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Validity-Reliability of Nine Types Temperament Scale Adolescent Form (NTTS-A) and Relationship Between Temperament Types and Attention Deficit Hyperactivity Disorder

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Abstract

The purpose of this study is developing adolescent form (11-16 years old) of Nine Types Temperament Scale (NTTS) depending on Nine Types Temperament Model (Study 1) and evaluating and searching the relationship between Attention Deficit and Hyperactivity Disorder (ADHD) and Types of NTTM (Study 2). Sample of Study I consist of 1240 students who are between 11 and 16 years old. Pilot form of the Scale which consists of 90 items is tested with confirmatory factor analysis and with convergent and discriminant validity and the last version of the measure which consist of 82 items is prepared. Basic Personality Traits Inventory (BPTI) which depends on Fife Factor Model is used for Criterion-related validation. Results show that NTTS-A is valid and reliable measure for evaluating temperament types between 11-16 years adolescents. Their fit index is calculated as $\chi 2$ /df <3; SRMR, 0.06; RMSEA, 0.045; CFI, 0.909: TLI, 0901 supported to validity data. Sample of Study II consist of 56 adolescents who are diagnosed with ADHD according to DSM-IV diagnosis criteria and 56 students who does not get diagnosed with ADHD or mental retardation/medical disorder. Temperament types of participants are evaluated by the agency of Study-I and NTTS-A,

Keywords

Nine types temperament adolescent scale

Nine types temperament model

Temperament

Attention Deficit and Hyperactivity Disorder

Nine types temperament scale

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which is developed appropriate for Turkish culture. Indication of the study shows that there are more NTT7 and NTT8 in NTTM types between adolescents with ADHD than the group, who are not diagnosed with ADHD. As a result, it is discussed that traits which belong to some temperament types could have a predisposing effect on emergence of ADHD, experiencing these traits extreme severely could cause a view similar to ADHD and ADHD which is a neurodevelopmental disease could interact with temperament traits of person, in that way it could illustrate ADHD clinic. Available findings support critics about that students are labelled as ADHD specially in the last years in education environment even if they have mostly not developmental problems and students are diagnosed easily with limited observations. However, it is asserted that diagnosis based on temperament, treatment and psychosocial support programmes could be formed and effects of ADHD, which is a factor interacting with temperament traits, on personality structure of adolescents on their development process, could be predicted. Our study has the feature of being the first measure developing study which is intended to evaluate temperament types of adolescents between 11-16 years old and also it is has the feature of being the first study which searches relationship between NTTM types and ADHD.

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Introduction

Temperament is considered in two categories as children oriented approach, which is built by observing children and babies (e.g. Rothbart, Derryberry & Posner, 1994; Thomas & Chess, 1977) and as adult oriented approach, which is built by observing adults (e.g. Mehrabian, 1996, Strelau, 2002, Cloninger, Przybeck, Svrakic, Wetzel, 1994, Akiskal, Akiskal, Haykal, Manning, Connor, 2005). One of the models, which approaches temperament as adult oriented is Nine Types Temperament Model (NTTM) (Yılmaz, 2010; Yılmaz et al., 2011; 2014a; 2014b; 2015a; 2015b; 2015c). According to NTTM temperament is a structural core, which underlies personality, comes from birth, and has specific motivation, searching and perception priority. (Yılmaz et al, 2014b). Interaction of this core with internal/inborn (intelligence, gender, genetic structure, age, biological features etc.) and with external/environmental (family, education, social environment, experiences, culture, belief etc.) generates personality (Yılmaz et al., 2014a; 2014b).

Temperament evaluation of children is done by using scales which are developed though child oriented models in our country. Child Behaviour List Short Form (3-7 years), which is developed according to The Developmental Model of Temperament of Rohtbart is adapted by Sarı and others (2012), Short Temperament Inventory for Children (5-6 years), which is developed according to New York Longitudinal Study (NYLS) is adapted by Kumru, Sayıl and Yağmurlu (2006) to Turkish sample. Evaluation of adults is done with Temperament Character Inventory (TCI) depending on Cloninger's Psychobiological Personality Model (PPM) and with Temperament Evaluation of the Memphis, Pisa, Paris, and San Diego Auto-questionnaire (TEMPS-A) depending on Affective Temperament Model (ATM) of Akiskal. (Akiskal et al., 2005; Cloninger et al., 1994)

Temperament is utilized with three methods as observation, questionnaire and rating scale (Joyce, 2010, p. 53). In evaluation of temperament of preschool children is used rather observation method and rating scales, which are filled by parents for teachers (Joyce, 2010, p. 55). For example Thomass and Chess (1977), develop Teacher Temperament Questionnaire, which should be filled by teachers due to measure nine types temperament traits, which is determined by them by observing 3-7

years old children in NYLS. The first form of the scale consists of 64 items and is scored as 7 point likert. The short form of the scale, which is developed by Keogh and others (1982) consists of 23 items, which are filled by teachers and scored as 6 point likert. Behavioural Style Questionnaire, which is developed by McDevitt and Carey (1978) according to NYLS and evaluates temperament of children who are 3-7 years old, is scored as 6 point likert and includes 100 items. Self-report forms are preferred in temperament evaluation of adolescents and adults. (Joyce, 2010, s. 55). For example, Characteristics of Behaviour-Temperament Inventory (FCB-TI) , which evaluates adolescents and adults who are between 15-77 years old, is a self-report inventory, which is answered in the form of "yes" and "no" and consists of 120 items (Strelau and Zawadzki, 1995). TCI (240 items) and TEMPS-A (110 items), which are used commonly for temperament evaluation of adults, are self-report scales, which are responded in the form of "yes" or "no" (Akiskal et al., 2005; Cloninger, 1994).

