions, respectively. Participants respond using a six-point Likert scale ranging from "not at all" to "very much," with a scoring range from 0 ("not at all") to 5 ("very much").

The minimum total score for a participant is 0, and the maximum is 260, with a cut-off point of 130 for each activity. Finally, the average scores for talents and skills, valuable career goals, personal capabilities, interests and preferences, and preferred occupations are summed. The highest mean score for each talent is then identified as the dominant talent and recorded in a summary score table.

If a participant fails to identify five talents, the number of reported talents is evaluated. Therefore, it is not necessary for participants or evaluators to mention exactly five items for each of the five components. The final status and ranking

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of talents are determined based on the number of reported talents and the frequency of responses.

2.3. *Data Analysis*

For data analysis, both descriptive and inferential statistical methods were employed. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were used to summarize demographic characteristics and participants' responses. Exploratory factor analysis (EFA) was conducted using principal component analysis with Varimax rotation to determine the factor structure of the Maher Multidimensional Talent Assessment (MMTA) Scale. Confirmatory factor analysis (CFA) was then performed to validate the factor structure and assess the model fit using indices such as χ^2/df, CFI, NFI, IFI, RMSEA, RFI, and TLI. Internal consistency of the scale was measured using Cronbach's alpha, and test-retest reliability was evaluated through correlation analysis. Pearson correlation coefficients were calculated to examine the relationships between the MMTA Scale and the Holland Talent Assessment Scale to assess convergent validity. The Tukey post-hoc test was used to compare age-based differences, and independent samples t-tests were conducted to examine potential gender differences. Statistical analyses were carried out using SPSS-28 and AMOS-24 software, with a significance level set at $P < 0.05$.

3. Findings and Results

The descriptive statistics for male and female students, as presented in Table 1, indicate that 50% of the participants were boys and 50% were girls.

Table 1

Descriptive Statistics of Male and Female Students by Gender

Gender	Absolute Frequency	Relative Frequency
Boys	200	0.50
Girls	200	0.50
Total	400	1.00

The validity of the Maher Multidimensional Talent Assessment (MMTA) Scale was examined using construct validity through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), as well as concurrent validity. Before conducting the exploratory factor analysis, the sampling adequacy test and Bartlett's test of sphericity for the MMTA Scale were performed, with results presented in Table 2.

Table 2

Sampling Adequacy and Bartlett's Test of Sphericity for the Maher Multidimensional Talent Assessment (MMTA) Scale

Index	Value
KMO	0.91
Bartlett's Test (Chi-Square)	12395.31
Degrees of Freedom	533
Sig	0.002
Determinant	2

Exploratory factor analysis was conducted on the MMTA Scale, which consists of 52 items derived from the theoretical foundations of talent assessment. The initial results of the principal component analysis of the research instrument indicated that all items had appropriate factor loadings. Based on this, the Kaiser-Meyer-Olkin (KMO) sampling adequacy measure was 0.89, and Bartlett's test of sphericity was significant at 12395.25 ($P < 0.001$). As illustrated in Figure 1, factor loadings for five factors exceeded one, and these five factors played a significant role in the exploratory factor analysis of the MMTA Scale. The eigenvalues, variance of each factor, and total variance explained by the factors are presented in Table 3.

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Table 3

Total Variance Explained for the Maher Multidimensional Talent Assessment (MMTA) Scale

Factor	Factor Name	Eigenvalue	Variance (%)	Cumulative Variance (%)
Factor 1	Abilities and Skills	8.48	25.69	25.69
Factor 2	Valuable Goals	5.10	15.48	41.18
Factor 3	Personal Capabilities	4.12	12.50	53.68
Factor 4	Interest and Enthusiasm	5.19	15.43	41.28
Factor 5	Preferred Professions	5.12	12.52	53.71

Exploratory factor analysis was conducted using principal component analysis with Varimax rotation on the 52 items of the MMTA Scale. The criterion of eigenvalues greater than one was used to determine the number of factors. Based on the data in Table 3, the results revealed the presence of five identifiable factors in this scale, collectively explaining approximately 54% of the variance in the talent assessment construct. These factors, in order, were abilities and skills, valuable goals, personal capabilities, interest and enthusiasm, and preferred professions. The factor loadings corresponding to the items of each factor were identified and are presented in Table 4.

