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ORIGINAL RESEARCH

The influence of culture on basic affective systems: the comparison of Turkish and American norms on the affective neuroscience personality scales

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Abstract The affective neuroscience personality scales (ANPS) aims to measure brain affective systems with the help of seven subscales: PLAY, SEEK, CARE, FEAR, ANGER and SADNESS, along with a spirituality subscale. From an affective neuroscience perspective, personality is substantially related to constitutional and developmental strengths and weaknesses in these basic subcortical emotional systems shared by all mammals. This study summarizes the standardization of the Turkish ANPS and its comparison to American ANPS norms. The Turkish translation of ANPS has been completed by 890 participants (245 of these

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composing an adult group and the remaining composing the university students group). 327 students out of this sample also completed a Goldberg-based Big-Five Scales (B5S), which was included in the validation of the Turkish ANPS. The obtained means and intercorrelations of the subscales on ANPS show both similarities and differences with the results attained from the study of Americans with ANPS. Gender comparisons in both cultures are mostly the same, with females having higher scores on SADNESS, CARE and Spirituality. The intercorrelations between Turkish version of ANPS and the B5S are mostly in line with the intercorrelations obtained in the original American study. Based on the results, the Turkish ANPS has sufficient reliability and construct validity. The similarities among the two ANPS studies are discussed in terms of the universal characteristics of basic affective systems, whereas the differences are discussed in the light of influences of cultural norms—as Turkish culture is more collectivistic than American culture which is more individualistic. The results of our study shows the need of carrying out further cross-cultural affective neuroscience researches to observe the influence of culture on the development of basic affective systems.

Keywords Affective neuroscience personality scales · Nature-nurture · Culture · Collectivism · Individualism

Introduction

Personality research seeks to illuminate existential questions that humans commonly ask about themselves: "Who am I?" and "Why am I the way I am?". Regarding the first question, "personality" has been historically defined as those characteristics of a person, which show consistent patterns of feeling, thinking and behavior. However, regarding the second question, the nature-nurture controversy in personality literature has not supplied integrated views till the latest century. While nature-based trait-approaches have suggested that personality is shaped by genetic determinants (e.g. Cattell 1986; Eysenck 1990; Costa and McCrae 1992), nurture-based approaches have emphasized the importance of environmental determinants like the qualities of early dyadic interactions, family systems and cultural norms (e.g. Kağıtçıbaşı 1996; Roland 1988, 1996; Singelis 1994).

In the last decade many lines of work, including neuropsychoanalytic investigations have revealed that the interaction of both nature and nurture contributes to the growth of personality (Solms and Turnbull 2002). Based on these interactive perspectives; the environmental factors that influence the construction of early mental representations—the primary care-giver, the extended family system and the cultural norms—shape the early developmentally wired neuronal group selections (Schore 1994; Beebe and Lachmann 2002; Fişek 2009). While the core of developmental self-organization is thought to be the primarily evolved subcortical affective systems that are universally shared by all mammalians (Panksepp 1998; 2011), the quality of the mother-infant attachment is now widely accepted to shape the neural wirings between these subcortical regions and the prefrontal cortex

(Korkmaz et al. 2013; Narvaez et al. 2012; Schore 1994, 2000). On the micro level, self-development and affect regulation (selective inhibition or arousal of certain affective systems) are influenced by the early dyadic interactions that shape these neural wirings. On the macro level, the patterns of affect regulation contributing to cognitive and behavioral reactions are influenced by culture that shapes mothering styles and family systems (Matsumoto and Hwang 2012). Thus, it seems likely that universally shared subcortical affective systems are regulated uniquely in each mother-infant bond, which in turn is influenced by the unique characteristics of the particular family system that is in turn affected by the particular cultural norms.

It is known that collectivistic and individualistic cultural norms influence the mothering styles in differing ways, leading to "eastern familial self" and "western individualized self" (Narvaez et al. 2012; Roland 1988, 1996). While prolonged symbiotic mothering styles do not reinforce separation-individuation and lead to loose self-object boundaries, western mothering styles reinforce separation-individuation and promotes a more separate senses of self (Roland 1996). These two cultural norms (that correspond to distinct mothering styles) are also linked to personality related neuropsychological differences (Han and Northoff 2008). For instance; it was found that subjects who endorse individualistic values show higher medial prefrontal cortex (MPFC) activation to general self-descriptions, whereas subjects who endorse collectivistic values show higher MPFC activation to contextual self-descriptions (Chiao et al. 2009). Based on this finding, it was argued that two kinds of neural representations of self (collectivistic self and individualistic self) exist within medial prefrontal cortical regions. Recent research also shows significant relationships between collectivistic cultural values and allelic variation of oxytocin receptor gene polymorphism (Luo and Han 2014), which may even promote gender-related differences in affective personality styles (Scheele et al. 2014; Wade et al. 2014). Considering that oxytocin is one of the major motherhood neuropeptides, the influence of culture on mothering styles (Roland 1996) seems to have neurochemical basis as well.