Child and adolescent forms of some scales depending on adult oriented approach are developed in literature based on the view, which supports that temperament transmits genetically and could be observed from babyhood (Strelau, 2002). For example, Junior Temperament and Character Inventory (JTCI), which is child form of TCI and is developed by Luby et al. (1999) is a scale, which is used commonly in this field and adapted to many cultures (Asch and others., 2009; Copeland et al, 2004; Moreira et al., 2012; Vangberg et al. 2013). Nine Types Temperament Scale (NTTS) is developed in the purpose of evaluating temperament types of NTTM (Yılmaz et al., 2014a). An original scale, which is used for evaluating temperament features of adolescents, has not developed yet in our country.

Evaluating temperament of adolescent sample; provides useful information for researchers and practitioners in the areas of academic performance of adolescents (Duckworth & Allred, 2012; Joyce, 2010), evaluation of their adaptation and communication skills (Schwartz et al., 1999), career planning, determination of their behavioural, academic and social difficulty (Sanson et al., 2009), prediction of their psychopathology and preventive studies (Caspi et al., 1996; Yılmaz et al. 2014b) determination of appropriate diagnosis, treatment and psychosocial support approaches (Muris and Ollendick, 2005; Yılmaz et al., 2014b; 2015a). Moreover, NTTM asserts that normal or pathological behaviours in childhood, adolescence and adulthood could be explained based on temperament features, which constitutes personality and does not change lifelong (Yılmaz et al. 2011; 2014a; 2014b).

Temperament and Attention Deficit and Hyperactivity Disorder

Rothbart and Bates (1998) emphasize importance of temperament in understanding developmental process of children. Furthermore, many researchers presents that temperament and personality traits of children and adolescents are related to developmental pathologies (Muris & Ollendick, 2005; Rettew et al, 2004; Rettew & McKee, 2005). Attention Deficit Hyperactivity Disorder (ADHD), is characterized with extreme mobility, careless and impulsive behaviours. (American Psychological Association [APA], 2001). Beginning of ADHD is generally about 3 years old, but its diagnosis is made in primary school years depending on expectation of increase in attention time development in focusing (Şenol et al., 2006, p.5).

According to Martel and Nigg (2006), diagnosis of ADHD is controversial because indication of ADHD frequently jibes with normal childhood traits. The view which supports that knowing temperament and personality traits of individual helps for understanding primary symptoms of heterogeneous structure of ADHD (comorbidity of behavioural varieties, different psychiatric disorders and behavioural- emotional problems) and careless-disorganized and hyperactive-impulsive behaviours, gains importance day by day between theoreticians (Pauw & Mervielde, 2010; Martel & Nigg, 2006; Nigg, 2006). Furthermore, approaching to ADHD from the temperament and personality traits perspective could provide easiness and understanding to researchers and clinicians both about diagnosis and explanation of incompatible behaviours (Pauw & Mervielde, 2011; Nigg et al., 2004).

It is known that there are biological differences between children with ADHD and children who are not diagnosed with ADHD, but understanding how these differences reflect to behaviour and to disorder could be understood due to understanding relationship between temperament and personality (Chandler, 2010). Temperament traits constitute structural ground of personality development (Yılmaz et al., 2014b). Personality traits which consist of interaction temperament traits with environmental factors (Yılmaz et al., 2014a; 2014b) are important predictors of emergence of ADHD the ages ahead (Barkley, 2000). Even there are a few amounts of studies, which search relationship between ADHD and temperament and personality traits with different models, importance of the topic increases day by day for researchers (White, 1999). Güney and others (2013), in their research which searches relationship between PPM and ADHD, report that scores of novelty seeking are higher; scores of persisting, self direction, cooperation and going beyond oneself are lower in ADHD group. Cho and his friends (2008) also determines children with ADHD get higher scores in novelty seeking and get lower scores in self direction in similar way. Pauw and Mervielde (2011) search relationship between Temperament Model of Buss-Plomin and Temperament Theory and Five Factor Model (FFM) of Rothbart. Results show that children with ADHD have lower profile from the point of control, conscientiousness, helpfulness and neuroticism which need effort and higher profile from the point of activity, sensuality and negative affect and feature in similar average with control group in the point of intemperance, shyness and extraversion. Nigg and others (2002a), in their study, which they search relationship between ADHD indication and BFM dimension, determine that carelessness-disorganization cluster is related to low conscience and neuroticism, hyperactivity-impulsivity cluster is related to low agreeableness. There is no study which search relationship between ADHD and temperament types from the perspective of NTTM.

The purpose of this study is developing a scale which evaluates temperament types of 11-16 years old adolescents based on NTTM, which is an adult oriented temperament model, and also searching relationship between temperament types of NTTM and ADHD, which is seen commonly in adolescent sample to demonstrate usefulness of the scale. The purpose of Study-I is developing an assessment instrument, which evaluates temperament traits of adolescents between 11-16 years old based on NTTM and NTTS. The purpose of Study II is investigating relationship between temperament types of NTTM and ADHD and representing approach perspective based on statistical data about temperament and ADHD. Descriptive effect of NTTS-A on ADHD is tested to test usefulness and validity of NTTS-A.

