

Temperament Scale for Children: Reliability and Validity Study

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ABSTRACT: *In this study, it is aimed to develop an assessment instrument in order to determine temperamental characteristics of children. Sample group composes of 306 mothers having children at the ages of 4-8. There has been utilized expert opinions for the validity of the assessment instrument, and there has been used Exploratory Factor Analysis for the structural validity. In validity analysis, there has been utilized corrected item-total correlation, reliability of 27% of bottom-top groups, and Cronbach's Alpha reliability coefficient. When analyzing the obtained findings, content validity of the assessment instrument has been provided. It has been found that the assessment instrument, composing of 33 item and 7 factors, clarifies 57,20% of the total variance. Internal consistency coefficient of the whole scale has been determined as 0,85. It has been concluded that Temperament Scale for Children is a reliable assessment instrument to be used for determining temperamental characteristics of children.*

KEYWORDS: *Temperament, developing scale, early childhood period*

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I. INTRODUCTION

Every individual has their own characteristics, and it is seen in all the areas of development. In addition to natal factors, environmental factors also have effects on development of the individual. Knowing the characteristics of an individual would be helpful in practices for developmental support.

Biological and genetic differences affect each individual's mood, performance and reactions (Zentner & Bates, 2008). Each child has their own genetic structure, and this structure affects their emotions, activity level and reactions. Temperament is an important parameter in child's personal development, academic success and social-emotional development. All these characteristics are named "temperament", and they Show up after the birth and become evident during course of life (Zuckerman & Frank, 1992; Rothbart & Bates, 1998; Culbertson, Newman & Willis, 2003).

Some children may give their parents, teachers or those nursing them a rough time because of their temperament. Especially, some temperamental characteristics such as short temper, timidity, high activity level and low endeavoring may be really challenging. In such situations, parents and baby-sitters may need to get additional support and training (Shiner, 2005). Early temperament characteristics starting from the babyhood may affect children's development and may later lead to psychopathology during childhood or adolescence period (Nigg, 2006).

When reviewed the literature, it is seen that there are various theories related to temperament. According to Buss and Plomin (1984), temperamental characteristics are inborn, and these characteristics would not change in time. They analyzed sentimentality, activity and socialization in temperament, and as a result, they stated that sentimentality includes emotional and behavioral arousal; activity includes talking, acting, time and responses of behaviors requiring energy; and socialization includes preferring interaction with others to being alone. As a result of their study, Chess and Thomas (1973) determined that temperament has nine dimensions – which are activity level, adaptability, biological rhythmicity, excitation threshold, intimacy/timidity, intensity of reactions, distractibility, attention span, qualification of habits, and continuity (Erermiş et.al., 2005).

On the other hand, Cloninger described the temperament in four different aspects as neophilia, perseverance, avoidance of harm, and reward dependence. Accordingly, temperament is hereditarily independent of each other, and it can be seen in different forms in different individuals. According to the studies conducted on this subject, it is seen that development of these four different aspects is independent from each other. It is assumed that the temperament is heredity and does not change with age (Cloninger & Svrakic, 1997; Cloninger & Svrakic; 2008). Unlike the theories aforementioned, instead of unchangeable characteristics of the temperament, there is also another concept of it which changes because of environmental effects and affects the environment. It is stated that individual differences between ease of excitation and self-regulation create the temperament, and all these differences are brought by heredity and are affected by maturation and experiences

(Derryberry & Rothbart, 1988). In this theory, the temperament changes by age, and it is categorized under three titles as Extroversion, Negative Affect and Effortful Control (Self-Regulation) (Rothbart, 2012).

Goldsmith and Campos (1982) regard the temperament as individual differences in basic emotions, and they focus on positive emotions. As a result of their multi-dimensional analysis, they classified the temperament in five categories as motor activity, anger, fear, pleasure/enjoyment, interest/continuity (Goldsmith, 1996). Today, there is a view suggesting that the temperament develops in the first years of the life and doesn't generally change during lifetime; but there are individual differences (Ma, 2006). The temperature is considered as a factor affecting child's behaviors. It is stated that there is a strong relationship between children's behaviors and the temperament (Yoleri, 2014). Particularly, the temperament in early childhood is an individual difference having significant effects on academic success, adaptation in social relationships, parenting styles of mothers and fathers, problematic behaviors (Zhou, Main & Wang, 2010; Rudasill & Rimm-Kaufmann, 2009).