To assess the research question, the items related to each of the five components were administered to the participants. Subsequently, the scores for each component were calculated based on the scoring formula, and the validity of the test was evaluated accordingly.

Table 4

Exploratory Factor Analysis of the Items in the Maher Multidimensional Talent Assessment (MMTA) Scale

Item	Talent	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Abilities and Skills						
1	To what extent are you interested in this ability or skill?	0.779				
2	To what extent do you have talent in this ability or skill?	0.755				
3	To what extent is this ability or skill valuable to you?	0.767				
5	How much income would this ability or skill generate if it became your desired profession?	0.711				
6	How satisfied would you be if you obtained a job related to this ability or skill?	0.809				
7	How much social credibility does a job related to this talent have if you achieve it?	0.951				
8	To what extent do you have the necessary tools to pursue a career related to this skill?	0.611				
9	To what extent do you have the necessary conditions to turn this ability into your desired profession?	0.755				
10	To what extent do you believe you can turn this ability into your desired profession?	0.776				
11	To what extent do you have the necessary personal capabilities to reach peak development in this ability?	0.779				
12	To what extent do you have sufficient knowledge about the job related to your desired skill?	0.778				
Valuable Goals						
13	How important is this valuable goal compared to other valuable goals?		0.766			
14	To what extent do you continue pursuing this valuable goal even in times of discouragement?		0.721			
15	To what extent are you committed to pursuing this valuable goal even when exhausted?		0.790			
16	To what extent do you persist in pursuing this valuable goal even without approval or encouragement?		0.733			
17	To what extent are you willing to sacrifice other desires and pleasures to achieve this valuable goal?		0.752			
18	To what extent will you feel competent upon achieving this valuable goal?		0.710			

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19	To what extent do you engage in imagination and dreaming to reach this valuable goal?	0.824			
20	To what extent do you strive to find the best solution to achieve this valuable goal?	0.738			
21	To what extent do you believe in finding appropriate role models to achieve this valuable goal?	0.790			
Personal Capabilities					
23	How important is this personality trait compared to other traits?		0.633		
24	How important is this personality trait in preventing discouragement in talent development?		0.746		
25	To what extent does this personality trait contribute to talent development even when exhausted?		0.734		
26	To what extent does this personality trait support talent development even without external approval or encouragement?		0.767		
27	To what extent does this personality trait help in sacrificing other desires and pleasures?		0.790		
28	To what extent does this personality trait create positive excitement in talent development?		0.691		
29	To what extent does this personality trait generate a sense of competence in talent development?		0.778		
30	To what extent does this personality trait encourage imagination and dreaming in talent development?		0.698		
31	To what extent does effort in finding the best solution enhance talent development?		0.858		
32	To what extent does this personality trait assist in finding appropriate role models for talent development?		0.792		
Interest and Enthusiasm					
33	How important is this enthusiasm in the development of your talents?			0.881	
34	To what extent does this interest contribute to the growth and development of your talents?			0.786	
35	To what extent is this interest valuable to you?			0.737	
36	To what extent does this interest help you reach your desired career?			0.864	
37	To what extent does this interest contribute to achieving social recognition in your desired career?			0.711	
38	To what extent does this interest stimulate imagination and dreaming in talent development?			0.732	
39	To what extent does this interest support efforts to find the best solution for talent development?			0.734	
40	To what extent does this interest assist in identifying appropriate role models for talent development?			0.708	
Preferred Professions					
41	To what extent is attaining this profession valuable and important to you?				0.853
42	To what extent do you have talent in this profession?				0.876
43	To what extent do you have interest and enthusiasm for this profession?				0.761
44	How socially prestigious is this profession?				0.781
45	How much income would you generate in this profession?				0.726
46	How satisfied would you be in this profession?				0.891
47	To what extent do you have the resources and tools necessary to attain this profession?				0.764
48	To what extent do you believe you will attain this profession?				0.677
49	To what extent do you have the necessary personality traits for this profession?				0.737
50	How familiar are you with this profession?				0.836
51	What is the likelihood of you attaining this profession?				0.753
52	To what extent do you have the necessary conditions and opportunities to pursue this profession?				0.876