This study gains importance in terms of being the first work of developing a scale which is aimed at temperament evaluation of Turkish adolescents and being the first work which investigates relationship between ADHD and temperament from the perspective of NTTM.

Method

Study-I Research Sample

Sample of this study are middle school students, who are going to school linked with MEB (ministry of national education) from the cities, which are in Turkish Statistical Institute (TSI) NUTS1 Istanbul, Ankara, Balıkesir, Erzurum, İzmir, Kahramanmaraş, Sakarya, Samsun, Sivas, Şanlıurfa, Trabzon and Van, are considered as adolescent according to development theoreticians such as Erikson, Piaget, because they are between 11 and 16 years old (Kulaksızoğlu, 1998; Selçuk 2012). The research is applied to 1370 adolescent students; data are analyzed on residual 1240 assessment instrument after eliminating deficient and defective forms. %52, 7 of research sample are girls (n= 654), %47,3 of research sample (n= 585) are boys. Average of ages is calculated as 13.80,± 1.41.

Statistical Analysis

Statistical analysis is conducted with SPSS and AMOS programs. Construct validity and concurrent validity analysis are applied for validity analysis of the scale. Statistical operations are conducted only with DFA (Harrington, 2008) because the scale based on a theoretic model and hypothesis.

Study-I Nine Types Temperament Model Adolescent Form (NTTS-A) Validity and Reliability Study

Premise of NTTS-A is NTTS, whose theoretical background based on NTTS and which is prepared to evaluate temperament types of NTTM in adult sample (Yılmaz et al. 2014a; 2014b). NTTS is a self-report scale, which is developed by Yılmaz and others (2014a) and whose validity and reliability is conducted, consists of 91 items and responded with 3 likert points (“yes”, “sometimes”, “no”). A new scale, which based on the same theoretical model in adolescent oriented configuration, is developed in this study. Adolescent form of NTTS is developed and named as NTTS-A.

Firstly, a psychiatrist and a psychologist who know NTTM well constitute items which represent each of temperament types in NTTM the way that represent adolescents in the stage of constitution of item pool. Item pool, which is constituted, is controlled in common meeting of experts either who know NTTM very well (psychiatrist, psychological counsellor and psychologist) and academicians who make research about adolescents and is formed again with contribution of different professional field workers. Items, which might be appropriate for adolescent sample, are selected for pilot analysis and draft test form is constituted. In the stage of writing items, each temperament category traits is grounded on items belonging for each temperament category. It is been cared that all items are specific for temperament category and sensitive from other temperament categories. The first item pool, which has total 167 questions, has been constituted with this way of process. After following processes, pilot application form, which has 90 items, is put in final form. 3 likert point options (“yes, “sometimes”, “no”) are used in response of items in the scale. Pilot form of the scale is applied to 430 students. Application form, which includes 82 items, is constituted after pilot application. Decision for elimination of scale items is made by searching total item correlation and DFA correction indices. Prepared draft form, is broached to measuring expert again for the last control in order to be evaluated except working team from an integrative perspective.

Basic Personality Traits Inventory (BPTI), which is used for standard validity is a self-report scale is developed by Gençöz and Öncül (2012) based on FFM and developed according to Turkish culture. The scale is includes 45 items and has 5 likert point, whose options are “Not applicable at all”, “Not applicable” “Neutral” “Applicable” “Very Applicable”. In factor analysis of the scale represent 53.25 % of the total variance. BPTI sub-scale names are Conscience-Self direction, Extraversion, Agreeableness, Openness to Experience and Neuroticism. Internal coefficient of consistence of BPTI change between 0.71 and 0.89, correlation coefficients of all items change between 0.32 and 0.77. Test-retest reliability coefficients change between 0.71 and 0.84.

Confirmatory Factor Analysis (CFA)

CFA explains relationship system casual connections between basic and latent variable by figuring the model based on a theory (Byrne, 1999; Sümer, 2000). CFA is accepted as natural extension of AFA model as a process. (Lee, 2007). CFA is applied for the purpose of evaluating adaption between factor and reel data based on a theoretical ground. CFA is a kind of Structural Equality Model (SEM) which is concerned about specially measurement models of latent variables (or factors) and observable measures (test items, scores etc) (Yılmaz & Çelik 2009). Basic advantage of CFA which is seen as a natural part of AFA process is that CFA could act differently from the trait of AFA, which standardize all variables conventionally. Latent and observed variables cannot be standardized in CFA process (Brown, 2006). In this way, CFA has the capacity to calculate and predict relationship between latent variables, which are relatively eliminated from measuring errors more consistently and with less error margin (Hoyle, 1995). According to Sümer (2000) CFA is an analysis, which evaluates that factors being consisted of many variables adjust to what extent. In the other words, CFA aims at searching to what extent a structure, which is determined and built before, is verified with collected data.

Convergent and Discriminant Validity

Reliability and composite reliability of items belonging every kind of structure in scale and also average variance extracted (AVE) is calculated in order to convergent validity of responses, which are given to measuring items. First of all, reliability of an item is determined by load factor value in its factor. If an item has more than 0.50 load factor value, that item is reliable. Load factor value, which belong to every group change between 0.734 and 0.875. Secondly, Kline (2005) point out that when alpha value of composite reliability coefficient CR is 0.70 or more, composite reliability is provided. Composite reliability values, which are calculated for every structure change between 0.825 and 0.888. As last indication about convergent validity AVE is calculated for values of each structure. It is expected that this value should be 0.50 or higher. In addition, it is shown in Table-1 that measuring instrument provides convergent validity of factor structure (Klem, 2000).