Culture-gene co-evolutionary theory also suggests that cultural values influence the social and physical environments under which genetic selection operates (Chiao and Blizinsky 2009). Molecular genetic studies have outlined the importance of a large number of candidate genes influencing human personality (Montag and Reuter 2014), while the latest studies show also the importance of epigenetics for psychological traits. Lately, methylation patterns which are shaped by environmental influences (including parenting styles) have also been investigated as potential indicators for differential gene activities (e.g. Weaver et al. 2004; Fish et al. 2004). For instance; repeated high level activation of the body's stress system, especially in early childhood, is shown to alter methylation processes and to change the chemistries of the individual's genes that lead to differential impact of the resulting protein products (Caldji et al. 2011; Champagne and Curley 2005). In sum, modern molecular genetics has also conciliated old nature-nurture polarities.

Despite the accumulation of modern scientific findings integrating the nature-nurture perspectives, none of the personality theories in the literature (e.g. psychoanalytic theory of personality, phenomenological theory of personality, trait approaches to personality, learning approaches to personality, cognitive theory of

personality) have been sophisticated enough to observe the interactions between constitution of subcortical affective systems and environmental factors. As an important part of personality clearly refers to individual differences in emotional reactions over a wide range of environmental situations, individual differences in emotionality may arise heavily from the phylogenetically oldest part of human and animal personalities, because it is anchored in evolutionary oldest subcortical networks of human and animal brains (Panksepp 1998; Montag 2014). Despite the fact that these archaic subcortical networks are the essential basis for the development of self, the psychometric studies utilizing the personality scales—derived from the personality theories stated above—have overseen this crucial point.

Only in the last decade, the affective neuroscience personality scale (ANPS) constructed by Davis et al. (2003) has opened this new area and era in personality research. The ANPS seeks to explore the neurological correlates of personality variations premised on long-accumulated knowledge of primary-process emotional systems that are illuminated by cross-species affective neuroscience investigations (Panksepp 1998, 2011). According to ANPS measures, personality variability depends, to a substantial degree, on the strengths and weaknesses in the variable activity levels of subcortical emotional systems (Davis and Panksepp 2011). The variations in the arousability of these affective systems are surely not only genetically determined, but also influenced by early dyadic interactions, as well as by other environmental factors (Schore 1994, 2000).

The ANPS focuses on six basic emotional systems namely: SEEKING, PLAY, CARE, FEAR, SADNESS, ANGER (please note that the capitalizations reflect a specialized scientific terminology for vertebrate brains' intrinsic psychoneurological systems), with the addition of "Spirituality" scale, since that is an important overall feature of human mental life, perhaps the highest human emotion (Davis et al. 2003). For the three major positive affect subscales (1) SEEKING is defined as "feeling curious, feeling like exploring, striving for solutions to problems and puzzles", (2) PLAY is described as "having fun, playing games involving physical contact, humor, laughter, being generally happy and joyful", (3) CARE consists of "nurturing, feeling softhearted toward animals and people in need, feeling empathy, feeling affection for and liking to care for others, liking to be needed". For the three negative subscales, (4) FEAR reflects the tendency for "feeling anxious and tense, worrying, struggling with decisions, ruminating about past decisions, losing sleep, not typically being courageous", (5) SADNESS monitors "feeling lonely, crying frequently, thinking about loved ones and past relationships, feeling distressed when not with loved ones" and (6) ANGER for "feeling hotheaded, being easily irritated and frustrated, expressing anger verbally or physically, remaining angry for long". "Spirituality" is defined as "feeling connected to humanity and creation as a whole, feeling a sense of oneness with creation, striving for inner peace and harmony, searching for meaning in life" (cf. Davis et al. 2003). ANPS includes the observation of Spirituality, as it is an emerging research field in mental health, like its successful utilization in the treatment of alcoholics (Miller and Thoresen 2003). Spirituality measured by ANPS is not equated to religiousness, but focuses largely on transcendent values. Although some see spirituality as a broader concept

including religiousness, others see them as overlapping constructs (Miller and Thoresen 2003), while there is also evidence that these are two independent dispositions (Saucier and Skrzypinska 2006).

All six of the monitored primary emotional tendencies have been related empirically to specific subcortical brain networks (Panksepp 1998; 2005). Various neurotransmitters, neuropeptides and hormones are important in the neurochemical activation of these systems (Panksepp 2000). For instance, the premier role of dopamine in the SEEKING system, testosterone and Substance P in the ANGER system, and the role of endogenous opioids and oxytocin in the CARE, SADNESS and PLAY systems have been extensively documented (e.g., Panksepp and Biven 2012; Reuter et al. 2005, 2009).

The original ANPS validation study (Davis et al. 2003) was carried out on two samples: university students and adult job applicants. Since the social desirability effect led to notably lower scores on the negative affect subscales in the sample of job applicants (who did not want to reveal their negative affects in order to be desired for the job position), most analyses were carried out based on the sample of university students. The exploratory factor analysis for ANPS (excluding the Spirituality subscale) revealed two higher order factors; with FEAR, SADNESS, ANGER loading on the first factor which represented overall "negative affect" and with PLAY, CARE, SEEKING loading on the second factor which represented global "positive affect". The inter-correlations showed that all three positive subscales were positively correlated with each other, while all three negative subscales were positively inter-correlated. There were significant gender differences in the ANPS scales, with males scoring higher on the SEEKING factor, whereas females scoring higher on CARE, SADNESS and Spirituality (Davis et al. 2003).

