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DEFENSE STYLES FROM THE PERSPECTIVE OF AFFECTIVE NEUROSCIENCE

Abstract

Objective: To our knowledge, no study has been carried out to observe which subcortical basic affective systems are related to which defense styles. Such a perspective may have the potential to reveal how defenses may interact with subcortical primary emotional systems (PES) and how they contribute to affect regulation. We aimed to analyze the relationship of immature, neurotic, and mature defenses with basic subcortical affects (PES-CARE, PLAY, SEEK, SADNESS, FEAR, ANGER), within an affective neuroscientific perspective, explore the effect of psychiatric disorders in relation to PES and defenses, and observe gender effects.

Method: The sample consisted of 703 university students, recruited online. The materials included the Turkish translations of the Affective Neuroscience Personality Scales (ANPS) and the Defense Style Questionnaire (DSQ).

Results: The correlations between ANPS and DSQ showed that the immature defenses increase as all negative emotions increase, whereas mature defenses increase as all positive emotions (except CARE) increase and all negative affects decrease (except ANGER). On the other hand, as neurotic defenses increase CARE, FEAR and SADNESS simultaneously increase. Subjects that reported the presence of psychiatric disorders also reported higher FEAR, SADNESS, ANGER accompanied by higher immature defenses. Finally, male subjects reported higher immature defenses, whereas the females reported higher neurotic defenses, accompanied by higher CARE, SEEK, SADNESS, FEAR, and slightly lower PLAY.

Conclusion: Investigating defenses through the lens of affective neuroscience offers the opportunity to link the abstract concept of defenses to increasingly well-understood neurobiology.

Keywords: basic affects, emotions, affective neuroscience personality scale, defense mechanisms, defense style questionnaire, affect regulation.

Introduction

1 Defenses are strategies, using a range of tools, that keep overwhelming emotions from
2 awareness (Coughlin, 2016). They are originally proposed to protect the self from instinctive
3 drives through the defense of repression (Freud, 1923) , though the term is now used for a wider
4 range of mechanisms (Baumeister et al., 1998; Cramer, 2015). Generally, they are categorized
5 as *mature* defenses (e.g. sublimation, humor, suppression, anticipation), *neurotic* defenses (e.g.
6 undoing, pseudoaltruism,idealization, reaction formation), and *immature* defenses (e.g. denial,
7 projection, passive aggression, acting out) (Cramer, 2006, 2015; Freud, 1936; Vaillant, 1995).
8 It is notable that both the immature and neurotic defenses are usually found to be related to
9 negative affective states (e.g. alexithymia, depression), whereas the mature defenses are
10 associated with positive affective states and better mental health (Calati et al., 2010; Steiner et
11 al., 2007; Ziadni et al., 2017). As the goal of defenses is to protect the person from distressing
12 emotions, defenses are of great importance in emotion regulation (Cramer, 2015).

13 The neurobiological investigation of the interaction of the defense mechanisms and
14 affects has advanced to a great extent in the last three decades. For example, extensive work
15 has been carried out on the biological basis of repression, through the lens of motivated
16 forgetting (Anderson & Hanslmayr, 2014; Bekinschtein et al., 2018). Further work has focused
17 on the demonstration of the defenses in neurological disorders like hemispatial neglect and
18 anosognosia (Ramachandran, 1994, 1996; Salas et al., 2019; Turnbull et al., 1997; Turnbull et
19 al., 2005; Turnbull et al., 2014; Turnbull et al., 2002; Turnbull & Salas, 2017; 2021). Finally,
20 another research approach focused on the neurobiology of emotion regulation, investigating the
21 role of executive functions over subcortical affective systems, which seems to resemble the role
22 of defenses over affects (Beer et al., 2007; Gross & Jazaieri, 2014; Northoff, 2005, 2007;
23 Schore, 2000, 2015; Turnbull & Salas, 2021). Thus it appears that human beings manage affects
24 by using a wide range of regulatory strategies that depend on diverse neuropsychological

1 functions (Turnbull & Salas, 2021). These various research strands emphasize that innate
2 subcortical affective systems need cortical regions for their regulation.