Discriminant validity determines to what extent factors, which are in the same model, discriminate each other. In this situation, in order that sub-factors which belong to a factor, they need certain level of correlation, on the other hand in order that all sub-factors could be by themselves, they should not be similar, so they need disintegrate. Discriminant validity is evaluated by comparing square root of a structure with correlation coefficient of the structure with other structures. Values, which are on diagonals, need to be higher than their line and column in order to mention about discriminant validity (McDonald ve Ho, 2002). Satisfactory results are got from discriminant validity both in item and structure levels.

Table 1. Measurement Model Results

Structure Items	Av.	Ss	Skewness	Kurtosis	FL (>50)[a]	t	AVE(>0.5)[a]	CR(>0.7)[a]	α (<0.7)[a]
NTT1									
nttm 1	1.70	.599	.223	-.601	.724	---	.625	.931	.700
nttm 10	1.61	.676	.635	-.684	.769	6.483			
nttm 22	1.81	.763	.317	-1.224	.725	8.325			
nttm 32	2.32	.711	-.574	-.868	.761	6.379			
nttm 41	1.85	.767	.245	-1.268	.879	5.161			
nttm 49	2.19	.736	-.327	-1.105	.803	6.943			
nttm 77	1.84	.716	.239	-1.031	.819	9.129			
nttm 85	1.90	.767	.182	-1.210	.832	9.223			
NTT2									
nttm 2	1.55	.673	.820	-.477	.750	---	.656	.950	.787
nttm 19	1.88	.817	.220	-1.470	.787	7.839			
nttm 23	2.11	.799	-.219	-1.403	.833	8.961			
nttm 28	1.78	.739	.369	-1.102	.753	6.351			
nttm 40	1.84	.821	.299	-1.455	.878	7.754			
nttm 47	2.11	.813	-.212	-1.457	.833	8.961			
nttm 52	1.87	.795	.232	-1.385	.910	7.048			
nttm 55	1.89	.760	.171	-1.253	.708	8.026			
nttm 74	2.02	.838	-.047	-1.575	.889	9.284			
nttm 87	2.14	.795	-.272	-1.372	.730	8.214			
NTT3									
nttm 4	2.32	.732	-.597	-.931	.773	---	.584	.939	*.816*
nttm 11	2.48	.692	-.991	-.300	.747	8.460			
nttm 27	1.77	.749	.404	-1.129	.789	10.41			
nttm 35	1.75	.682	.359	-.852	.764	8.711			
nttm 44	1.79	.752	.365	-1.157	.731	9.665			
nttm 51	2.12	.851	-.235	-1.581	.705	9.305			
nttm 56	2.11	.778	-.198	-1.326	.843	11.05			
nttm 63	2.40	.709	-.755	-.688	.747	9.884			
nttm 71	2.17	.797	-.324	-1.358	.780	10.30			
nttm 81	2.02	.765	-.013	-1.227	.815	10.73			
nttm 89	1.79	.711	.320	-.993	.700	7.722			

Tablo 1. Continue

Structure Items	Av.	Ss	Skewness	Kurtosis	FL (>50)[a]	t	AVE(>0.5)[a]	CR(>0.7)[a]	α (<0.7)[a]
NTT4									
nttm 13	1.92	.815	.141	-1.482	.755	6.061	.668	.953	.795
nttm 20	2.03	.810	-.070	-1.476	.826	8.830			
nttm 26	2.14	.782	-.252	-1.327	.790	6.419			
nttm 29	2.19	.780	-.365	-1.274	.852	6.925			
nttm 39	1.67	.709	.570	-.860	.892	9.267			
nttm 43	2.05	.787	-.098	-1.380	.755	9.383			
nttm 53	2.25	.774	-.483	-1.181	.774	9.413			
nttm 58	2.00	.802	-.014	-1.446	.779	7.491			
nttm 68	2.16	.709	-.245	-.996	.841	9.502			
nttm 78	1.95	.823	.081	-1.521	.895	6.061			
NTT5									
nttm 3	2.39	.727	-.771	-.739	.758	---	.637	.924	.730
nttm 12	2.46	.739	-.989	-.486	.793	5.522			
nttm 18	2.27	.725	-.465	-.993	.800	5.575			
nttm 42	2.33	.745	-.640	-.945	.810	6.498			
nttm 48	2.24	.744	-.431	-1.095	.727	4.892			
nttm 84	2.46	.723	-.946	-.440	.809	5.884			
nttm 88	1.92	.725	.113	-1.091	.880	6.467			
NTT6									
nttm 5	1.87	.780	.216	-1.331	.768		.604	.931	.773
nttm 9	1.86	.719	.207	-1.050	.748	8.357			
nttm 15	1.88	.721	.184	-1.067	.775	9.864			
nttm 50	1.84	.777	.278	-1.297	.897	10.12			
nttm 59	2.19	.752	-.332	-1.174	.888	9.416			
nttm 67	1.73	.712	.433	-.955	.732	10.54			
nttm 70	1.96	.760	.064	-1.264	.756	9.337			
nttm 79	1.82	.786	.323	-1.315	.700	6.229			
nttm 86	1.60	.661	.647	-.627	.701	8.773			
NTT7									
nttm 8	1.50	.675	.971	-.268	.712	---	.631	.932	.700
nttm 16	1.80	.728	.310	-1.076	.787	6.033			
nttm 36	1.75	.652	.297	-.731	.764	5.096			
nttm 45	1.69	.763	.585	-1.063	.701	4.933			
nttm 62	1.77	.717	.365	-1.005	.880	6.226			
nttm 66	1.84	.723	.251	-1.064	.848	5.554			
nttm 76	1.77	.767	.407	-1.202	.795	6.266			
nttm 82	1.53	.688	.913	-.404	.851	4.787			
NTT8									
nttm 6	1.70	.691	.461	-.855	.897	---	.682	.955	.851
nttm 14	1.94	.761	.090	-1.269	.801	11.37			
nttm 24	2.14	.780	-.251	-1.317	.848	12.16			
nttm 33	2.24	.769	-.447	-1.185	.884	11.74			
nttm 38	2.09	.740	-.157	-1.164	.767	10.90			
nttm 54	1.93	.769	.108	-1.303	.774	12.23			
nttm 64	2.03	.793	-.064	-1.407	.880	13.37			
nttm 69	2.42	.715	-.841	-.606	.705	12.27			
nttm 73	2.38	.728	-.741	-.776	.834	13.02			
nttm 80	2.35	.674	-.568	-.729	.848	9.247			
NTT9									
nttm 7	1.70	.691	.461	-.855	.704	---	.572	.923	.721
nttm 17	1.94	.761	.090	-1.269	.772	7.646			
nttm 31	2.14	.780	-.251	-1.317	.806	8.624			
nttm 34	2.24	.769	-.447	-1.185	.705	5.371			
nttm 37	2.09	.740	-.157	-1.164	.840	8.834			
nttm 61	1.93	.769	.108	-1.303	.763	8.087			
nttm 72	2.03	.793	-.064	-1.407	.702	5.394			
nttm 83	2.42	.715	-.841	-.606	.710	6.415			
nttm 90	2.38	.728	-.741	-.776	.789	7.710			