The external validity of the ANPS was highlighted by another exploratory factor analysis focusing on the interrelations of the subscales of ANPS and Big-Five markers developed by Goldberg (1992) for each of the five factors namely: Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to Experience. The factor analysis carried out for the validity of ANPS did not include the ANPS Spirituality subscale or the Big-Five Conscientiousness scale and revealed four factors. All three negative ANPS subscales and Emotional Stability (although negatively) loaded on the first factor called "Low emotional stability". The second factor called "Agreeableness" consisted of Agreeableness, CARE and ANGER, with the latter having a negative loading. The third factor labeled "Extraversion", with Extraversion and PLAY most strongly loading together on the same factor. The fourth factor named "Openness to experience" included Openness to Experience and SEEKING (Davis et al. 2003).

The main findings of the original ANPS study (Davis et al. 2003) have been confirmed by the ANPS standardization studies in Spain and France (Abella et al. 2011; Pahlavan et al. 2008; Pingault et al. 2011). For instance, the positive inter-correlations among positive subscales and the positive inter-correlations among negative subscales were found in both Spanish and French samples, strengthening the supposition that both positive and negative affect might be higher-order personality factors (Davis et al. 2003), shared by different cultures. Moreover, the gender difference obtained in the original study showing that females have higher

scores than males on CARE and SADNESS was also detected in the Spanish and French studies (Abella et al. 2011; Pahlavan et al. 2008; Pingault et al. 2011), pointing to a potential universal female "resonance" with attachment/CARE and separation/distress. On the other hand, different from the findings of the original study (Davis et al. 2003), potential culture specific gender differences were also obtained; for instance, both Spanish and French females having higher scores than males on FEAR, Spanish females showing higher scores than males on SEEK, and French females showing lower scores than males on PLAY (Abella et al. 2011; Pahlavan et al. 2008).

In line with the literature summarized above, the main aim of our study was to carry out the Turkish standardization of the ANPS and to investigate its validity utilizing the Big Five Scales (B5S), which was used in the original study (Davis et al. 2003). The second goal was to replicate the universally shared findings across cultures, while exploring whether culture specific trends would be evident within the Turkish norms, which tends to be more collectivistic compared to American norms. Such culture specific trends may point to the importance of cultural influences on affective patterns and affect regulations.

The Turkish culture in the past was characterized by collectivistic values that are reinforcing family interdependence and "related self", however the socioeconomic development in the last three decades has shown to lead to a shift to the development of "autonomous-related self" (Kağıtçıbaşı 2005). The Family Change Theory by Kağıtçıbaşı (2007) shows that economic development of traditional cultures with totally interdependent family models do not necessarily lead to the emergence of independent Western family models. Instead; the family model of complete interdependence change into family model of emotional interdependence, where material interdependencies and traditional hierarchies decrease, whereas psychological interdependencies do not decrease. Therefore, it can be said that current Turkish culture stands as a transitional bridge between western individualistic and eastern collectivistic norms. While Turkish cultural norms are more collectivistic compared to western individualistic norms, they are more individualistic compared to collectivistic norms of eastern cultures. Hence, in the present study, we expect both overlapping findings and culturally specific findings among Turkish and American ANPS norms.

Method

Sample

ANPS data was collected from 890 participants, of which 645 were students and 245 were adults. Student participants' ages range between 18 and 25 ($M = 21.66$, $SD = 1.60$). Among student participants, there were 433 females and 212 males. Students were recruited from both social and natural sciences' departments (e.g. psychology, sociology, management, media studies, biology, physics, engineering), and from both state and private universities in Istanbul, Turkey. Adult participants' ages varied between 26 and 63 ($M = 37.89$, $SD = 9.45$). Among adult participants,

there were 150 females and 95 males. 98 (40 %) of these adult participants had bachelor degrees, whereas 78 (31.84 %) had master and 15 (6.12 %) had doctorate degrees. Only 13 (5.31 %) and 41 (16.73 %) adult participants were primary and high school graduates, respectively.

327 student participants out of the larger sample also completed the Big-Five Scales for the construct validation of ANPSs dimensions. This subset of subjects was very similar to the larger sample; 209 (63.90 %) of these participants were female, whereas 118 (36.10 %) were male. The ages of these participants varied between 18 and 25, ($M = 21.33$, $SD = 1.49$).

Translation process of ANPS into Turkish

For the Turkish version of the ANPS, the translation was performed by a 30 years old clinical psychologist (other than the authors), who is Turkish and proficient in the Anatolian Turkish language, but who lived in an English speaking compound beginning from age 3 and attended an American elementary school. She had completed her bachelor's degree in the U.S. and her post-graduate education again in English. The items translated by her were also back-translated into English by an independent translator, whose mother tongue is English and who has no knowledge of the ANPS. The back translation yielded only a few discrepancies, which were discussed and corrected by the researchers. For a trial, the final Turkish ANPS form was filled out by 10 laymen (five females, five males) with a request of feedback on how well the items were comprehended. Based on their positive feedbacks, our version of Turkish ANPS was finalized.

Materials

Turkish version of the ANPS

The scale assesses six basic affects (PLAY, SEEK, CARE, FEAR, ANGER, SADNESS) and "Spirituality". Parallel to the original ANPS study (Davis et al. 2003), the total questionnaire includes 110 items. Each subscale features 14 questions; 7 positively and 7 negatively formulated, whereas only the Spirituality subscale comprises 12 questions; 6 positively and 6 negatively formulated. The scale had 14 filler items, some of which sought to evaluate deception (e.g., "I always tell the truth."). All the questions are designed to be answered on a four-point Likert scale.

