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RESEARCH ARTICLE

Scale for Identifying Overexcitability in Gifted Children: Reliability and Validity Study

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ABSTRACT

This study aims to develop a valid and reliable instrument to measure the overexcitabilities of gifted individuals. Participants comprised 584 gifted students from Science and Art Centers across Turkey during the 2023-2024 academic year. Data were gathered using the draft Overexcitability Areas Identification Scale (33 items) and a Personal Information Form. Validity was assessed through face, content, and construct validity, while reliability was determined using Cronbach's alpha and item discrimination indices. Exploratory and Confirmatory Factor Analyses (EFA and CFA) were performed on separate samples (300 for EFA, 284 for CFA). Following EFA, nine items were removed. The CFA results demonstrated good fit: $\chi^2/df = 1.856$, RMSEA = 0.055, NFI = 0.85, IFI = 0.92, CFI = 0.92, TLI = 0.91. The final 21-item, five-factor scale demonstrated strong reliability (Cronbach's $\alpha = 0.83$; McDonald's Omega $\omega = 0.80$) and validity for assessing the overexcitabilities of gifted middle school students. The results demonstrate that the instrument can serve as a reliable screening and support planning tool within SACs to identify overexcitability profiles of gifted students.

Introduction

Although a gifted individual is often perceived as someone who excels in academic achievement tests (Akindipe, 2024), the concept of giftedness extends beyond simple academic performance. It also includes the impact of high intelligence on potential achievements in areas such as insight and innovation, creative behavior, and effective interpersonal communication, including visual and performing arts (Karwowski et al., 2021). Theorists and psychologists have identified several key characteristics that distinguish gifted individuals from others (e.g., high motivation, active imagination, high energy levels, intense frustration, profound emotional experiences, and reduced need for sleep) (Piirto, 2004; Sword & Director, 2005). In the literature, these characteristics are referred to as overexcitability or heightened sensitivity, defined as an intensified reaction to stimuli (Piechowski & Colangelo, 1984; Piirto & Fraas, 2012).

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This concept was first introduced by Dabrowski in 1967. It was later developed in the 1980s through the Theory of Positive Disintegration (TPD) (Dabrowski, 1972) to explain various aspects of the socio-emotional domain of gifted individuals (Mendaglio & Tillier, 2006). Over time, this theory has been increasingly applied to explain the social and emotional needs of gifted individuals and has become a central framework in gifted education (Mendaglio, 2022). Dabrowski defined this concept as an intense physiological experience of sensory stimuli resulting from heightened neuronal sensitivity (Mendaglio & Tillier, 2006). It is also described as an innate intensity in responsiveness to stimuli. Overexcitabilities, which are more commonly found in creative and gifted individuals, are expressed as heightened sensitivity, awareness, and intensity, representing a great difference in the fabric of life and the quality of experiences (Piechowski & Wells, 2021). However, overexcitability domains in gifted individuals have been used for various purposes, including preventing the misdiagnosis of giftedness as Attention Deficit/Hyperactivity Disorder (ADHD) (Webb et al., 2005) or high-functioning autism (Gelbar et al., 2022); identifying creative personality traits (Wirthwein et al., 2011); defining the social and emotional needs of adolescents (Webb, 2008); assessing social and emotional needs (Winkler & Voight, 2016); providing counseling for gifted individuals (Tourreix et al., 2023); examining the interaction between developmental potential and psychological growth (Piechowski & Wells, 2021); and studying the topic of suicide (Winkler & Voight, 2016).

Dabrowski identified five domains of overexcitability, which include psychomotor, sensory, imaginational, intellectual, and emotional overexcitabilities (Dabrowski & Piechowski, 1977; Piechowski, 2008). Psychomotor overexcitability is defined as an "organic surplus of energy or high excitability of the neuromuscular system" (Yakmacı-Güzel & Akarsu, 2006). It manifests as a love of movement, rapid speech, a strong desire to be active, impulsivity, restlessness when required to remain still, and an overall need for physical activity (Tourreix et al., 2023). While often perceived as excess energy, it can also present irritability and tension, as well as psychomotor behaviors such as emotional strain, tics, nail-biting, or impulsive acts (Mendaglio & Tillier, 2006). Individuals with heightened psychomotor overexcitability may exhibit competitive behavior, anxious tendencies, or involuntary movements when experiencing stress (Alexopoulou et al., 2020). Sensory overexcitability refers to a heightened experience of sensory pleasures and an increased search for sensory outlets to reduce internal tension (Mendaglio & Tillier, 2006). It is characterized by strong emotional responses, either pleasure or discomfort, associated with one or more of the five senses (Dabrowski & Piechowski, 1977). Individuals with this overexcitability often develop an early and intense appreciation for music, language, and the arts, deriving deep enjoyment from tastes, smells, textures, sounds, and visual stimuli (Lind, 2001).

Children with sensory overexcitability may feel discomfort from clothing tags, find classroom environments overwhelming, experience strong aversions to certain odors in a cafeteria, or become so absorbed in a piece of art or music that they completely disconnect from their surroundings. Imaginational overexcitability is marked by a rich interplay of images and impressions, a strong inclination toward creating imaginary productions, vivid visualization, and elaborate dreams (Lind, 2001). Individuals with this trait often enjoy fantasizing about their real-world experiences, adding imaginative elements to their daily lives (Yakmacı-Güzel & Akarsu, 2006). They may struggle within rigid educational settings that lack opportunities for creativity and imaginative exploration (Piechowski, 2008). Intellectual overexcitability is characteristic of individuals with a highly active and inquisitive mind. They demonstrate intense curiosity, persistence in problem-solving, enjoyment of detailed planning, strong ethical and moral reasoning, concern for societal issues, deep concentration, and an affinity for using metaphors (Lind, 2001). It is important to distinguish intellectual overexcitability from intelligence; while intelligence may be defined as the ability to solve a complex mathematical problem, intellectual overexcitability reflects the love of solving such a problem (Tourreix et al., 2023). Emotional overexcitability is characterized by deep emotions, strong attachments, an overwhelming sense of responsibility, and a profound engagement with emotional experience (Piirto, 2004). In addition to these key traits, individuals with emotional overexcitability may show strong emotional memory, preoccupation with existential topics such as death, tendencies toward depression, shyness, and concern for others (Tourreix et al., 2023). This form of overexcitability plays a crucial role in self-evaluation, self-criticism, compassion, and sensitivity toward others, shaping an individual's relationship with themselves and the world around them (Yakmacı-Güzel & Akarsu, 2006).