3 A parallel strand of research has studied defense mechanisms in psychiatric disorders,
4 but without investigating their neurobiological basis. Several of these studies have tried to
5 observe the relation between defense categories and personality disorders, where emotion
6 regulation is disturbed. The immature defenses are found to be related to Axis II personality
7 disorders (Cramer, 1999; Kraus & Reynolds, 2001; Perry & Bond, 2017), especially the Cluster
8 B personality disorders, such as antisocial, histrionic, borderline, and narcissistic (Kraus &
9 Reynolds, 2001). Notably, paranoid personality disorder appears to be related to projection;
10 antisocial personality disorder to acting out, denial, and dissociation; and narcissistic
11 personality disorder to denial and dissociation (Cramer, 1999; Hibbard & Porcerelli, 1998;
12 Johnson et al., 1992; Porcerelli et al., 2011; Sinha & Watson, 1999; Vaillant, 1995). On the
13 other hand, several studies have found that the mature defenses are negatively related to
14 borderline, dependent, and passive-aggressive disorders, while the neurotic defenses are found
15 to be related to dependent personality (Cramer, 1999; Hibbard & Porcerelli, 1998; Johnson et
16 al., 1992; Porcerelli et al., 2011; Sinha & Watson, 1999).

17 Unfortunately, these personality disorder studies lacked the neurobiological correlates
18 regarding their findings, and the observation of the defenses and primary emotions systems in
19 psychiatric disorders. To explore the nature of affects and defenses in both normal and clinical
20 samples, the Affective Neuroscience Personality Scales (ANPS), which investigates affective
21 personality profiles based on the neuropsychological substrates, might present a synthesizing
22 psychometric tool (Davis et al., 2003).

23

24 **A Synthesizing Tool: The Affective Neuroscience Personality Scale**

1 The field of affective neuroscience, developed by Jaak Panksepp, has made many gains
2 in understanding the neurological substrates of basic affects (Montag et al., 2021; Panksepp,
3 1998, 2005). Based on brain stimulation studies, seven basic emotions (primary emotional
4 system-PES) anchored in the subcortical regions of the mammalian brain have been identified:
5 SEEKING, LUST, CARE, PLAY, ANGER, FEAR, and SADNESS/PANIC (Montag et al.,
6 2021; Panksepp, 2011; Panksepp et al., 2017). In order to elaborate the individual differences
7 in personality in line with the affective neuroscience findings, the ANPS was developed (Davis
8 et al., 2003). The ANPS uses verbal items to assess the PES; SEEKING, PLAY, CARE as the
9 positive subscales and ANGER, SADNESS, FEAR as the negative subscales. The relation of
10 the ANPS and the Big Five Scales / Five Factor model (FFM), also showed that ANPS is a
11 valid tool (Davis & Panksepp, 2011; Davis et al., 2003). The results revealed that high
12 SEEKING correlates to Openness to Experience, high PLAY to Extraversion, low ANGER and
13 high CARE to Agreeableness, high FEAR, SADNESS and ANGER to low Emotional Stability
14 (high Neuroticism). These results were supported by subsequent studies in different cultures
15 which were later summarized by a meta-analysis over 12 countries (Marengo et al., 2021). We
16 may say that conscientiousness is the Big Five factor which is most likely to relate to emotion
17 regulation (Davis & Panksepp, 2018). These consistent relations, between basic emotions
18 measured by the ANPS and the cognitive systems measured by the Big Five/FFM, support the
19 suggestion that the basic emotions need the cortical regions in their regulation (Turnbull &
20 Salas, 2021). In line with these findings, ANPS is seen as a future promising tool for the
21 evaluation of emotions and emotion regulation/dysregulation.

22 Psychiatric disorders reflect affective imbalances accompanied by emotion
23 dysregulation within the brain, where pathological defenses are in action. The ANPS has the
24 potential to demonstrate the balance and/or imbalance of both positive and negative emotions,
25 related to emotion regulation (Montag et al., 2021). At the present time, the clinical studies

1 (n=245) range 18-33 (M=21.66 SD=2.54). Among participants 65.1% were female, 35.7% had
2 a history of psychiatric disorders, 8% had current use of psychiatric medication, 12% had a
3 chronic illness, and 10% had a family history of psychiatric disorders.