Turkish version of the Big Five Scales (B5S)

Big Five Scales (B5S) was modelled after Goldberg (1990, 1992) by Davis et al. (2003) and consisted of 70 items with five subscales measuring five personality dimensions, namely; Extraversion-Intraversion, Agreeableness-Hostility, Conscientiousness-Undirectedness, Emotional Stability-Neuroticism and Openness to Experience-Not

Open to Experience. Every subscale has 14 items with a mixture of positively and negatively formulated adjectives.

The reliability and validity studies of the Turkish version of B5S were conducted by Özkarar-Gradwohl et al. (2014). The 44 items of B5S were taken from the Turkish Big-Five personality structure research carried out by Somer and Goldberg (1999) and Goldberg and Somer (2000), which supplied the translation of 498 person-descriptive adjectives. The remaining 26 items of B5S used in the original study (Davis et al. 2003) were translated and back translated in the study of İçöz et al. (unpublished paper). Cronbach's Alphas were found to be .88 for extraversion, .83 for agreeableness, .88 for conscientiousness, .81 for emotional stability and .78 for openness to experience were found. For criterion validation of the Turkish B5S used in the present study, non-clinical sample and outpatient sample (diagnosed with anxiety disorders) were compared and significant differences were obtained on extraversion, emotional stability and openness to experience.

Procedure

For the collection of data, the "Ethical Committee for Conducting Research on Human Beings" of Istanbul Bilgi University approved the distribution of the questionnaires. For both the students and adult samples, participation was voluntary and participants' confidentiality was guaranteed. Both students and adults completed a consent form before filling the questionnaires. Students completed the questionnaires during scheduled class hours.

Results

Descriptive scores and the comparison of Turkish and American mean scores

The means and standard deviations of student and adult participants in all subscales of ANPS are shown on Table 1. Among student participants, female participants

Table 1 Means and standard deviations of the subscales of Turkish ANPS

Subscale	Students ($N = 645$)		Adults ($N = 245$)	
	Male Mean (*SD*) ($N = 212$)	Female Mean (*SD*) ($N = 433$)	Male Mean (*SD*) ($N = 95$)	Female Mean (*SD*) ($N = 150$)
PLAY	24.00 (5.54)	24.93 (4.48)	23.46 (5.37)	23.19 (4.37)
SEEK	25.21 (4.65)	24.81 (4.06)	24.03 (4.09)	23.74 (4.09)
CARE	25.32 (4.93)	28.16 (5.32)	25.78 (4.70)	27.30 (4.85)
FEAR	22.87 (4.97)	23.34 (5.18)	21.44 (4.49)	21.93 (4.44)
ANGER	25.44 (5.97)	25.43 (5.51)	22.34 (4.88)	23.40 (4.67)
SADNESS	20.39 (4.47)	21.25 (4.33)	19.58 (3.65)	20.52 (3.80)
Spirituality	19.38 (5.29)	21.51 (5.48)	22.04 (5.67)	22.53 (5.34)

exhibited significantly higher scores than male participants on CARE (t (643) = 6.53, $p < .001$, $d = .51$), PLAY (t (643) = 2.35, $p < .05$, $d = .16$), SADNESS (t (643) = 2.35, $p < .05$, $d = .16$) and Spirituality (t (643) = 4.71, $p < .001$, $d = .32$) subscales. Among adult participants, female and male participants differed significantly to a lesser degree, with female participants having significantly higher scores than male participants only on CARE (t (243) = 2.43, $p < .05$, $d = .16$).

Age of the participants were found to be very modestly, albeit statistically significantly, negatively correlated with SEEK (r (888) = −.1, $p < .01$), PLAY (r (888) = −.17, $p < .001$), FEAR (r (888) = −.17, $p < .001$), ANGER (r (888) = −.21, $p < .001$), SADNESS (r (888) = −.14, $p < .001$) and positively correlated with Spirituality (r (888) = .09, $p < .05$). Comparison of female adult and female student participants revealed that student participants had significantly higher scores than adult participants in the subscales of SEEK (t (581) = 2.94, $p < .01$, $d = .20$), FEAR (t (581) = 2.98, $p < .01$, $d = .20$), ANGER (t (581) = 4.05, $p < .001$, $d = .27$) and PLAY (t (581) = 4.15, $p < .001$, $d = .28$). Female adult participants scored significantly higher than female students participants only on the Spirituality subscale (t (581) = 1.99, $p < .05$, $d = .13$). Among all male participants, student participants scored significantly higher than adult participants on SEEK (t (305) = 2.13, $p < .05$, $d = .14$), FEAR (t (305) = 2.39, $p < .05$, $d = .16$) and ANGER (t (305) = 4.44, $p < .001$, $d = .30$) subscales, whereas adult participants scored significantly higher than student participants in Spirituality (t (305) = 4.00, $p < .001$, $d = .27$) subscale.