A review of the literature reveals that the relationship between overexcitability domains and gender has been extensively explored. Research indicates that women tend to score higher in emotional overexcitability, whereas men exhibit elevated intellectual overexcitability scores (Bouchet & Falk, 2001; He & Wong, 2014; Piechowski & Miller, 1995; Warne, 2011; Wirthwein et al., 2011). Additionally, some studies report that women demonstrate greater imaginational overexcitability (He & Wong, 2014), while others find higher imaginational scores among men (Bouchet & Falk, 2001). Overall, studies involving young children have found no significant gender differences in overexcitability domains (Fung & Chung, 2022; Yoon & Moon, 2009). Considering age, He and Wong (2014) examined fourth- and fifth-grade students. They observed that girls scored higher than boys in emotional, intellectual, imaginational, and sensory overexcitabilities, whereas boys showed elevated psychomotor overexcitability scores.

In a study comparing gifted and non-gifted individuals across age groups, Piechowski and Colangelo (1984) reported that both gifted adolescents and graduate students scored higher in intellectual overexcitability. Moreover, gifted students generally exhibited significantly higher intellectual, emotional, and imaginational overexcitability scores than their average-ability peers. Similarly, Lysy and Piechowski (1983) found that male graduate students had higher psychomotor overexcitability scores than females. Consistent with these findings, Wood et al. (2024) investigated gifted tenth- and eleventh-grade students and reported significantly higher intellectual, emotional, and psychomotor overexcitability scores compared to non-gifted students. However, a study of gifted children aged 9–14 found no significant differences in sensory and psychomotor overexcitability domains (Piechowski & Miller, 1995). Variability in findings may reflect differences in sample sizes and their influence on effect size (Piirto et al., 2008).

In the literature, overexcitability is often considered a core characteristic of gifted students. However, this trait can lead to peer labeling (Al-Hroub & Krayem, 2020). Research shows that overexcitability domains may negatively affect gifted students' personalities and cause discomfort among peers during learning (Smith, 2006). If unaddressed, this can hinder the social and emotional development of gifted students (Webb et al., 2005). Additionally, their heightened sensitivity to learning environments may disrupt social interactions and communication (Smith, 2006). Therefore, teachers must recognize and understand manifestations of overexcitability in gifted students. Such awareness supports creating effective and supportive learning environments tailored to their needs (Webb et al., 2015). Furthermore, Treat (2006) emphasized that overexcitability influences students' sensitivity, awareness, and intensity in areas of interest. According to Piechowski (1999), stronger overexcitability correlates with lower acceptance by peers and teachers in academic and social settings. Teachers with limited knowledge of overexcitability may misinterpret these behaviors as disciplinary problems (Guthrie, 2019). In contrast, educators who understand overexcitability can transform it into an opportunity by nurturing students' potential and enhancing their learning experiences (Daniels & Meckstroth, 2009). Moreover, characteristics of psychomotor overexcitability often resemble those of ADHD. Piechowski (1999) suggested that students with high psychomotor overexcitability scores may be misdiagnosed with ADHD.

Similarly, Rinn and Reynolds (2012) found correlations between overexcitability traits and ADHD symptoms, contributing to frequent misdiagnosis (Kaplan-Sayı, 2018). Therefore, raising awareness and developing specific assessment tools for overexcitability is essential. Supporting this view, Al-Hroub and Krayem (2020) emphasized the importance of a comprehensive evaluation process to distinguish overexcitability from ADHD, arguing that accurate diagnosis requires multiple assessment methods. The importance of overexcitability assessment tools is thus evident. Çetin (2019) emphasized the need to consider overexcitability traits when assessing gifted individuals for ADHD. However, it is also important to acknowledge that a child may exhibit both giftedness and ADHD simultaneously. Likewise, Tieso (2007) observed that, despite anecdotal evidence, high psychomotor overexcitability in gifted students may indicate ADHD or learning disabilities.

Although previous instruments such as the Overexcitability Questionnaire-II (OEQ-II) have been widely used in international contexts to assess overexcitability traits (Falk et al., 1999; Falk et al., 2008), direct adaptation of these tools was intentionally avoided in the present study. This decision was based on both theoretical and methodological considerations. According to the guidelines on test adaptation (Hambleton et al., 2005; International Test Commission [ITC], 2017), linguistic translation of an existing scale does not guarantee conceptual equivalence across cultures. Overexcitability traits, while theoretically universal under

Dabrowski's Theory of Positive Disintegration (Dabrowski, 1972), are likely to manifest differently depending on sociocultural contexts such as educational expectations, emotional expression standards, and cognitive-emotional socialization practices.

In the Turkish cultural context, collectivist values, hierarchical family structures, and intense academic achievement pressure may uniquely shape the way gifted individuals experience and express intellectual, emotional, or imaginational overexcitabilities (Kağıtçıbaşı, 2007). Therefore, rather than adapting the OEQ-II, a new measurement tool was developed to better reflect these sociocultural nuances. Item development was informed by expert interviews, pilot studies, and a review of local literature on gifted education in Turkey. This culturally sensitive approach aligns with best practices in scale development, which recommend tailoring item content to reflect the specific social and cultural context of the target population (van de Vijver & Tanzer, 2004).

