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**CROSS-CULTURAL AFFECTIVE NEUROSCIENCE:
AN INTEGRATIVE APPROACH TO PERSONALITY**

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School of Psychology
Bangor University
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Declaration and Consent

'Yr wyf drwy hyn yn datgan mai canlyniad fy ymchwil fy hun yw'r thesis hwn, ac eithrio lle nodir yn wahanol. Caiff ffynonellau eraill eu cydnabod gan droednodiadau yn rhoi cyfeiriadau eglur. Nid yw sylwedd y gwaith hwn wedi cael ei dderbyn o'r blaen ar gyfer unrhyw radd, ac nid yw'n cael ei gyflwyno ar yr un pryd mewn ymgeisiaeth am unrhyw radd oni bai ei fod, fel y cytunwyd gan y Brifysgol, am gymwysterau deuol cymeradwy.'

Rwy'n cadarnhau fy mod yn cyflwyno'r gwaith gyda chytundeb fy Ngrichwyliwr (Goruchwylwyr)'

'I hereby declare that this thesis is the results of my own investigations, except where otherwise stated. All other sources are acknowledged by bibliographic references. This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree unless, as agreed by the University, for approved dual awards.'

I confirm that I am submitting the work with the agreement of my Supervisor(s)'

Gökçe Özkarar Gradwohl

Date: 10/03/2023

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I dedicate this thesis to my motherland Türkiye, born to bridge the "mind and body" of three continents… And to mother earth, Gaia, who carries us all...

Contents

Thesis Summary

The study of personality investigates an existential question that humans have been asking since ancient times: "Why am I the way I am?". However, the science of psychology developed an interest in personality surprisingly late, not until the late 1930's. Nevertheless, individual differences have been interpreted by all cultures (and belief systems) throughout history, with two common themes still found in today's theories: *external influences* on personality, and the *internal bodily localization*s of personality traits.

This thesis aims to integrate these two themes, with the help of Cross-cultural Affective Neuroscience (CAN). Chapter One presents a review that covers new ground by discussing these themes from the perspective of the most historically prominent belief systems (Part A), and points to its projections in modern science (Part B). By the start of the 20th century, a number of theorists started to work to synthesize these external and internal themes. The 21st century started with the scientific realization that the emotional brain functions as a bridge between the external influences and the internal bodily localizations. Despite these advances, only Panksepp attempted to theorize the relationship of the emotional brain to personality.

Part B summarizes how the Affective Neuroscience Personality Scale (ANPS) was constructed, based on Panksepp's approach, to measure six basic affective systems: SEEK, PLAY, CARE, FEAR, SADNESS, and ANGER. The ANPS has proved to be a valid and reliable tool, standardized in at least 15 countries. However, the ANPS literature has not addressed certain points, such as (1) the role of culture, (2) the cross-cultural investigation of gender effects, and (3) the cross-cultural analysis of the relation of the ANPS to the Big Five Scales (B5S). Part C offers a solution to these missing points, through the development of CAN, presented in a summary of five published papers. The main premise of CAN is that

culture influences subcortical affective systems, via mothering styles, family models, and parental attachments.

Chapters Two to Six present the emprical aspects of this thesis. These studies demonstrate that (i) cultures have varying influence on the subcortical affective systems, (ii) gender has both universal and culturally specific effects on ANPS, and (iii) cortical cognitive personality factors measured by the B5S are rooted in certain subcortical affective systems measured by the ANPS. The first CAN study (Chapter Two) compares the norms of the original American ANPS with the norms attained by the Turkish ANPS study. The second CAN study (Chaper Three) compares the ANPS findings among Japan, Türkiye, and Germany. It also observes how ANPS and Big Five factors load on interdependent-independent self construals. The third CAN paper (Chapter Four) reviews all the ANPS literature, including the first two CAN papers. It suggests future directions for CAN research, including gender/culture comparisons. The fourth CAN paper (Chapter Five) observes the gender effect on ANPS in 15 countries. Lastly, the fifth paper (Chapter Six) includes a meta-analysis of ANPS-Big Five correlations, over 21 papers from 12 countries.

Chapter Seven discusses the main findings deduced from these five CAN papers: universal similarities and cultural differences, and the influence of connectedness and separateness on ANPS findings across cultures. These findings confirm the main premise of CAN that culture influences the affective neuroscience personality profiles. The discussion demonstrates that CAN is a valid, integrative research field to observe personality through the lens of culture, gender and the emotional brain. It also presents the limitations of this new-born field, and suggestions for further research: the development of a Global Affective Mapping, that illustrates the cultural affective personality profiles within universal affective networks.

1.Chapter One

"We must declare that this Cosmos has come into existence as a Living Creature, truly endowed with soul and reason [...] A Living Creature, one and visible, containing within itself all the living creatures which are by nature akin to itself."

> *-Plato's Timaeus*

1. Introduction:

The first part of the introduction (Part A) presents a brief review of the historical approaches to personality and intends to elaborate two of the recurrent concepts (the external influences and the internal bodily localizations), that might bridge the historic approaches to the present modern theories. The second part (Part B) provides the reader an overview of the modern approaches to personality, focuses on the cultural influences and the role of subcortical affective systems in the brain. Part B also emphasizes the missing parts in the relevant literature that are investigated in this thesis: the influences of culture and gender on subcortical affective systems. In the final part (Part C), an overview of five published papers regarding "Cross-cultural Affective Neuroscience" is presented. They are examples of a new-born field that can synthesize the recurrent concepts of the external influences and internal bodily localizations, and that can answer the missing parts such as culture and gender.

1.1. Part A- Historical Approaches to Personality

"Personality" is defined as the characteristics of an individual, which show consistent patterns of (1) feeling, (2) thinking and (3) behavior (Larsen & Buss, 2017; Pervin & John, 2001; Schultz & Schultz, 2009). The study of personality seeks to illuminate an existential question that humans have been asking to themselves since ancient times: "Why am I the way I am?" (Pervin & John, 2001). As this question is very central to understand individual differences, one might expect that personality studies have been always a focus of attention in psychology. However, the science of psychology developed an interest to the study of personality surprisingly late. Textbooks on personality psychology start reporting theories of personality which date back only to the first decades of 20th Century (Larsen & Buss, 2017; Pervin & John, 2001; Schultz & Schultz, 2009). In their well-known textbook, Schultz and Schultz state that: "It was not until the late 1930's that the study of personality became formalized and systematized in American psychology, primarily through the work of Gordon

Allport at Harvard University. Allport's landmark book, Personality: A Psychological Interpretation, is generally considered to mark the formal beginning of the study of personality." (2009, page 7).

While the American literature accepts Allport as the initiator of personality psychology, this eclectic topic has been long discussed in other cultures, for several thousand years. This Western bias manifests in several different ways such as: 95% of papers published in APA journals (from 2003 to 2007) include Western samples, of which 68% are American (Arnett, 2008). Thus, this bias against theories from other cultures may be not only historical, but may also apply to current personality theories. Nevertheless, although not covered in textbooks, individual differences have been interpreted by all cultures throughout history. Van Wyhe (2004b, page 6) puts this as "There are and have been countless systems of character reading and counselling in all times and cultures".

These systems have evolved along with the current Zeitgeist, which is highly influenced by the *belief systems* of societies (Durkheim, 1912). Approaches to individual differences by all the *belief systems* (e.g. animism, polytheism, non-theism, henotheism, and monotheism) - despite seeming so different from each other- seem to have two common themes, which are still found in today's modern theories. These themes include *external influences* on personality, and the *internal bodily localization*s of personality traits. This distinction is similar to Allport's concepts of *external and internal sources* of personality (see phenotypes and genotypes, Allport, 1937), and will be used in the historical review below. Although these two concepts almost correspond to the two determining factors, namely *environment and genetics*, accepted by modern personality psychology, modern textbooks of personality never appear to review this historic literature (Larsen & Buss, 2017; Pervin & John, 2001; Schultz & Schultz, 2009).

These historically common themes, that are mentioned above, may serve as a useful frame to understand the evolution of modern personality literature, especially in a cross-cultural context. The review below covers new ground by discussing these two common themes from the perspective of the most historically prominent of these belief systems and points to its projections in relation to today's science.

1.1.1. External Influences

Throughout history, what individuals believed naturally influenced how they thought, felt and behaved towards the external world. Similarly, the individuals allowed the external world (e.g. families, social groups, political authorities) to think, feel and behave towards them according to these belief systems. In short, the beliefs of the current Zeitgeist decided how the individual and the environment will interact with each other, how the individuals will perceive and theorize about the nature of this interaction, and how they will adapt to the environment in cognitive, emotional, and behavioral realms (Sosis, 2009).

Mentioning all of the historical beliefs in this review is of course not possibile. However this section will try to summarize the influence of the most prominent belief systems (shamanism, polytheism, nontheism, henotheism, monotheism) on the perception of external influences on personality. By doing that, it will also try to discuss how the earlier animistic religions (which still exist in Eastern cultures) are more collectivistic and based on connectivity with the environment, while the latest doctrinal religions (which are mostly applied in Western cultures) are more individualistic and independent of the environment (Watts, 2020).

The Animistic Perspective

The ancient *Ubuntu* philosophy, derived from African shamanism, is based on the concept of *connectivity*, where everything and everyone that exists is connected to each other

(Tutu, 2013). Shamanism, which is known to be the first animistic religion that dates back to perhaps *30.000 years ago*, appears to have been built on the experience of connectedness of the humans with their external world: the universe, nature, and ancestors (Krippner, 2002; Michael, 2017; Roux, 2002). In this naturalistic religion, they believed in spiritual deities in nature; such as the gods of the sky, the sun, moon, stars, thunder, water, fire, animals, and gods of their ancestors (Guan, 2003; Guo, 2001). Seen in this framework, the characteristics of a person were thought to be formed via "introjection" and/or "identification" of these various powers of the universe and nature (Freud, 1938; 1939). They worshipped the sky god and tried to read the constellations to predict the personality of a new-born (Roux, 2002). Besides the impact of celestial bodies, they believed that spiritual deities in nature had the power to influence personality characteristics (Roux, 2002). Especially, the ancestral spirits were believed to have an effect on the body and the soul of the individual (Krippner, 2002; Michael, 2017; Roux, 2002). Communication with ancestors during altered states of conciousness and dream interpretations were applied as a method for understanding the self and its relation to the environment (Roux, 2002). The belief in inter-generational spiritual transmissions founded the basis of the concept that the past has an influence on the present state and characteristics of the individual.

These animistic views about the influence of the universe, nature and ancestors on the self, were maintained in the polytheistic religions (Kishlansky, Geary & O'Brien, 2010; MacMullen, 2014), such as in Mesopotamia (Sumer, Babylonia and Assyria, dating back to 5th Millenia BC), Egypt (Egypt, 3000 BC), Anatolia (Hatti and Hittite dating back to 2500 BC), Ancient Greece and Ancient Rome (8th century BC), and in non-theistic and henotheistic Asian religions, such as Hinduism (3000 BC), Taoism (5th century BC) and Buddhism (6th century BC) (Marbaniang, 2015; Sayers, 2013; Van, 2020). The anthropology of religion accepts particularly the *connectedness of the individual with ancestors* as the most

universal concept related to self-formation (Reuter, 2002; 2014). In line with this argument, it is known that the ancestral veneration rituals have been maintained in several later belief systems (e.g. polytheism, non-theism, henotheism) and they were widely applied in Africa, Asia, Europe and the Americas (MacMullen, 2014; Reuter, 2014). African and Asian collectivistic cultures still maintain these ancestral rituals and the emphasis on *connectivity* in their belief systems (Reuter, 2014). In short, the continuity of this theme across space and time, throughout history, shows that ancestral veneration might be the most universal of all world religions and forms the basis for most ancient approaches to individual differences in personality (Reuter, 2002; 2014).

This universal concept of ancestral veneration may also signal an evolutionary need of individuals for *connectedness*, in the service of group cohesion (David-Barrett & Carney, 2015). It appears that the accumulated knowledge and norms, transferred from ancestors to their descendants, prepare the ground of groups that share a *culture* (Reuter, 2014). It seems that this archaic need of humans (to stay in touch and to identify with their ancestors, and to build up a cohesive group that ascends to these ancestors) has been transformed across time, in certain geographies, in line with their Zeitgeist (David-Barrett & Carney, 2015). While the archaic need of group cohesion has altered in time (especially for the individualized Western cultures), the views on *connectedness with the environment*, thus the diversity of the external sources to explain individual differences, also changed.

The evolutionary theories of religion emphasize the adaptive quality of all belief systems, also based on cultural group selection models (Bulbulia et al., 2008; Sosis & Alcorta, 2003; Sosis, 2004; Wilson, 2002). They argue that while earlier animistic religions (which still exist in Eastern cultures) are more collectivistic, intuitive and embodied, the latest doctrinal religions (which are mostly applied in Western cultures) are more individualistic, conceptual, and independent of bodily and social context (Watts, 2020). Moreover, it is noted

that, initially, worshipping was solely for the 'universe', nature deities and ancestors in shamanism; and then adding anthropomorphic gods/goddess in polytheism; and lastly it was only for an omnipotent God and prophets in monotheism (Berktay, 2021; Watts, 2020). The worshipping of human like gods/goddess in polytheism seems like a transitional phase (Berktay, 2021; Watts, 2020), from a collectivistic self-definition in relation to blood-related ancestors to a more individualized self-definition in relation to some other human divinities, with no blood relation, thus no natural connection.

The Monotheistic Perspective

In his famous book "Moses and Monotheism", Freud (1939) discusses the ancient Egyptian pharaoh Akhenaten's religious revolution, from polytheism to a kind of monotheism (circa 1350 BC), and how this inspired Moses. After the introduction of monotheism, the Abrahamic religions (Judaism 14th century BC, Christianity, Islam 7th Century AC) gradually prohibited ancestral veneration, and reinforced the worshipping of one omnipotent God and identification with prophets (Assman, 2005; Hawting, 1999; McMullen, 2014). Assmann (2005, page 147) describes the initiation of this transformation as "…the exodus from Egypt cuts the links to the host culture and helps to prepare a 'tabula rasa' for God on which to write His revelation".

With the campaign against ancestral veneration led by St Augustine in 5th century (McMullen, 2014) and with the prohibition of worshipping human images and idols by Islam in 7th century (Hawting, 1999), the monotheistic reform was gradually completed. Via this reform, monotheism decreased the possibile sources for individual differences, with the prohibition of all external sources to identify with (e.g. celestial bodies, nature deities, ancestors, gods/goddess). In a way, monotheism narrowed down the sources of *connectivity*, monopolized the identification process (which is the basis of self-formation) and reinforced

the individuals to identify with the virtues of one role model (the prophets). An endless number of external sources to identify with, which could lead to an endless number of individual differences (in the animist and polytheist era), was compressed into the personality characteristics of one individual, to a singular personality type that everyone must take as a role model (Reuter, 2002; 2014). In short, diversity was silenced.

This singular personality type to identify with was not only an example of virtuous characteristics against sinful characteristics, it was also always a *male* personality (Berktay, 2021; Bolen, 1984). The disappearance of goddesses, which symbolized love, sexuality, fertility and care throughout history (e.g. Inanna, Ishtar, Artemis, Aphrodite) and the appearance of only male prophets were signals of the opression of female personality characteristics in monotheistic religions (Berktay, 2021; Bolen, 1984; Glassman, 2017). Monotheism supported a patriarchy, where female personality characteristics were restrained to fertility and care. Therefore, the monotheistic reform not only took the ancestors away, but also the females were silenced and framed as the first sinners, despite previously being percieved to be the carriers of inherited personality characteristics from the ancestors (Berktay, 2021; Bolen, 1984; Glassman, 2017).

As a summary, with the prohibition of ancestor worshipping, Abrahamic religions appear to have replaced the cultural heritage of individuals, and organized the need of connectedness of larger groups under one umbrella, by letting them identify with only one spiritual ancestor, that is the male prophet of that religion. The influence of ancestors on the individual gradually became a concept that was locked away and maintained- in a limited way- only in anniversary ceremonies for the deceased family members (Reuter, 2002; 2014).

Detaching from the ancestors, who are *the monist sources for both nature and nurture*, has been argued to be followed by a philosophical splitting, namely the nature-nurture

dilemma (Reuter, 2002; 2014). The ancient philosophical view (4th century BC) was arguably divided between Plato's "nature" position, where an individual is born with innate inherited traits, and Aristotle's "nurture" position, where an individual is born as a "tabula rasa", the well-known blank slate (Lewkowicz, 2011). In addition, Plato's view, that females and males are potentially equal, was also replaced by Aristotle's view that females are inferior to males and therefore women are incomplete men (Nicholas, 1983). Not surprisingly, the Islamic philosophy of self (e.g. Al Farabi, Ibn Sina (Avicenna), 9th-10th Century AC), and later the Catholic philosophy of self in the medieval period (e.g. Aquinas, 13th Century AC) were highly inspired by the Aristotelian notion of "tabula rasa" (Duschinsky, 2012; Freely, 2011; Naaman, 2017). The influence of past ancestors on the present state of the individual was –in a way- has been argued to be supressed by the notion of a blank slate, which detached the self-definition from deceased ancestors (Reuter, 2002; 2014).

The monotheistic monopoly over individual differences had experienced several challenges due to various historical events that occured from the late Middle Ages (e.g. Black Death, European Renaissance and Reformation, Scientific Revolution). These events can be framed as having an important impact on the gradual return of connectedness to various external sources, including ancestors (thus, the family of origin). Initially, the epidemics of the Black Death (mid 14th century) was thought to shift the monotheistic world view (Cantor, 2002). It is discussed that it has led individuals to question religion, as the unfair mortality of their families was inevitable, despite their faith. This shift was followed by the European Renaissance (15th-16th centuries) and the Reformation (16th century), during which the ancient Greco-Roman philosophy and beliefs (that were supressed long time ago in Europe) appear to have been revived (Deason, 2009; Eisenbichler, 2014; Freely, 2011). The return of the classical philosophy clearly allowed greater discussion of the topic of individual rights,

which appear to have increased an interest in *individual differences* (Deason, 2009; Eisenbichler, 2014). The long forgotten door to *human diversity* was slowly re-opening.