The t-tests for the comparison of the Turkish and the American mean scores were only carried out for the student samples, as the original study did not consider the negative scale scores of the adult subjects valid, due to a social desirability effect displayed by the adults, who were recruited from job applicants that are reluctant to reveal the true level of their negative affects. For ANPS subscales Turkish male students scored significantly lower than American male students on PLAY ($t = 4.09$, $p < .001$) and SEEK ($t = 3.26$, $p < .01$). No significant difference was obtained on FEAR, ANGER, SADNESS, CARE, and Spirituality. Turkish female students scored significantly lower than American female students on PLAY ($t = 9.65$, $p < .001$), SEEK ($t = 2.29$, $p < .05$), CARE ($t = 5.51$, $p < .001$), FEAR ($t = 3.63$, $p < .001$) and SADNESS ($t = 3.53$, $p < .001$), whereas higher on ANGER ($t = 2.55$, $p < .05$). No significant difference was obtained on Spirituality.

Reliability of the Turkish version of affective neuroscience personality scales (ANPS)

With respect to the individual subscales, Cronbach's Alphas of .56 for SEEK, .72 for CARE, .70 for PLAY, .70 for FEAR, .73 for ANGER, .55 for SADNESS and .78 for Spirituality are calculated. These findings were parallel to the findings of the original ANPS study, where the Cronbach's Alphas ranged between .65 and .85 (Davis et al. 2003). The Cronbach Alphas obtained in the original study were .65 for SEEK, .78 for CARE, .69 for PLAY, .85 for FEAR, .81 for ANGER, .70 for SADNESS and .84 for Spirituality. While in the original study, the reliabilities of SEEK and PLAY were around .65 and needed to be improved, in the present

Turkish study the reliabilities of SEEK and SADNESS were around .55 and needed to be improved. A new research that is being planned under the supervision of the sixth author, in order to develop ANPS 3.0 as the latest version, aims to strengthen the reliability of ANPS in general. Based on these results obtained with the currently available ANPS form, the reliability of the Turkish ANPS was found to be mostly satisfactory, with psychometric properties comparable to other languages.

Inter-correlations between the subscales of Turkish ANPS for student sample

Negative subscales (FEAR, ANGER and SADNESS) were found to be positively and significantly correlated with each other. Similarly, positive subscales (PLAY, SEEK and CARE) were found to be positively and significantly correlated with each other. Significant positive correlations were observed between CARE and FEAR, and ANGER and SEEK, whereas PLAY was found to be significantly and negatively correlated with FEAR and SADNESS. Spirituality was significantly and positively correlated with CARE, PLAY and SEEK. ANGER was found to be negatively correlated with Spirituality. The subscale inter-correlations are shown in Table 2.

Correlations between subscales of ANPS and B5S

Detailed coefficients and significance levels of correlations between subscales of ANPS and B5S scales are given in Table 3. As for the relationships between the ANPS dimensions and Big-Five personality dimensions, the subscale of SEEK of ANPS was found to be positively and significantly correlated with Extraversion, Agreeableness, Conscientiousness and Openness to experience. CARE correlated positively and significantly with Extraversion, Agreeableness, Conscientiousness, Emotional stability and Openness to Experience. There were positive and significant correlations between PLAY, and Extraversion, Agreeableness, Emotional Stability and Openness to Experience. FEAR was found to be negatively and significantly correlated with Extraversion and Emotional Stability. Similarly, ANGER had significant negative correlations with Agreeableness and Emotional Stability, and

Table 2 Inter-correlations between the subscales of ANPS in Turkish student sample

	PLAY	SEEK	CARE	FEAR	ANGER	SADNESS
PLAY	1					
SEEK	.24***	1				
CARE	.36***	.28***	1			
FEAR	−.14***	.08*	.13**	1		
ANGER	.07	.18**	.05	.36***	1	
SADNESS	−.18***	−.04	.07	.58***	.22***	1
Spirituality	.16***	.16***	.36***	.01	−.10*	.06

* , ** and *** indicate $p < .05$, $p < .01$ and $p < .001$, respectively (2-tailed)

Table 3 ANPS subscales correlated with B5S subscales

	PLAY	SEEK	CARE	FEAR	ANGER	SADNESS	Spirituality
Extra-version	.47***	.26***	.16**	−.29***	.05	−.39***	.07
Agreeab-leness	.36***	.19**	.48***	−.03	−.16***	−.14*	.18**
Conscien-tiousness	.02	.16**	.17**	−.09	−.08	−.09	.14*
Emotional stability	.19**	.01	.11*	−.51***	−.56***	−.54***	.04
Openness to experience	.20***	.50***	.24***	.05	.14**	.01	.08

* , ** and *** indicate $p < .05$, $p < .01$ and $p < .001$, respectively. $N = 327$

significant positive correlations with Openness to Experience. There were significant negative correlations between SADNESS, and Extraversion, Agreeableness and Emotional Stability. Spirituality had significant positive correlations with Agreeableness and Conscientiousness. These correlations were observed to be largely congruent with the original ANPS findings.

An exploratory factor analysis of ANPS (excluding Spirituality and Conscientiousness, like it was done in the original American study) and Big Five subscales yielded four eigenvalues greater than 1. The highest coefficient that loaded to each factor was taken into consideration, instead of a cut-off point. FEAR, ANGER, SADNESS and Emotional Stability constituted a factor, which was named Low Emotional Stability, in line with the original denomination of Davis et al. (2003). The factor of Low Emotional Stability represents the same meaning with Neuroticism, defined in many personality theories (e.g. Eysenck 1990). CARE and Agreeableness were found to be the components of another factor, which was called Agreeableness. PLAY and Extraversion form another factor, which was labelled as Extraversion. SEEK and Openness to Experience composed another factor, which was named as Openness to Experience. Factor-loadings of this factor analysis are given in Table 4.