Based on the data in Table 4, 12 items (Items 1–12) were loaded onto the first factor, which was labeled "Abilities and Skills." Ten items (Items 13–22) were loaded onto the second factor, labeled "Valuable Goals." Ten items (Items 23–32) were loaded onto the third factor, labeled "Personal Capabilities." Eight items (Items 33–40) were loaded onto the fourth factor, labeled "Interest and Enthusiasm." Twelve

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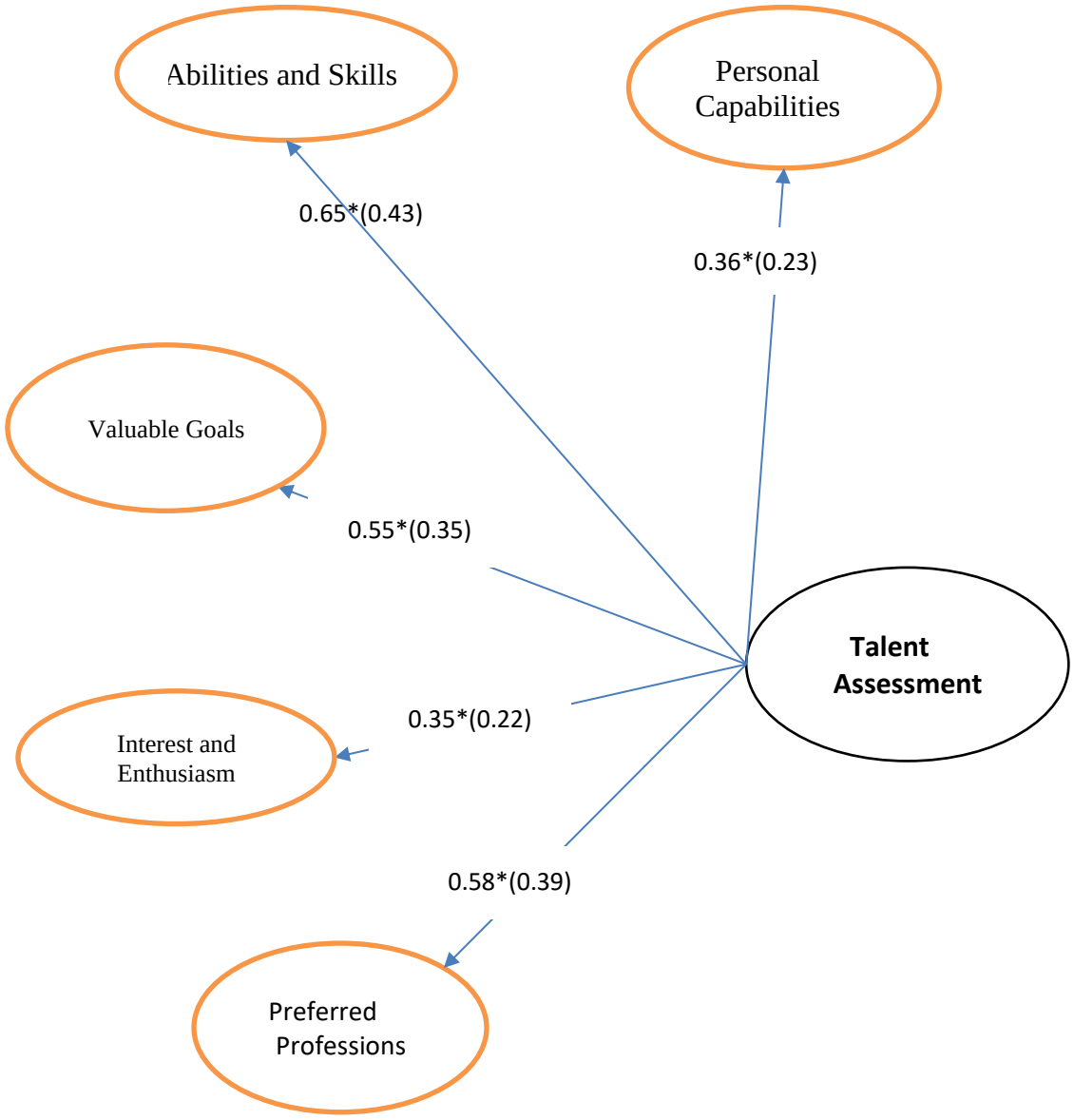
items (Items 41–52) were loaded onto the fifth factor, labeled "Preferred Professions."