A review of the literature reveals that several assessment instruments have been developed to identify the overexcitability domains of gifted individuals (Falk et al., 1999; Lysy & Piechowski, 1983; Wellisch, 2024; Wood et al., 2024), and their reliability and validity have been evaluated in different countries (Falk et al., 2008). Moreover, studies in this area have frequently emphasized the gender variable (Bouchet & Falk, 2001; Moon & Montgomery, 2005). Similarly, Sword (2003) noted that the number of assessment tools created to measure overexcitability in gifted individuals remains limited. A review of the existing literature suggests that culture-specific measurement tools have been preferred for assessing overexcitability domains in Turkey. This study aims to develop a valid and reliable instrument to evaluate the overexcitability levels of gifted middle school students.

Method

This study investigates scale development. The process involved the following steps: reviewing the literature, generating an item pool, obtaining expert evaluations, conducting a pilot study and determining content validity, establishing the overall framework of the scale, selecting the study group, performing exploratory factor analyses, conducting factor analyses, carrying out confirmatory factor analysis, and performing reliability analyses. The study aimed to develop a five-point Likert-type scale intended to assess the overexcitability domains of gifted middle school students.

Participants

The participants of the study consist of gifted middle school students, as overexcitability is closely related to giftedness. Indeed, the literature indicates that overexcitability is more commonly observed in gifted and creative individuals compared to the general population (Chang & Kuo, 2013; Gillioz et al., 2023).

The sample group for the study was determined using the convenience sampling method, which involves selecting participants who are readily accessible to the researcher. This method is commonly used in educational and psychological research due to its practicality and efficiency in reaching target populations (Etikan et al., 2016). The participants in this study are 584 gifted middle school students enrolled in the Science and Art Centers across various cities in Turkey, who have received a giftedness diagnosis. In the study, ensuring an adequate sample size was prioritized to minimize measurement errors (Pohlmann, 2004; Sümer, 2000). Similarly, Noar (2003) highlights that for studies utilizing Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA), a sample size of more than 500 is necessary to achieve reliability. It is crucial to conduct both analyses with different sample groups (Worthington & Whittaker, 2006). Accordingly, the sample groups in this study consisted of distinct individuals, and the data obtained were used for two different analyses. Demographic information of the participants is presented in Tables 1 and 2.

Table 1. Demographic characteristics of the participant group (Exploratory Factor Analysis)

Analysis Type	**Variables**		**N**	**%**
Exploratory Factor Analysis (EFA)	Gender	Female	153	51
		Male	147	49
		Total	300	100
	Grade Level	5. Grade	87	29
		6. Grade	79	26.3
		7. Grade	116	38.7
		8. Grade	18	6.0
		Total	300	100
	Age	10	19	6.3
		11	69	23
		12	101	33.7
		13	94	31.3
		14	17	5.7
		Total	300	100
	Area of Diagnosis	General Aptitude	254	84.7
		Music	20	6.7
		Art	15	5
		General Aptitude-Music	6	2
		General Aptitude-Art	4	1.3
		Total	300	100

As shown in Table 1, among the participants from whom data were collected for the Exploratory Factor Analysis (EFA), 153 (51%) are female and 147 (49%) are male. Regarding grade levels, 87 (29%) participants are in the 5th grade, 79 (26.3%) are in the 6th grade, 116 (38.7%) are in the 7th grade, and 18 (6.0%) are in the 8th grade. Concerning age distribution, 19 (6.3%) participants are 10 years old, 69 (23%) are 11 years old, 101 (33.7%) are 12 years old, 94 (31.3%) are 13 years old, and 17 (5.7%) are 14 years old. As for the areas of special ability diagnoses at the Science and Art Centers, 254 (84.7%) students are diagnosed with general ability, 20 (6.7%) with music, 15 (5%) with visual arts, 6 (2%) with general ability and music, and 4 (1.3%) with general ability and visual arts.

Table 2. Demographic characteristics of the participant group (Confirmatory Factor Analysis)

Analysis Type	Variables		N	%
Confirmatory Factor Analysis (CFA)	Gender	Female	143	50.4
		Male	141	49.6
		Total	284	100
	Grade Level	5. Grade	96	33.8
		6. Grade	87	30.6
		7. Grade	84	29.6
		8. Grade	17	6
		Total	284	100
	Age	10	22	7.7
		11	74	26.1
		12	108	38
		13	69	24.3
		14	11	3.9
		Total	284	100
	Area of Diagnosis	General Aptitude	244	86
		Music	19	6.7
		Art	12	4.2
		General Aptitude-Music	5	1.7
		General Aptitude-Art	4	1.4
		Total	284	100

As indicated in Table 2, among the participants from whom data were collected for Confirmatory Factor Analysis (CFA), 143 (50.4%) are female and 141 (49.6%) are male. Regarding grade levels, 96 (33.8%) participants are in 5th grade, 87 (30.6%) are in 6th grade, 84 (29.6%) are in 7th grade, and 17 (6%) are in 8th grade. Concerning age distribution, 22 (7.7%) participants are 10 years old, 74 (26.1%) are 11 years old, 108 (38%) are 12 years old, 69 (24.3%) are 13 years old, and 11 (3.9%) are 14 years old. As for the areas of special ability diagnoses at the Science and Art Centers, 244 (86%) students are identified in general ability, 19 (6.7%) in music, 12 (4.2%) in visual arts, 5 (1.7%) in general ability and music, and 4 (1.4%) in general ability and visual arts.

Scale Development Process

During the scale development process, the researchers conducted a comprehensive literature review to assess existing instruments with similar characteristics. In this context, several internationally used scales aimed at identifying overexcitability domains among gifted students have been identified (Al-Onizat, 2013; De Bondt & Van Petegem, 2015; Falk et al., 1999, 2008). It was observed that all these instruments were developed based on Dabrowski's (1972) Theory of Positive Disintegration, which proposes a five-factor structure encompassing intellectual, psychomotor, emotional, sensual, and imaginational overexcitabilities. Following this review, rather than adapting existing instruments, the researchers decided to develop a new measurement tool that would be culturally and linguistically suitable for the Turkish context. Consequently, no adaptation or modification was made to the foreign-developed instruments. In line with this approach, and grounded in the aforementioned theoretical framework, the items of the newly developed scale were organized under five subdimensions: intellectual, psychomotor, emotional, sensual, and imaginational overexcitabilities.