[a,b] Acceptable reliability and validity values

Note: CR is summary of $(\Sigma\lambda)^2 / (\Sigma\lambda)^2 + (\Sigma\eta)$ AVE is summary of $(\Sigma\lambda^2) / (\Sigma\lambda^2) + (\Sigma\eta)$

Table 2 Measurement Model Goodness of Fit Indices

Model Goodness of Fit Indices	Value	Recommended Value	References
χ^2	6544,765	Not Significant p<0.05	Klem (2000), Kline (2005), McDonald and Ho (2002)
χ^2/ df	2,043	< 3	Gefen, Karahanna, & Straub (2003)
SRMR	0.06	< 0.05	
RMSEA	0.045	< 0.05 (perfect fit)	McDonald & Ho (2002)
	(0.043, 0.046)	< 0.08 (low fit)	
CFI	0.909	=>0.90	Klem (2000), McDonald & Ho (2002),
TLI	0.901	=>0.90	Klem (2000), McDonald & Ho (2002)

Criterion Related Validity

The correlation between NTTS and BPTI on 1070 people is searched to demonstrate criterion related validity. Semantic relations are observed between NTT1 and Conscience-Self direction, .37 (p<001); between NTT2 and Extraversion .56, (p<001), Agreeableness .41, (p<001), and Openness to Experience .48, (p<001), Neuroticism .52 (p<.001) ; between NTT3 and Extraversion .36 (p<.001); between NTT4 and Conscience-Self direction -.47 (p<.001); NTT5 Extraversion -.27 (p<.001); between NTT6 and Neuroticism .32 (p<.001); NTT7 and Openness to Experience .62 (p<001), Extraversion .51 (p<.001); NTT8 and Agreeableness -.39 (p<001) and NTT9 and Agreeableness .58 (p<001) levels. Negative correlations are seen between NTT6 and Extraversion as excepted, negative correlations are seen between NTT7 and Conscience- Self direction, positive correlations are observed between NTT8 and Extraversion but calculated value is statistically insignificant.

Reliability Work

When internal consistency analyses were applied to all of the scale, Cronbach alpha=α value was calculated as 0.88. Cronbach alpha internal consistency coefficients of temperament types NTT 1; 0.90, NTT 2; 0.89, NTT 3; 0.80, NTT 4; 0.84, NTT 5; 0.90; NTT 6; 0.88, NTT 7; 0.86; NTT 8; 0.92; NTT 9; 0.90 were found statistically significant. NTTS was re-applied to 210 participants after three weeks, and test-re-test analyses were applied (0.79) and for every temperament type were found to be as follows: NTT 1; 0.79, NTT 2; 0.82, NTT 3; 0.78, NTT 4; 0.80, NTT 5; 0.76; NTT 6; 0.86, NTT 7; 0.78; NTT 8; 0.80; NTT 9; 0.78.

Study-II Relationship Between Attention Deficit and Hyperactivity Disorder and Temperament Types.

Research Model

The model of this research which searches relationship between temperament types based on NTTM and ADHD from the perspective is scientific research model. Relational research is a research model which is used by determining relationship between two or more variables (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz and Demirel, 2014). This research shows what kinds of relationship have Nine Types Temperament Model in adolescent with hyperactivity and without hyperactivity.