To confirm the association between the items and the primary construct, confirmatory factor analysis was conducted using a sample of 400 participants. The results of this analysis are presented in Figure 1.

Figure 1

Fitted Research Model



In the above model, ellipses represent latent variables, and squares represent observed variables. The numbers on the arrows indicate factor loadings, while the numbers in parentheses represent factor loadings related to latent variables. ($P < 0.001$, $\chi^2 = 25.55$, df = 19, sig = 0.001)

According to the above model, the standardized path coefficients for the talent assessment components are as follows: The first factor, "Abilities and Skills," consists of 12 items (items 1–12) with a path coefficient of 0.65 and t = 0.43, which is significant at the $P < 0.005$ level. The second factor, "Valuable Goals," consists of 10 items (items 13–22) with a path coefficient of 0.44 and t = 0.35, which is significant at the $P < 0.005$ level. The third factor, "Personal Capabilities," consists of 10 items (items 23–32) with a path coefficient of 0.36 and t = 0.23, which is significant at the $P < 0.005$ level. The fourth factor, "Interest and Enthusiasm," consists of 8 items (items 33–40) with a path coefficient of

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0.35 and t = 0.22, which is significant at the P < 0.005 level. The fifth factor, "Preferred Professions," consists of 12 items (items 41–52) with a path coefficient of 0.58 and t = 0.39, which is significant at the P < 0.005 level. The structural model fit indices for the talent assessment scale are presented in Table 5.

Table 5

Fit Indices for the Structural Model of the Talent Assessment Scale

Fit Index	χ^2	χ^2/df	IFI	NFI	CFI	RMSEA	RFI	TLI
Acceptable Range		1–5	>0.90	>0.90	>0.90	<0.07	>0.90	>0.90
Observed Values	24.51	1.22	0.98	0.93	0.98	0.04	0.90	0.97
Fit Status	Good	Good	Good	Good	Good	Good	Good	Good

As seen in Table 5, one of the absolute fit indices is the chi-square statistic (χ^2), which was obtained as 24.51 with df = 18. The chi-square test is an absolute fit index, and a non-significant small value indicates a good model fit with the data. Additionally, the relative chi-square index was found to be 1.22, which is in the acceptable range. The root mean square error of approximation (RMSEA), a widely accepted absolute fit index, was 0.04, which is considered an excellent fit according to Byrne (1998), who suggests that RMSEA values below 0.07 are acceptable.

Moreover, the comparative fit index (CFI) was 0.98, the normed fit index (NFI) was 0.93, and the incremental fit index (IFI) was 0.98, all of which indicate a good model fit. Knight, Weirden, Ocampo, and Rosa (1994) suggested that a fit value above 0.90 is considered highly suitable. Additionally, the relative fit index (RFI) was 0.90, and the Tucker-Lewis index (TLI) was 0.97, all of which were in the acceptable range.

Considering the above values, the significance of the standardized correlation coefficients, and the overall fit indices, it can be concluded that the structural model of the talent assessment scale has a good fit with the empirical data.

The reliability of the Maher Multidimensional Talent Assessment (MMTA) Scale was calculated using internal consistency (Cronbach's alpha) and test-retest methods. The results are presented in Table 6.

Table 6

Overall Reliability of the Maher Multidimensional Talent Assessment (MMTA) Scale Using Cronbach's Alpha and Test-Retest

Dimension	Number of Items	Cronbach's Alpha	Test-Retest*
Abilities and Skills	12	0.91	0.88
Valuable Goals	10	0.89	0.89
Personal Capabilities	10	0.93	0.71
Interest and Enthusiasm	8	0.88	0.65
Preferred Professions	12	0.89	0.69
Overall Talent Scale	52	0.92	0.79

*The test-retest reliability was conducted on a sample of 50 participants.