In the next stage, the draft version of the scale prepared by the researchers was submitted for expert review to assess the face and content validity of the 39 items included in the Expert Evaluation Form. Feedback was obtained from a total of six experts: two from the field of gifted education, two from educational measurement and evaluation, and two from psychological counseling and guidance. All experts held doctoral degrees in their respective fields and were experienced academics. For each item in the Expert Evaluation Form, a section was provided for ratings such as "appropriate," "needs revision," "should be removed," or suggestions. The content validity indices (CVI) for the items based on the experts' suggestions and feedback were calculated using

Davis's Technique. The resulting content validity index of the scale was found to be .88. According to Davis (1992), items with a content validity index below .80 should be eliminated. Based on the experts' feedback and the content validity index results, the draft items of the scale were reduced to 33 items.

Subsequently, a pilot application was conducted with 30 gifted students to assess the comprehensibility of the items in the draft form. As a result of the pilot study, it was concluded that there were no ambiguous items or items with multiple meanings, and the draft form was finalized. The items in the draft form were structured according to a 5-point Likert scale: strongly disagree (1), disagree (2), somewhat agree (3), agree (4), and strongly agree (5).

Data Collection and Analysis

Before the main data collection, a pilot study was conducted with 20 gifted students. Following the pilot implementation, revisions were made to the scale items based on the students' comprehension and clarity of the items. The data obtained from the pilot study were not included in the subsequent analyses. The data for the study were collected through Google Forms and written documents developed by the researchers in an electronic environment. Before analyzing the obtained data, outliers, missing, and erroneous data were assessed, and the normality of the distribution was checked. In the study, Exploratory Factor Analysis (EFA) was conducted using the SPSS 25.00 software to determine the factor structure of the data, and Confirmatory Factor Analysis (CFA) was performed using AMOS software to examine the accuracy of the emerging model.

Before conducting EFA, the suitability of the data set was tested. According to the literature, different opinions exist regarding the required sample size for EFA: it should be 5-10 times the number of items (Child, 2006), at least 300 participants (Field, 2009), or between 300 and 500 participants (Comrey & Lee, 2016). In this regard, the sample size of 300 participants in the study can be regarded as sufficient. The Kaiser-Meyer-Olkin (KMO) and Bartlett's Test analyses were conducted to determine whether the data were appropriate for factor analysis. A KMO value greater than 0.60 and a significant Bartlett test indicate that the data are suitable for factor analysis (Büyüköztürk, 2024). Based on the obtained results, EFA and CFA were performed.

The suitability of the data for factor analysis was checked using Principal Component Analysis (PCA) to determine how many factors the items in the scale could be grouped under. Considering that the subfactors in the scale were not assumed to be entirely independent and might be moderately correlated, the oblique rotation technique was selected (Field, 2009). Since the subdimensions of overexcitability have been theorized to be conceptually interrelated rather than independent (Dabrowski, 1964), an oblique rotation method that allows for estimating correlations among factors was employed. This approach has also been applied in similar studies, where cognitive, emotional, imaginative, psychomotor, and sensual domains emerged in an interrelated manner, and multiple subdimensions were examined simultaneously (Bouchard, 2004). In this context, experimental research has demonstrated that emotional, intellectual, and imaginational overexcitabilities are significant indicators and predictors of advanced personality development (Falk & Miller, 2009). Moreover, other studies have similarly addressed overexcitability within intellectual and emotional domains (Bouchet & Falk, 2001; Siu, 2010) as well as within the imaginational dimension (Harrison & Van Haneghan, 2011). These findings emphasize the multidimensional and integrative nature of overexcitability (Falk et al., 1999; Piechowski, 1999; Silverman, 2009), providing a consistent theoretical rationale for the use of oblique rotation in the present study.

In the EFA process, to determine the factor structure of the items in the scale, the extraction value, which indicates the variance explained by each item, was first reviewed. It is sufficient for the common variance of each item to be at least 0.10. Eigenvalue statistics were examined, and factors with eigenvalues greater than 1 were considered stable, while factors with eigenvalues less than 1 were excluded. In this context, the total amount of variance explained by the factors was assessed. A variance of at least 40% is considered adequate (Büyüköztürk, 2024).

One of the methods used to decide the number of factors in EFA is the examination of the scree plot. The primary approach in this method is counting the inflection points or the number of bends (Nelson et al., 2011). In this study, the number of inflections was counted. Subsequently, the cross-loading status of the items was analyzed. If an item loads onto more than one factor and the highest factor loadings are smaller than 0.10, this

item is considered a cross-loading item (Pallant, 2020), and it should be excluded from the scale. The factor loadings of the items grouped under a factor should be at least 0.40 (DeVellis, 2017).

Initially, data were collected for Exploratory Factor Analysis (EFA). Following the EFA, data were gathered from a different sample group for Confirmatory Factor Analysis (CFA) using the items retained in the scale. To evaluate the model emerging from CFA, multiple fit indices ($\chi 2$, df, $\chi 2$/df, RMSEA, CFI, NFI, IFI, and TLI) were used. To determine the construct validity of the scale, independent sample t-tests and factor analysis were performed. The students were divided into the lower and upper 27% groups based on their scores, and a significance level of 0.05 was used to determine whether a significant difference existed between the groups. To assess the reliability of the items in the scale, internal consistency was evaluated by calculating both Cronbach's Alpha and McDonald's Omega coefficients. A coefficient value of .70 or above is generally considered acceptable for both Cronbach's Alpha (Pallant, 2020) and McDonald's Omega (Viladrich et al., 2017), indicating satisfactory internal consistency. Similarly, the item-total correlation value should be non-negative and at least 0.20 (Tavşancıl, 2019).

Results

This section presents the findings obtained during the scale development process. To determine the construct validity of the scale developed within the scope of the study, both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were performed. The results obtained are discussed hereafter.