The Scientific Perspective

In addition to these changes, the Scientific Revolution (starting with Copernicus in mid 16th century) liberated the study of all the *external sources* in universe and nature (Deason, 2009; Kuhn, 1997). With the masterpiece of Copernicus ("On the Revolutions of the Celestial Spheres"), philosophers had noted that this Neoplatonist astronomy brought back the celestial objects (Deason, 2009; Kuhn, 1997), with which the ancestors were used to identify. Not surprisingly, these ideas were not welcome by the Vatican, who found Neoplatonism (the philosophy that believed in the mathematical nature of god) as sinful (Deason, 2009). But inevitably, the Scientific Revolution built a transitional bridge from the Middle Ages to modernity, where theology (and its singular type personality) declined gradually (Deason, 2009; Eisenbichler, 2014). In a way, science was giving voice to various *external sources* in the universe and nature, which were believed to be linked to *individual differences*, in the ancient world.

During this transitional period, travels during the Age of Discovery (15th-17th centuries) caused Europeans to meet with people from different continents, thus cultures (Jahoda, 1961). The encounters with foreigners, who carried several cultural and physical differences, also challenged the idea of "*a singular type individual living in a mono-culture*", defined by monotheism. In Jahoda's words "The all embracing theological shell had cracked… The realization of human diversity presented a challenge to the biblical account of descent from Adam and Eve" (1997, pg 14-15).

After all these historical events that had challenged the monotheistic doctrines, the Age of Enlightenment (17th-18th centuries) arrived with its explorations of *human diversity*

(Chiao, 2009; 2017; Jahoda, 1997). In the beginning of early 17th century, the philosophical dilemma of nature-nurture was revitalized by Locke's "nurture" argument, as opposed by Descartes' "nature" (Chiao, 2009; Duschinsky, 2012). These discussions brought back the issues of culture and nature to light, which later led to the birth of two important but different disciplines by mid 19th century: social anthropology and evolutionary biology (for these disciplines influenced by Boas and Darwin, see Chiao, 2009; 2017; Jahoda, 1997).

The complex events of the last three hundred years (French Revolution, World War 1 and 2, Industrial Revolution etc.) must have effected views on personality. For example, the rise of nationalism triggered by the French Revolution (late 18th century) challenged the divine-kings of the monarchies, and led to several absolutist monarchies to be abolished by late 19th century and early 20th century (Barron, Huang, Spang, & DeDeo, 2018). The separation from monarchic identities and other factors, has been argued to provide more space for the recognition of *family identities*, as a source for *individual differences* (Desan, 2012; Verjus, 2012). The gradual transition from patriarchal family types to more democratic family types allowed also the recognition of *female identities*, via the discussions of gender equality (Desan, 2012; Verjus, 2012).

The role of the family (not only fathers, but also and especially the mothers) in the development of personality was also beginning to be highlighted in the psychological theories. An important insight was from Freud's famous book "Totem and Taboo", which discussed that the monotheistic worshipping of God seems to have replaced the worshipping of ancestors (Freud, 1938). Freud's psychoanalytical method, which was deeply influenced by anthropology, excavated the ancient animistic approach to personality, where the past (family of origin) is considered to have an influence on the present state of the individual. The topic regarding *the influence of the past* was reborn, with the discussion that the personality of the individual (which was influenced by the mother and the father) was formed early in childhood

(Freud, 1887–1902/ 1950). Freud's theory contributed to the foundation of attachment theory in a later literature, where attachment to parents shapes personality development (e.g. Ainsworth et al, 1978; Bowlby, 1958; Harlow, 1958).

As a contemporary of Freud, C. G. Jung extended the range of external influences from parents to *all ancestors*, by theorizing that all ancestral knowledge is carried as archetypes in the collective unconscious (Jung, 1875-1961/ 1980). Jung revitalized the concept of *the influence of ancestors* on the individual and rejoined the feminine and masculine impacts (anima and animus). With the introduction of the theory of collective unconscious, the *connectivity of self to external influences* was broadened not only to ancestors, but also to nature and the universe (Neher, 1996). Although the theories of Freud and Jung were criticized for not having sufficient empirical evidence (e.g. Eysenck, 1985; Crews, 1995; Neher, 2016; Wolpe & Rachman, 1960), they can be viewed as revolutionaries, who helped the return of the repressed concepts from the ancient animistic beliefs.

In the same era, Wundt opened the issue of culture to discussion by the introduction of "Folk Psychology" (Wundt, 1900). However, the science of psychology did not systematically study the influence of culture on personality (and the influence of gender on personality) until the late 1960's (Schultz & Schultz, 2009; Zosuls et al., 2011). In the latest edition of their textbook on personality theories Schultz and Schultz had added: "A specialty area called *cross-cultural psychology* developed in the late 1960s, as reflected in new publications such as the Cross-Cultural Psychology Bulletin and the Directory of Cross-Cultural Psychological Research….. In 2002, an article entitled 'Cultural influences on personality' was published in the influential Annual Review of Psychology. The authors noted that 'personality is shaped by both genetic and environmental influences. Among the most important of the latter are cultural influences'." (2009, page 11). In a way, cross-cultural psychology finally brought back the ancestors' from its locked away corner and initiated the

scientific study of the ancestral influences on the self, via the exploration of the influence of culture on personality.

The mid 20th century also witnessed the birth of epigenetics (which suggests that individuals are determined by neither environmental nurture nor genetic nature, but by their mutual interactions) and the birth of Culture-Gene Coevolution theory (which discusses that culture and genes evolve in a mutual interaction) (Cavalli-Sforza & Feldman, 1973; 1982). Finally, in the beginning of the 21st century, the scientific monist perspective increasingly argues that the nature and nurture interactions are holistically maintained in *ancestoral lineage* (Lewkowicz, 2011; Reuter, 2014). This approach emphasizes that our ancestors are simultaneously the transmitters of culture, genes and their interactions. Reuter suggests that "We should rather look at our genes as the accumulated and already embodied sum of the effects of the past exposure of 'others'– namely our biological ancestors (both human and non-human)– to selective external influences in past environments… The cosmos, material and social alike, does not feature any radical lines of separation, no fundamental break between nature and nurture, inside and outside, only differentiation within an interconnected whole." (2014, page 225).

This historical summary demonstrates the complex ways in which the past of the personality literature had an influence on its present state. Today's science is ready to re-acknowledge the ancestors as *the monist sources for both nurture and nature*. By doing so, it is increasingly prepared not to differentiate external from internal sources. While the *external* influences was one of the common themes of these historic attempts at understanding individual differences, the second common theme has been *internal* bodily localizations of personality traits. In the next section, the historical literature on the internal body localizations of personality traits will be discussed, with some of the most prominent examples.

1.1.2. Internal Bodily Localizations

Throughout history, all cultures appeared to have believed that an individual is composed of a physical body and a non-physical soul (later named as 'mind') (Samuel & Johnston, 2013). Cross-cultural developmental psychology has shown that humans may intuitively be dualists, as they believe in body and soul, across all cultures and belief systems (Bloom, 2004; Chudek et al., 2013). Since ancient times, humankind has not only questioned *how* the soul is materialized in the body, but they have also reflected on *where* the individual differences in affects, thoughts and behaviors (in other words, personality) are carried in the body. Almost in all cultures, the most ancient belief was that the body is the bridge between the environment and the soul (mind), and it mediates the interaction of the external influences and the inner world (Krippner, 2002; Michael, 2017; Roux, 2002).

The Animistic Perspective

The ideas regarding how the introjections (of the external influences) might be localized in the body seem to have changed across time and place. In ancient shamanism, the environmental influences from the universe (celestial bodies), nature and ancestors (that lead to individual differences) were believed to be introjected in various ways by the body (Roux, 2002). Regarding the influence of the celestial objects, the timing of the birth of the "physical body" was considered by virtually all shamanic cultures as a probable reason for individual differences in the soul (Roux, 2002). Although now it seems implausible, it was believed that the initial touch of the "physical body" to the environment determined the individual differences in affects, thoughts and behaviors (thus personality). Remarkably again, the individual differences in positive/negative affects-thoughts-behaviours were widely believed to be caused by the body's introjection of the good/evil spirits in the universe and nature (via identification or possession) (Krippner, 2002; Michael, 2017; Roux, 2002).

The rituals for the purification of the body from malevolent spirits, and the introjection of benevolent spirits, were both a way for self-development and –when necessary- a treatment method for physical/psychological illnesses. In order to free the body from possessing spirits, the main emphasis was often given to the resolution of unsolved issues related to ancestors, which helped to heal both the self and the ancestor (Krippner, 2002; Michael, 2017; Roux, 2002). Although the body localizations of personality traits were not specifically defined in ancient shamanism, haruspicy (analysis of organs of a sacrificed animal, especially the liver) was typically used as a divination method to read the signs related to the diagnosis/prognosis regarding an event or an individual (Annus, 2010; Oppenheim, 1974; Roux, 2002). Haruspicy, as one of the proto-scientific prediction models that attempted to reveal causations, had been widely used in shamanic cultures of Africa and Asia, and advanced further in the ancient civilizations of Mesopotamia, later spreading to Anatolia, Ancient Greece, Ancient Rome, India and Iran (Annus, 2010; Oppenheim, 1974).

The animistic belief that the 'body' might be the mediator of individual differences influenced by the universe, nature, and the ancestors were also maintained in later belief systems (e.g. polytheism, non-theism, henotheism) (Kishlansky, Geary & O'Brien, 2010; MacMullen, 2014; Marbaniang, 2015; Sayers, 2013; Van, 2020). As a key difference from earlier animistic beliefs, the latter civilizations (who had started to use numbers and writing) seemed to apply more quantitative approaches to measure the variations in personality. For instance, more empirical methods were developed for celestial divination techniques (e.g. astrological and/or numerological calculations) (Bobrick, 2006; Hoskin, 1997; Rochberg, 2004; 2016). Personality assessment and attempts to categorize personality types, based on constellations at birth, were seen in various astrologies: Shamanic, Assyrian and Babylonian, Egyptian, Hittite, Ancient Greco Roman, Islamic, Indian and Chinese (Bobrick, 2006; Hoskin, 1997; Rochberg, 2004; 2016). Interpretations of personality characteristics by numeric

calculations of the birth date of the physical body were also seen across several numerologies; such as the Chaldean in Mesopotamia, Hittite in Anatolia, Pythagorean in Ancient Greece, Roman in Ancient Rome, Indian and Chinese (Schimmel, 1993).

In addition to these quantitative approaches, the zodiacal signs (which were related to natural forces: earth, wind, fire and water) were not only associated with a cluster of personality traits, but they were also associated with certain parts of the body. Astrological medicine, starting from ancient Egyptian and Mesopotamian civilizations until the end of the Medieval period, was mainly based on a "Zodiac Man" map, where each planet (therefore each zodiac sign) was believed to be related to certain organs of the body (Rochberg, 2004; Wee, 2015). It is widely acknowledged that astrological medicine was accompanied by humoral medicine (Jouanna, 2012; Margotta, 2001; Plinio, 2003), starting from the ancient Egyptian and Mesopotamian civilizations, later adapted by Hippocrates (5th Century BC), Galen (2th Century AC), and widely used in the Middle Ages.

Humorism related also the four elements in nature (earth, water, air, fire) to the four bodily humors given by nature: black bile, phlegm, blood, and yellow bile which were in turn related to four personality dimensions; melancholic, phlegmatic, sanguine, and choleric (Jouanna, 2012). The four bodily humors were also assigned to certain organs: black bile to the spleen, phlegm to the brain and lungs, blood to the liver, and yellow bile to the gallbladder (Jouanna, 2012).

The notion of the body's introjection of the energies in the universe and nature was also observed in the Eastern belief systems like Hinduism (3000 BC), Buddhism (6th century BC), and Taoism (5th century BC). Hinduism and Buddhism believe that the body consists of energy channels connected by chakras, that are mediators between body and psyche (Dwivedi, 2018; Giordano, 2010; Jung, 1996). Chakras, which are located along the physical

spinal cord, influence not only the organs, but the emotions as well. Hinduism names seven chakras in an ascending order as: the root chakra, the sacral chakra, the solar plexus, the heart chakra, the throat chakra, the third eye, and the crown chakra (Dwivedi, 2018; Jung, 1932-1996;). Buddhist esoterism focuses only on 4 chakras (namely, Manipura, Anahada, Vishuddha and the Crown) and relates these to natural forces: earth, wind, fire and water (Jung, 1932-1996). The personality types have been differentiated based on the suggestion that each individual has a certain chakra that is overactivated or underactivated (Dwivedi, 2018; Jung, 1932-1996). For instance, three personality somatotypes were defined by Indian Ayurvedic "doshas" (combinations of characteristics based on five elements), that are Vata, Pitta and Kapha (Rizzo-Sierra, 2011; Shilpa & Venkatesha Murthy, 2011).

Similar to the *holistic body theories of personality* applied in Hinduism and Buddhism, Taoism also followed a holistic body approach, however with different explanations of energy systems. Taoism argued that there is no one omnipotent God, but there is Tao (a guiding life force) that flows through all life, connects the person with other beings, nature and universe (Hagen, 2002; Wang & Wang, 2020). "Yin & Yang" are defined as the energies in nature and in all living beings, including individuals, whose balance is important for both physical and psychological health, as well as personality types (Tu & Guo, 2011; Wang et al., 2019; Wang & Wang, 2020). Chinese Medicine is built on the map of bodily meridians, which are based on Yin & Yang energies. The theory of five-pattern personality traits, which originated from traditional Chinese medicine, classifies individuals into the five patterns of TaiYang, ShaoYang, PingHe, ShaoYin, and TaiYin, based on their Yin-Yang differences (Zhao, Song, Du, Li, Wang, Cheng, Li, Zhang, Li, Yang, & Xu, 2020).

Although seeming so different from each other, in all these earlier medicine types (e.g. astrological medicine, humoral medicine, Chinese medicine), it seems that several external influences and internal bodily organs were interactive, and a certain number of personality

types were offered (Jouanna, 2012; Margotta, 2001; Plinio, 2003; Rochberg, 2004; Wee, 2015; Zhao et. al. 2020) . The head (thus the brain) was often considered as an important center for the body; such as in the Egyptian Edwin Smith Surgical Papyrus (Breasted, 1930) and the naming of head as the "crown" in chakra models of Hinduism and Buddhism (Dwivedi, 2018; Jung, 1996), and "keter" (crown) later in Jewish Qabalah (Drob, 1997; 1999; Jung, 1964). While the head may sometimes have been seen to be the locus for personality, nomore specific localization could be offered.

The Monotheistic Perspective

Like the animistic, polytheistic, non-theistic and henotheistic cultures, the monotheistic cultures also maintained the astrological and numerological attempts to analyze individual differences (e.g. Qabalah numerology in Judaism, Biblical numerology in Christian cultures, Abjad numerology in Islamic cultures) based on the birth time of the physical body (Schimmel, 1993). However, with the initiation of Abrahamic religions, it appears that the influences of the universe and nature were renamed as the influences of God over individuals. Judaic belief, that properties of God (sefirots) are found also in the properties of the individual, and each sefirot is identified with a part of the body and a characteristic of personality, resembled the ancient celestial influences on the Zodiac Man (Drob, 1997; 1999; Jung, 1964).

Arguably, the influences of the celestial bodies introjected by the Zodiac Man were replaced by the sefirots of God (Drob, 1997; 1999; Jung, 1964). These ten sefirots included Keter (Crown), Wisdom, Understanding, Loving kindness, Might or Judgment, Beauty, Splendor, Victory, Foundation, and Sovereignty or the Divine Presence (Drob, 1997; 1999; Jung, 1964). Besides the impact of God to impose individual personality differences on the body, Jewish esoterism maintained the belief that four fundamental natural forces (earth,

wind, fire and water) also influenced the nature of human personality traits (Drob, 1997, 1999; Jung, 1964). The idea of the introjection of the properties of God by individuals was also theorized in the Sufi philosophy of Islam, where the individual is considered as a microcosmos living in a macrocosmos, which is the Creator (Burckhardt, 2008; Chittick, 2000).

The earlier theories had a very wide-range of *external* influences (the effects of the universe and nature in animism, polytheism, non-theism, henotheism) introjected by individual bodies. In contrast, the monotheistic approach had a singular external locus of influence: the influences of the properties of God. Therefore, monotheism narrowed down the variety of external natural influences on the body and exerted a monopolized power over the body (McGuire, 1990; Vorster, 1997).

Indeed, reflecting on the social sciences of religion, Freud, Marx and Weber all pointed to religion's role in the control of the body (McGuire, 1990). According to this power strategy, monotheism was less embodied and more spirit oriented (Colish, 1968; McGuire, 1990; Vorster, 1997). Especially, the Augustine philosophy argued that only the soul has an effect on the body, but the body does not have an effect on the soul (Colish, 1968). In line with this passive body concept, monotheism ordered to cover and hide the body (which is an important part of nature), especially of females who carry on the inherited nature to the offspring (Berktay, 2021). To control the body was equal to the control of nature, culture, personality and gender (Durkheim, 1912; Kirby, 1997; McGuire, 1990; Vorster, 1997). As all bodies come out of female bodies, to control the body (especially of females) was essential to the patriarchal opression of nature and culture (Kirby, 1997; McGuire, 1990). Due to all these reasons, while the earlier animistic religions were more *embodied*, the later doctrinal religions (which are mostly applied in Western cultures) became more *independent of bodily context* (Watts, 2020).