Actually, concept of temperament in children is a subject much-discussed but less-studied on because of limited assessment tools. When gone through the studies on the temperament, it is seen that there are used different instruments in assessing the temperament. There have been made adaptations such as Short Form of Child Behavior Checklist (3-7 years-old) developed by Sari et. al. (2012) in accordance with Rothbart's developmental temperament model, Short Temperament Inventory for Children (5-6 years-old) developed by Kumru, Sayıl and Yağmurlu (2006) in accordance with New York Longitudinal Study, Temperament and Character Inventory by Arkar et. al. (2005) (Cited by Yılmaz et. al., 2015). Nine Types Temperament Scale for adults has been developed in accordance with Nine Types Temperament Model (Yılmaz et. al., 2014). Temperament assessments for adults have been conducted through Temperament and Character Inventory based on Cloninger's Psychobiological Personality Model, and Temperament Evaluation of the Memphis, Pisa, Paris, and San Diego Autoquestionnaire (TEMPS-A) based on Akiskal's Affective Temperament Model (Cloninger et. al., 1994; Akiskal et. al., 2005). And while assessing temperament of much younger individuals (children), there are used Children and Temperature Inventory developed and revised for 8-15 years-old children (Köse et. al., 2017), Temperament Assessment Battery for Children-Revised Parent Form (Yoleri, 2014) prepared for 2-7 years-old children in accordance with temperament theory of Martin and Bridger (1999).

When reviewed the assessment instruments in the related literature, it is seen that they are generally for adults, and especially the ones used for early childhood period are inadequate. It also draws attention that the scales used have been adapted for Turkish culture. Because there is a need for an assessment instrument to be used in studies related to context of the temperament concept and the temperament in children, and conducted on a Turkish sample group, it has been aimed in this study to develop an assessment instrument for temperament in children at the ages of 4-8.

II. METHODOLOGY

Research Design

In this study, stages of scale development have been taken into consideration, and stages of development of Temperament Scale for Children to determine temperament in children at the ages of 4-8 are stated below.

Development Process of Data Gathering Tool

At the first stage, related literature was reviewed, and evaluation instruments previously developed and adapted were analyzed. Later, there was created an item pool composing of 60 statements which include situations directly related to temperament or acknowledged in order to assess temperament of children at the ages of 4-8. There was shown regard to statements' being comprehensible and dealing with the temperament properly. After forming the draft, content validity was checked.

Application of Pre-Test

After getting ethical and official permissions for the study, the evaluation instrument was carried out on 14 mothers having children at the ages of 4-8. Participating mothers were asked whether the statements in the questionnaire were easy to understand, and if they had any suggestion. But there was found no problem on this point. Therefore, it was determined that the evaluation instrument was ready to be carried out, and it was redesigned as an online document.

Sample Group

Sample group of this study composed of 306 mothers from different cities of Turkey, having children at the ages of 4-8. Even though there is no official rule, it was thought suitable five people at least and ten people at most per statement (Cohen & Swerdlik, 2013). Accordingly, it was concluded that the data obtained from 306 individuals would be enough for his study. While creating the sample group, cluster sample method was used. Because of conducting the study in different cities and wideness of the population, it is more appropriate to

divide the population into various clusters. In the cluster sample method, individuals composing of the sample group have equal position to be chosen (Karasar, 2009).

Data Gathering and Data Analysis

The questionnaire used in this study was conveyed to the mothers as an online document. Obtained data was computerized and statistically analyzed. Its construct validity was tested via Exploratory Factor Analysis (EFA) method. After analyzing the EFA results, statements would be removed from the assessment instrument, or new ones would be added and analyzed again. After all analysis, the evaluation instrument is finalized (Karakoç & Dönmez, 2014). For determining distinctiveness of the statements in the draft, first, corrected item-total correlation coefficients were calculated; and later, difference between item average scores of 27% of bottom-top groups—which were determined through t-Test according to the total score, were determined. Reliability of the assessment instrument was determined according to Cronbach Alpha coefficient.

III. DISCUSSION

In this study, it is aimed to develop an assessment instrument in order to determine temperamental characteristics of children at the ages of 4-8. At the development process of the assessment instrument, first, existing literature assessment instruments related to temperament were reviewed. Then, content validity of the assessment instrument was enabled through getting expert opinion, and its construct validity was analyzed via EFA. Reliability of the scale was analyzed by utilizing corrected item-total correlation, reliability of 27% of bottom-top groups, and Cronbach's Alpha reliability coefficient. As a result of the practices conducted, there has been achieved an assessment instrument having 33 statements and 7 sub-dimensions. It has been detected that the assessment instrument is a valid and reliable scale in assessing temperamental characteristics of children at the ages of 4-8. First sub-dimension of the scale has statements assessing child's activity level; second sub-dimension of the scale has statements assessing child's intimacy and adaptability; third sub-dimension of the scale has statements assessing child's sensory sensitivity; fourth sub-dimension of the scale has statements assessing child's reactance state; fifth sub-dimension of the scale has statements assessing child's attention and perseverance; sixth sub-dimension of the scale has statements assessing child's rhythmicity; and seventh sub-dimension of the scale has statements assessing child's emotional sentimentality. The assessment instrument has been named "Temperament Scale for Children".