A factor analysis of just the ANPS scales (excluding Spirituality) revealed two eigenvalues greater than 1. The two factor rotation resulted in factors for Positive affect and Negative affect. PLAY, CARE and SEEK were in the first component with loadings .75, .73, .71 respectively. FEAR, SADNESS and ANGER were in the second component with loadings .87, .82, .57 respectively; where only ANGER had the lowest loading. These two factors replicate the findings of Davis et al. (2003).

Discussion

In this study, we developed the Turkish version of the ANPS and obtained normative data for the ANPS with substantial samples of university students and also adults. The reliability and the validity for the Turkish ANPS were found mostly satisfactory in terms of psychometric properties. The results attained in the exploratory factor analysis closely resembled the original factorial structure of the original ANPS study (Davis et al. 2003).

Table 4 Rotated component matrix of ANPS and B5S subscales (conscientiousness and spirituality excluded)

	Factor 1 Low Emotional Stability	Factor 2 Agreeableness	Factor 3 Extraversion	Factor 4 Openness to Experience
PLAY			**.73**	
SEEK				**.80**
CARE		**.83**		
FEAR	**.72**			
ANGER	**.75**			
SADNESS	**.67**			
Extraversion			**.77**	
Agreeableness		**.74**		
Emotional Stability	**−.86**			
Openness to Experience				**.87**

Four eigenvalues > 1. Four rotated factors accounted for 67.13 % of the variance. $N = 327$

Extraction method Principal Component Analysis; *Rotation Method* Varimax with Kaiser normalisation

Bold values are highest coefficients of each item

Relations of the ANPS subscales to gender, age and culture

In line with the original ANPS study (Davis et al. 2003), among Turkish student participants, female participants generated significantly higher scores than male participants on CARE, SADNESS and Spirituality subscales. This finding was also confirmed in Spanish and French ANPS standardization studies (Abella et al. 2011; Pahlavan et al. 2008). This may imply a universal gender effect on certain affective neuroscience personality traits. In addition, it was also found that Turkish female students scored higher on PLAY compared to male students; which may indicate a culturally unique feature in Turkish society. Such culturally unique features were also observed in different cultures; like Spanish females scoring higher than males on SEEK and FEAR, or French females scoring higher than males on FEAR, but lower on PLAY. Therefore, it can be thought that, besides a universal gender effect, different cultures may also foster specific gender effects based on varying socialization norms. The present study also analyzed the gender effect among adults, which yielded only one gender based difference; with female adults scoring higher than male adults on CARE. Thus, in the present study *CARE* appears to be the only gender effect that is independent of age at testing, reflecting a genetically hard wired evolutionary trait in females towards caring for their offspring and others.

In exploring the effect of age, the correlational analysis of the present study showed that as age increased, the intensities of all the affects (SEEK, PLAY, FEAR, ANGER, SADNESS, except CARE) decreased, which may imply stronger affect regulation as one matures. EEG researches on brain maturation show that as aging increases, a shift occurs in the alpha activity towards the more anterior sides of the brain (Fisch 1991). This higher alpha activity in the anterior regions of the aging

brain may be interrelated with the role of the frontal lobes in affect regulation and self-organization (for overviews, see Schore 1994; 2000). Among all affects only CARE appears to be the only affective system that is again independent of age at testing. In addition, Spirituality—as a higher order affective trait—constituted the only exception among all ANPS subscales, since it was observed to increase with age. From the existential point of view, the journey to a "true self" may go through the need to face the potential of dying (Heidegger 1962). This pattern may reflect that spiritual values of humans may increase with the search for existential meaning while approaching death. On the other hand, spiritual experiences may also occur at any age, when people encounter the risk of losing their loved ones or actually lose their loved ones.

Regarding the comparison of Turkish and American norms on positive subscales; it is seen that Turkish subjects—regardless of gender—had lower scores than Americans. Only exception is Turkish and American males being equal on CARE. Turkish culture's collectivism may be related to lower report of positive affect by Turkish sample. In contrast to American individualistic culture, collectivist cultures discourage the expression of high arousal positive affect, but value calm and peaceful positive affect that will maintain group's inner adjustment (Tsai 2007). Therefore, experiencing pleasurable emotions in society is allowed only up to a limit that will not damage the harmony of the group. On the other hand, on negative subscales Turkish and American males did not differ from each other, whereas Turkish females had lower FEAR and SADNESS and higher ANGER than American females do. Lower reports of FEAR and SADNESS by Turkish females compared to American females support a previous finding of lower anxiety in Turkish females compared to American females on five factor model (Gülgöz 2002). But no such difference was found between Turkish and American males on five factors. It seems that cross-cultural affective neuroscience studies must always consider the gender effect on anxiety and mood disorders. Finally, in terms of spirituality levels, Turkish sample did not differ from the American sample; which signals that spirituality is a universal concept regardless of differences in religion.

Although the cultural comparisons stated above may imply the influence of culture on basic affective systems, observing the interrelations between affects is more important in order to understand how emotions are regulated in relation to each other, in different cultures. For instance, although the levels of experiencing an affect can be similar between two cultures, handling it in relation to other affects may differ among them. In sum; the amount of experiencing an affect is different than the way of regulating it in relation to other affects.