The monotheistic control over the body, which was at its peak during Medeival Period (5th-15th Century), had experienced several historical confrontations that occured in the late Middle Ages. Despite the religious restrictions over the medical study of the body (Hustings, 2010; Margotta, 2001), by the start of 13th century, the ancient Greek medical knowledge was transfered back to Europe, by muslim scientists like Ibn Sina (Avicenna) and İbn Rüşd (Freely, 2011; Margotta, 2001). The back translations of Hippocrates (5th Century BC) and Galen (2th Century AC) included the claim that the *brain* (but not the heart) is the organ that controls the body (Finger, 2004). This knowledge seems to have liberated the body and opened the way to reconsider *brain* as the controller of one's self. Later, the European Renaissance (15th-16th centuries) released the image of "body" from its locked away corner, where it was covered and hidden by religion, and the individuals started to rediscover their bodies and its joys (Boureau & Benjamin, 1994).

The Scientific Perspective

It is widely accepted that the Scientific Revolution (mid 16th century) (Deason, 2009), followed by the Age of Enlightenment in Europe (17th-18th centuries) enabled individuals to explore nature and the body in detail (Jahoda, 1997). For example, Descartes' claim that the pineal gland in the brain is where the body and soul interacts, became a milestone in brain studies of the 17th century (Descartes, 1637, trans. 1912). He also argued that not only the soul has an influence on the body, but the body also has an influence on the soul. It might be argued that the return of studies on the *head and brain*, that were emphasized in ancient times as the *crown* (controller) of the body (Breasted, 1930; Drob, 1997; 1999; Dwivedi, 2018; Jung, 1964, 1996), signalled a challenge to the crowns of the monarchy.

By the late 18th century, pseudo-scientific approaches, that reduce the individual differences only to the head and the brain, started to appear in Western cultures. For instance

by the end of the 18th century, the Swiss pastor Lavater, who was inspired by the earlier Enlightenment naturalistic theorists, developed a facial personality theory called physiognomy, which supposed that the personality traits are revealed in the facial features (Lavater, 1878; for recent review see Boshears & Whitaker, 2013). Based on physiognomy, German physicians Joseph Gall and Gaspar Spurzheim developed the well-known brain-based personality theory called phrenology, which was later enhanced in Europe and U.S. throughout 19th century (Boshears & Whitaker, 2013; McLaren, 1974; Van Wyhe, 2004).

Phrenology, which is considered as one of the origins of neuroscience (Finger, 1994), argued that personality can be established by the differences of bumps on the skull. Compared to previous holistic approaches, it suggested that different regions of the brain (not the different regions of *the body*) are specialized for different functions (Boshears & Whitaker, 2013; Van Wyhe, 2004). The phrenologists believed that certain overdeveloped localizations in the brain lead to bumps on the skull, and calculating the size of these bumps can define individual differences in personality (Boshears & Whitaker, 2013; Van Wyhe, 2004). The propensities that were measured via these calculations were variables such as: acquisitiveness, cautiousness, combativeness, love of life, and secretiveness (Combe, 1851). Clearly, this was not a list of categories based on empirical sources.

Gall emphasized that "nature" is the "sole authority" (pp 40, Gall, 1846) and it is a human right to learn about individual differences in characters, by the help of phrenology, to attain greater self knowledge (Van Wyhe, 2004). The idea of phrenology also had interesting reformist, cultural consequences (Van Wyhe, 2004b). As phrenologists emphasized nature, they also equated the natural characteristics of animals and human beings. Therefore, the Vatican, not surprisingly, criticized phrenology as a materialistic method, which values the power of nature over the power of God (McLaren, 1974; White, 2018). However, religious liberals, especially in U.S., conceptualized phrenology as a unifying method, which can

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synthesize science and religion, where psychological differences can be localized in the nature of the body (and the brain) created by God (White, 2018). British and American phrenologists even attempted to use phrenology to *prove* the existence of God (Van Wyhe, 2004a; 2004b). For all these mind-set changing reasons, the history of science accepts phrenology as a reformist movement that brought socio-political change, especially because of its perspective on the self (Van Wyhe, 2004b).

In sum, these pseudoscientific approaches to personality had some quantitative measures, and both physiognomy and phrenology suggested that animals and humans shared common criteria to be observed in terms of facial features or skull bumps. However, despite their proto-neuroscientific attempts based on animal models, they were still based on faith and speculation, and not on reliable empirical findings (Van Wyhe, 2004a; 2004b).

An important change arrived with studies of focal brain lesion. The most notable was the famous case of Phineas Gage in 1848, whose personality changed sharply after an accident which damaged his ventro-medial frontal lobe (Damasio et al., 2005; Harlow, 1868). The 20th century saw a growing interest in lesion studies to identify functional specializations of different regions in the brain (Damasio et al., 2005; Harlow, 1868). This might be considered as the birth of modern neuroscience of personality.

In the last century a number of very different approaches to localizations in the body and the brain appeared. Some relate directly to brain structures and some to the broader body. However these also show a continuity with ideas that are much more ancient. For example, Freud built up his psychoanalytical theory based on neurology, and underlined that "The ego is first and foremost a bodily ego" (Freud, 1923). In 1960's the second wave of feminism brought the topic of women rights for the control over their own bodies and this intensified the liberation of the body concept (Shilling, 2016). On the other side, Herbert Sheldon

developed the constitutional psychology, which linked personality traits to body shapes and defined three main somatotypes: Ectomorphic, Mesomorphic and Endomorphic (Sheldon, 1954). Actually, this was like a return of Indian Ayurvedic "doshas" (Vata, Pitta, and Kapha) defined several thousand years ago (Rizzo-Sierra, 2011; Shilpa & Venkatesha Murthy, 2011).

After the 1980's academic studies on embodiment in social sciences increased rapidly (Shilling, 2016). By the end of the 20th and the start of the 21st century, the study of body in social sciences and the study of the brain in neurosciences, in relation to identity and personality, increased sharply (Davis et al., 2003; Davis & Panksep, 2011; 2018; Shilling, 2016). Although Freud, Sheldon and second wave of feminism are very different approaches to understand the body concept, they all emphasized the importance of the body. Indeed, the holistic body/mind approaches which had never disappeared in the Eastern traditions, restarted to increase in the West as well (Shilling, 2016). Thanks to these developments, today's science is increasingly ready to re-acknowledge the body (brain) as *the monist container for both nature and culture*.

1.1.3. **Summary of Part A**

The historical approaches to personality, which were summarized above, suggest that humankind has elaborated on the *external* and *internal* sources of personality since ancient times. Throughout history, the views on these two themes seem to have shifted from an integrative animist approach (which perceives nature/nurture and body/mind as a whole) to a segregative monotheist approach (which perceive nature/nurture and body/mind as separate entities). Finally, the Zeitgeist of the 21st century is ready to take an integrative position, which re-acknowledges "*cultural ancestors*" as the monist sources, and "*body and brain*" as the monist containers, for both nature and nurture.

Reflecting on the current separation of the social sciences and natural sciences, the anthropologist Vicky Kirby (2017), who explores opposites such as nature/culture, and body/mind, argues that separation of these opposites led to several political mistakes (e.g. environmental problems, gender inequality issues). In her book "Quantum Anthropologies", she discusses that the recent scientific studies suggest that these opposites, which were considered separate, are actually inseparable and interacting (Kirby, 2011; 2017). The above summary of historical approaches to personality also points out that it is time to re-integrate the concepts of *nature/culture* and *body/mind*. For such a re-integration, the recognition of the role of the females, in the intergenerational transmission of nature/culture and in the dyadic body/mind interactions with the offspring, seem to be the themes that bind the ancient and modern.

1.2. Part B- Modern Approaches to Personality

By the start of 20th century, a number of theorists were working to synthesize mind and brain. For example, Freud's psychoanalytical theory, based on neurological substrates, (Freud, 1887-1902/ 1950) had attempted to integrate nature and nurture perspectives for personality. Similarly, the Vygotsky-Luria project attempted to integrate socio-cultural theory and neuropsychology via the mediation of emotional interactions with significant others (see zone of proximal development, Luria, 1935; 1976; Vygotsky, 1934). However, for many scientists throughout the 20th century, opinions were still divided into two opposing camps, with limited tolerance for integration. Nurture-based approaches emphasized the importance of learning with the mediation of environmental determinants like early dyadic interactions, family systems and cultures (e.g. Bandura, 1977; Bowlby, 1958; Dollard and Miller, 1950; Kelly, 1955; Roland, 1988, 1996; Singelis, 1994; Skinner, 1953), whereas nature-based approaches suggested that personality is shaped mostly by genetic determinants (traits) and

allowed for a minimum effect for environment (e.g. Allport, 1937; Cattell, 1986; ; Costa & McCrae, 1992; Eysenck, 1990).

Nurture Based Approaches

The *nurture based approaches to personality* focused intensely on external influences, adopting a range of different approaches. For instance, *behavioral approaches to personality* emphasized the external environmental determinants, rejected the internal sources, and argued that all behaviors are learned by conditioning (e.g. Skinner, 1953; Watson, 1924). Stimulus-Response theory (Dollard and Miller, 1950) stated that personality characteristics are learned through patterns of reward and punishment from parents and significant others.

Cognitive approaches to personality, which was started with Kelly's personal construct theory (Kelly, 1955), claimed that individuals develop a cognitive construct (a schema) based on their experiences, and these schemas determine how they will think, behave and feel. *Attachment approaches to personality* (Ainsworth & Bowlby; 1991; Bowlby, 1958; 1988) focused on the influence of maternal (and paternal) attachment styles on the development of personality types. Finally, in the *Social-cognitive theory of personality* (Bandura, 1977; 1986), we can see the roots of a gradual tolerance for nature-nurture interaction. It accepted behavior as an interaction of the individual and the environment, where there is mutual determinism (Bandura, 1977; 1986). Bandura's approach emphasized the role of observational learning, where the parents model to their children appropriate behaviors and where the child imitates or identifies with significant others (Bandura, 1986). He also argued that emotional reactions are learned by vicarious conditioning, where the child learns emotional reactions by observing others (Bandura, 1986).

Nature Based Approaches

On the other hand, *nature based theories of personality* emphasized the primary importance of the inherited traits. *Allport's trait theory* argued that certain characteristics are hereditary, however it also allowed space for interaction between genotypes and phenotypes, by saying that some traits are open to environmental influences (Allport, 1937). Similarly, *Cattell's trait-factor analytic approach* (Cattell, 1986) believed that traits are primarily inherited, but both genes and environments contribute to the development of traits. He used objective measures, like factor analysis, to explore personality traits, and identified 16 factors (Cattell, 1986). *Eysenck's trait-type-factor analytic theory* (Eysenck, 1990) also discussed that traits had solid biological foundations. It defined two basic dimensions in personality, that are Introversion/Extraversion and Neuroticism/Stability.

Lastly, the *Big Five model of personality* (Costa & McCrae, 1992) discussed that traits are genetically determined, and defined five traits: Openness to Experience, Conscientiousness, Extraversion, Agreableness and Neuroticism. Although the model is based on questionairre completion, they argued that five factors exist because they were shaped by the process of natural selection (Costa & McCrae, 1992).

Detailed discussion of all the nurture and the nature based theories of personality in this section is not possibile. However, it is interesting that, despite their differences, these two approaches had two common missing points. Firstly, neither of these approaches linked their theory to empirical evidence observed in the *brain*. Secondly, both approaches focused more on the cognitive and behavioral dimensions of personality, and gave little emphasis on the *emotional* dimension. Surprisingly, the theories of emotions also did not focus on how emotions can be related to personality. Instead, they mostly elaborated where the emotions are derived from: physiological reactions, neurological functions and/or cognitive appraisals (e.g. Cannon, 1927; James, 1884; Lazarus, 1991; Schachter & Singer, 1962). Similarly, the neuroscience of emotions in the 20th century also focused only on the clarification of the

functional *localization* of emotions (Cannon, 1927; Davidson, 1992; MacLean, 1949; LeDoux, 1996; Panksepp, 1998; Rolls 1999), but not to its relation to personality.

Interestingly, these two missing points (emotions and brain) in both nature and nurture approaches, were going to be the integrative key to reach a gestalt in personality theories, in the future. The *emotional brain* was going to be coined, to bridge the external influences on personality with internal bodily localizations.

1.2.1. Integrative Approaches of the 21st Century

The passage from the 20th to the 21st Century brought back the idea of *holistic approaches* in almost all fields of natural and social sciences (Borgatti et al., 2009; Von Bertalanffy; 1968; Wilson; 1998). The historians depicted this paradigm shift as the revival of ancient philosophies of *connectivity* (e.g. Ubuntu, Taoism, Confucianism), where all persons, creatures, and things are intertwined (e.g. see Oneness Hypothesis by Ivanhoe, 2017). Holistic approaches within disciplines were also accompanied by the attempts of integration between all scientific disciplines, in order to reach a unity of knowledge (e.g. see Consilience Theory, Wilson; 1998). In a way, *rediscovery of connectivity* became the main spirit of the new century. Accordingly, *systems analysis and network methods* used in research increased sharply in both the natural and social sciences (for a review of Systems Theory see Capra, 1997; Checkland, 1997; for a review of Network Theory see Borgatti et al., 2009).

The *connectivity* concept brought several new *holistic views* also for the disciplines, that study the human *brain* and *mind*; such as network approaches in neuroscience (e.g. Büchel and Friston 2000; Boccaletti et al. 2006; Hagmann et al. 2008; Newman 2010), the systems approach in family and cultural psychology (Broderick, 1993; Kerr & Bowen, 1998; Rothbaum et al., 2002), and social network theory in social sciences (Borgatti et al., 2009; Wasserman & Faust, 1994). In line with the rise of connectivity within disciplines,

interdisciplinary studies that attempt to integrate *mind/body,* and *nurture/nature* emerged as well. The *brain* became the bridge used in these integrative studies; such as developmental neuropsychology (e.g. Schore 1994); neuropsychoanalysis (Solms & Turnbull, 2002), cultural neuroscience (e.g. Chiao & Ambady, 2007; Chiao & Blizinsky 2009), epigenetics (e.g. Cavalli-Sforza & Feldman, 1982; Fish et al. 2004; Weaver et al. 2004).

Within this Zeitgeist, there has been a return to the holistic perspective (that believed in the embodiment of external influences on self), however this time, it is far more empirically grounded and associated with a skeptical mindset. The intersubjective experiences, that stem from the interactions with environmental influences- like the primary care-giver, the family system and the cultural norms- (e.g. Beebe and Lachmann 2002; Fişek 2009; Stern, 2000) are now shown to be embrained (e.g. Schore 1994; Gallese, 2001). Interactions with the primary care-giver are now argued to be internalized by the infant (via mirror neurons?), and to shape the early developmentally-wired neuronal group selections, especially in the right hemisphere (e.g. Gallese, 2001; Rizzolatti et al., 1999; Schore 1994). The quality of the mother-infant emotional attachment styles and early life experiences are now widely accepted to shape the neural wirings within the limbic system (Davis & Panksep, 2011; 2018; Korkmaz et al. 2013; Narvaez et al. 2012; Panksepp 1998; 2011; Schore 1994; 2000). It is increasingly understood that the *emotional brain* is the corporeal localization for the connectivity between individual and environmental influences.

The next section will summarize how the inclusion of *emotional brain* into personality theories, helped to synthesize nature and nurture approaches to personality.

1.2.2. Localizing Personality in the Emotional Brain

In the 20th century, the neuroscience of emotions had begun to investigate the functional localization of emotions, but not yet the personality. Cannon (1927) had

demonstrated that the removal of the neocortex does not lead to the extinction of emotions. Following this work, MacLean (1949; 1990) developed his triune brain model, which divided the brain into 3 main regions based on evolutionary phases. Some of his evolutionary analogies have now entered popular culture. These three areas are the brainstem (the reptilian brain), the limbic system (the paleomammalian brain) and the neocortex (the neomammalian brain). He linked the brain stem to autonomous bodily functions, the limbic system to emotions and the neocortex to cognitions (MacLean, 1990). By the end of 20th century, authors such as LeDoux (1996; 2002) became the opponent of MacLean's view that divides the cortex into old and new. While LeDoux (1996) claimed that the higher brain functions of the cortex are crucial for the generation of emotions, Panksepp (1998) pointed out that direct neocortical stimulation fails to generate emotional states.

In the same historical period, emotion research also attempted to focus on the lateralization of emotion. Many studies demonstrated a right hemisphere advantage for the perception and the expression of emotions (Borod, 1993, for a review). In the same period, another stream of research claimed that the left hemisphere is mostly involved with positive emotions, whereas the right hemisphere with negative emotions (Davidson, 1992; Rolls 1999).

In the last two decades, the neural basis for the basic emotion systems has been outlined with greater precision, and it has become clear that the neural substrate for basic emotions is subcortical. For instance, the brainstem was discussed to be crucial for affective consciousness (Damasio, 1999; Panksepp, 1998). Moreover, the consolidation of emotionally important memories were found to be related to other subcortical structures, like the hippocampus and the amygdala (Kandel et al., 2000). The diencephalon (especially the hypothalamus) was discovered as the mediator of sensory inputs that carry emotional charges (LeDoux 1996; Panksepp, 1998). The hypothalamus was especially found to be the regulator

of many neurochemical responses that are related to emotions (Damasio, 2003; Kandel et al., 2000; Panksepp, 1998). Linking the subcortical regions to the body, Damasio (2003) discussed that signals from the entire body are related to the feelings, and the body sensing regions (like the insula) are the neural substrates leading to these feeling states.

Despite all these neuroscientific advances summarized above, only Panksepp (2011) attempted to theorize the relation of subcortical affective systems to *personality*. The details of the Affective Neuroscience Personality theory will be discussed in the next section.