The results in Table 6 indicate that the Cronbach's alpha coefficient for the overall MMTA Scale was 0.92, demonstrating excellent internal consistency. The Cronbach's alpha coefficients for the subscales were as follows: 0.91 for abilities and skills, 0.89 for valuable goals, 0.93 for personal capabilities, 0.88 for interest and enthusiasm, and 0.89 for preferred professions. The test-retest correlation coefficient for the overall test was 0.79, indicating good reliability.

Furthermore, the mean and standard deviation for each dimension and the overall test were calculated separately for male and female participants, as presented in Table 7.

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Table 7

Mean and Standard Deviation of the Maher Multidimensional Talent Assessment (MMTA) Scale for Male and Female Students

Dimension	Gender	N	Mean	SD	t	p
Abilities and Skills	Boys	998	27.78	8.24	0.79	0.685
	Girls	1022	27.29	7.44		
	Total	2020	22.53	7.99		
Valuable Goals	Boys	989	16.98	6.68	0.49	0.619
	Girls	1002	16.74	5.91		
	Total	1991	16.86	5.79		
Personal Capabilities	Boys	992	31.50	6.84	0.44	0.659
	Girls	1012	31.18	7.41		
	Total	2002	31.34	8.61		
Interest and Enthusiasm	Boys	1002	16.11	5.55	0.521	0.712
	Girls	1001	16.86	5.21		
	Total	2003	16.55	5.34		
Preferred Professions	Boys	1003	31.50	6.84	0.44	0.810
	Girls	1012	32.18	7.41		
	Total	2015	32.34	8.61		
Overall MMTA Scale	Boys	1001	71.25	11.98	0.78	0.890
	Girls	2003	74.23	12.40		
	Total	1922	75.73	13.68		

The results in Table 7 present the mean and standard deviation of the Maher Multidimensional Talent Assessment (MMTA) Scale and its components (abilities and skills, valuable goals, personal capabilities, interest and enthusiasm, and preferred professions) among male and female students. According to the findings, no significant differences were observed in the overall score or the component scores of the MMTA Scale between male and female students.

In conclusion, the overall analysis indicates that the 52-item Maher Multidimensional Talent Assessment (MMTA) Scale has satisfactory validity and reliability. Furthermore, the mean and standard deviation for the overall test across different age groups were calculated separately and are presented in Table 8.

Table 8

Comparison of the Maher Multidimensional Talent Assessment (MMTA) Scale by Age

Index	Age	N	Mean	SD	F	p
	12	130	33.47	10.56		
	13	133	33.70	9.47		
Intelligence Test	14	127	33.28	8.33	4.33	0.001

The results in Table 8 present the comparison of the Maher Multidimensional Talent Assessment (MMTA) Scale based on age. The findings indicate a significant difference in overall scores across different age groups. A post-hoc Tukey test was conducted to compare the differences between age groups, and the results are presented in Table 9.

Table 9

Post-Hoc Tukey Test Results for Differences in the Maher Multidimensional Talent Assessment (MMTA) Scale Across Age Groups

Age (I)	Age (J)	Mean Difference	Standard Error	Significance Level
12	12	-0.23	1.41	0.869
	13	-2.80	1.42	0.049
	14	-3.79	1.40	0.007
13	12	-3.56	1.37	0.011
	13	-5.55	1.38	0.001
	14	-6.61	1.41	0.001

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14	12	-0.99	1.40	0.479
	13	-2.98	1.39	0.033
	14	-4.04	1.42	0.005

The results in Table 9 indicate that the MMTA Scale scores do not show a significant difference between the 12- and 13-year-old groups, but they do differ significantly from the older age groups. Similarly, the MMTA Scale scores of 13- and 14-year-olds do not show a significant difference, but they do differ significantly from the other groups. Likewise, the scores for 12- and 14-year-olds do not differ significantly but are significantly different from the remaining age groups. The norm scores for the MMTA Scale in the present sample for ages 12 to 14 years were determined, and the results are presented in Table 10.