Exploratory Factor Analysis (EFA) Results

Before beginning the factor analysis on the scale developed for the research, it is essential that the sample size of the research data is adequate. To assess the suitability of the data for factor analysis, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test were used to determine the correlation matrix among items and their normal distribution. For the 33-item trial form of the Identification of Overexcitability Areas in Gifted Individuals scale, the KMO value was found to be .79. In the literature, it is considered acceptable for the KMO value to be at least .60 (Pallant, 2020) and between .70 and .80 (Hutcheson & Sofroniou, 1999). Additionally, to determine whether the research data showed multivariate normal distribution, Bartlett's Sphericity test was found significant ($\chi 2(528) = 3009.925$; $p \leq .00$). Therefore, it can be stated that the trial form data of the scale are appropriate for exploratory factor analysis.

In the research, Principal Component Analysis was used as the factor extraction method, and direct oblimin rotation was applied. As a result of the EFA, it was found that there were 11 factors with eigenvalues greater than 1, and the variance for the first five factors was 5.00% or higher. According to the initial findings, it was determined that the factors explained 43.91% of the total variance. For scales with multiple dimensions, it is considered sufficient for the variance to range between 40% and 60% (Tavşancıl, 2019).

In the literature, when determining the number of dimensions in scale development, the structure of the measured characteristic, the interpretation of items, the nature of the measured variable, and the theoretical framework are emphasized for evaluating analysis results (Kılıç, 2022). In this regard, based on both the theoretical framework in the literature and the principal component analysis conducted, a second Exploratory Factor Analysis (EFA) was performed for the five-factor structure of the scale. During the analysis process, factor loadings were evaluated, with a minimum threshold of 0.40 (DeVellis, 2017). Items with loadings on multiple factors were removed if the difference between the two components was less than 0.10 (Seçer, 2018). After examining the factor loadings of the items, a total of seven items, Items 7, 12, 13, 19, 24, 29, 31, were removed, as their factor loadings were below 0.40 or they loaded on multiple factors. These items were excluded from the analysis, and the EFA was repeated. After re-examining the factor loadings of the remaining items and those that loaded on multiple factors, five items—Items 2, 10, 15, 18, and 21—were removed. Prior to the removal of each item, the total item correlations were checked, revealing that the total item correlations of the removed items were below 0.20. When the factor analysis was repeated with the remaining items, the KMO value was .77, and Bartlett's Test of Sphericity results ($\chi 2(210) = 1969.264$; $p \leq .00$) confirmed the data's suitability for factor analysis. The new EFA produced a five-factor structure explaining 57.39% of the total variance. The eigenvalue graph of the resulting five-factor structure is shown in Figure 1.

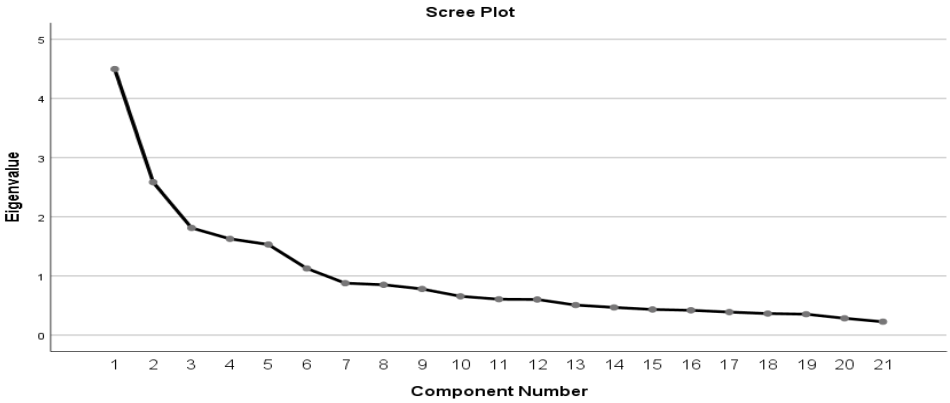

Figure 1. Eigenvalues plot

In the eigenvalue graph in Figure 1, it can be observed that the scale structure continues horizontally after the 5th factor, with no significant decline between the factors. The five-factor structure of the scale explains 57.39% of the total variance. In the literature, it is generally considered sufficient for the explained variance in multi-factor scale structures to range between 40% and 60% (Tavşancıl, 2019). Therefore, it can be stated that the obtained results are consistent with the scale development procedure. The variance values of the factors related to the scale, as determined by the conducted analysis, are presented in Table 3.

Table 3. Total variance values for the scale

Factor	Eigenvalue	Percentage of Variance	Cumulative Percentage
Factor 1 (Imagination Area)	4.49	%21.41	%21.41
Factor 2 (Cognitive Area)	2.58	%12.31	%33.72
Factor 3 (Emotional Area)	1.81	%8.62	%42.34
Factor 4 (Psychomotor Area)	1.62	%7.74	%50.09
Factor 5 (Sensory Area)	1.53	%7.29	%57.39

Based on the analyses, when examining the explained variances for the factors in Table 3, it was found that the Imagination Area explained 21.41%, the Cognitive Area explained 12.31%, the Emotional Area explained 8.62%, the Psychomotor Area explained 7.74%, and the Sensory Area explained 7.29%, with the total explained variance for the scale being 57.39%. The obtained results are presented in Table 4.

Table 4. Factor loadings and common factor variance

		Factors				
Factors	**Items**	**1**	**2**	**3**	**4**	**5**
Cognitive Area	Item 11	.788				
	Item 5	.769				
	Item 27	.642				
	Item 4	.613				
	Item 32	.508				
	Item 9	.448				
Emotional Area	Item 39		.859			
	Item 23		.833			
	Item 17		.791			
	Item 28		.516			
Imagination Area	Item 3			.847		
	Item 20			.798		
	Item 8			.743		
	Item 26			.693		
	Item 14			.401		
Psychomotor Area	Item 1				.857	
	Item 6				.810	
	Item 30				.734	
Sensory Area	Item 22					.871
	Item 25					.833
	Item 16					.683
Eigenvalue		4.49	2.58	1.81	1.62	1.53
Explained Variance Total Variance		%21.41 %57.39	%12.31	%8.62	%7.74	%7.29