1.2.3. Affective Neuroscience Personality Theory

Panksepp's Affective Neuroscience theory (Panksepp, 1998; Panksepp & Biven, 2012) takes its strength from its evolutionary perspective, claiming that the ancient subcortical layers of the brain are the source of primal instincts and emotions, that are shared by all mammals. In line with MacLean's earlier proposals (1949), the more recent parts of our brain (especially the frontal lobe) are built on these very ancient layers. Affective Neuroscience therefore gives voice to a bottom-up approach, in contrast to Cognitive Neuroscience's top-down approach which emphasized the executive power of top layers over bottom layers (e.g. Gazzaniga, Ivry & Mangun, 2009). According to Affective Neuroscience, emotions based in the subcortical affective systems are the primary processes, which are shaped by the secondary processes of learning and development, which end in cortical cognitive systems of tertiary processes (Panksepp, 1998; Panksepp and Solms, 2012; Turnbull & Salas, 2021).

The subcortical basic affective systems defined by Panksepp (1998) include the SEEKING system, the LUST subsystem, the RAGE-ANGER system, the FEAR system, the PANIC-GRIEF (separation-distress) system, the CARE subsystem (in relation with PANIC-GRIEF system), and the PLAY system. These brain systems are complex but can be summarized around a few basic principles. These are firstly the oldest foundational parts of

the system located in the PAG; secondly that basic emotion systems project to different areas such as the anterior cingulate and the nucleus accumbens, typically the hypothalamus; and thirdly that these newer subcortical systems are less concerned with emotions but more with emotion learning (Panksepp and Solms, 2012; Solms & Turnbull, 2002).

Panksepp built up his neurodevelopmental approach to personality based on the premise that personality is formed upon the strengths and weaknesses found in these basic affective systems (Davis et al., 2003; Davis & Panksep, 2011; Davis & Panksepp, 2018; Montag & Davis, 2018; Panksepp, 2011). The variations in the arousability of these affective systems are surely not only genetically determined, but also influenced by early dyadic interactions and other environmental factors (Davis & Panksepp, 2018; Korkmaz et al, 2013; Schore 1994; 2000). Panksepp's model of personality is summarized in his last book (Davis & Panksepp, 2018), and it is heavily based on findings from the Affective Neuroscience Personality Scales (ANPS). The ANPS enables us to explore how the emotional brain becomes the *mediator* of the nature-nurture interactions that contribute to personality development.

Affective Neuroscience Personality Scales

Based on this interactive approach, the Affective Neuroscience Personality Scales (ANPS) was constructed in 2003 (Davis et al. 2003). The ANPS measures the subcortical affective systems, in other words, the primary processes that are shaped by secondary processes and that are evolutionary older than the tertiary processes. As a psychometric tool born within the scientific awareness of 21st Century; ANPS stands objectively on an evolutionary theory, where affect is considered as the prior building block of personality. Previous personality theories- widely used in the 20th Century- lacked such a strong evolutionary and neurodevelopmental ground and did not measure universally shared neural

systems on which personality is built. Notably, the lexically derived Big Five Factors (Costa & McCrae, 1992) measures the tertiary processes, whereas the ANPS measures the primary processes, shared by all mammals. Moreover, the Big Five is mostly based on Western values (Gurven et al. 2013; Piedmont et al. 2002; Schmitt et al. 2007), wheras the ANPS is based on universal primary processes, that are regulated via secondary processes.

The ANPS measures six basic affective systems namely: SEEK, PLAY, CARE, FEAR, SADNESS and ANGER (Davis et al. 2003). For the three positive affects: SEEK is defined as (following the terminology of Davis et al. 2003) feeling curious, feeling like exploring, striving for solutions to problems, PLAY is described as having fun, playing games involving physical contact, humor, laughter, being generally happy and joyful, CARE consists of nurturing, feeling softhearted toward animals and people in need, feeling empathy, feeling affection for and liking to care for others. For the three negative affects: FEAR reflects the tendency for feeling anxious and tense, worrying, struggling with decisions, ruminating about past decisions, losing sleep, not typically being courageous, SADNESS monitors feeling lonely, crying frequently, thinking about loved ones and past relationships, feeling distressed when not with loved ones, and ANGER for feeling hotheaded, being easily irritated and frustrated, expressing anger verbally/physically, remaining angry for long.

The ANPS has been translated into several languages: (in order of publication) Spanish, French, Turkish, Norvegian, Italian, Polish, Portuguese, Persian, Japanese, Chinese, German, Serbian, Brazilian Portuguese, Russian (Pahlavan et al., 2008; Abella et al., 2011; Pingault et al., 2012; Özkarar- Gradwohl et al., 2014; Geier et al., 2014; Pascazio et al., 2015; Cwojdzińska & Rybakowski, 2015; De Almeida, 2016; Amiri & Azad-Marzabadi, 2017; Narita et al., 2017; Sinderman et al., 2018; Reuter et al., 2017; Montag et al., 2017; Gurfinkel et al., 2018; Volf & Privodnova, personal communication) and has been also standardized for the Hong Kong and Canadian populations (Yu et al., 2016; Orri et al., 2016). The construct

validity of ANPS has been well proved in these standardization studies by analyzing the significant correlations between ANPS subscales and Big Five Scaless (B5S). All these ANPS standardization studies confirmed the main general findings of the original ANPS study, (Davis et al, 2003) and demonstrated that ANPS is a reliable and a valid tool.

In short, the Affective Neuroscience Personality Theory achieved a big step for the integration of nature-nurture approaches of personality, via the mediation of the emotional brain. In this theory (Davis et al., 2003), the influences of nurture included mainly the primary care-giver. However, none of the ANPS studies mentioned *culture,* as one of the variables in nurture (e.g. Abella et al., 2011; Amiri & Azad-Marzabadi, 2017; Cwojdzińska & Rybakowski, 2015; De Almeida, 2016; Geier et al., 2014; Gurfinkel et al., 2018; Montag et al., 2017; Narita et al., 2017; Pahlavan et al., 2008; Pascazio et al., 2015; Pingault et al., 2012; Reuter et al., 2017; Sinderman et al., 2018). The exception is Özkarar-Gradwohl et al., (2014), which will be discussed in later sections. Indeed, it might be suggested that the Affective Neuroscience Personality theory seemed to revive the Vygotsky-Luria project (Luria, 1935; Luria, 1976; Vygotsky, 1934), but the only missing part was *culture*.

1.2.4 Cultural Influences

The 21st century started with strong criticisms of behavioral sciences, for being based mostly on Western samples and for lacking awareness of the effect of culture (e.g. Arnett, 2008; Henrich, Heine, & Norenzayan, 2010). In one of the widely cited (almost 12,000) critique articles, it was argued that behavioural scientists need to stop assuming that the cognitive, affective and behavioral findings, gathered from Westerners, apply to all cultures (Henrich, Heine, & Norenzayan, 2010). These criticisms were in line with the argument of Vygotsky, who discussed that developmental stages may vary across cultures (Vygotsky, 1934). This time, these discussions were grounded on studies from *cultural psychology* which

rose by the end of the 20th Century (for a review see Schultz & Schultz, 2009), and which gave birth to *cultural neuroscience* at the start of the 21st Century (with the initiation of Chiao & Ambady, 2007). In the following sections, a brief summary of findings from these two areas will be provided.

Cultural Psychology

Cultural psychology became one of the integrative fields that explore the interactions of culture and self (for a review see Matsumoto & Wilson, 2022). Most research focused on the observation of the influence of two cultural norms on the development of self: often described as collectivism and individualism, or other terminologies such as interdependency and independency; relatedness and autonomy; connectedness and separateness (e.g. Hofstede, 1980; Kağıtçıbaşı, 1996a; 2005; Matsumoto & Hwang, 2012; Markus and Kitayama, 1991; 1998; Nisbett, 2003; Singelis, 1994; Triandis, 1995; 1997; Triandis et al., 1988; Triandis & Suh, 2002).

With the help of cultural psychology findings, it is now increasingly accepted that culture has an influence on minds, and culture must be integrated within personality studies (Giordano, 2010, 2019; Kitayama & Uskul, 2011; Markus & Kitayama, 2010). Personality psychology is also evolving as a field, and now it is also discussed that the personality assessments need to be culturally relevant (Cheung et al., 1996; Cheung & Ho, 2018). There is an increasing awareness about how culture effects all three broadly agreed dimensions of personality: the emotions, cognitions and behaviors (e.g. Friedlmeier et al. 2011; Kağıtçıbaşı, 2007; Kitayama, 1991; 1998; Markus and Matsumoto & Hwang, 2012; Nisbett, 2003; Singelis, 1994; Song and Trommsdorff; 2016; Tsai 2007).

Mentioning all these studies here is not possible, however a rough summary of findings can be stated as follows. In regards to the emotional dimension, it is now widely

accepted that Eastern collectivistic cultures discourage the expression of high arousal positive affect, or anger, that will disturb group's harmony. In contrast, Western individualistic cultures allow the high arousal emotions, including anger (Friesen, 1972; Holloway & Nagase, 2014; Roland, 1996; Tsai 2007). Regarding the cognitive dimension, it has been repeatedly reported that while Eastern collectivistic cultures focus to the whole and to the synthesis of the parts, Western individualistic cultures have a more analytical and linear thinking, focusing on the parts (for a review see Nisbett, 2003). For the behavioral dimension, it has been widely argued that while persons from collectivistic cultures behave more interdependently, the persons from individualistic cultures behave more independently (for a review see Markus and Kitayama, 1991; Singelis, 1994).

The literature summarized above shows that culture influences the dimensions of personality, but does not explain how?. Studies, that attempted to explain how culture may influence personality, focused on investigating the roles of three variables: *mothering styles, family systems, and emotion socializations* (e.g. Friedlmeier et al. 2011; Kağıtçıbaşı, 1996a; 1996b; 2007; Mayer et al., 2012; Roland 1988; 1996; Song and Trommsdorff; 2016). For mothering styles, cultural psychoanalysis has been the most influential field. It proposed- broadly- that Eastern symbiotic mothering styles do not reinforce separation-individuation and lead to "familial self", while Western mothering styles reinforce separation-individuation and promote a more separate sense of self; "individualized self" (for reviews see, Fişek, 2009; Kağıtçıbaşı, 2007; Narvaez et al. 2012; Roland, 1988, 1996).

As regards family systems, the *independent* family models are discussed to focus mainly on the personal autonomy of the child, and to a relatively smaller degree on interpersonal relationships and interdependence (Kağıtçıbaşı, 2007; Mayer et al., 2012). On the other hand, the *interdependent* family models focus more on the emotional inter-relatedness of the child and less on autonomy. Lastly, in the *emotionally interdependent*

family models, personal autonomy is allowed while emotional closeness and inter-relatedness are maintained (like in Türkiye, see Kağıtçıbaşı, 2007). For emotion socializations, cross-cultural studies showed that how the parents teach their boys/girls to regulate (promote or inhibit) basic affects vary across cultures (Friedlmeier et al. 2011; Song and Trommsdorff; 2016). For instance, in cultures where interdependency is highly valued, anger expression is widely discouraged in order to protect the inner harmony of the family and/or the social group against conflicts (Friesen, 1972; Holloway & Nagase, 2014; Roland, 1996).

In sum, via mothering styles, family systems and emotion socializations, culture has proven to influence the emotional, cognitive, behavioral dimensions of personality. The next question was how these cultural influences get embrained? This need for grounding the cultural psychology findings into the material realm, inspired several studies in cultural neuroscience. The summary of this second interdisciplinary field will be presented in the next subsection.

Cultural Neuroscience

Although the Vygotsky-Luria project attempted to integrate socio-cultural psychology theory and neuropsychology, via the mediation of emotional interactions with significant others, the project was left incomplete with the early death of Vygotsky (Luria, 1935; Luria, 1976; Vygotsky, 1934). In the 21st century, Cultural Neuroscience emerged as one of the most important interdisciplinary fields, introduced by Chiao & Ambady (2007), which aimed to functionally localize the influences of culture in the *brain* (e.g. Chiao & Ambady, 2007; Chiao & Blizinsky, 2009; Chiao et al., 2009; 2013; Chiao, 2017; for reviews see Han et al., 2013; Matsumoto & Wilson, 2020). By doing that, it opened a new field, which will improve the integration of nature-nurture approaches in personality studies, with the inclusion of

culture. Mentioning all the cultural neuroscience studies here is not possible, however the prominent examples, related to the field of personality, can be summarized as below.

The two cultural norms (collectivism and individualism), investigated in detail by cultural psychology, were discussed to be linked to *varying neural networks in the cognitive, emotional, and social dimensions of personality* (e.g. Chiao & Ambady, 2007; Chiao et al., 2009; Han & Ma, 2014; Han and Northoff, 2008). A recent meta-analysis of 35 functional MRI studies (Han & Ma, 2014) showed some interesting findings that can be related to the cultural variables discussed above. As regards social cognitive processes, East Asians appear to have stronger activity in areas related to emotion regulation. Han & Ma (2014) report that "social cognitive processes are characterized by stronger activity in the dorsal medial prefrontal cortex, lateral frontal cortex and temporoparietal junction in East Asians" (pp. 293). In Westerners, there appears to be greater experience of basic emotions, such as "stronger activity in the anterior cingulate, ventral medial prefrontal cortex and bilateral insula in Westerners" (Han & Ma; 2014, pp 293). There are also interesting findings of laterality and culture, which are more difficult to interpret. Han & Ma (2014) conclude that "social affective processes are associated with stronger activity in the right dorsal lateral frontal cortex in East Asians, but greater activity in the left insula and right temporal pole in Westerners." (pp. 293).

The two cultural norms may also be related to *varying neural networks for self representations* and *significant other representations* (e.g. Chiao et al., 2009; Ng et al., 2010; Zhu et al., 2007). It was found that while Westerners use medial prefrontal cortex (MPC) exclusively for self-representations (e.g. Northoff & Bermpohl, 2004; Northoff, DeGreck, Bermpohl, & Panksepp, 2006), Chinese individuals use MPC for both self representations and mother representations (e.g. Ng et al., 2010; Zhu et al., 2007). Chiao et al. (2009) argued that two kinds of neural representations of self (collectivistic self and individualistic self) may require the medial prefrontal cortical regions. These neural materializations were discussed to

be in line with independent self and high self-object differentiation on the one hand, and interdependent self and lower self-object differentiation on the other (Ng et al., 2010).

This research, investigating the influences of collectivism/individualism on the brain, were accompanied by neurochemical studies as well. Significant relations were found between collectivistic cultural values and allelic variation of the oxytocin receptor gene polymorphism (Han et al., 2013; Luo and Han, 2014). Considering that oxytocin is one of the major "motherhood" neuropeptides, there may be interesting relationships between neurochemistry and mothering styles (symbiotic vs autonomy fostering mothering styles) (Fişek, 2009; Kağıtçıbaşı, 2007; Narvaez et al. 2012; Roland, 1996).

In sum, cultural psychology started to enlighten how *cultural influences* effect personality (via mothering styles, family systems, parental attachments) and cultural neuroscience is promising to demonstrate how these influences are also embrained. Affective Neuroscience Personality Theory has also demonstrated that the emotional brain is the key mediator for the influences of nurture-nature interactions on personality (Davis & Panksepp, 2018; Montag & Panksepp, 2017; Montag & Davis, 2018; Panksepp, 1998; 2011). However, many parts of this complex problem, such as how culture may influence the basic affective systems, remain underinvestigated. The next section adresses the areas where further research is needed in the ANPS literature.

1.2.5 Missing Parts of the Puzzle

The ANPS has proved to be a valid and reliable tool, which has been standardized in a large number of countries (in order of publication: Pahlavan et al., 2008; Abella et al., 2011; Pingault et al., 2012; Özkarar- Gradwohl et al., 2014; Geier et al., 2014; Pascazio et al., 2015; Cwojdzińska & Rybakowski, 2015; De Almeida, 2016; Yu et al., 2016; Orri et al., 2016; Amiri & Azad-Marzabadi, 2017; Montag et al., 2017; Narita et al., 2017; Sinderman et al.,

2018; Reuter et al., 2017; Gurfinkel et al., 2018; Volf & Privodnova, personal communication). However, the ANPS literature has failed to address certain points, such as (1) the culture, (2) the cross-cultural investigation of gender effect, (3) the cross-cultural analysis of the relation of the ANPS to B5S.

Culture: All ANPS standardization studies were carried out in order to describe the norms of that particular country, in relation to the original American study (Davis et al., 2003). Therefore all these publications were compared to the American culture, and gained its validity and reliability in relation to the American norms. None of these studies state that studying ANPS findings cross-culturally was required. None of these articles discussed whether cutural variations of individualism-collectivism can influence the expression of the affective systems measured by the ANPS.

Gender: Gender effect studies focus mostly on cognitive differences, but not on the affective differences (for a review see Schmitt et al., 2008). With the utilization of ANPS, the observation of gender effect on affective differences has been facilitated. Most ANPS standardization studies published about the gender effect on ANPS emphasized the similarities with the original American study (Davis et al., 2003). None of these publications discussed their culturally specific gender effects. Moreover, some of these publications focused only on the general sample, and did not carry out gender-specific analysis. There is a need of observing the gender effect on ANPS across all the cultures that were involved in the ANPS literature.

The ANPS and the B5S: As discussed in the review, the B5S (as a tool born in the 20th century) measures mostly the cognitive and behavioral characteristics of personality, found in Western norms, and overlooks the universal subcortical affective characteristics. On the other hand, ANPS was born in the 21st Century, based on the recent neurodevelopmental

literature, which values the nature-nurture interaction and the priority of subcortical affective systems. Therefore, these two tools can be complementary to each other. Although the ANPS standardization studies used the B5S to measure construct validity, they discussed their findings only in relation to the ANPS-B5S findings of the original American study (Davis et al, 2003). An overall analysis of the ANPS-B5S relation was not carried out across cultures, which could have helped to bridge the B5S and the ANPS literatures.