4 **Materials:**

5 *Defense Style Questionnaire (DSQ-40)*: The DSQ-40 was first developed by G. Andrews,
6 Singh, and Bond (1993). The Turkish validity and reliability of the scale was performed by
7 Yılmaz et al. in 2007 (Yılmaz et al., 2007). DSQ-40 is a self-assessment scale consisting of 40
8 items and 20 defenses that empirically evaluates the reflections of unconsciously used defense
9 mechanisms on the conscious level. There are two items for each of the 20 defenses. Individual
10 defense scores are simply the average of the two items for that defense. In this scale, each item
11 is evaluated between 1 and 9. The 20 defense mechanisms in the scale are collected in 3
12 dimensions immature, neurotic, and mature defenses. Immature defenses are projection, passive
13 aggression, acting out, isolation, devaluation, autistic fantasy, denial, displacement,
14 dissociation, splitting, rationalization, and somatization. Neurotic defenses are undoing,
15 pseudo-altruism, idealization, and reaction formation. Mature defenses are sublimation,
16 humor, anticipation, and suppression. The internal-consistency coefficient was found to be .70,
17 .61, and .83 for the Mature Defense Style, the Neurotic Defense Style, and the Immature
18 Defense Style subscales, respectively.

19 *Affective Neuroscience Personality Scales (ANPS)*: The ANPS assesses six primary emotional
20 systems (PLAY, SEEK, CARE, FEAR, ANGER, SADNESS) (Davis et al., 2003). Like the
21 DSQ, some elements might be regarded as a tool for measuring the unconscious mechanisms.
22 The total questionnaire includes 110 items. Each subscale features 14 questions; 7 positively
23 and 7 negatively formulated. The scale had 14 filler items, some of which sought to evaluate
24 deception (e.g., “I always tell the truth.”). All the questions are designed to be answered on a

1 four-point Likert scale. The Turkish validity and reliability of the scale was performed by
2 Özkarak-Gradwohl et al. in 2014 (Özkarak-Gradwohl et al., 2014).

3 **Statistical Analysis:** To evaluate the normality of distribution, the Shapiro-Wilk test
4 was used. The relationship between the ANPS and the DSQ was assessed with Pearson's
5 correlation coefficient under the parametric test assumption and Spearman's rank correlation
6 coefficient under the nonparametric test assumption. Independent Sample t-test and Mann-
7 Whitney U test were used to examine the difference in the ANPS and the DSQ subscales
8 according to both gender and report of present psychiatric disorder. All statistical analyses were
9 tested at the $p < 0.05$ level.

10 **Results:**

11 The results showed that the defense styles are moderately linked to affective valence, to
12 the current state of psychiatric disorders, and to gender.

13 **Defenses and affects:**

14 Table 1 shows the correlations between the defenses measured by the DSQ and the
15 affects measured by the ANPS. According to the results of the correlation analysis between
16 ANPS and DSQ-40, a moderately significant correlation was observed between the anger
17 subscale and immature ($r_s = .380, p < .001$), a weak significant correlation was observed with
18 mature ($r_s = -.131, p < .001$) and no significant correlation was observed with neurotic ($r =$
19 $.061, p = .103$). The Fear subscale had a weak correlation with immature ($r_s = .231, p < .001$),
20 with mature ($r_s = -.277, p < .001$) and with neurotic ($r_s = .277, p < .001$). The Sadness subscale
21 showed a close moderate and significant correlation with immature ($r_s = .379, p < .001$), with
22 mature ($r_s = -.300, p < .001$), and a weak correlation with neurotic ($r_s = .243, p < .001$). While
23 a weak significant correlation was observed subscales of Seek between the mature ($r_s = .254, p$
24 $< .001$) and with neurotic ($r_s = .102, p < .001$). No significant correlation was observed with

1 immature ($r_s = -.006, p = .870$). While a weak significant correlation was observed with the
 2 play subscale with immature ($r_s = -.145, p < .001$) and with mature ($r_s = .250, p < .001$), no
 3 significant correlation was observed with neurotic ($r_s = .051, p < .174$). The Care subscale
 4 showed a weak significant correlation with immature ($r_s = .186, p < .001$) and with neurotic
 5 ($r_s = .260, p < .001$), no significant correlation was observed with mature ($r_s = .056, p = .139$).
 6 These are also illustrated in Figure 1, which shows correlational patterns. As can be seen, there
 7 is an orderly relationship between the primary emotional systems and the defense styles.
 8 Typically, there are positive relationships between the immature defenses and the negative
 9 emotions. The mature defenses are associated with lower SADNES and FEAR but higher SEEK
 10 and PLAY. In contrast, neurotic defenses are associated with higher FEAR, SADNESS and
 11 CARE.