Research Group

Study group in this research is chosen with the purposeful sampling method. Purposeful sampling gives opportunity to make studies deeply by choosing group which are rich about information and this method is used in situations that have a specific feature or specific features. Making research on adolescents between 11-16 years old, who are diagnosed with ADHD and who are not diagnosed with ADHD necessities purposeful sampling options. In this way, sample group of the study consist of 112 adolescents totally, as 56 adolescents, who are followed in İstanbul Cerrahpaşa Medicine Faculty, Trabzon Kanuni Education and Research Hospital, Gümüşhane Hospital, Ordu Government Hospital, Samsun Education and Research Hospital, Erzincan Mengücek

Gazi Education and Research Hospital and Erzurum Region Education and Research Hospital Child Psychiatry Policlinics, who are diagnosed with ADHD according to DSM IV-TR, who have not mental retardation, who have not any medical comorbidity and as 56 adolescents, who are not diagnosed with ADHD, have similar age and gender group, who have not mental retardation and medical disorder. 56 participants (45 men, 11 women), who are diagnosed with ADHD and 56 participants (45 women and 11 men) participants, who are not diagnosed with ADHD are evaluated in this study. Participant with ADHD have 12.89±1.12 age average, participants without ADHD have 12.60±1.22 age average.

Instrument for Collecting Data

Nine Types Temperament Model Scale Adolescent Form (NTTS-A)

Validity and reliability information of NTTS-A, which is developed for evaluation of temperament types between 11-16 years old, according to NTTM, are given under title of Study-I. NTTM-A is a self report scale, which consists of 82 items and scored as 3 likert points with options "yes", "sometimes" and "no".

The Way of Process

Research, which is made to search relationship between temperament types based on NTTM and ADHD, is approved by Bezmialem Foundation University Clinical Researches Ethic Committee. Study group of the research consist of 56 adolescents with ADHD, who accept to join to the study and whose volunteer consent form is signed by his family members (mother, father, 18+ sister/brother). This form is not signed to 56 adolescents who are not diagnosed with ADHD. Socio-demographic form is signed by researchers by counselling family members and NTTS-A is signed by participants individually. Information about the research and information how scales should be filled by participants are given before application. At the same time, a sample item is filled with adolescents in study group. After filling scales, it is thanked to the study group. After that, research data are entered to data base, which is built in SPSS program. After data entry, data cleaning for analysis, determining marginal values and required procedures are made.

Analysis of Data

Data are evaluated with SPSS 21.00 program. T test is applied for independent groups in order to determine relationship between temperament types of NTTM and ADHD. There are two independent groups in the research as adolescent, who are diagnosed with ADHD and who are not diagnosed with ADHD. Research data is analyzed with t test to determine what kinds of differences have these two groups according to temperament types of NTTM. Statistical significance value is accepted as $p<0.05$ in the research. Furthermore, descriptive statistic is made of adolescents in study group in the context of gender and age.

Findings

56 participants (45 men, 11 women), who are diagnosed with ADHD and 56 participants (45 women and 11 men) participants, who are not diagnosed with ADHD are evaluated in this study. Participant with ADHD have 12.89±1.12 age average, participants without ADHD have 12.60±1.22 age average. According to results from using t test for independent variables of group with ADHD and without ADHD, NTT7 and NTT8 are found statistical significant ($p<0.05$). Analysis results of group with ADHD and without ADHD are shown in Table 3.

Table 3. NTTS-A Score Values of Adolescent with ADHD and who are not diagnosed with ADHD

Temperament Types	Variable	N	Average	Ss	t	p
NTT1	Normal	56	1.14	.37	.56	.42
	ADHD	56	1.09	.40		
NTT2	Normal	56	1.01	.45	1.56	.11
	ADHD	56	1.20	.41		
NTT3	Normal	56	.97	.44	1.44	.16
	ADHD	56	1.12	.56		
NTT4	Normal	56	.71	.43	1.70	.09
	ADHD	56	.94	.40		
NTT5	Normal	56	.78	.46	1.22	.13
	ADHD	56	.69	.32		
NTT6	Normal	56	1.11	.45	.35	.82
	ADHD	56	1.09	.45		
NTT7	Normal	56	1.16	.41	6.60	.000*
	ADHD	56	1.99	.27		
NTT8	Normal	56	.91	.44	5.30	.000*
	ADHD	56	1.50	.50		
NTT9	Normal	56	1.02	.40	.96	.29
	ADHD	56	1.14	.41		

** p<.001 statistically significant*

In the result of comparing temperament types between adolescents with ADHD and without ADHD, significant difference is seen for NTT7 and NTT8. It has seen significant difference for NTT7 t=6.60, p<.001 level. It is understood that this difference is originated from adolescents, who are diagnosed with ADHD, when average scores are searched. Significant difference is seen for NTT8 t=5.30, p<.001 level and the difference is originated from also group with ADHD.

Discussion, Results and Suggestions

Calculation of validity and reliability of NTTS-A shows, that temperament scale, which is developed firstly, is useable for adolescent population in Turkey. Data collecting process is applied with the amount of participants, which could be generalized to adolescent population in Turkey within TUIK NUT1 cities in order to increase epitomising efficiency of the scale. Only CFA is applied because theoretical structure based on NTTM is described and content model and measurement model are presented. Because scale provides evaluation function within context of individual traits of adolescents' temperament types, it is cared that validity data is enriched. Convergent and discriminant validity calculations, which are made from this reason show that result are provided well accepted values in literature. Calculations for every test item are seen in Table-1. Standard validity and reliability calculations are in furtherance psychometric efficiency. NTTS-A provides in the context of every type of temperament and NTTM theory and within standard validity correlational results in expected direction. Reliability analysis results, which are enriched with test retest scores leads good results, when a comprehensive structure like temperament and quality of application population for 82 items are observed. Available indicators with 82 items and triple rating with an answer structure, which could be used easier for this age group, are provided ready to use.