These three missing issues (culture, gender, relation to B5S), that the ANPS literature failed to investigate, are adressed in the five papers reported in this thesis. Part C gives an overview of these papers, that represent the birth of a new research field: Cross-cultural Affective Neuroscience.

1.3 Part C- Five Papers Addressing Cross-cultural Affective Neuroscience

The emprical aspects of this thesis is based on 5 publications (in order of publication: Özkarar-Gradwohl et al., 2014; Özkarar-Gradwohl et al., 2018; Özkarar-Gradwohl, 2019; Özkarar-Gradwohl & Turnbull, 2021; Marengo et al., 2021). In various combinations, these publications address the three large themes discussed above.

Culture: Three of the five papers address the influence of culture: two emprical studies and a literature review (Chapter Two, Özkarar-Gradwohl et al., 2014; Chapter Three, Özkarar-Gradwohl et al., 2018; Chapter Four, Özkarar-Gradwohl, 2019). Reflecting on the influence of culture, all the ANPS standardization studies might have both universal and culturally specific findings. Based on these reflections, Cross-cultural Affective Neuroscience (CAN) was initiated as a new research field that aims to investigate the influence of culture on basic affective systems, measured by the ANPS (Özkarar-Gradwohl, 2012). CAN based its rationale on a two-way interaction between self and culture. In the bottom-up direction, universally shared subcortical affective systems are initially regulated uniquely in each

mother-infant bond, and subsequently by family models and culture. In the top-down direction, family models and mothering styles influence the degree to which subcortical affective systems are reinforced or inhibited (Özkarar-Gradwohl et al., 2014; Özkarar-Gradwohl et al., 2018; Özkarar-Gradwohl, 2019).

The first CAN study (Chapter Two, Özkarar-Gradwohl et al., 2014) compared the norms of the original American ANPS with the norms attained by the Turkish ANPS study. These two samples were chosen because the American culture is widely considered as individualistic, where interdependency is lower than that of the Turkish culture (Kağıtçıbaşı, 2005; 2007). The results showed both universally similar and culture-specific findings (see Chapter Two), which are discussed also in Chapter Seven (Discussion). As a conclusion, the first CAN study (Chapter Two) confirmed the premise that the regulation of basic affective systems can vary across cultures. Following this confirmation, it was decided that rather than relying on theoretical generalizations of Eastern collectivism versus Western individualism, self-construals must be assessed empirically in each cross-cultural ANPS study. Accordingly, the number of countries was increased with the first Euro-Asian CAN research (see Chapter Three, Özkarar-Gradwohl et al., 2018), where the results of three scales (Self-Construal Scales- SCS, ANPS and Big Five Scales) across three countries (Japan, Türkiye and Germany) were compared.

This second CAN study (see Chapter Three, Özkarar-Gradwohl et al., 2018) showed that the interdependent self-construals measured by the SCS decreased from East to West, however independent self-construals did not show a gradual westward increase. These findings confirmed that relying on geographical generalizations can be misleading (see Chapter Three, for discussion see Chapter Seven), therefore assessment of self-construals is necessary in each CAN study. Similar to the first CAN study, the second study (Chapter Three) also indicated both universally similar and culture-specific findings for ANPS

comparisons. Chapter Three and Seven discuss all these findings in terms of different mothering styles and emotion socializations found in Japan, Türkiye, and Germany (Chervenkova, 2017; Holloway & Nagase, 2014; Özdemir, 2009; Roland, 1996).

Chapter Four (published as a review article; Özkarar-Gradwohl, 2019) reviewed the findings from these two CAN studies and suggested: (i) cultures have specific styles to regulate the universally shared subcortical affective systems, (ii) the assessment of self-construals for cultures is an important requirement for every cross-cultural study, and (iii) the gender effects need to be explored in detail in future CAN studies.

Gender: Four of the five papers addressed the influence of gender: two emprical studies (Chapter Two, Özkarar-Gradwohl et al., 2014; Chapter Three, Özkarar-Gradwohl et al., 2018), a literature review (Chapter Four, Özkarar-Gradwohl, 2019) and a cross-cultural review (Chapter Five, Özkarar-Gradwohl & Turnbull, 2021). The first two articles (Chapters Two and Three) confirmed the gender effects obtained in the original study (Davis et al., 2003), but also reported some culture-specific gender effects. Chapter Four (published as a literature review, Özkarar-Gradwohl, 2019) reviewed certain culture specific gender effects in other ANPS studies as well, and emphasized the need of exploring the issue in both universal and culture-specific dimensions. The fourth paper (Chapter Five, Özkarar-Gradwohl & Turnbull, 2021) focused to this unmet need, and systematically demonstrated that universal and geographically specific gender effects do exist.

To address this need, Chapter Five reports the first global review study (Özkarar-Gradwohl & Turnbull, 2021), observing the gender effects on ANPS in 15 countries. This cross-cultural literature review (Özkarar-Gradwohl & Turnbull, 2021) was the first study to explore the gender effects on affective personality profiles. The results were broadly consistent with gender effects reported in the Big Five personality literature (Schmitt et al.,

2008), including a trend of gender differences increasing when moving from 'East' to 'West. The results also showed that gender differences on the ANPS were variable, for different classes of basic emotions. This gender effect review clarified that universal gender effects co-exist with geographically specific gender effects, a core assumption of cross-cultural affective neuroscience. These findings are presented in Chapter Five (Özkarar-Gradwohl & Turnbull, 2021), and also discussed in Chapter Seven.

The ANPS and the B5S: Four of the five papers addressed the relationship between the ANPS and the Big Five Scales (B5S) in personality development: two empirical studies (Özkarar-Gradwohl et al., 2014; Özkarar-Gradwohl et al., 2018), a literature review (Özkarar-Gradwohl, 2019) and a meta-analysis paper (Marengo et al., 2021).

Chapter Two (the first CAN study, Özkarar-Gradwohl et al., 2014), observes the relationship between the ANPS and the B5S in Turkish and American samples. The findings showed that the Turkish correlation patterns between these two scales were mostly similar to the correlations attained by the original ANPS study (Davis et al., 2003). This similarity was confirmed also by other ANPS studies (Abella et al., 2011; Montag & Panksepp, 2017; Pahlavan et al., 2008; Pingault et al., 2012). These similar correlations implied that cortical cognitive personality factors measured by the B5S might be rooted in certain subcortical affective systems. However, a systematical analysis of all these links was needed. In order to meet that need, a meta-analysis of 21 samples from 12 countries, which bridge the Big Five and the ANPS literatures was carried out (see Chapter Six, Marengo et al., 2021). Significant relationships observed between B5S and ANPS measures are reported in Chapter Six, and discussed in Chapter Seven. This meta-analysis was the first study in the literature to show that the cortical cognitive Big 5 factors can be universally mapped on the subcortical affective roots measured by the ANPS.

Chapter Three (Özkarar-Gradwohl et al., 2018) paid attention to how the ANPS and the B5S load on to interdependent and independent self-construals measured by the SCS. The findings showed that different ANPS-B5S loadings are found for Japanese, Turkish and German self-construals (see Chapter Three and Seven). Based on these findings, Chapter Four (published as a literature review, Özkarar-Gradwohl, 2019) emphasized that although ANPS and B5S might have certain virtually universal relations, cultures may differ in terms of their cortical and subcortical personality loadings on the self-construals. Therefore, cross-cultural exploration of the wirings of subcortical-cortical networks into interdependent-independent self-construals is crucial (Özkarar-Gradwohl, 2019).

Conclusion

These 5 papers (in order of publication: Özkarar-Gradwohl et al., 2014; Özkarar-Gradwohl et al., 2018; Özkarar-Gradwohl, 2019; Özkarar-Gradwohl & Turnbull, 2021; Marengo et al., 2021) showed that: (i) cultures have varying influence on the subcortical affective systems, (ii) gender has both universal and culturally specific effects on ANPS, and (iii) cortical cognitive personality factors measured by the B5S are rooted in certain subcortical affective systems measured by the ANPS. All these findings confirmed that cross-cultural affective neuroscience is a valid research field to observe personality through the lens of culture, gender and affect.

2.Chapter Two

2.1 The Influence of Culture on Basic Affective Systems: The Comparison of Turkish and American Norms on the Affective Neuroscience Personality Scales[11]

2.1.1 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 ANPS has .been completed by 890 participants (245 of these 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 correlations between Turkish ANPS and the B5S are mostly in line with correlations 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.

[1] Özkarar-Gradwohl, F. G., Panksepp, J., Içöz, F. J., Çetinkaya, H., Köksal, F., Davis, K. L., & Scherler, H. N. (2014). The influence of culture on basic affective systems: The comparison of Turkish and American norms on the Affective Neuroscience Personality Scales. Culture and Brain, 2(2), 173–192.

2.1.2 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, Panksepp, and Normansell (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; Reuter et al. 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 3 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.

2.2 Method

2.2.1 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, Türkiye. 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 Affective Neuroscience Personality Scales 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, ($M = 21.33$, $SD = 1.49$).

2.2.2 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 (5 females, 5 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.

2.2.3 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 İçöz, Scherler, Çengel and Özkarar (unpublished paper). 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.

2.2.4 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.

2.3 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 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).

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)

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.

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

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

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 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.

Table 3 ANPS Subscales Correlated with B5S Subscales

	PLAY	SEEK	CARE	FEAR	ANGER	SADNESS	Spiri-tuality
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

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

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.

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

Note. 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.

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).

2.4 Discussion

In this study, we developed the Turkish version of the Affective Neuroscience Personality Scale 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

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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).

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 (eg. 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

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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, Türkiye and Germany points to varying ANP findings on the Euro-Asian spectrum of collectivism to individualism, with Türkiye representing a transitional zone between eastern and western cultures (Özkarar-Gradwohl, Narita, Montag, Scherler, Yama, Kazuyuki and Köksal; Unpublished results).

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.

3.Chapter Three

3.1. Cross-cultural affective neuroscience personality comparisons of Japan, Turkey and Germany[1]

3.1.1 Abstract

Mothering styles and family models of different cultures- that vary in interdependency and independency combinations—can influence the development of basic affects differently. The present study carried out the cross-cultural comparisons of samples from Japan, Turkey and Germany on self-construals, basic affects and Big Five factors. The countries were selected along a Euro-Asian spectrum, from highly collectivistic Japan to least collectivistic Germany, with Turkey as a bridging culture. The sample consisted of undergraduate and graduate students from Kyoto in Japan ($n = 353$), Istanbul in Turkey ($n = 327$) and Bonn in Germany ($n = 222$). The questionnaire included the self-construal scale (SCS), the affective neuroscience personality scales (ANPS) and the big five scale (B5S). SCS scores showed that the level of interdependent self-construals decreased from East to West, but independent self-construals did not gradually increase. Highest independency score was found in Turkey. Theoretically well-known German individualism was not found to be based on higher independency, but on lower interdependency. On ANPS, female groups seemed very similar on positive affects whereas for negative affects they had differences; like Japanese females had higher FEAR, Turkish females had higher ANGER. Similarly, Japanese males had higher FEAR and SADNESS, Turkish males had higher ANGER. On ANPS, Turkish and Japanese males were more similar and distinct from the German males who had lower scores almost on all affects. However on B5S; Turks and Germans were found to be quite similar and distinct from the Japanese. Turkey seemed to maintain more subcortical affective personality similarities with Japan, while attuning more to B5 factors displayed by Germany. Findings are discussed in light of child-rearing styles in each country.

3.1.2 Introduction

The desire to be socially related to others and the desire to be a unique individual that is independent are the two existential needs of each human being. These universal needs for inter-relatedness and autonomy are the fundamentals of interdependent and independent self-construals (Markus and Kitayama, 1991). While interdependent self-construals are related to attending to maintain the social harmony, controlling internal states in order to promote the ideals of the social group and behaving based on social norms; independent self-construals are related to attending to the self, expressing individual needs and autonomy and behaving based on individual internal attributes (Markus and Kitayama 1991; Triandis 1995). These two self construals are reinforced differently in Eastern and Western cultures and cross-cultural theories of self-development discuss this issue generally as the "Collectivistic Self and Individualistic Self" (Triandis et al. 1988), "Interdependent Self and Independent Self" (Markus and Kitayama 1991) or "Relational Self and Separate Self" (Fişek 2010; Kağıtçıbaşı 1996).

Although polarized terminologies have been used for Eastern and Western selves, in all cultures the mother-infant interaction is the primal biopsychosocial context where infants first experience *"symbiotic union and relatedness"* and then *"separation and individuation"* (Mahler et al. 2008). Therefore, the role of mother-infant interaction styles in the biopsychological development of human beings is universally important. However the time-lines of developmental progressions seem to vary across cultures. For instance, the basic characteristics of mothering (duration of breast feeding, onset of toilet training, duration of co-sleeping in the room of parents etc.) are regulated uniquely by each culture. While breast feeding may typically last around 6-12 months in individualistic cultures, it may extend up to 2 years in more collectivistic cultures (www.lansinoh.com/en/globalsurvey). While the infant may be placed in a separate room to sleep independently after about half a year in

individualistic cultures, co-sleeping with parents is more common and prolonged in collectivistic cultures (Mindell et al 2010; Shimizu 2014). Thus, relatedness and separateness, and the reinforcement or suppression of self-object differentiation, are molded by cultural influences (Fişek 2010; Kağıtçıbaşı 1996; Roland 1996).

The collectivistic and individualistic cultural norms are taught to influence mothering styles in different ways (Narvaez et al. 2012; Roland 1988, 1996). While prolonged symbiotic Eastern mothering styles do not reinforce separation-individuation, thereby promote loose self-object boundaries, Western mothering styles reinforce separation individuation in order to promote more distinct and separate selves (Roland 1996). A cross-cultural study carried out by Friedlmeier & Trommsdorff (1998) found that Japanese mothering style- which is based on feeling oneness with the child- amplified the affectionate interpersonal relationship by a stronger emotional bond between the mother and child, more physical contact and higher maternal sensitivity and responsiveness. On the contrary, German mothering style - which is based on perceiving the child as a separate being- amplified a more distant mother-child relationship by less physical contact (except high eye contact) and lower maternal sensitivity/responsiveness. In a way, Japanese children had more emotional interactions to internalize compared to German children. The authors suggested that the cultural differences in emotional internalizations may influence the emotional development of these children differently.

Consistent to mothering styles, interdependent family models include extended families where emotional interdependencies are highly valued but personal autonomy is de-emphasized while independent family models include nuclear families where personal autonomy is highly valued but emotional interdependencies are de-emphasized (Mayer et al., 2012). For child rearing practices, the independent family models focus mainly on the personal autonomy of the child, and to a relatively smaller degree on interpersonal

relationships and interdependence; whereas the interdependent family models focus more on the emotional inter-relatedness of the child and less on autonomy. A recent study comparing Germany, Turkey and India in terms of family models and family change found out that Germany showed the highest prevalence of independent family model, India showed the highest prevalence of interdependent family models, while Turkey displayed the highest prevalence of emotionally interdependent family models- which is the synthesis of the former two models (Mayer et al., 2012). In emotionally interdependent families, personal autonomy is allowed while emotional closeness and inter-relatedness are maintained. It is possible to be independent while keeping interdependency, as these are not opposing poles, but co-existing needs (Kağıtçıbaşı, 2005; 2007).

The argument, that the different mothering styles and family models found in different cultures can lead to variations in interdependency and independency, gains support also from personality related neuropsychology studies (Han and Northoff, 2008) and oxytocin related neuroscientific studies (Luo and Han 2014; Scheele et al. 2014; Wade et al. 2014). In line with the notion that the self and the mother are more symbiotic for Easterners, but more separated for Westerners; it was found that Chinese show a substantial increase in the MPFC for both self judgement and mother judgment, while Westerners show no such increased activation in the mother-reference condition (Zhu et al. 2007). Moreover, subjects who endorse individualistic values have higher medial prefrontal cortex (MPFC) activation to general self-descriptions, whereas subjects who endorse collectivistic values have higher MPFC activation to social-contextual self-descriptions (Chiao and Blizinsky 2010). Based on such findings, it has been argued that two kinds of neural representations of self (collectivistic self and individualistic self) are elaborated within MPFC regions of individuals from different cultures.

The Influence of Culture on Basic Affects and Affective Neuroscience Personality Scale

The different mothering styles/family models found in different cultures lead to cross-cultural variations not only for inter-relatedness and separateness, but also for affective developments. Cross-cultural emotion socialization studies also show that parents promote or inhibit different emotions of the child, depending on their cultural norms and the gender of their child (Friedlmeier et al. 2011; Song and Trommsdorff; 2016). However, emotion socialization studies are carried out by observations of parent-child interactions, not by objective tools. On the other side, neuroscientific studies for affective development supply us the necessary objective means to enlighten the probable neurological mechanisms that may be underlying the emotion socializations. According to the *Affective Neuroscience* of Panksepp (1998)*,* emotions based in the subcortical affective systems are suggested to be the primary processes, which are shaped by the secondary processes of learning and development, which finally result into cortical cognitive systems of tertiary processes (Panksepp and Solms, 2012). Mothering styles shape the development of subcortical affective systems and subcortical-cortical networks (especially in the right hemisphere) of the infant, influencing the qualities of affect regulation in later life (Korkmaz and Njiokiktjien 2013; Narvaez et al. 2012; Panksepp, 1998; Panksepp and Biven 2012, Schore, 1994). The degree to which subcortical basic affective systems are reinforced or inhibited is discussed to be influenced further by culture (Özkarar-Gradwohl et al. 2014). Thus, it is increasingly recognized that universally shared subcortical affective systems are initially regulated uniquely in each mother-infant bond and subsequently by family models and culture.