Table 10

Raw and Norm Scores for the Maher Multidimensional Talent Assessment (MMTA) Scale Among Students Aged 12–14 Years

Raw Score (12)	z Score	Raw Score (13)	z Score	Raw Score (14)	z Score
105	-2.60	106	0.38	102	-2.37
108	-2.31	107	0.48	104	-2.22
100	-2.11	110	0.77	105	-2.15
102	-1.90	112	0.96	107	-2.01
104	-1.71	114	1.43	108	-1.94
105	-1.62	115	1.25	109	-1.81
106	-1.52	117	1.44	111	-1.73
107	-1.42	118	1.54	113	-1.60
108	-1.33	120	1.73	115	-1.52
109	-1.23	122	1.92	118	-1.38
110	-1.14	124	2.11	117	-1.31
111	-1.03	125	2.21	119	-1.17
112	-0.95	126	2.31	91	-1.03
113	-0.85	128	2.50	92	-0.96
114	-0.75	200	2.68	93	-0.89
115	-0.66	102	2.87	94	-0.82
116	-0.56	105	3.11	95	-0.75
117	-0.47	106	3.24	105	-0.68
118	-0.37	107	3.35	106	-0.54
119	-0.27	109	3.52	107	-0.48
120	-0.18	110	3.63	109	-0.41
121	-0.07	115	2.21	110	-0.34
122	0.01	118	2.31	115	-0.27
123	0.10	119	2.50	105	-0.20
124	0.20	120	2.68	119	-0.13
125	0.29	122	2.87	120	-0.06

Based on Table 10 and the results of norming the MMTA Scale for 12-year-olds, the lowest score observed was 100, and the highest score was 125, with a score range of 25. The 50th percentile (cut-off score) for 12-year-olds was determined to be 112. The mean and standard deviation for the MMTA Scale in 12-year-olds were 107.47 and 17.56, respectively.

The results of norming the MMTA Scale for 13-year-olds showed that the lowest score was 102, and the highest score was 128, with a score range of 13. The mean and standard deviation for the MMTA Scale in 13-year-olds were 107.70 and 16.47, respectively. The 50th percentile for 13-year-olds was determined to be 113.

The results of norming the MMTA Scale for 14-year-olds indicated that the lowest score was 91, and the highest score was 120, with a score range of 15. The mean and standard deviation for the MMTA Scale in 14-year-olds were 70.28 and 8.33, respectively. The 50th percentile for 14-year-olds was determined to be 70.

4. Discussion and Conclusion

The findings of the present study, based on exploratory factor analysis using principal component analysis with

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Varimax rotation on the 52 items of the Maher Multidimensional Talent Assessment (MMTA) Scale, identified five distinct factors: abilities and skills, valuable goals, personal capabilities, interest and enthusiasm, and preferred professions. The results of standardized path coefficients for the talent assessment components indicated that the first factor, "Abilities and Skills," consisting of 12 items (items 1–12), had a path coefficient of 0.65 with t = 0.43, which was significant at the P < 0.005 level. The second factor, "Valuable Goals," with 10 items (items 13–22), had a path coefficient of 0.44 with t = 0.35, also significant at the P < 0.005 level. The third factor, "Personal Capabilities," consisting of 10 items (items 23–32), had a path coefficient of 0.36 with t = 0.23, significant at the P < 0.005 level. The fourth factor, "Interest and Enthusiasm," with 8 items (items 33–40), had a path coefficient of 0.35 with t = 0.22, significant at the P < 0.005 level. The fifth factor, "Preferred Professions," with 12 items (items 41–52), had a path coefficient of 0.58 with t = 0.39, significant at the P < 0.005 level. Furthermore, the findings demonstrated that the obtained model had an adequate fit with the research data.