As shown in Table 4, the loadings of the items range from 0.40 to 0.87. Among the factors on the scale, the first factor, "Cognitive Area," comprises six items (Items 11, 5, 27, 4, 32, and 9), with factor loadings ranging from 0.448 to 0.788. The second factor, "Emotional Area," comprises four items (Items 39, 23, 17, and 28), with factor loadings ranging from 0.516 to 0.859. The third factor, "Imagination Area," comprises five items (Items 3, 20, 8, 26, and 14), with factor loadings ranging from 0.401 to 0.847. The fourth factor, "Psychomotor Area," comprises three items (Items 6, 1, and 30), with factor loadings ranging from 0.734 to 0.857. The final factor, "Sensory Area," comprises three items (Items 22, 25, and 16), with factor loadings ranging from 0.683 to 0.871. According to DeVellis (2017), an item must have at least a 0.40 factor loading to be included in a factor. In this context, the results obtained indicate that the loadings in the pattern matrix are appropriate. In summary, the Exploratory Factor Analysis (EFA) conducted in this study resulted in a structure composed of five factors and 21 items, explaining 57.38% of the total variance. Each factor has been named according to the literature, as noted above. Example items for each factor, along with the rotated factor loadings, are provided in Table 5.

Table 5. Example items and rotated factor loadings for the factors in the scale

Factors	**Item No**	**Sample Items**	**Rotated Factor Loadings**
Imagination Area	8	I dream so vividly in my mind that it seems real.	.74
Cognitive Area	5	I am extremely sympathetic to everyone around me.	.76
Emotional Area	23	I can lose control of my emotions and burst into tears.	.83
Psychomotor Area	1	I enjoy physical activities that require me to expend more energy than usual.	.85
Sensory Area	25	I notice odors in my environment.	.83

Confirmatory Factor Analysis (CFA) Results

To assess the structural validity of the scale, Confirmatory Factor Analysis (CFA) was performed based on the five-factor and 21-item structure previously identified through Exploratory Factor Analysis (EFA). For the CFA, data collected from 284 participants were employed, differing from the participants in the EFA. The CFA analyses were performed using the AMOS software package. The model fit indices used in the analysis included Chi-Square ($\chi 2$) Goodness of Fit, Comparative Fit Index (CFI), Normed Fit Index (NFI), Incremental Fit Index (IFI), and Tucker-Lewis Index (TLI). The initial CFA results yielded the following fit indices: $\chi 2/sd = 2.311$, RMSEA = 0.068, CFI = 0.88, NFI = 0.81, IFI = 0.88, and TLI = 0.86. In the literature, acceptable cut-off points for the fit indices are as follows: $\chi 2/sd$ should be less than 3, RMSEA should be 0.050 or lower, and NFI should be acceptable up to 0.80 (Hu & Bentler, 1998). Furthermore, IFI, TLI, and CFI values between 0.90 and 0.95 are regarded as acceptable (Marcholudis & Schumacher, 2001). When comparing the CFA results with these criteria, it is observed that some results do not meet the acceptable thresholds. According to the CFA results, several modification suggestions emerged for certain item pairs; however, only those between items belonging to the same subdimension were considered. The fact that these items are conceptually related and reflect similar latent constructs indicates that the modifications were not only driven by statistical necessity but also supported by theoretical coherence. The item pairs for which modifications were implemented are as follows: Item 1–Item 2, Item 1–Item 3, Item 1–Item 6, Item 2–Item 3, Item 2–Item 5, Item 3–Item 5, Item 6–Item 8, and Item 14–Item 18. These modifications aimed to enhance the internal consistency and structural validity of the model. A second CFA was then performed. The obtained results are shown in Figure 2.