IV. FINDINGS

In this section, analysis on validity and reliability of the Temperament Scale for Children was mentioned.

Content Validity

With the aim of testing the content validity of the draft, expert opinion was sought. In this regard, experts—two from field of assessment and evaluation, three from field of psychology, and two from field of child development, were asked for opinions about the 60 statements prepared for the evaluation instrument. While interpreting the expert opinions, Davis technique was utilized. In this technique, views related to suitability of the statements are given numeric values, and content validity index (CVI) is obtained by dividing those values to expert number. If the CVI is 0,80, then it's acceptable (Cited by Taşkın & Akat, 20110). At this stage, 18 statements inimical to experts' opinions were removed from the assessment instrument. CVI of the other 42 statements was found .08, and it was decided that content validity of the assessment instrument was enabled.

At the beginning of the draft, there was written an introduction for the participants, and there was added 5-point Likert style assessment columns. There were used statements such as "never", "rarely", "sometimes", "often", and "always". In the assessment instrument in which option of "never" is 1 point and option of "always" is 5 points, if the obtained score is high, then it means that temperamental characteristic of the child is highly identified. In the practice, the participants are asked for choosing the most suitable option after reading the statements about the child. As is, draft form of the assessment instrument named "Temperament Scale for Children (TSC)" has been made ready for practice.

Construct Validity

At the stage of testing the construct validity, it was analyzed whether there was any outlier which may affect the data through Mahalanobis distance value, and 19 data was excluded from the assessment. Analysis continued on 306 data. Before the EFA, Kaiser-Meyer-Olkin (KMO) and Bartlett sphericity tests were calculated in order to detect suitability of the data. KMO değeri 0,84 olarak hesaplanmış ve Bartlett testi manidar çıkmıştır ($\chi^2=5504,5264$, $df=861$, $p<.001$). According to these values, it was decided that the data is suitable for the factor analysis (George & Mallery, 2001). Dispersion graph obtained from the analysis has been given in Figure 1.

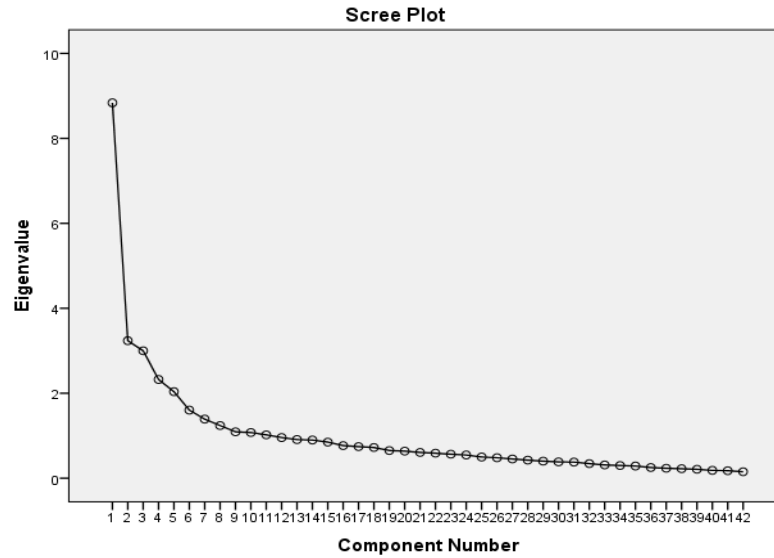


Figure 1: Dispersion graph of factors and eigenvalues

In Figure 1, it is seen that there are 11 factors of which eigenvalue is 1 and more than 1; and there are 7 factors of which eigenvalue 2 and more than 2, and of which variance rate is higher than the others. Thus, test was limited to 7 factors, and 9 statements of which factor load value is under 0,30 were removed. And after that, analysis was redone. If there is a cluster of statements highly related to a factor, it means that all those statements evaluate a notion-structure-factor. If a variance has 0.3 factor load, it means that the variance explained by the factor is 9%. The variance at this level is significant, and generally, regardless of its notation, it can be defined as high if its load value is 0,60 and more; and it can be defined as average if its load level is between 0,30-0,59. This is taken into consideration in variance extraction (Kline 1994; cited by Büyüköztürk, 2002). Büyüköztürk (2010) stated that the limit value for the total item correlation should be 0,30. Similar cases can be found also in the literature. For instance, Greca et. al. (1998) excluded the items of which factor load values were under 0,30 from the scale. Hwang and Henry (1990) excluded the items of which factor load values were under 0,45 from the scale. The obtained factors and eigenvalues are shown in Table 1.