Interrelations of the ANPS subscales

Inter-correlations between the ANPS subscales indicate that while three positive affects (PLAY, CARE or SEEK) reinforce each other, the three negative affects (SADNESS, FEAR or ANGER) reinforce each other as well. This finding is in line with the original ANPS study, as well as the French, and the Spanish studies (Davis et al. 2003; Pahlavan et al. 2008; Abella et al. 2011). The confirmation of this finding among different cultures implies a universal polarization in basic affective

systems in terms of positive and negative emotional valence. This supports Osgood's theory that the primary dimension of personality structure is positive and negative tones of hedonism which is related to basic evolutionary principles that approaching good objects/events and avoiding bad ones is essential to survival (1952).

The ANPS subscale inter-correlations showed a modest but significant positive correlation between CARE and FEAR, which was also observed in the original ANPS study (Davis et al. 2003), as well as in the Spanish (Abella et al. 2011) and the French (Pahlavan et al. 2008) ANPS studies. This may point to a universally shared relationship between CARE and FEAR. The caring-nurturing emotional system seem to have interrelated psychodynamic and neurological substrates with the anxiety system keeping the caregiver alert to potential risks when taking care of children. On the other hand, contrary to the three studies showing a positive correlation between CARE and SADNESS (Davis et al. 2003; Pahlavan et al. 2008; Abella et al. 2011), no such finding was obtained in the Turkish sample. As separation and individuation is not reinforced in the prolonged symbiotic mothering styles of collectivistic cultures (Roland 1988), separation distress may be less developmentally conditioned with CARE in terms of neuropsychological networks.

It has been argued that the SEEKING urge is foundational for many other positive emotional feelings (Panksepp and Wright 2012; Wright and Panksepp 2012). SEEKING system has been always associated with energizing the organism in line with positive affects, but not with negative affects (Solms and Turnbull 2002). However, the significant positive correlation between ANGER and SEEK found in the Turkish sample seemed to be a culture specific finding, which was not evident in the original ANPS study, the French ANPS study or in the Spanish ANPS study (Davis et al. 2003; Pahlavan et al. 2008; Abella et al. 2011 respectively). In line with our finding that higher the ANGER score, higher the SEEK score is; only an interesting study carried out in Germany had indicated that higher levels of testosterone seem to be an endocrinological marker of higher SEEK scores (Reuter et al. 2005). Therefore, in certain cultures SEEK system might be also related with negative emotions, like ANGER. Hence, it must be explored further whether SEEK is a highly energizing system that leads to motivated behavior charged by either positive or negative affects.

The relation of PLAY to other basic affective systems showed more varying findings among different cultures. In our study, PLAY was found to be significantly and negatively correlated with FEAR and SADNESS, which was in line with the French ANPS study (Pingault et al. 2011), but was contrary to the finding of a positive correlation in the Spanish ANPS study (Abella et al. 2011). No correlations of PLAY either with FEAR or SADNESS were observable in the original ANPS study (Davis et al. 2003). As PLAY is considered as the initial ground where human beings learn the rules of social interactions (Panksepp 1998), we may think that varying norms of socialization found in different cultures may influence the neuropsychology of PLAY differently.

Finally, in the Turkish sample, Spirituality was significantly and positively correlated mostly with CARE, and weakly with SEEK, which replicated the findings of Davis et al. (2003). This consistency supports that the main attributions to

spirituality are wisdom-in-service-of-others, altruism, and spiritual care. Different than the original findings, Spirituality showed weak positive significant correlation with PLAY and weak negative significant correlation with ANGER in the Turkish sample. This may point to the higher social interdependency features of Turkish collectivist culture. As Spirituality is defined as "feeling connected to humanity and creation as a whole and feeling a sense of oneness with creation" (c.f. Davis et al. 2003), its positive relation to PLAY as the primary ground of social connectedness-seems reasonable in a collectivistic culture. Moreover it has been frequently stated that collectivistic selves perceive ANGER as a threat to the harmony of the group and tend to hold ANGER in order to maintain the oneness and connectedness with the group (e.g. De Greck et al. 2012).

Relations of affective neuroscience personality scales with Big Five scales

The correlations between the subscales of ANPS and B5S were observed to be mostly congruent with the original ANPS findings (Davis et al. 2003); this supports the validity of the Turkish version of ANPS. Each affective trait measured by ANPS was also found to be compatible with semantically related personality dimensions put forward by Big-Five personality structure. Parallel to the original findings, the most striking positive correlations were among PLAY and Extraversion, CARE and Agreeableness, SEEK and Openness to Experience. The most robust negative correlations were among all three negative ANPS subscales and Emotional Stability. From these overlapping results, we suggest that the expression of extraverted attitudes maybe related to the acquisition of the social skills learned during PLAY experiences in childhood, and that the root of Agreeableness may be traced back to the CARE system fostering attunement in social bonds, seem reasonable (Davis et al. 2003). In addition to these, a key underlying affect of Openness to Experience may arise from the SEEK system, which plays a cardinal role in directing our attention to the outer world (Wright and Panksepp 2012). Finally, the destructive influence of negative affects like FEAR, SADNESS and ANGER on Emotional Stability supports the strong association of negative feelings and Neuroticism (Abella et al. 2011).