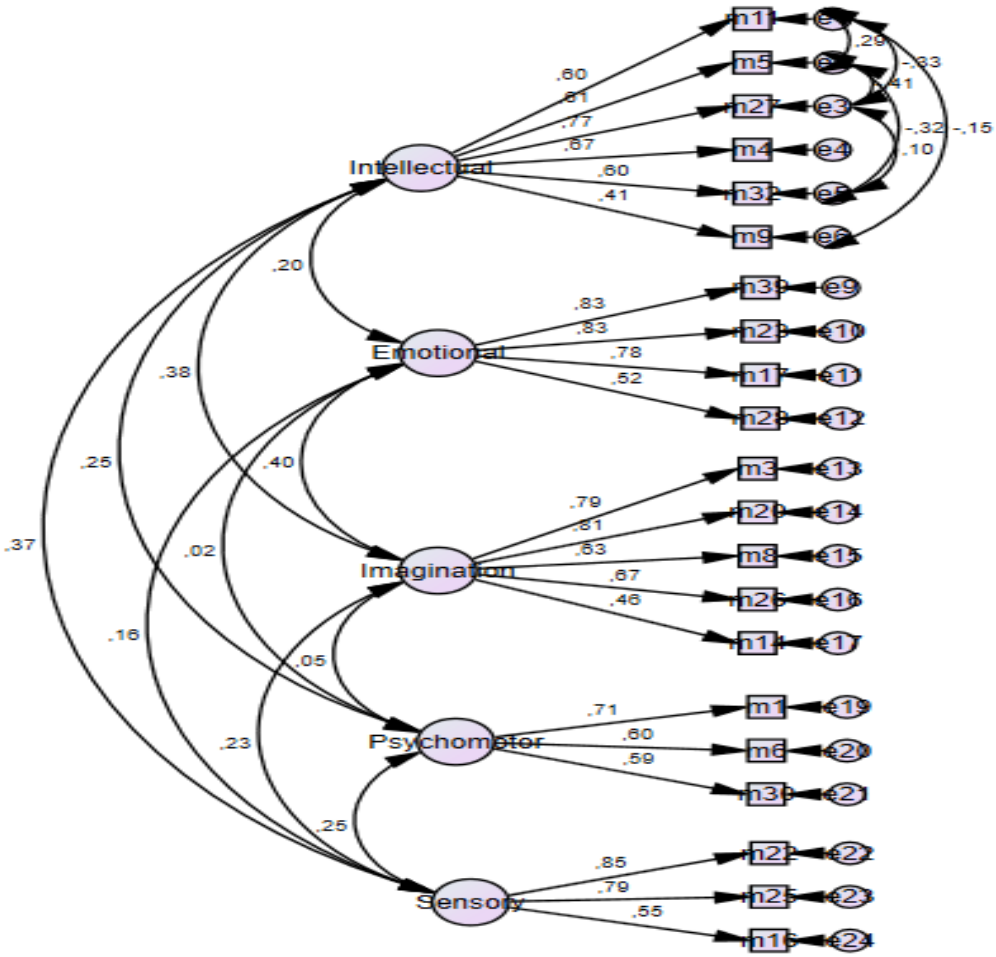

Figure 2. Confirmatory factor analysis (CFA) results

Table 6. Confirmatory factor analysis (CFA) fit values

N	χ2	df	χ2/df	RMSEA	NFI	IFI	CFI	TLI
284	321.117	173	1.856	0.055	.85	.92	.92	.91

When the goodness-of-fit indices of the five-factor model presented in Table 6 were examined, the following values were obtained: χ2/df = 1.856; RMSEA = 0.055; NFI = 0.85, IFI = 0.92, CFI = 0.92, and TLI = 0.91. Based on these results, it can be stated that the χ2/df, NFI, IFI, CFI, TLI, and RMSEA values indicate acceptable fit. Therefore, it can be concluded that the model demonstrates good overall fit.

Reliability Analysis Results

In the research process, to assess the reliability of the developed overexcitability Areas Scale, the method of internal consistency was applied, and discriminant validity was evaluated by comparing the lower 27% and upper 27% groups. In addition to Cronbach's Alpha, McDonald's Omega coefficients were also computed, considering the assumptions of the congeneric measurement model. The reliability coefficients for each factor of the scale are presented in Table 7. The Cronbach's Alpha and McDonald's Omega coefficients for the subdimensions and the total scale were above .70, showing acceptable internal consistency.

Table 7. Reliability values for the factors

Factors	Item Number	Cronbach's Alpha	McDonald's Omega
Cognitive Area	6	.74	.75
Imagination Area	5	.77	.77
Emotional Area	4	.80	.82
Psychomotor Area	3	.70	.70
Sensory Area	3	.76	.78
Total Points	21	.81	.80

According to Table 8, the total correlation values of the items in the scale range from 0.23 to 0.52, and the t-values are statistically significant ($p < 0.001$). A total item correlation value of .20 and above indicates high internal consistency of the items in the scale (Tavşancıl & Keser, 2002).

Table 8. Item analysis results

Factors	Item Number	Item-Total Correlation	*t* Lower 27% and Upper 27%
Cognitive Area	11	.46	10.66*
	5	.39	10.19*
	27	.40	11.63*
	4	.39	11.07*
	32	.43	12.31*
Imagination Area	9	.26	7.53*
	20	.45	14.88*
	3	.42	11.61*
	8	.44	14.82*
	26	.52	15.53*
Emotional Area	14	.34	10.60*
	39	.42	14.20*
	23	.37	11.52*
	17	.45	12.34*
	28	.23	8.06*
Psychomotor Area	1	.25	7.17*
	6	.29	8.05*
	30	.23	7.64*
Sensory Area	22	.36	10.21*
	25	.36	10.18*
	16	.29	9.62*

Item Discrimination Analysis

To assess the item discrimination property of the scale, the scores obtained from the lower 27% and upper 27% groups of the participants were compared using an Independent Samples t-test. The results of the analysis are presented in Table 9.

Table 9. Item discrimination analysis results

Groups	N	x̄	Sd	df	t	p
Upper Group	158	90.30	4.95	314	39.80	.00
	158	64.33	6.53			

According to Table 9, a significant difference was found in the comparison of the scores obtained from the lower 27% and upper 27% groups of participants, demonstrating the item discrimination property of the Overexcitability Scale ($t(314) = 39.80$, $p < 0.00$). The analysis results indicate that the Overexcitability Areas Scale for gifted students is a reliable and valid measurement tool consisting of 5 factors and 21 items.

Discussion

This study aimed to develop a scale to identify overexcitability areas in gifted middle school students. Overexcitability areas, which are seen as traits that distinguish gifted individuals from their intellectual peers, are vital for these children to receive the education they need. Overexcitability often includes descriptors attributed to gifted children, such as unlimited energy (psychomotor), sensor/physical sensitivity (sensory), asking profound questions (intellectual), imaginary friends (imaginational), and emotional intensity (emotional) (Mendaglio, 2022). For instance, unexplained intense emotional experiences and outbursts, as witnessed by parents and teachers, can be explained by emotional overexcitability (Guthrie, 2019; Mendaglio & Tillier, 2006). Over time, overexcitability areas have been used to explain the social and emotional needs of gifted youth. In parallel, research has found that gifted students have higher scores than typically developing students in one or several of the overexcitability domains (He et al., 2017; Limont et al., 2014; Van den Broeck et al., 2014; Winkler & Voight, 2016).

In the development process of the scale in this study, similar scales developed by researchers through a literature review were examined. In this context, scales developed to identify overexcitability areas of gifted students (Al-Onizat, 2013; De Bondt & Van Petegem, 2015; Falk et al., 1999; Falk et al., 2008) were found to be based on the overexcitability areas theory (intellectual, psychomotor, emotional, sensory, and imagination) proposed by Dabrowski (1964). Upon examining the items in these developed scales, it was observed that their compatibility with Turkish culture was low. For this reason, a new measurement tool was required.

In the next phase, the Draft Expert Evaluation Form, containing 39 items, was evaluated for appearance and content validity by two measurement and assessment experts, two psychological counseling and guidance experts working in the field of giftedness, and one expert specializing in gifted education. Based on expert feedback and the content validity index results, the number of draft items was reduced to 33. Subsequently, a pilot application was conducted with 30 gifted students to determine item comprehensibility. The pilot results indicated that there were no unclear or ambiguous items, and the draft form was finalized. During the scale development process, the participant group consisted of 584 gifted middle school students for analysis. Exploratory Factor Analysis (EFA) was conducted to determine the factor structure of the data, and Confirmatory Factor Analysis (CFA) was performed to test the accuracy of the resulting model.