Table 1: Factor load of the scale

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
1	,697						
2	,835						
3	,703						
5	,746						
9	,534						
7		,795					
8		,859					
10		,534					
11		,816					
13			,659				
14			,614				
15			,677				
16			,391				
17			,451				
19				,802			
20				,818			
21				,491			
22				,712			
23				,732			
25				,562			
12					,381		

28	,672
29	,607
30	,596
35	,794
36	,815
37	,607
38	,733
26	,434
39	,714
40	,692
41	,684
42	,707

As seen in Table 1, Temperament Scale for Children (TSC) composes of 7 factors explaining 57,20 of the total variance. Büyüköztürk (2009) states that 30% and above of explained variance is adequate in social sciences. Tavsancıl (2002) states that in the analyzes made in the social sciences, variance rates ranging between 40% and 60% are considered sufficient. The fact that factor eigenvalues and statement factor loads are high means validity of the TSC is high.

After analyzing the statements of 7 factors, each factor has been named in accordance with the statements they include. Accordingly, 1st Factor (5 statements) is Activity Level; 2nd Factor (4 statements) is Intimacy and Adaptability; 3rd Factor (5 statements) is Sensory Sensitivity; 4th Factor (6 statements) is Reactance State; 5th Factor (4 statements) is Attention and Perseverance; 6th Factor (4 statements) Rhythmicity; and 7th Factor (4 statements) is Emotional Sentimentality. Final form of the TSC composes of 33 statements.

Reliability Analysis

Findings about TSC corrected item-total correlation and difference of 27% of bottom-top groups are shown in Table 2.

Table 2: results related to tsc corrected item-total correlations and difference of 27% of bottom-top groups

Factor	Item	Correlation	t	p
Activity Level	1	,550	5,04*	,000
	2	,707	5,87*	,000
	3	,575	5,83*	,000
	5	,583	5,17*	,000
	9	,423	5,99*	,000
Intimacy and Adaptability	7	,616	5,15*	,000
	8	,792	9,54*	,000
	10	,467	9,04*	,000
	11	,713	10,11*	,000
Sensory Sensitivity	13	,388	7,23*	,000
	14	,392	8,04*	,000
	15	,387	2,05*	,000
	16	,236	6,99*	,000
	17	,224	2,83*	,000
Responsiveness/Reactivity	19	,654	9,28*	,000
	20	,692	9,59*	,000
	21	,408	5,66*	,000
	22	,597	10,08*	,000
	23	,629	9,36*	,000
	25	,525	9,27*	,000
Attention and Persistence	12	,369	6,95*	,000
	28	,434	6,26*	,000
	29	,373	6,94*	,000
	30	,460	7,82*	,000
Rhythmicity	35	,642	6,67*	,000
	36	,730	6,09*	,000
	37	,506	4,97*	,000
	38	,477	4,12*	,000

Emotional Sensitivity	26	,628	7,93*	,000
	39	,620	8,53*	,000
	40	,585	8,84*	,000
	41	,604	6,58*	,000
	42	,602	5,96*	,000

*p<0,001

When analyzing the Table 2, it is seen that corrected item-total correlations of TSC vary between 0,22 and 0,79. It is also seen that t (sd=164) values related to statement point difference of 27% of bottom-top groups vary between 0,83 (p<0,001) and 10,11 (p<0,001). Accordingly, it can be said that TSC statements have distinguishing feature in determining children's temperamental characteristics.

Cronbach alpha reliability coefficient has been determined as 0,85 for the whole scale. And it has been calculated for the sub-dimensions as; 0,79 for Activity Level sub-dimension, 0,82 for Intimacy and Adaptability sub-dimension, 0,57 for Sensory Sensitivity sub-dimension, 0,82 for Responsiveness State sub-dimension, 0,62 for Attention and Persistence sub-dimension, 0,78 for Rhythmicity sub-dimension, 0,80 for Emotional Sensitivity sub-dimension.