Affective Neuroscience Personality Scale (ANPS) has been constructed as an objective tool based on this "neurodevelopmental approach" that personality is formed upon the strengths and weaknesses of the basic affective systems, which are initially regulated by the mother-infant interactions and early environmental experiences (Davis et al., 2003; Panksepp, 2011). ANPS measures the subcortical affective systems, thus the primary

processes that are shaped by secondary processes and that are evolutionary older than the tertiary processes located in cortical regions. Big Five Model- which had been widely used in personality studies in the 20th century- is not based on such a neurodevelopmental theory of personality and it measures mostly the cortical cognitive and behavioral characteristics of personality. The Five Factors are named as Extraversion (e.g. talkative, assertive, sociable, optimistic), Agreeableness (e.g. trusting, compliant, modest, compassionate), Conscientiousness (e.g. cautious, disciplined, planful, neat), Openness to Experience (e.g. curious, experimenting, adventurous, intellectual, open-minded) and Emotional Instability (the only factor related to the cortical control over negative affects, named also as Neuroticism; e.g. anxious, worrying, restless, self-critical). The Big Five dates back to the "lexical approach" of Allport and Odbert who had prepared a list of personality describing words based on the "English dictionary" in 1920's, which was later improved by Cattell and categorized into Five Factors by Tupes and Christal in 1961 (cf. John & Srivastava, 1999). Linguistic universality of the lexically derived Big Five is open to discussions, as it is criticized to be based on Western cultural norms embedded in the English language (John & Srivastava, 1999). Moreover, Big Five produces findings that lead to East-West polarizations; lower scores in East and higher scores in West (Gurven, Von Ruden, Massenkoff, Kaplan and Vie, 2013; Piedmont, Bain, McCrae, & Costa, 2002; Schmitt et al., 2007; Triandis, 1997).

Based on the evolutionary theory of Affective Neuroscience, primary processes of subcortical affective systems come prior to cortical linguistic processes. Neurodevelopmentally speaking, the affects of an infant exist before his/her language develops. Therefore, ANPS stands as a more fundamental tool, which has the privilege of assessing the primary processes embedded in the universally shared subcortical affective systems. ANPS measures six primal basic affective systems namely: SEEK, PLAY, CARE, FEAR, SADNESS and ANGER (capitalizations are used to highlight their primary-process

nature; see Panksepp, 2011), with the addition of a "Spirituality" subscale, which may qualify

as the highest human emotion (Davis et al. 2003). Among the three major positive affect

scales, SEEK is defined as "feeling curious, feeling like exploring, striving for solutions to

problems", PLAY is described as "having fun, playing games involving physical contact,

humor, laughter, being generally happy and joyful", CARE consists of "nurturing, feeling

softhearted toward animals and people in need, feeling empathy, feeling affection for and

liking to care for others". For the three negative scales, FEAR reflects the tendency for

"feeling anxious and tense, worrying, struggling with decisions, ruminating about past

decisions, losing sleep, not typically being courageous", SADNESS monitors "feeling lonely,

crying frequently, thinking about loved ones and past relationships, feeling distressed when

not with loved ones" and ANGER for "feeling hotheaded, being easily irritated and

frustrated, expressing anger verbally/physically, remaining angry for long". Spirituality is

defined as "feeling connected to humanity and creation as a whole, striving for inner peace

and harmony, searching for meaning in life" (Davis et al. 2003), in short the intrinsic

brotherhood and sisterhood of all human beings, indeed based on ancestral relationships with

all other mammals. Spirituality measured by ANPS focuses mostly on transcendent values,

therefore its operational definition *is not* equal to religiousness. While some see spirituality

and religiousness as overlapping constructs (Miller and Thoresen 2003), there is also evidence

that these are two independent dispositions (Saucier and Skrzypinska 2006).

The main findings of the original ANPS study (Davis et al. 2003) have been confirmed

by the ANPS standardization studies in Spain, France, Turkey, Japan and Germany (Abella,

Panksepp, Manga, Bárcena, & Iglesias, 2011; Pahlavan, Mouchiroud, Zenasni, & Panksepp,

2008; Pingault, Pouga, Grèzes, & Berthoz, 2012; Özkarar-Gradwohl et al., 2014, Narita et al

2017; Reuter, Panksepp, Davis, & Montag 2017). For instance, positive inter-correlations

among positive subscales and positive inter-correlations among negative subscales were

found in all Spanish, French, Turkish, Japanese and German samples; strengthening the proposition that both positive and negative affect might be higher-order cross-cultural personality factors (Davis et al. 2003). Moreover, the gender effect obtained in the original study showing that females have higher scores than males on CARE and SADNESS were also detected in the Spanish, French, Turkish and German studies (Abella et al., 2011; Pahlavan et al., 2008; Pingault et al., 2012; Özkarar-Gradwohl et al., 2014; Montag, Widenhorn-Müller, Panksepp, & Kiefer 2016; Montag, Hahn, Reuter, Spinath, Davis, & Panksepp, 2016). On the other hand, different from the findings of the original study (Davis et al. 2003), culture specific gender effects were also obtained; like both Spanish and French females having higher scores than males on FEAR, Spanish females having higher scores than males on SEEKING, French females showing lower scores than males on PLAY (Abella et al. 2011; Pahlavan et al. 2008). Within gender differences were also seen, e.g. American females had higher SADNESS and FEAR than Turkish females, whereas Turkish females had higher ANGER (Özkarar-Gradwohl et al. 2014).

In sum, standardization studies of ANPS demonstrated that the basic affective systems (underlying the development of self) have both universal and culture specific properties, which are open to gender effect. However, the influence of culture on the regulation of basic affective systems is still a new topic and needs to be explored further (Özkarar-Gradwohl et al. 2014).

The Aims of the Present Study

Sufficient amount of literature argue that interdependent/independent norms influence the affective development differently via varying mothering styles/family models, but studies that analyze the influence of culture on basic affective systems are not common. *To our knowledge, the cross-cultural comparison of basic affective systems along a Euro-Asian cultural spectrum has not been yet studied.* Therefore we decided to carry out a cross-cultural

comparison of Japan, Turkey and Germany on basic affective systems. Literature defines Japan as a collectivistic Asian culture, Turkey as a bridging culture between East and West, and Germany as a more individualistic European culture. After measuring the levels of interdependent-independent self-construals for our samples and empirically controlling to what extend our samples fit to these theoretical descriptions in the literature; we proceeded with our aims stated below.

The first aim of the present study was to carry out comparisons of Japan, Turkey and Germany on the Affective Neuroscience Personality Scale (ANPS) and to explore how basic affective systems evolve in these three cultures which vary in interdependency-independency levels. *The second aim of this study* was to carry out the comparisons of these three samples on Big Five Scale (B5S). We predicted that the East-West polarizations, reported by cross-cultural Big Five studies, will be confirmed by our B5S comparisons, while no such polarizations will be found for our ANPS comparisons. If our prediction is supported, we suggest the utilization of ANPS as a non-polarized psychometric tool in future cross-cultural personality studies. *The last aim of our study* was to observe how the subcortical affective characteristics measured by ANPS and the cortical cognitive/behavioral characteristics measured by B5S relate to the formation of self-construals in each country. Although Panksepp (1998) stated that the self is rooted in subcortical affective processes, the relation of ANPS to self-construals has not been yet studied. It was found that B5 factors influence self-construals (Levinson et al. 2011), but Asian subjects were excluded from those analyses. Our study is the first to observe how ANPS and B5S relate to self-construals in different cultures. We predicted that different affective and cognitive-behavioral compositions may be related to interdependency-independency in each culture.

Cross-cultural Affective Neuroscience (CAN) is *a new research field* that we propose to analyze the influence of culture on basic affective systems. Therefore, the aims of our study

are mostly exploratory rather than hypothetical and the results will be discussed in order to see whether our new research field can be affirmed in line with the relevant literature.

3.2 Method

3.2.1 Sample

The research sample was composed of undergraduate and graduate university students from the Kyoto Bunkyo University, Kio University and Kyoto Gakuen University in Japan, from Istanbul Bilgi University in Turkey and from the University of Bonn in Germany. The German sample included 222 participants with 115 females and 107 males (Age $M = 28.39$, $SD = 12.33$, median = 23), the Japanese sample included 353 participants with 144 females and 209 males (Age $M = 19.47$, $SD = 5.07$, median = 19), and the Turkish sample included 327 participants with 209 females and 118 males (Age $M = 21.33$, $SD = 1.49$, median = 21). All three samples were recruited from the students who attended the courses of the psychology departments. However some of the students who were taking these classes came from other social sciences departments. All subjects attended the research voluntarily and did not receive any extra credit for their courses. Data were collected in classroom settings, from the students who filled in the consent forms. In Germany, 72 participants responded online rather than in classroom.

3.2.2 Procedure

All subjects completed the Self Construal Scale, Affective Neuroscience Personality Scale and Big Five Scale. For the collection of data, the Ethical Committee for Conducting Research on Human Beings- in the related universities of Turkey and Japan- approved the distribution of the questionnaires. This ethical approval was considered valid also in Germany.

3.2.3 Materials

Self-Construal Scale: The Self-Construal Scale was developed by Singelis (1994) to measure the independent self which represents the separate dimension of the self and the interdependent self which represents the inter-related side of the self. These two dimensions of the self are measured with 15 questions assigned to each dimension. The participants are asked to rate their experiences in daily life, related to independent and interdependent self-construals, on a seven-point Likert scale and receive an independence score and an interdependence score. The reliabilities for SCS were; for the Japanese version (Takahashi et al. 2009) .67 and .72 for independent and interdependent self-construal subscales; for the Turkish version (Wasti & Erdil 2007) .68 and .75 for independent and interdependent self-construal subscales; for the German translation (Montag, unpublished data) .64 and .71 for independent and interdependent self-construal subscales. There were slight item differences between the translated versions used in Japan, Turkey and Germany; therefore only the common items among these translated versions were used for the statistical analyses. These common items correspond to those in the 24-item version of the SCS, of which subsequent versions are a superset (Singelis 1994).

Affective Neuroscience Personality Scales: Translated versions of the Affective Neuroscience Personality Scales- ANPS in Japanese (Narita et al. 2017), in Turkish (Özkarar-Gradwohl et al. 2014) and in German (Reuter et al. 2017) - were used to measure the six affective neuroscience subscales (PLAY, SEEK, CARE, FEAR, ANGER, SADNESS) and the Spirituality subscale. The ANPS uses a four-point Likert scale that ranges from strongly agree to strongly disagree. The ANPS assessments used in the different countries were based on two different versions of the original English-language ANPS, which vary slightly in length, item phrasing, and item selection. A 110-item questionnaire based on the first version of the ANPS (Davis et al, 2003) was used in Turkey and Germany, whereas 112-item questionnaire

based on the second version of the ANPS (Davis & Panksepp 2011) was used in Japan. In both versions, each subscale contains 14 items, the Spirituality subscale contains 12 items, and positively and negatively phrased items are balanced equally. The remaining items in both versions are filler items. The two different versions of the ANPS used in the present study have 81 out of 96 (84.4%) scored items in common. The statistical analysis was carried out based on the common items in the two versions. Reliabilities for the original full subscales used in each country, as well as the subset of common items (used for the statistical analysis) are presented in Table 1. Using the common items of the two ANPS versions did not lead to a significant change in subscale reliabilities.

Big Five Scales: Big Five Scales (B5S) were modelled after Goldberg (1990, 1992) by Davis et al. (2003) and consisted of 70 items with five subscales measuring five personality dimensions, namely; Extraversion, Agreeableness, Conscientiousness, Emotional Instability and Openness to Experience. Every subscale has 14 items with a mixture of positive and negative adjectives. The reliabilities measured for B5S were; for the Japanese translation .86 for Extraversion, .80 for Agreeableness, .83 for Conscientiousness, .74 for Emotional Instability and .72 for Openness to Experience; for the Turkish translation .88 for Extraversion, .83 for Agreeableness, .88 for Conscientiousness, .81 for Emotional Instability and .78 for Openness to Experience; for the German translation .88 for Extraversion, .86 for Agreeableness, .86 for Conscientiousness, .81 for Emotional Instability, .84 for Openness to Experience.

3.3 Results

Cronbach's Alphas for ANPS

The Cronbach's alpha levels measured for the different versions of the ANPS used in each country and the Cronbach's alphas measured for the common item sets of ANPS for each country are summarized in Table 1.

Table 1

Observed Cronbach's α levels for the different versions of the ANPS used in each country

Country	SEEK	FEAR	CARE	ANGER	PLAY	SADNESS	Spirituality
DE	.86 (.87)	.84 (.83)	.90 (.88)	.80 (.81)	.91 (.87)	.61 (.67)	.88 (.93)
JP	.80 (.77)	.85 (.83)	.74 (.73)	.87 (.86)	.77 (.77)	.82 (.74)	.72 (.70)
TR	.64 (.60)	.74 (.71)	.70 (.69)	.76 (.76)	.70 (.60)	.60 (.63)	.78 (.80)

Note: Values are calculated from the data used in the present study. The values in parentheses indicate Cronbach's alphas for common item sets shared by all the versions.

Analysis of covariance for SCS, ANPS and B5S

The means and standard deviations derived from the common items of the SCS, ANPS, B5S versions are presented in Figures 1-3. One-way analysis of covariance (ANCOVA) with age as the covariate and country as the grouping variable ($\alpha = .05$) was performed separately for females and males on each subscale of SCS, ANPS and B5S. In a prior Turkish ANPS study (Özkarar-Gradwohl et al., 2014) age had been found to have negative correlations with all ANPS subscales and a positive correlation with Spirituality, therefore the present study considered age as a covariate that must be controlled for all the analysis. In line with the literature of ANPS where genders are always analyzed separately (e.g. Davis et al., Abella et al., 2011; Pahlavan et al., 2008; Özkarar-Gradwohl et al., 2014), all our analysis were also made separately for females and males. Tukey's HSD tests were used for post hoc analysis.

Females: On the SCS subscales presented in Figure 1, ANCOVA's showed significant differences for Independent self-construals, $F(2, 464) = 45.70$, $p < .001$, $\eta^2 = .26$; and Interdependent self-construals, $F(2, 464) = 3.35$, $p = .036$, $\eta^2 = .26$. Tukey's HSD tests showed that, for independency, Turkish females had significantly higher scores than both the Japanese and the German females, whereas Japanese and German females did not show a

significant difference. For interdependency, Japanese females scored significantly higher than German females, whereas Turkish females showed no significant difference to Japanese and German females.

For ANPS subscales presented in Figure 2, ANCOVA showed significant differences among the three groups on ANGER, $F (2, 464) = 43.15, p < .001, \eta^2 = .26$; CARE, $F (2, 464) = 18.36, p < .001, \eta^2 = .26$; FEAR, $F (2, 464) = 24.42, p < .001, \eta^2 = .26$; and Spirituality, $F (2, 464) = 44.69, p < .001, \eta^2 = .26$. Tukey's HSD tests showed that, for ANGER, Turkish females scored significantly higher than German and Japanese females, whereas German females scored significantly higher than Japanese females. For CARE, Turkish and German females scored significantly higher than Japanese females, whereas no difference was found between Turkish and German females. For FEAR, Japanese females scored significantly higher than Turkish and German females, whereas no significant difference was found between Turkish and German females. For Spirituality, Turkish females had significantly higher scores than both the Japanese and the German females, whereas Japanese females had significantly higher scores than German females. No significant differences were found among countries for PLAY, SADNESS or SEEK.

On the B5S subscales presented in Figure 3, ANCOVA's showed significant differences for Openness to Experience, $F (2, 464) = 103.69, p < .001, \eta^2 = .26$; Conscientiousness, $F (2, 464) = 66.44, p < .001, \eta^2 = .26$; Extraversion, $F (2, 464) = 51.14, p < .001, \eta^2 = .26$; Agreeableness, $F (2, 464) = 122.69, p < .001, \eta^2 = .26$; and Emotional Instability, $F (2, 464) = 17.81, p < .001, \eta^2 = .26$. Tukey's HSD showed that for Openness to Experience, Turkish females scored significantly higher than German and Japanese females, whereas German females scored significantly higher than Japanese females. For Conscientiousness, Extraversion, and Agreeableness Turkish females and German females had significantly higher scores than Japanese females, whereas Turkish and German females

did not significantly differ from each other. For Emotional Stability, Turkish females had significantly higher scores than German and Japanese females, whereas German and Japanese females did not significantly differ from each other.

Males: On the SCS subscales presented in Figure 1, ANCOVA's showed significant differences for Independent self-construals, $F (2, 430) = 34.27$, $p < .001$, $\eta^2 = .26$; Interdependent self-construals, $F (2, 430) = 9.87$, $p < .001$, $\eta^2 = .26$. Tukey's HSD tests showed that for independency; Turkish males had significantly higher scores than Japanese and German males, whereas Japanese and German males did not show a significant difference from each other. For interdependency; Japanese and Turkish males were significantly higher than German males, while Japanese and Turkish males did not show a significant difference from each other.

For ANPS subscales presented in Figure 2, ANCOVA's showed significant differences between groups on ANGER, $F (2, 430) = 32.94$, $p < .001$, $\eta^2 = .26$; CARE, $F (2, 430) = 121.69$, $p < .001$, $\eta^2 = .26$; FEAR, $F (2, 430) = 67.87$, $p < .001$, $\eta^2 = .26$; PLAY, $F (2, 430) = 34.22$, $p < .001$, $\eta^2 = .26$; SADNESS, $F (2, 430) = 24.52$, $p < .001$, $\eta^2 = .26$; SEEK, $F (2, 430) = 81.51$, $p < .001$, $\eta^2 = .26$; Spirituality, $F (2, 430) = 5.71$, $p = .004$, $\eta^2 = .26$. Tukey's HSD tests showed that for CARE, PLAY and SEEK; Japanese and Turkish males had significantly higher scores than German males, whereas Japanese and Turkish males did not significantly differ from each other. For FEAR and SADNESS; Japanese males scored significantly higher than Turkish and German males, whereas Turkish males scored significantly higher than German males. For ANGER, Turkish males had significantly higher scores than German and Japanese males, but Japanese and German males did not show a significant difference from each other. For Spirituality, Turkish males had significantly higher scores than Japanese males, while no significant difference was found between Turkish and German males, or between Japanese and German males.