It was concluded that a sample size of 300 participants was sufficient for the factor analysis in the study. The suitability of participants for EFA was assessed using the Kaiser-Meyer Olkin (KMO) measure of sampling adequacy and Bartlett's Sphericity Test. The KMO value was 0.79. Since the items were based on a theory measuring a five-factor structure, the factor structure was fixed, and analyses were performed. As a result of the EFA, a structure consisting of five factors and 21 items emerged, explaining 57.38% of the total variance. After CFA, a five-dimensional structure with 21 items was obtained. The fit indices of the five-factor model were: $\chi^2/df = 1.856$; RMSEA = 0.055; NFI = 0.85; IFI = 0.92; CFI = 0.92; and TLI = 0.91. These values indicate the resulting model demonstrates a good fit.

A reliability study for the Overexcitability Areas Scale for gifted middle school students has also been conducted. For reliability, the Cronbach's Alpha and McDonald's Omega internal consistency coefficients

were computed for the subdimensions and total score of the scale. The analysis results indicate that internal consistency is at an acceptable level for both the subdimensions and the total score. To test item discriminability, an Independent Samples T-Test was conducted to compare scores obtained from the lowest and highest 27% groups. The analysis revealed significant differences. This difference indicates that all items in the scale have discriminative properties between the groups (Büyüköztürk, 2024). Based on this result, it can be concluded that the scale items effectively differentiate between higher and lower groups. Additionally, all items in the scale exhibit item-total correlation values ranging from .23 to .52, which is important for overall internal consistency. These item-total correlation values indicate that the items align with the scale and contribute to increasing its reliability.

As a result of the analyses, the final version of the scale consists of 5 dimensions and 21 items. The scale includes six items under the intellectual factor, five items under the imagination factor, four items under the emotional factor, three items under the psychomotor factor, and three items under the sensory factor. The scores that can be obtained from the scale range from 21 to 105. As the scores for each factor and the total score of the scale increase, the level of overexcitability also increases. The developed scale is intended for use by school psychological counselors, educational diagnosticians, and professionals working in Science and Art Centers (SACs) as part of comprehensive guidance and assessment practices. Specifically, the instrument can serve as a screening and support planning tool within SACs to identify overexcitability profiles of gifted students and guide psychoeducational interventions. It may also be used by psychological counselors to inform referral decisions and individualized support strategies within school counseling services. Additionally, the scale can be employed during the talent development planning process to determine students' emotional, cognitive, and behavioral sensitivities, thereby contributing to personalized educational environments. Through systematic administration and interpretation by trained professionals, the scale can support decision-making in areas such as group guidance programming, parent counseling, and collaborative teacher planning. In this regard, it is recommended that the scale be implemented as part of a multi-method assessment process rather than as a sole diagnostic tool.

Future studies may include adaptation research for primary and high school students. Intervention and support programs can be developed for student groups identified with overexcitability areas through scale application. These support and intervention programs can contribute to helping students better understand themselves. Furthermore, they may also help reduce conflicts between gifted students and their peers, educators, and parents. In parallel, Roeper (2009) has suggested that overexcitability is a concept that can help gifted students make better sense of their lives. Fiori et al. (2023) emphasized that if individuals with a certain degree of overexcitability develop emotion regulation skills, this sensitivity will produce positive outcomes. For this reason, it is important to reveal areas of overexcitability. Additionally, seminars and training on overexcitability areas can be provided to gifted students and their families at Science and Art Centers. Indeed, Fonseca (2024) emphasized that teachers and parents of gifted students should understand overexcitability and provide information to students. Moreover, future studies may involve sample groups that include students diagnosed with ADHD and learning disabilities.

While the scale offers valuable contributions to the literature, it also has certain limitations. During data collection, students' email addresses were obtained with their knowledge and consent. For test-retest reliability analysis, follow-up emails were sent to participants; however, only a limited number of responses were received. Due to the insufficient response rate, test-retest analyses could not be performed. It is recommended that future studies conduct test-retest reliability analyses using larger and more responsive participant samples to further assess the temporal stability of the scale. Another limitation is the lack of criterion validity in the study. Another limitation of the study is the absence of criterion-related validity analysis. Although the Overexcitability Questionnaire developed by Falk et al. (1999) was adapted into Turkish by Yakmacı-Güzel and Akarsu (2006), the validity and reliability studies of the adapted version were not published, and thus, the instrument was not available for use as a criterion measure.

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Consent to Participate: Informed consent was obtained from all the individual participants that were included in the study.

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Scale for Identifying Overexcitability Domains in Gifted Students

		(5)Strongly Agree	(4) Agree	(3)Somewhat Agree	(2) Disagree	(1)Strongly Disagree
Psychomotor	1) I enjoy physical activities that require me to expend more energy than usual.					
	6) I feel more energetic than my peers.					
	30) When I start running, I feel like I could run without stopping.					
Sensual	16) I can distinguish the flavours of foods with great sensitivity.					
	22) I notice delicate and sharp scents.					
	25) I notice the smells in the environments I am in.					
	28) I am easily startled by sudden noises or sounds.					
Imagination	3) When I get bored, I daydream.					
	8) I create such vivid images in my mind that they seem real.					
	14) I believe inanimate objects have feelings too.					
	26) The things I imagine excite me.					
Intellectual	4) I simplify complex topics and make them easier to understand.					
	9) I enjoy engaging with scientific topics.					
	27) I question the underlying causes of problems.					
	32) I try to analyse my own thoughts and behaviour.					
Emotional	5) I am extremely understanding towards everyone around me.					
	11) I am sensitive to other people's feelings.					
	17) I consider myself an emotional person.					
	23) I cannot control my emotions and am overcome with tears.					
	29) I often feel very unhappy.					
	39) I have intense emotional reactions.					