The high score obtained from the TSC sub-dimensions is interpreted as follows: Activity Level expresses that child's motor activity level during activities is high; Intimacy and Adaptability expresses that levels of child's acting in a warm way towards new people and adapting himself/herself to new situations/environments are high; Sensory Sensitivity expresses that intensity of child's showing his/her emotions such as anger, fear, sadness is at a normal/acceptable level; Reactance State expresses that level of child's sensory sensitivity such as sound, light, smell is high; Attention and Perseverance expresses that level of child's attention and perseverance during the activities is high; Rhythmicity expresses that child's biological rhythm is concordant and his/her level of rhythmicity is high; Emotional Sentimentality expresses that level of child's being sensitive to emotions of others around him/her.

V. CONCLUSION

Temperamental characteristics, composing of core of the personality and being determinant of personal characteristics, has an important role in child's development. Both parents and teachers have great responsibility in providing a healthy development process for children by determining temperamental characteristics which show up from very early ages. It is thought that the assessment instrument developed through this study for determining temperamental characteristics of children at the ages of 4-8 would contribute to related area (Appendix 1).

Information for Academics

It is okay for researchers who want to do academic studies on the subject without using any special permission from the authors, within the framework of ethical rules.

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Appendix 1: Temperament Scale for Children	Her zaman	Çoğunlukla	Bazen	Nadiren	Hiçbir zaman
AKTİVİTE DÜZEYİ					
1. Oyun veya diğer etkinliklerde enerjisi yüksektir.					
2. Hareketli etkinlikleri sever (koşmak, zıplamak, oynamak vb.)					
3. Oyun parkındaki araçlarda (kaydırak, salıncak, tahterevallı vb.) zaman geçirmekten hoşlanır.					
5. Hareketli etkinliklerde uzun süre vakit geçirebilir.					
9. Yeni karşılaştığı bir oyuncağı merak edip oynamak ister.					
YAKINLIK VE UYUM					
7. Yeni tanıştığı yetişkinlere karşı sıcaklık/yakınlık gösterir.					
8. Yeni tanıştığı akranlarına hemen sıcaklık/yakınlık gösterir.					
10. Günlük rutinlerin dışında yeni duruma (tatile gitmek, misafirlığe gitmek vb.) çabuk uyum sağlar.					
11. Yeni ve farklı bir ortama girdiğinde girişken davranır.					
DUYUSAL HASSASİYET					
13. Gürültülü ortamlardan etkilenmeyip rahat hisseder.					
14. Ani ısı değişimlerinde (su, hava vb.) normal tepki verir.					
15. Düzensiz veya dağınık ortamlardan rahatsız olmayıp memnun görünür.					
16. Farklı özellikteki malzemelere (kum, jöle, elbise etiketi vb.) dokunduğunda normal/kabul edilebilir tepki verir.					
17. Çevresindeki kokulara hassasiyeti yoktur.					
TEPKİSELLİK DURUMU					
19. Öfkelenildiğinde normal/kabul edilebilir tepkiler verir.					
20. Üzülendiğinde normal/kabul edilebilir tepkiler verir.					
21. Üzüntü veren bir olayın etkisini çabuk atlatır.					
22. Küçük yaralanmalara karşı normal/kabul edilebilir tepkiler verir.					

23.Korktuğunda normal/kabul edilebilir tepkiler verir.					
25.Sevgi veya nefret duyguları normal/kabul edilebilir düzeydedir.					
DİKKAT VE SEBAT					
12.Bir etkinlikten başka bir etkinliğe geçmek için istekli davranır.					
28.Yap-boz tamamlamak gibi zor görevleri bitirene kadar devam eder.					
29.Hoşlandığı/hoşlanmadığı etkinlikler tutarlılık gösterir.					
30.Verdiği kararları uygulama konusunda çaba gösterir.					
RİTMİKLİK					
35.Her gün aynı saatlerde acıkır.					
36.Her gün aynı saatlerde uykusu gelir.					
37.Uyku saatleri sorunsuz geçer.					
38.Her gün aynı saatlerde büyük tuvaletini yapar.					
DUYGUSAL DUYARLILIK					
26. Sevindiğinde normal/kabul edilebilir tepkiler verir.					
39.Üzgün insanlara teselli eder (sarılıp okşar, güldürmeye çalışır vb.)					
40.Çevresindeki insanları mutluluğunu benzer tepkiler göstererek paylaşır.					
41.Öfkeli birini gördüğünde, yatıştırmaya çalışır.					
42.Diğerlerinin duygularını sorular sorarak anlamaya çalışır.					

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