The relations between ANPS and B5S subscales differed from the original study only in Conscientiousness findings. In the original study, Conscientiousness had only slight but significant negative correlations with FEAR, ANGER and SADNESS, which suggested that as the self experiences any of the major negative moods, conscientious behaviors decline (Davis et al. 2003). However, in the present study Conscientiousness showed only slight but significant positive correlations with SEEK, CARE and Spirituality; which suggests that to the degree that the self has positive affective experiences with the outer world, conscientious behaviors tend to increase. This raises the question whether in different cultures Conscientiousness may be modulated and reinforced by different hedonic tones experienced in "object relations" such as; while the individualistic self displays conscientious attitudes more when in a less negative mood in relation to the outer world, the collectivistic self displays conscientious attitudes more when in a more positive mood aiming connectedness and harmony with the outer world.

The factor analysis carried out for the Turkish ANPS study was carried out in line with the analysis made in the original study, excluding Spirituality and Conscientiousness (Davis et al. 2003). The four factors attained were the same factors attained in the main study; Low Emotional Stability, Agreeableness, Extraversion and Openness to Experience. In line with the original findings (Davis et al. 2003), all three negative affects loaded on Low Emotional Stability, CARE and Agreeableness loaded on Agreeableness, PLAY and Extraversion loaded on Extraversion, SEEK and Openness to Experience loaded on Openness to Experience. The only un-replicated finding was that ANGER did not have a significant negative loading on Agreeableness in the Turkish sample. It is known that the main affect used in the service of separation-individuation is ANGER and the collectivistic cultures tend to suppress their anger in order to maintain the connectedness, thus agreeableness, among members of the social group. In addition, showing respect to hierarchies is a well-known collectivistic value, which may prevent the individual from opposing the person in power. Therefore, this absent finding of a negative relationship between ANGER and Agreeableness implies that Turkish subjects may display attitudes of agreement despite their feelings of opposition and ANGER. Therefore even if ANGER is experienced, the outer culturally expressed attitudes may be incongruent with the inner feeling.

Suggestions and limitations

Based on the results of the present study, it has been confirmed that ANPS is a promising neuropsychological psychometric tool that potentially links well-established human personality dimensions to cross-mammalian neurobiological substrates for primary emotions (see also Farinelli et al. 2013). To our knowledge, the present study was the first ANPS study: (1) to discuss its results in the light of cultural characteristics of collectivism and individualism, (2) to supply direct comparison of norms between student and adult samples, thus demonstrating the potential influences of aging on ANP traits. The further improvement of our ANPS form, by empowering the reliabilities of SEEK and SADNESS subscales, may lead to better psychometric accuracies. Further item analyses showed that on SEEK and SADNESS subscales, all the subscale items obtained statistically significant loadings on the related subscale, however the reliabilities of some reverse items were remarkably lower than the reliabilities of the normal items. This fact decreased the overall reliability coefficients of these two subscales. No such difference between the reversed and the normal items were found on other subscales. The item analyses revealed that items 9, 25, 57 on SEEK subscale and items 14, 46, 62, 78, 110 for SADNESS subscale especially had significant but low correlations (equal or below .30) with the overall subscale. Therefore, we suggest that restructuring the content of these items would greatly enhance the reliability of these subscales.

The future ANPS research that is being planned under the supervision of the sixth author, in order to develop ANPS 3.0 as the latest version, aims to enhance the reliability of the ANPS in general. The ANPS 3.0 will be also applied to Turkish samples in the future, to make an enhanced ANPS version available for psychometric purposes. However, given the original ANPS form utilized in this

study; it is shown that the reliability and validity of the Turkish ANPS form is mostly satisfactory, and the current form is sufficient to replicate the universally shared features evident in other cultures, as well as to highlight the culturally specific features.

Considering the probable influence of cultural factors on ANP traits, the influence of culture on the regulation of basic affective systems and personality needs further empirical attention. The facilitation and inhibition of certain affective expressions in the social interactions of specific cultures may influence the affect regulatory systems in varying ways. As a preliminary study, an additional research on a Turkish sample was carried out to investigate the influence of interdependency-independency dimensions on basic affective systems (Özkarar-Gradwohl et al. 2014). All these observations highlight the need for further cross-cultural affective personality investigations, especially with regard to cultural spectrum of individualism-collectivism. As an initiation, the first cross-cultural ANPS study that we are carrying out among Japan, Turkey and Germany points to varying ANP findings on the Euro-Asian spectrum of collectivism to individualism, with Turkey representing a transitional zone between eastern and western cultures (Özkarar-Gradwohl, Narita, Montag, Scherler, Yama, Kazuyuki and Köksal; Unpublished paper).

The expected differential cross-cultural ANPS outcomes may be also utilized for the modification of psychotherapy techniques according to the cultures in which they are applied. Kirmayer (2007) states that psychotherapy forms—which are mainly based on Euro-American values of individualism—need to be modified while working in collectivistic cultures. Fişek and Kağıtçıbaşı (1999) also point that forcing separation and individuation during adolescent counseling—for interdependent families in Turkish culture—may harm the healthy family relationship, rather than helping the family. Therefore; the future cross-cultural ANPS studies may help us to adapt of our clinical theories to culture, and thus improve the effectiveness of our therapeutic interventions.

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