Literature says that it is associated with disposition to psychopathology and temperament characteristics of children. And in addition some of temperament characteristics of children are known to be characterised by some psychopathology in childhood (Muris ve Ollendick, 2005; Rettew ve McKee, 2005). Bussing and friends (2003) reveal that temperament is predisposing to DEHB. Nigg and friends (2004) state that characteristics of temperament form the core symptom of DEHB. In this context parallel to these opinions DTTM comes up with that temperament characteristics can sustain the disposition for some psychopathologies. In this context, NTTM points out that temperament types tend to some psychopathologies parallel to these views in literature (Yılmaz et al., 2011).

Results of our study show that NTT7 and NTT8 in NTTM types are more than group, which are not diagnosed with ADHD. NTT7 group shows sociable, quicksilver, extrovert, impulsive, impatient traits, they like new experiences, addict to adventure and they have difficulties in self direction (Yılmaz, 2010; Yılmaz et al., 2014b). They lose their attention easily, are bored from studying in the same topic so quickly and seek new activities (Yılmaz, 2010). They are very innovative, are keen on new experiences and seek adventure and excitement (Yılmaz, 2014a; 2014b; 2015a). Cho and his friends (2008), suggest that children with ADHD have high novelty seeking and low self direction traits. It is reported that temperament types of children with ADHD is investigated and children with ADHD has high activity level both at home and at school, high distractibility and low patience traits in another study based on parent-teacher observations (McIntosh & Cole-Love; 1996).

NTT8 shows extrovert, brave, independent, leader, confident traits and likes being in the front almost everywhere. They are authoritarian, strict, repressive and manipulative (Yılmaz, 2010; Yılmaz et al., 2014b). They decide quickly without thinking, act quickly. They behave in impatient, defensive and challenging way. They show in flammability, being angry, keen to violence and being aggressive traits (Yılmaz, 2010; Yılmaz et al., 2014a; 2014b). Martel and his friends (2011), determine that children with ADHD in hyperactive-impulsive group have aggressive, warlike traits, have low control and are extrovert in their study, which they apply to 548 children and 302 of these children have ADHD. Kern and his friends (1999) suggest that individuals with ADHD are more independent and less rule oriented and keener to conflict and be aggressive in stressful situations than individuals without ADHD. Weyandt and DuPaul (2008) points out that students with ADHD cares less about rules and keen to present aggressive behaviours in stressful situations, in the similar way. Harty and his friends (2009) suggest that one of the important traits of children with ADHD is aggressiveness, rage and hostility. In that way, depending on coinciding traits belonging NTT7 and NTT8 with traits of children with ADHD, it could be suggested that these traits could prepare predisposing factor for ADHD.

It is thought that biological and psychosocial factors take part in ADHD aetiology together (Güney et al., 2008; Dias et al. 2013).Children with ADHD, show temperament traits similar to ADHD, such as common activity, irritation, mobility, nutrition problems and sleeping little (Davison and Neale, 2004, p. 430, Şenol et al., p. 12). However, many children continue their development without being diagnosed with ADHD, although they are described as extreme mobile and careless by their parents and by their teachers in preschool period (Davison & Neale, 2004, p. 430). In another meaning, every child who show extreme mobility and carelessness, are not diagnosed with ADHD. However, interaction some temperament traits with incompatible environment build inclination to ADHD (Neven et al., 2002). As it can be waited, NTT7 and NTT8 temperament types are seen significantly more in ADHD group, although there are no individuals with NTT7 and NTT8 temperament in the group without ADHD. It could indicate other factors could be also effective beside temperament in emergence of ADHD. Namely, environmental factors affect temperament types differently (Yılmaz, 2010). Moreover, temperament, which determines behaviour tendency, can form some advantages and disadvantages in occurrence of ADHD. For example, NTT1 temperament type child, who is raised by parents who have difficulties in establishing rules and border might not have border problem because he follows rules finically and is self controlled. However a parent's attitude like this could cause that a child with NTT7 temperament behave more mobile and impulsive, so he can live more border problems. Another example; a child with NTT4 traits, who is extreme sensitive, fragile and vulnerable could be very introvert when he grows up in conflict and violence atmosphere, but a child with NTT8, who grows up in the same atmosphere, could be more mobile, impulsive, aggressive and violence oriented (Yılmaz, 2010). From this frame, neurodevelopmental factors and environmental factors, which provide constitution of ADHD configuration of NTT7 and NTT8, could be seen as ADHD.

Another reason of that NTT7 and NTT8 is found significantly high in ADHD group could be about diagnosis process of ADHD. ADHD is a disorder, whose diagnosis is discussed. Barkley, 2003; Goldman et al.,1998). Researchers point out that more children are diagnosed with ADHD than necessary, in clinics, and medical treatment is applied, even if it is unnecessary (Diller, 1999; Goldman et al., 1998; Lefever et al., 1999; 2003). Concentration difficulty, attention and irritation problems are similar to other childhood psychiatric disorders, so differential diagnosis of ADHD is complicated and children with these kinds of symptoms could be diagnosed with ADHD by mistake (Fettahoğlu & Özatalay, 2006). Symptoms of ADHD have traits, which could be very similar to NTT7 and NTT8 types (for example: being mobile, being bored easily, impulsivity, discovering and investigating always new objects because of their artificial curiosity, novelty seeking, deciding fast, acting quickly being violence oriented and aggressive etc.) (Yılmaz, 2010; Yılmaz et al., 2014b). From this reason, when individuals with NTT7 and NTT8 temperament types present their temperament traits severely, it can be evaluated as ADHD, even it does not have neurodevelopmental root. So, evaluations, which are made from the perspective of NTTM could make easy to differ normal temperament traits and psychopathological tables and could help for clear errors, which roots from clinical observations (psychometric measurements).