12

13 **Table 1. Correlations between the defenses measured by the DSQ and the affects**
 14 **measured by the ANPS**

15

16

17

18

19

20 **Figure 1.** Correlation graphs

21

22

23 **Psychiatric Disorders:**

24 Table 2 shows the comparison for ANPS and DSQ between psychiatrically healthy and
 25 unhealthy samples. The t-tests showed a clear pattern of relationships for the ANPS. Negative

1 emotions were significantly higher in subjects who reported psychiatric disorder. There was no
2 significant difference for positive emotions. Moreover, those with reports of psychiatric
3 disorder showed significantly higher immature defenses and lower mature defenses. No
4 significant difference was obtained for neurotic defenses.

5

6 **Table 2. Psychiatric Disorders-Specific Mean Comparisons for ANPS & DSQ-40**

7

8 **Gender:**

9 Table 3 summarizes gender comparisons for ANPS and DSQ. For ANPS, the results
10 showed higher FEAR, SADNESS, CARE, as well as slightly higher SEEK and lower PLAY
11 for females. Moreover, females had significantly higher neurotic defences, whereas males
12 higher immature defences.

13

14 **Table 3. Gender-Specific Mean Comparisons for ANPS & DSQ-40**

15

16

Discussion

17 There are three clear findings from the results: that defense styles are strongly linked to
18 affective valence, to current state of psychiatric disorders, and to gender. Each of these findings
19 will be discussed below.

20 **Defense styles are strongly linked to affective valence**

21 The first aim of the present study was to analyze the immature, neurotic and mature defense
22 styles in relation to basic affects, within an affective neuroscientific perspective. Results
23 revealed that higher scores on negative PES were associated with higher scores on immature
24 defenses. In higher Neurotic defenses scores, we observed FEAR and SADNESS scores are
25 higher, as well as CARE scores, which is a positive emotional system. Mature defenses were

1 associated with lower negative emotional systems such as sadness and fear and higher positive
2 emotional systems such as SEEK and PLAY.

3 Previous research revealed that mature defenses were positively correlated with the Big-
4 Five domains of Extraversion, Openness, and Agreeableness, whereas neurotic and immature
5 defenses were related to higher Neuroticism (Costa Jr et al., 1991; Costa & McCrae, 1998;
6 McCrae, 1989). Recently a meta-analysis carried out over 21 samples, revealed that
7 SEEKING and Openness to Experience were strongly positively related, and the same is true
8 for PLAY and Extraversion (Marengo et al., 2021). Also, in that meta-analysis high CARE
9 and low ANGER have been linked to Agreeableness, while higher FEAR, ANGER, and
10 SADNESS have been linked to Neuroticism. The relationship of immature defense
11 mechanisms, which are closely related to neuroticism, with FEAR, ANGER and SADNESS is
12 consistent with this information. In previous studies, mature defense mechanisms associated
13 with Extraversion, Openness and Agreeableness were correlated with increased SEEK and
14 PLAY.

15 These findings seem broadly consistent with the understanding of modern affective
16 neuroscience. Developmentally, we inherit a set of primary emotional systems. The ANPS is
17 an attempt to measure these primary emotional systems. Across development, we learn and
18 acquire a set of defensive styles which help to manage these basic emotions. These are
19 probably mediated by cortical cognitive systems. They are also closely related to
20 neuropsychological skills . This opens the question of the relationship between defense
21 mechanism, emotion regulation and neuropsychological skills. This is a complex issue that
22 has been discussed detailed in elsewhere and will be clearly important topic for future
23 research (Turnbull & Salas, 2021). Finally, the Big Five/FFM is another way of attempting to
24 measure the success of these emotion regulation strategies. For these reasons, it is not
25 unsurprising that these different approaches to the problem are reliably correlated.