On the B5S subscales presented in Figure 3, ANCOVA's showed significant differences for Openness to Experience, $F(2, 430) = 124.51$, $p < .001$, $\eta^2 = .26$; Conscientiousness, $F(2, 430) = 60.52$, $p < .001$, $\eta^2 = .26$; Extraversion, $F(2, 430) = 34.70$, $p < .001$, $\eta^2 = .26$; Agreeableness, $F(2, 430) = 76.43$, $p < .001$, $\eta^2 = .26$; and Emotional Instability, $F(2, 430) = 19.16$, $p < .001$, $\eta^2 = .26$. For Openness to Experience; Turkish males had significantly higher scores than German and Japanese males, and German males had significantly higher scores than Japanese males. For Conscientiousness, Extraversion, Agreeableness and Emotional Stability, German and Turkish males had significantly higher scores than Japanese males, but they didn't differ from each other.

Figure 1 Means and Standard Deviations for SCS by Gender and Country
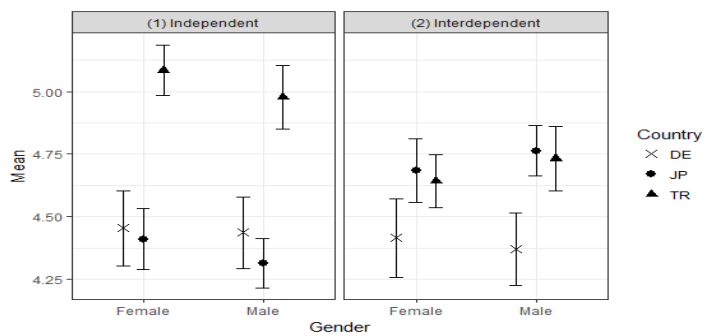
Note: Age-adjusted means for Self-Construal Scales with 95% confidence intervals. Overlapping confidence intervals indicate no significant differences at the 95% level.

Figure 2 Means and Standard Deviations for ANPS by Gender and Country
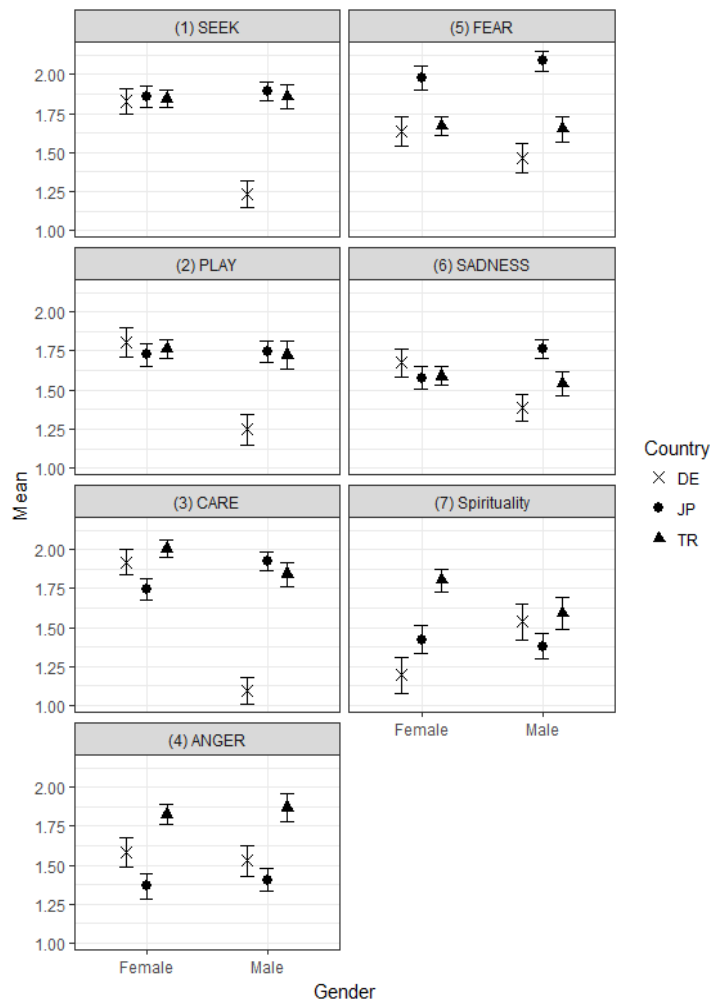
Note: Age-adjusted means for ANPS with 95% confidence intervals. Overlapping confidence intervals indicate no significant differences at the 95% level.

Figure 3 Means and Standard Deviations for B5S by Gender and Country
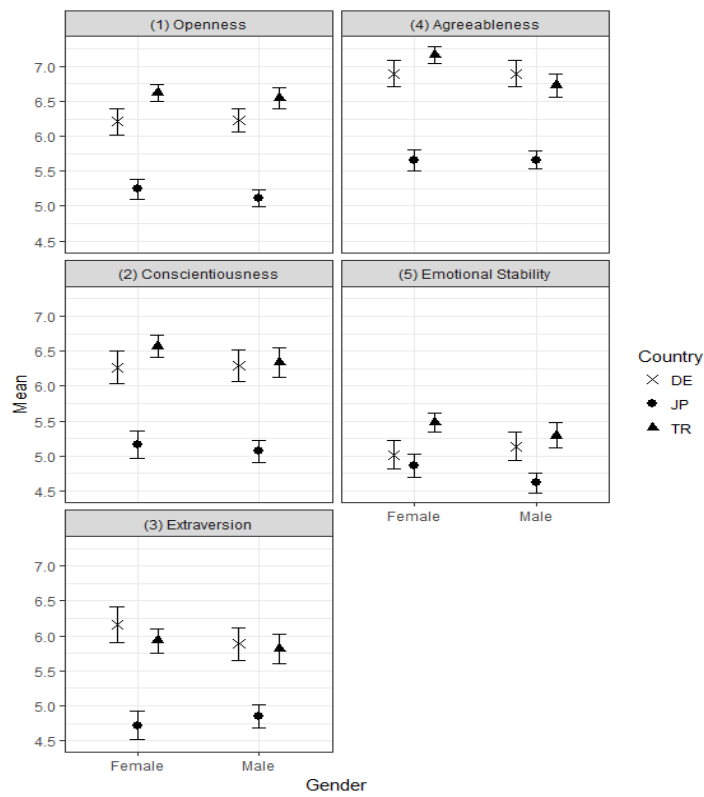
Note: Age-adjusted means for Big Five Scales with 95% confidence intervals. Overlapping confidence intervals indicate no significant differences at the 95% level.

Regression Analysis for Loadings of ANPS and B5S on SCS

To observe how the affective personality traits and Big Five factors load on interdependency and independency measured by SCS, multiple linear regression analysis were carried out. The results by country, taking age and gender into consideration are shown on Table 2.

Table 2   Multiple linear regression analysis predicting SCS scores, by country

	Independent			Interdependent		
Fit Statistics	DE	TR	JP	DE	TR	JP
R^2	.28	.25	.34	.20	.37	.38
Adjusted R^2	.23	.22	.31	.15	.35	.35
F	5.787	7.601	12.17	3.785	13.34	14.54
df1	14	14	14	14	14	14
df2	207	312	338	207	312	338
P	< . 001	< .001	< .001	< .001	< .001	< .001
β coefficients						
(Intercept)	.00***	.00***	.00***	.00***	.00***	.00***
Age	.00	.04	-.02	-.11	.10*	-.02
Female	.02	.03	.07	-.09	-.20***	.02
ANGER	.03	.18*	-.05	.02	-.14*	-.09
CARE	-.06	.00	.04	.02	.04	.22***
FEAR	-.16	-.12	-.15*	.21*	.02	.06
PLAY	-.22*	.04	.02	-.01	.03	.25***
SADNESS	.02	-.06	-.01	-.07	.15*	.07
SEEK	.16	-.05	.17**	.20	.02	-.02
Spirituality	.00	.08	.15**	.13	.28***	.10*
Openness	.28***	.21**	.06	-.24**	-.25***	-.18***
Conscientiousness	-.11	.04	.10	.10	.09	.04
Extraversion	.35***	.19**	.29***	-.03	.07	-.17**
Agreeableness	-.23**	.14	-.04	.42***	.43***	.31***
Emo. Stability	.25***	-.07	.01	-.20**	-.13	-.04

Note: *, ** and *** indicate p<.05, p<.01 and p<.001, respectively.

The regression analysis showed that the main factor predicting independent self-construals in all three countries was Extraversion. For Germany, independency was mostly

predicted by B5S factors; higher Openness to Experience, higher Extraversion, lower Agreeableness, higher Emotional Stability and only the lower PLAY on ANPS. For Japan; independent self-construals were determined mostly by ANPS traits like lower FEAR, higher SEEK and Spirituality, and only by higher Extraversion on B5S. Lastly, for the Turkish sample only higher ANGER on ANPS, higher Openness to Experience and Extraversion from B5S were predictors for independency. For interdependent self-construals the B5S predictors were more overlapping for the three countries, with high Agreeableness and low Openness to Experience being significant factors for all three countries. In addition; higher FEAR and lower Emotional Stability were predictors of German interdependency; higher CARE and PLAY, and lower Extraversion were predictors for Japanese interdependency; lower ANGER and higher SADNESS predicted Turkish interdependency. Spirituality was a positive predictor of interdependency for both Japanese and Turkish samples. Age was a positive predictor for interdependency only for the Turkish sample.

3.4   Discussion

Cultural Descriptions of Our Samples by Self-Construals Comparisons

In line with the literature, on interdependent Self Construal scores, Japan ranked the highest and Germany the lowest. Japanese and Turkish samples - regardless of gender - did not significantly differ in terms of their level of interdependency. German males had significantly lower interdependency from their Japanese and Turkish counterparts, while German females had significantly lower interdependency only from their Japanese counterparts. In sum, for our Japan, Turkey and German samples, the level of interdependency decreased while moving from East to West. The same gradual pattern did not occur for independent self-construals hence the level of independency did not increase gradually from East to West. The Turks –regardless of gender- showed significantly higher independency than either Germans or Japanese. Although Germans had higher independency

scores than Japanese, the difference was not statistically significant. In short, the theoretically well-known Japanese collectivism was confirmed by our SCS findings. However, the theoretically well-known German individualism was found to be based mostly on their lower interdependency rather than on a higher independency. The German child-rearing style, that reinforces autonomy and separateness, does not seem to promote the independency of the self, but it seems to decrease the interdependency. Our finding regarding Turkish sample was in line with the literature review that Turkey -especially Turkish women- display higher independency scores than certain Western cultures like USA and Canada (İmamoglu & Karakitapoglu-Aygun, 2004). In Turkey, children are socialized to become autonomous while maintaining high levels of emotional proximity with their families (Kağıtçıbaşı, 2007). It is discussed that the Turkish self is neither a typical Western nor a typical Eastern self, but a unique combination which can be conceptualized as "individuated familial self" (Fişek, 2018), which can act independently while staying interdependent (Kağıtçıbaşı, 2005).

The SCS results for Japan, Turkey and Germany show that no culture is uniformly interdependent or independent, but each displays different combinations of interdependency and independency. Although the present study did not analyze the SCS item clusters in detail, the overall scores pointed to the need of being cautious about not attributing independency solely to Western cultures. The recent debate over world-wide SCS comparisons emphasizes that theoretical generalizations like "collectivistic East versus individualistic West" must be avoided (Vignoles et al., 2016). Our findings imply that inter-relatedness promoting upbringing styles seem to lead to higher interdependent self-construals, but the relation of autonomy promoting upbringing styles to independent self-construals needs to be explored further. Generally speaking, our samples fit to most of the cultural descriptions in the literature where Japan stands as an Asian culture where interdependency prevails; Turkey as a bridging culture where emotional interdependency (coexistence of interdependency-

independency) prevails; and Germany as a European culture where lower interdependency prevails. Therefore the discussions in further sections will be based on this confirmed definitional ground.

Cross-cultural Affective Neuroscience Personality Traits Comparisons

The females, regardless of country of origin, had similar results on the positive affects SEEK and PLAY and on the negative affect SADNESS. The only small difference on positive subscales was on the CARE subscale, where Turkish and German females had *slightly* higher scores than Japanese females. Based on the finding of Friedlmeier and Trommsdorff (1998), that Japanese mothers display higher maternal sensitivity than German mothers do, one should have expected higher CARE in Japanese females. However, the same authors had discussed that maternal sensitivity has different meanings in different cultural contexts. This brings the question how mothers, who are described as having prolonged symbiotic mothering styles (described by Roland 1988, 1996), express their maternal sensitivity for their off-springs. In Japanese child rearing practices, maternal sensitivity is shown by not expressing negative emotions like anger towards the child and presenting high patience and tolerance for the needs of the child (Friedlmeier and Trommsdorff, 1998; Holloway & Nagase, 2014). Supporting this argument, our study also found that Japanese females had the lowest ANGER scores.

On the contrary, the Turkish females had the highest ANGER scores. This was consistent with the previous finding that Turkish females had higher ANGER than American females did (Özkarar-Gradwohl et al. 2014). As ANGER is the main affect underlying "separation-individuation" (Mahler et al., 2008), the highest independency scores obtained by Turkish women seemed related to their higher ANGER. As our findings showed larger cross-cultural discrepancies on ANGER, rather than on CARE; this directed our attention to the probable cultural variations in child rearing styles with regard to expressing anger towards the

child. It has been found that Turkish mothers respond with more anger to their child's anger, compared to their respond to their child's distress and sadness (Özdemir, 2009) and higher anger is observed in Turkish children who receive less emotional support about their anger (Çorapçı et al. 2012). In a way, Turkish mothers seem to display high CARE besides high ANGER, which enables self-object inter-relatedness and separateness simultaneously. On the contrary, not expressing ANGER towards the child is the core aspect of Japanese child rearing practices (Roland, 1996; Holloway & Nagase, 2014) in order to protect the inner harmony of the family against conflicts and separations (Friesen 1972). In other words, Japanese mothers may be providing CARE with minimum ANGER, which strengthens interdependency, while suppressing the sense of separateness. Roland (1988) describes the Japanese mothering style to be marked by intense emotional connectedness, where almost all the needs of the child are immediately gratified with minimum frustration. Hence, the child barely needs to separate from this almost fully gratifying "we-ness" and the rumination about or the experience of losing such "we-ness" may cause intense anxiety. In line with this analytical perspective, the Japanese females and males had significantly higher FEAR scores than their Turkish and German counterparts. This high FEAR in overall Japanese sample (and high SADNESS in Japanese males) also explains the high social anxiety and depression prevalence stated for Japan (Lim, 2013). "Taijin Kyofusho" is known as Japanese "social phobia", where the person fears to embarrass others and it is found to be positively correlated with interdependent self-construals and negatively correlated with independent self-construals (Vriends et al., 2013). The relation of FEAR to self-construals will be discussed more after reporting the findings for the male groups.

The ANPS comparisons for females showed both similar (on SADNESS, PLAY and SEEK) and culturally different (on ANGER, FEAR, slightly on CARE) results, however finding a common result shared by all the three male groups was not possible. Although,

Japanese and Turkish males were quite similar to each other on all positive affects (namely SEEK, PLAY and CARE), German males had significantly lower scores on all ANPS subscales (except ANGER). Moreover, the males of the three countries showed several differences on all negative subscales (namely ANGER, FEAR and SADNESS).

For ANGER, Turkish males had significantly higher scores than Japanese and German males. Turkish mothers show low emotional support to the anger of their children regardless of gender (Çorapçı et al. 2012), which may be related to higher ANGER and higher independency scores found for the overall Turkish sample (both for females and males). The developmental affective outcomes of mirroring anger- seen in Turkish child rearing practices- need to be explored further. Another probable explanation for higher ANGER found in Turkish sample and the low ANGER found in Japanese sample may be related to the fact that Turkey has an honor culture which utilizes ANGER to protect honor, while Japan has a face culture which inhibits ANGER in order to protect the face against shame (Boiger et al., 2014). Moreover, the previous finding that Turkish males did not differ from American males on ANGER (Özkarar-Gradwohl et al., 2014) brings the necessity of examining how ANGER is utilized in the United States.

For FEAR and SADNESS, Japanese males had significantly higher scores than Turkish and German counterparts, while Turkish males had significantly higher scores than German males. Although, this Eastward increasing pattern brings into mind the question whether the level of FEAR and SADNESS increases as the level of interdependent self-construals increases, one must avoid such robust generalizations. Previous ANPS findings showed that American and Turkish males did not differ on FEAR and SADNESS, while a Westward increasing pattern was found for females, where American females had higher FEAR and SADNESS than Turkish females did (Özkarar-Gradwohl et al., 2014). In the present study, although similar pattern of Eastward increase in FEAR was observed for the

female groups, no difference was obtained for the SADNESS of German, Turkish and Japanese females.