The correlation coefficient between abilities and skills, valuable goals, personal capabilities, interest and enthusiasm, and preferred professions with the overall score of the MMTA Scale and the Holland Talent Assessment Scale was positive and significant. This indicates that the present scale has satisfactory convergent validity. These results also confirm the divergent validity of the Maher Multidimensional Talent Assessment (MMTA). The studies (Azadi & Dezhkoohi, 2021; Cavas & Cavas, 2020) on the assessment and standardization of Gardner's multiple intelligences showed that various types of intelligence, including the MMTA Scale, demonstrate adequate reliability in child and adolescent populations. The findings of these studies, based on Gardner's theory, support the notion that the MMTA Scale is important in educational settings and in the cognitive development of children. The assessment of this scale can play a significant role in the learning and educational process of children. Therefore, an instrument with appropriate validity can assist children and teachers in identifying and assessing intelligence. The results confirm that the MMTA Scale has acceptable validity.

For the present scale, after the relevant and appropriate items were developed, construct validity was examined using exploratory and confirmatory factor analyses to determine factor loadings and assess the relationship between the components and the overall construct. The findings align with prior studies (Ershadi Chahardeh et al., 2024; Saadati Shamir & Zahmatkesh, 2022).

The reliability results of the MMTA Scale for male and female secondary school students showed that the Cronbach's alpha coefficient for the overall scale was 0.92. The reliability coefficients for the subscales were 0.91 for abilities and skills, 0.89 for valuable goals, 0.93 for personal capabilities, 0.88 for interest and enthusiasm, and 0.89 for preferred professions. The test-retest correlation coefficient for the overall test was 0.79. Additionally, the mean and standard deviation were calculated separately for each dimension and for the overall test in male and female students. The results showed no significant difference in the overall score or in the subscale scores between male and female students.

Various studies (Hashemi Rezini, 2013; Mir Arabshahi et al., 2022; Nazarian et al., 2020; Yaqoubi & Davoodi, 2018) have confirmed the reliability of different talent dimensions. These findings suggest that individuals, based on their unique personality traits, environment, and individual differences, develop one or more types of talent to a greater extent and are better prepared to utilize them in their lives (Nazarian et al., 2020). In recent research, talent has attracted significant attention among scholars due to its relevance to social relationships (Yaqoubi & Davoodi, 2018).

The literature on talent assessment indicates that tools standardized in other countries have not specifically evaluated talent assessment scales. Studies conducted outside Iran have not considered the country's cultural foundations, and within Iran, most available tools are either translated versions or adapted from standardized foreign assessments. Therefore, the MMTA Scale, due to its localized nature and consideration of national and cultural indicators, can be a suitable tool for talent assessment. This scale can help children understand their interests, capabilities, and personality traits, enhancing their self-awareness, cognition, and self-efficacy. The MMTA Scale plays a vital role in child development, emphasizing that each child possesses unique strengths and weaknesses. By identifying these talents, educators and teachers can tailor their teaching methods to enhance each child's specific strengths instead of relying on a uniform approach. This scale allows children to learn in ways that are more engaging and meaningful to them, ultimately improving their individual and academic performance. Therefore, the use of the MMTA Scale for identifying and evaluating children's

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talents can be highly significant and serve as a reliable tool for talent assessment.

Recognizing the appropriate contexts for developing talents and understanding abilities and limitations can help children acquire necessary skills for better self-awareness and psychological well-being. Considering talent assessment and individual differences in this regard can facilitate identifying children's abilities and utilizing their talents more effectively. Talent assessment has a substantial impact on children's personal development. Given prior research and the development of the present instrument, further investigations into this domain remain necessary. Skills, capabilities, interests, and valuable goals contribute to interpersonal competence, enhancing empathy and social understanding, which can promote positive collective behaviors and individual and social well-being. Talent assessment encompasses both verbal and non-verbal communication to comprehend others, share emotions and feelings, express oneself, interpret others' emotions and thoughts, and motivate and inspire others (Plewan & Dogart, 2017).

The study had limitations, including the reliance on a paper-pencil assessment method, which might yield more precise results if adapted into a software-based format. Additionally, using a 360-degree evaluation approach, incorporating feedback from parents, friends, and teachers, could enhance the reliability of the assessment. Future qualitative research on talent assessment in different age groups, particularly children, is recommended. Expanding this research with larger and more diverse samples from different cities would allow for a more precise validation of the instrument. Moreover, implementing real-world task analyses alongside paper-pencil and software-based assessments is suggested for a comprehensive approach to talent identification.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the interview and participated in the research with informed consent.

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