Defense Styles are Linked to Psychiatric Health

The second aim was to explore the effect of the current state of psychiatric disorders on the relationship of PES and defense styles. As regards PES, our findings demonstrated that subjects that have psychiatric disorders have higher scores on negative emotions such as FEAR, SADNESS, and ANGER. This result was in line with the previous ANPS finding, that these three negative emotions (FEAR, SADNESS, and ANGER) are the bottom-up drivers of Neuroticism (Davis et al., 2003; Marengo et al., 2021; Montag & Davis, 2018; Özkarar-Gradwohl et al., 2014; Quevedo & Abella, 2011). Notably, neuroticism is a well-known risk factor for depression and other psychiatric disorders (Lahey, 2009). In line with this connection, several studies had also indicated higher SADNESS, lower SEEKING and PLAY in depression (Fuchshuber et al., 2019a; Montag et al., 2017), higher FEAR in anxiety (Jung et al., 2022), higher ANGER and SADNESS in borderline disorders (Karterud et al., 2016), higher SADNESS, FEAR, and ANGER in attention deficiency and hyperactivity disorder (Wernicke et al., 2019). In short, our study confirmed the literature that higher negative PES are related to the presence of psychiatric disorders.

Secondly, our results showed that the subjects with psychiatric disorders use immature defenses more widely, compared to the healthy subjects. As immature defenses include disconnection from reality (Vaillant et al., 1986), their higher prevalence in subjects with psychiatric disorders was not surprising.

Gender Strongly Linked to Defense Styles

The third aim of the present study was to analyze the influence of gender on PES and defense styles. Firstly, the findings showed that females have higher scores on SEEK, CARE, SADNESS, and FEAR (as well as slightly higher on SEEK and slightly lower on PLAY). These findings were mostly in line with our previous literature review which observed the gender effect on basic affective systems across 15 countries (Özkarar-Gradwohl & Turnbull, 2021).

1 The affective neuroscience literature suggests that female mammals show more behaviors
2 linked to *attachment* and *separation distress* (Panksepp, 1998, 2011, 2012), and seems to
3 correspond to females' higher CARE and higher SADNESS and FEAR, respectively. Secondly,
4 our results showed that the females exhibit higher levels of *neurotic* defenses (such as undoing,
5 reaction formation, pseudo-altruism, and idealization), measured by DSQ. Males exhibit higher
6 levels of immature defenses (projection, passive aggression, acting out, isolation, devaluation,
7 autistic fantasy, denial, displacement, dissociation, splitting, rationalization and somatization).
8 On the other hand, females and males did not differ in terms of mature defenses (sublimation,
9 humor, anticipation and suppression). So far, the literature examining the relationship between
10 gender and defense mechanisms has yielded varying results (Andrews et al., 1993; Muris &
11 Merckelbach, 1996; Watson, 2002; Watson & Sinha, 1998). However, the present study's
12 findings imply that females are more prone to utilizing neurotic defenses to deal with conflictual
13 internal and/or external states. This is also in line with the cross-cultural Big Five meta-analysis,
14 which revealed that females generally have significantly higher levels of Neuroticism (Schmitt
15 et al., 2008).

16 Gender identity theory claims that women build their identities on relatedness, and
17 men on separateness (Hartwell et al., 1992; Kagitcibasi, 2005; Özkarakar-Gradwohl & Turnbull,
18 2021; Verbrugge, 1985). Females' tendency for relatedness, and avoidance of separateness,
19 may also lead them to utilize the neurotic defenses more when faced with conflicting states.
20 The increase in CARE, along with SADNESS and FEAR, may lead females to apply defenses
21 which will maintain the feeling of relatedness, despite the feeling of separateness induced by
22 the conflicts. Mahalik et al. reported that men who experience more rigour in being
23 successful, strong and competitive, and who have difficulty in expressing their emotions and
24 showing love to others, use immature defenses more frequently (Mahalik et al., 1998). Less

1 use of the CARE, FEAR, and SADNESS systems may facilitate their adaptation to the role
2 society expects of them, by providing less emotional expression and communication.

3 This is the first study to analyze immature, neurotic, and mature defenses in relation to PES
4 within an affective neuroscientific framework. The demonstration of such a relationship paved
5 the way for the defense styles to be considered from a neurobiological perspective. However,
6 our study has certain limitations. First of all, defense styles are determined by self-rating scales.
7 Although this provides practicality to reach a large participant group, determining defensive
8 styles in clinical interviews may increase the validity of the data. It may also be important to
9 conduct similar studies in different geographical locations, to consider the influence of culture
10 on the relationship of primary emotional systems to defense styles.