Clinicians should consider effects of predisposing, precipitating and protective traits of environmental factors on behaviours. When theoretical approaches guide for understanding nature of disorders, findings about individual factors such as development period; temperament and personality traits help to understand unique nature of child delicately (Wilmshurst, 2005, p. 19). At this point, views of parents and teachers who know the child closely, have importance in diagnosis process (Ghanizadeha et al., 2006). However, it is seen that many parents use hyperactive word for their child, who is careless, naughty, and mobile or shows behaviour disorder (Davison & Neale, 2004,

p. 429; Karabekiroğlu et al., 2009). Furthermore, Karabekiroğlu and his friends (2009) find that teachers have significantly higher level of wrong labelling than their parents even they have more information about ADHD, in the study which they investigate labelling levels and information levels about ADHD and autism. The reason of this could be difficulty of coping with children, who have problems similar to ADHD such as extreme mobility, impulsivity, having difficulty in waiting queue, talking a lot, having difficulty in social relations and medical control and medical support are seen as solutions for problematic behaviours. Another reason could be that adults evaluate activity and attention levels of children as abnormal even they are appropriate for their age period in our educational system which forces children to compete (Fettahoğlu & Özatalay, 2006). It is thought that increasing ADHD diagnosis could be related with pressure about school performance (Schneider and Eisenberg, 2006). On the other hand, collaboration of clinicians in treatment process with teachers and parents, which are educated about approaching to the child, who has ADHD and about coping with symptoms, could give very positive results (Armstrong, 1999; Brock et al., 2009; Kaymak - Özmen, 2011; Vereb & DiPerna, 2004). At this point, it can be said that, psychosocial preventive intervention programs and education programs for teachers and parents could be very useful on several counts. In such way that, when teachers and parents have information about temperament traits, which could be similar to ADHD, labelling normal temperament traits as ADHD could be prevented. It could be useful that teachers and parents develop their skills for coping with behaviours, which are similar to ADHD and which create problems to prevent consistency of these behaviours or at least minimize these behaviours. At the same time, this situation could provide a decrease in those students, who present behaviours similar to ADHD and are lead to clinics by teachers. Moreover, building treatment procedures, in which temperament traits are used as a step in treatment process of students, who are diagnosed with ADHD and applying this with collaboration of clinician with teacher and parent, could give affective results for child benefit.

Miller and his friends, (2008) suggest that ADHD traits, which are seen in childhood can be related permanent personality traits in adolescence in their study, which they apply with individuals, who are diagnosed with ADHD and who are observed from their childhood to their adolescence. Because personality traits are not maturated in childhood, researches investigating relationship between ADHD and personality traits focus on adult sample group more (Nigg et al., 2002b). However, relationship between temperament, which can be determined in childhood and in adolescence and determines personality traits, and ADHD, is known (Buss & Plomin, 1975; Pauw & Mervielde, 2010). In that way, NTTM approach and as a result of this study developing a scale, which can evaluate temperament of adolescents between 11 and 16 years old, can provide a new perspective to workers in this field. For example, as a result of our study, interaction ADHD with extraversion and extreme mobility traits which are seen in individuals with NTT7 temperament, which are more common in adolescents with ADHD than in adolescents who are not diagnosed with ADHD, can cause that these individuals present extraversion and extreme mobility traits in their adulthood. Thus, by knowing temperament types of children with ADHD, it can be possible to be predicted how a child's personality is affected from interaction ADHD with temperament types.

Findings of this study supports that some types of NTTM can have relationship with ADHD. According to NTTM approach, it can be mentioned that temperament which comes from birth, forms behavioural, emotional and cognitive functioning, can be useful for understanding biopsychosocial nature of ADHD. It can be thought that determining predisposing temperament traits for ADHD and normal outlook of temperament types in personality can contribute to the solution for labelling definitive diagnosis of ADHD and wrong diagnosis problems. Furthermore, evaluating ADHD from temperament perspective can provide easiness and common perspective to psychiatrists,

psychologists and educators, in treatment, psychosocial and educational approaches. Limitation of this study is that sample group consists of 56 participants, because it is hard to access to adolescents, who continue to go psychiatry clinic, are between 11 and 16 and have not mental retardation and medical comorbidity. Investigating relationship between temperament types and ADHD with further statistical methods with studies, which are made with wider sample group in the future, can help to be tested whether temperament is predisposing or core element for ADHD. Moreover, a study in which sub-types of ADHD are controlled, can answer the question whether there are sub types of ADHD according to temperament types or not.

When results of this study are evaluated generally, it is found that developed NTTS-A have acceptable psychometric values on 11-16 years old adolescent sample. In this way, an original measuring instrument which evaluates temperament types of adolescent between 11 and 16 years old is presented to researchers for the first time. Study, in which relationship between temperament and ADHD is evaluated, shows that the scale has a wide area of usage particularly in psychiatry, psychology, psychological counselling and in guidance and education. It can be mentioned that future studies, which will made with various disciplines, can present wideness of usage area.

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Appendix 1. Path Diagram