11

12 **Conclusion**

13 This research represents an important new approach to investigating the defenses. A
14 century ago, these were seen as abstract hypotheses for which there was little scientific
15 evidence. Towards the end of the last century, research demonstrated that the effects were
16 reliable, but did little to demonstrate their mechanisms. Investigating the defenses through the
17 lens of affective neuroscience offers the opportunity to link the abstract concept of defense to
18 increasingly well-understood neurobiology, with implications for treatment.

19

20 **Declaration of Competing Interests**

21 The authors declare no competing interests. The authors declare that they have no known
22 competing financial interests or personal relationships that could have appeared to influence
23 the work reported in this paper.

24

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3

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39 **Table 1.**40 *Correlations between the defenses measured by the DSQ and the primary emotinal systems*
 41 *measured by the ANPS*

	IMMATURE	MATURE	NEUROTIC
ANGER	.380**	-.131**	.061
FEAR	.231**	-.277**	.217**
SADNESS	.379**	-.300**	.243**
SEEK	-.006	.254**	.102**
PLAY	-.145**	.250**	.051
CARE	-.186**	.056	.260**

42 Note: *P<.05.

43 **P<.001

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Table 2.
Psychiatric Health-Specific Mean Comparisons for ANPS & DSQ-40

	Report of present Psychiatric illness.		<i>P</i>
	Yes 253 (35.7%)	No 455 (64.3%)	
ANPS			
Anger	26.92±6.66 27.0 (10.0)	24.85±5.97 25.0 (8.0)	<.001 ^U
Fear	27.70±5.72 28.0 (8.0)	23.93±6.26 24.0 (8.0)	<.001 ^U
Sadness	23.89±5.64 24.0 (8.0)	20.47±5.41 20.0 (7.0)	<.001 ^U
Seek	25.96±5.44 25.0 (6.0)	25.50±4.71 26.0 (6.0)	.367 ^U
Play	24.24±5.99 24.0 (7.50)	25.41±5.21 25.0 (7.0)	.024 ^U
Care	28.68±5.83 29.0 (8.0)	27.73±5.40 28.0 (7.0)	.009 ^U
Defense styles			.941 ^U
Immature	108.74±26.99 108.0 (35.0)	101.18±25.78 98.0 (35.0)	
Neurotic	39.71±10.43 40.0 (13.0)	37.83±9.75 38.0 (13.0)	<.001 ^U
Mature	43.89±10.11 44.0 (13.50)	47.14±9.54 48.0 (13.0)	.017 ^t
			<.001 ^t

11 *Note:* ANPS: Affective Neuroscience Personality Scales
12 mean±standard deviation, median (IQR)
13 *t*: Independent sample *t* test, *U*: Mann-Whitney U test

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Table 3.
Gender-Specific Mean Comparisons for ANPS & DSQ-40

	Gender
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	Female 458 (65.1%)	Male 245 (34.9%)	<i>P</i>
ANPS			
Seek	25.97±4.95 26.0 (6.0)	25.17±5.03 25.0 (6.0)	.026 ^U
Fear	26.31±6.16 26.0 (8.0)	23.49±6.12 23.0 (7.50)	<.001 ^U
Care	29.44±5.03 29.0 (7.0)	25.45±5.61 25.0 (7.0)	<.001 ^U
Anger	25.80±6.09 26.0 (8.0)	25.34±6.59 25.0 (9.0)	.349 ^t
Play	24.68±5.64 25.0 (7.0)	25.54±5.29 25.0 (6.50)	.029 ^U
Sadness	22.34±5.74 22.0 (8.0)	20.59±5.47 20.0 (7.0)	<.001 ^U
Defense styles			
Immature	102.03±25.90 100.0 (36.0)	107.91±26.82 105.0 (35.50)	.006 ^U
Neurotic	39.53±9.67 39.50 (13.0)	36.53±10.48 36.0 (13.0)	<.001 ^t
Mature	45.74±9.77 46.0 (14.0)	46.44±9.99 48.0 (13.50)	.370 ^t

1 *Note:* ANPS: Affective Neuroscience Personality Scales
 2 mean±standard deviation, median (IQR)
 3 *t*: Independent sample *t* test, *U*: Mann-Whitney U test
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6 **Figure 1**
 7 Correlation graphs