Consequently, German males reported the lowest scores for all the basic affects measured by ANPS (except ANGER). Interestingly, this general affect inhibition measured by ANPS is observed only in German males, but not in German females. Emotion inhibition is thought to be related to lack of emotional support in childhood, negative beliefs about emotions that they are signs of weakness, and beliefs that one must cope with emotions with rational strategies (Coggins & Fox, 2009). Although Friedlmeier & Trommsdorff (1998) reported that the German mothering style is characterized by a distant mother-child relationship with lower affective inter-relatedness and lower maternal sensitivity, their study was carried only for mothers and daughters, but not for boys. Therefore, future studies on German child rearing practices need to focus more on gender specific emotion socializations and need to explore how German males are raised with a more rationalistic emphasis that inhibits affects. The only cultural cue, that may explain why all the affects- except ANGER- is inhibited in German males, comes from the cross-cultural studies on beliefs about power. Power -which is defined as one of the basic factors in personality- is found to be related to different emotions in different cultures (Mondillon et al., 2005). Germans are found to believe that powerful people inhibit all submissive emotions, but express dominant emotions like ANGER; whereas for Japanese it is not uncommon for a powerful person to also express SADNESS (Mondillon et al., 2005). In short, future cross-cultural studies on gender specific emotion socializations need to specify which beliefs about expressing emotions and which beliefs about power are taught to the children by their parents.

As for the Spirituality subscale, the Turkish females had significantly higher scores than Japanese and German females, while Japanese females had significantly higher scores than German females. On the other hand the Turkish males had significantly higher scores

than Japanese males, but did not differ from the German males. Interestingly, although German females did not differ from their Turkish and Japanese counterparts on most of the affects, they scored the lowest on Spirituality subscale. As Spirituality can be considered as a higher form of intersubjectivity, this finding shows that German mothers' lower emotional connectedness observed by Friedlmeier & Trommsdorff (1998) seems to be related to lower emotional intersubjectivity. In contrast, although German males differed sharply from their Turkish and Japanese counterparts on almost all basic affects, Spirituality became the subscale where they did not differ from their Turkish and Japanese counterparts. As Spirituality measured by ANPS is based on transcendent values, these results must not be elaborated as comparisons of different religions found in Japan, Turkey and Germany. Spirituality- as a form of attachment to all existence- must be elaborated as a primary affect that has subcortical roots. For a future article, we carried out further analysis to observe the correlations of ANPS, B5S, SCS to Spirituality and found that the Japanese, Turkish and German Spirituality have both similarities and culture specific differences. Rather than simply comparing the Spirituality scores, how Spirituality is composed and experienced in different cultures must be understood.

Cross-cultural Big Five Comparisons and the East-West Polarizations Caused by Big Five

Although the Turkish subjects shared more similarities with the Japanese subjects on ANPS (which underpin the subcortical affective characteristics of personality), they shared more similarities with the German subjects on Big Five factors (which are more likely related to cortical cognitive/behavioral characteristics of personality). The Turkish sample, as a «bridging culture, seems to maintain certain subcortical affective personality characteristics of Eastern cultures, while attuning more to cortical Big Five personality factors displayed by

Western cultures. As a rough metaphor, Turkey- as the eastern part of the Mediterranean melting pot- seems to function like the geographical corpus callosum of our globe.

Our cross-cultural comparisons of B5S showed that the Turkish sample- regardless of gender- had similar results with German sample on Conscientiousness, Extraversion and Agreeableness. Moreover, on Openness to Experience - regardless of gender- the Turks had the highest scores while the Japanese had the lowest scores. In today's science, the distance and duration of immigration is considered as a factor that influences culture-gene interactions, e.g. long allelic versions of DRD4 (dopamine receptor gene 4) provide an advantage in adapting to new environments (and experiences) because they are increasing as a function of the distance and duration by which people immigrated in history (Chen et al. 1999). The distance/duration of migration and the variety of genetic intermixture for the humans that populated Japan, Turkey and Germany seem to be different (for world map of migrations see Oppenheimer, 2012; for world map of haplogroups see McDonald, 2005). Japan, as an Asian "island culture" that gave importance to protect its cultural uniqueness against intrusions from outsiders for centuries, had to culturally interact with Westerners only in the last two centuries (Clements, 2017). On the contrary, the Turkish population had settled in a "melting pot" geography (Anatolia), where a mosaic of cultures from 3 continents; Europe, Asia, (North) Africa had largely culturally/genetically interacted/intermixed throughout history (Çağatay & Kuban, 2006). Not surprisingly, German culture- which is a "continental culture" that had culturally/genetically interacted/intermixed with other European cultures (Hawes, 2017) - stands in between Japan and Turkey in terms of their Openness to Experience.

In contrast to the similarities shared by the Turkish and the German samples on B5S, the Japanese sample showed widespread differences from its counterparts. Japanese sample – regardless of gender- had significantly lower scores on all five factors; Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Emotional Stability. Our

B5S findings for Japan, Germany, Turkey were similar to the findings of the cross-cultural Big Five Factor research (comparing 56 countries) of Schmitt, Allik, McCrae and Benet-Martinez (2007) that all East Asian countries -including Japan- had lower scores on big Five Factors. In our study, only on Emotional Stability, Japanese females did not significantly differ from German females, while the Turkish females had the highest scores. As Schmitt et al. (2007) did not analyze the Big Five data separately for males and females; it was not explicit in their study how gender contributes to Neuroticism (low Emotional Stability).

In sum, all our results confirmed the previously reported East-West polarized findings on Big Five. It is well documented that the Five Factor Model receives less consistent support in many non-Western countries (e.g., Piedmont, Bain, McCrae, & Costa, 2002; Schmitt et al., 2007), thus the universalism of its lexically derived content is increasingly questioned (Gurven, Von Ruden, Massenkoff, Kaplan and Vie, 2013). The low cultural sensitivity of the B5S is discussed to be caused by its content that is constructed on Western cultural norms. For instance, while filling the items about Conscientiousness, praising yourself as a tidy, punctual, well-organized person may not be appreciated in Japan, where the praise must be taken from the society, but not declared on your own.

As a conclusion, in line with the second aim of our study, our cross-cultural B5S comparisons confirm the East-West polarizations produced by the Big Five, where Japan stands totally apart from Turkey and Germany. On the contrary, our cross-cultural ANPS comparisons do not show any East-West polarizations on subcortical affective personality characteristics, where one country stands totally apart from others. Therefore, our study confirms that lexically derived B5S is not immune to the differences in Eastern-Western cultural norms, whereas neurodevelopmental constructed ANPS seems to supply a more global personality assessment tool, as it measures the universally shared subcortical affective systems described by the evolutionary theory of Affective Neuroscience (Panksepp, 1998).

More cross-cultural affective neuroscience personality researches need to be carried out to test the universalism of ANPS and to re-discuss the East-West polarizations in the previous literature of personality studies.

The Relation of ANPS and B5S to Independent and Interdependent Self-Construals

In line with the third aim of our study, we observed if different affective and cognitive formulations relate to independent and interdependent self-construals for our three samples. Literature suggests that collectivism and individualism may have different causes in different parts of the world (Rentfrow, 2014). Therefore, we analyzed which Affective Neuroscience Personality traits and Big Five factors contributed to independency and interdependency.

Turkish independent self-construals were determined positively by ANGER, Openness to Experience and Extraversion. Considering that Turks had the highest scores on ANGER and Openness to Experience, the highest level of independency found in Turkish sample seems to be based on this specific formulation. On the other hand for Germany, Openness to Experience, Extraversion, and Emotional Stability were positive predictors and Agreeableness and PLAY were negative predictors of independent self-construals. The American finding that Extraversion, Emotional Stability and Openness to Experience have a significant positive relationship with independent self-construals (Levinson et al, 2011) was in line mostly with our German sample. On the other hand, Japanese independency was influenced positively by SEEK, Spirituality and negatively by FEAR, whereas affected positively only by Extraversion. Our regression results showed that, for independency the common positive predictor shared by all our samples was Extraversion. The comparisons point out that Extraversion may be a universal predictor for independency. However in our study, the affects underlying the independent self-construals were varying; Turks utilized ANGER, Japanese utilized SEEK and Spirituality in the service of independency, while FEAR suppressed Japanese and PLAY suppressed German independency.

For German interdependency FEAR and Agreeableness were positive predictors and Openness to Experience and Emotional Stability were negative predictors; for Japanese interdependency CARE, PLAY, Spirituality were positive predictors and Openness to Experience, Extraversion were negative predictors; and finally for Turkish interdependency SADNESS, Spirituality, Agreeableness were positive predictors and Openness to Experience and ANGER were negative predictors for Turkish interdependency. The negative influence of Openness to Experience and the positive influence of Agreeableness were the shared B5 predictors of interdependency for all samples. This was partly in line with the American finding that showed Agreeableness to have positive relationship to interdependent self-construals (Levinson et al, 2011). The comparisons point out that Agreeableness may be a more universal predictor for interdependency. However, our study also showed that the subcortical affective processes underlying the interdependent self-construals varied again among cultures; Germans seem to get more interdependent when they experience FEAR, Japanese seem to get more connected when they experience CARE, PLAY and Spirituality, while Turks seem to get more interrelated when they experience SADNESS and Spirituality, and only their ANGER suppresses their interdependency.

To summarize the formulations of self-construals; it might be said that while the German independent-interdependent self-construals were determined mostly by B5 factors rather than subcortical affective systems measured by ANPS, the Turkish independent-interdependent self-construals were influenced by both ANP traits and B5 factors. In contrast to German independent self-construals, the Japanese independent self-construals were influenced by various ANPS subcortical affective systems rather than B5 factors. On the other hand, similar to the Turkish interdependent self-construals, the Japanese interdependent self-construals were determined by both ANP traits and B5 factors. Moreover, in line with the argument that the German self-construals were mostly predicted by cortical personality

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characteristics and less by affective personality traits, Emotional Stability –thus the cortical control over negative affects- was a significant predictor of independent-interdependent self-construals only for the German sample.

Although common B5 predictors namely Extraversion, Openness to Experience, Agreeableness contribute to self-construals in all the 3 countries; how a Japanese, a Turkish or a German "feel" when acting independently or interdependently vary from each other. This supports the suggestion that collectivism and individualism may have different causes in different parts of the world (Rentfrow, 2014). Collectivistic/individualistic attitudes which look alike across cultures are not induced necessarily by similar affects in different cultures. The similarities in the cortical levels do not necessarily imply subcortical affective similarities. Our findings showed that although independent-interdependent self-construals may be related to some similar tertiary cognitive processes, it is linked to varying primary affective processes in different cultures. Sharing the same cognition or behavior does not necessarily imply sharing the same affect. Therefore, when self-construals are studied among cultures, researchers must be aware that independency-interdependency is formulated by culturally unique neuropsychological compositions. We strongly recommend that rather than simply comparing the scores of independent- interdependent self-construals among cultures, these unique neuropsychological formulations underlying self-construals must be analyzed in each culture. As females and males may experience interdependency and independency differently, within country gender effects on these neuropsychological formulations will be also analyzed and reported in our future article.

Suggestions and Limitations

Our samples were selected from certain cities in Japan, Turkey and Germany; namely Kyoto, Istanbul and Bonn. As the influence of urban life and rural life on the shaping of basic

affective systems is a newly discussed topic (Sindermann et al., 2017), within country ANPS comparisons among urban and rural areas are also required in the future. Although our study had limitations based on variances in age and gender distribution (female-male ratio), the optimum statistical measures were taken in order to eliminate the variances; taking age as a statistical covariate and avoiding total sample comparisons and separately analyzing female and male samples between countries.

On the other hand, as the present study is the first inter-cultural Affective Neuroscience Personality Scale research in the literature, our findings on the Euro-Asian spectrum have the strength of opening a new research field: **"*Cross-cultural Affective Neuroscience (CAN)*"**. Up to date, the cross-cultural personality literature undermined the role of affect and mostly focused on South East Asia - North West America comparisons, falsely naming it as East-West comparisons. In the globalized world of 21st Century, we suggest the utilization of further CAN researches to analyze the influence of culture on affective personality traits, considering the four directions: North, West, South, East. For future CAN researches, we also recommend the cross-cultural comparisons of Northern and Southern cultures in terms of affect expressions and affect inhibitions. Although, up to date, cultural variations in mother-child interaction styles, parents' child-rearing styles and emotion socializations have not been discussed in order to explain the differences found in cross-cultural personality studies, CAN suggests the consideration of these variables as possible explanation of cultural differences. Moreover, CAN recommends exploring *the unique affective personality profile of each culture* rather than overemphasizing a dichotomy like collectivistic versus individualistic self.

The outcomes of the present and the future CAN researches may be also utilized for the selection and/or modification of psychotherapy techniques according to the cultures in which they are applied. For instance, in a culture where cognitive control over emotions is so

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high, emotive therapy techniques rather than solely cognitive techniques may be opted. In a culture where anger expression is so high, analytic techniques that promote anger expression in the service of separation-individuation need to be avoided and instead of that the meaning of anger may be analyzed and resolved. In a culture where the fear of loosing social bonds due to self-assertiveness is so high, self-reflection oriented introspective non-verbal therapies rather than the talking cure may be opted. Moreover; Kirmayer (2007) states that psychotherapy techniques—based on Euro-American values of individualism—need to be modified while working in collectivistic cultures. The Western ideal of separated-individuated individual can not be accepted as a universal therapeutic goal, as it may have contraindications for Easterners (Fişek, 2018). Psychotherapists must be careful not to harm their clients with culturally inappropriate techniques (Fişek & Kağıtçıbaşı, 1999). Future CAN researchers can be utilized to specify the unique affective personality profiles and the unique interdependency-independency combinations in each culture. According to these cultural specifications, culture-specific needs in order to regain homeostasis can be assessed and therapy techniques can be modified accordingly.

Conclusion

As a conclusion, Japans, Turks, Germans (all humankind) share universal subcortical affective systems, however, which affects are reinforced or inhibited and which affects underlie independent-interdependent attitudes vary across these cultures. This makes "affect" the inevitable starting point for personality researches. The comparisons of "how cultures regulate the universal primary processes in the subcortical affective systems" enable us to have a *neurodevelopmental approach to cross-cultural personality studies.* The findings of the present study support *our initiation of Cross-cultural Affective Neuroscience and our suggestion of the utilization of ANPS as a global tool in cross-cultural personality studies of 21st century.*

4.Chapter Four

4.1. Cross-cultural Affective Neuroscience[1]

4.1.1 Abstract

Panksepp, the father of Affective Neuroscience, dedicated his life to demonstrate that foundations of mental life and consciousness lay in the archaic layers of the brain. He had an evolutionary perspective emphasizing that the subcortical affective systems come prior to cortical cognitive systems. Based on his life-long work, the Affective Neuroscience Personality Scales (ANPS) was constructed, and a new neurodevelopmental approach to personality was started. The new approach suggested that personality was formed based on the strengths and/or weaknesses found in the subcortical basic affective systems, which are initially regulated by the mother-infant attachment styles and later by early life experiences. ANPS measured six basic affects: CARE, PLAY, SEEK, SADNESS, FEAR, and ANGER; along with a Spirituality subscale. Up to date, it has been translated to several languages, and these studies confirmed that ANPS is a reliable and valid tool. Based on the observation that these ANPS studies have both universal and culturally specific findings, cross-cultural affective neuroscience (CAN) was initiated in 2012, with the approval of Panksepp. As a new research field, CAN aims to investigate the influence of culture on the regulation of basic affective systems. CAN claims that this influence can be studied by observing the cultural variations in (1) the level of emotional interdependency, (2) the types of reinforced or suppressed affects, and (3) the types of affects that accompany interdependent or independent self-construals. Cross-cultural comparisons of Turkish and American ANPS findings and the results of our first Euro-Asian CAN project among Japan, Turkey, and Germany support these claims. These cultures regulate the basic affective systems in unique ways, while maintaining certain similarities with each other. In a way, each culture has a unique affective personality

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profile and a specific function in the global affective network. The conclusion of this review shares guidelines, suggestions and ethical codes for future CAN researches.

4.1.2   Emotions for Panksepp

Being the father of Affective Neuroscience, Panksepp dedicated all his scientific work to demonstrate that the role of subcortical affective systems comes prior to the role of cortical cognitive systems (Panksepp, 1998). He built the foundations of his affective theory, in a period where Zeitgeist was more on the side of the behaviorists and the cognitive neuroscientists, who were considering the executive role of the frontal lobe to be the most important factor in mental life. His life-long work helped the scientific world to develop awareness for "affective consciousness" (Panksepp, 2005). His affective prophecy was confirmed by the increasing awareness in the 21st Century that "affective consciousness" has the most important role in mental life (Davis & Montag, 2018; Watt, 2017).

This clear foresight of his Affective Neuroscience theory (Panksepp, 1998) took its strength from its evolutionary perspective, claiming that the ancient subcortical layers of our brain keep the primal instincts and emotions, that are shared by all mammals and that functioned as tools for survival. The lately developed parts of our brain (the frontal lobe) were,in a way,built on these very ancient layers. Panksepp's Affective Neuroscience theory was largely in line with the evolution based Triune Brain Model (MacLean, 1990; Panksepp, 2002), where reptillian brain (primitive brain) lies under the paleomammalian brain (limbic system) which in turn lies under the neomammalian brain (neocortex). Hence, Affective Neuroscience gave voice to the bottom-up approach, in contrast to Cognitive Neuroscience's top-down approach which overemphasized the executive power of top layers over bottom layers.

In a way, Panksepp became the scientific advocate of the suppressed archaic layers that were devaluated and undermined, just because they were related to "emotions". His courage to defend "emotions" against orthodox behaviorists might have come from his early childhood traumas during 2nd World War in Estonia (Sorensen, 2013). These sad experiences had painfully taught him to be aware of the hazards that occur when people over-suppress their affects and destroy affective bonding among human beings. Later in life, the tragic loss of his daughter caused him enormous pain and he overcame his depression through the care of his wife and friends. He sublimated this endless grief into uncountable scientific work; including research on neural mechanisms of separation distress (panic and grief) following social loss (Panksepp, 2010; Panksepp & Watt, 2011). His awareness for his own affects wisely inspired him during the birth, growth and maturation of Affective Neuroscience. In the last decade of his work, he and his close collegue Kenneth Davis utilized these life-long findings to build up an affective neuroscientific approach also for personality researches (Davis et al., 2003; Davis & Panksepp, 2011; Davis & Panksepp, 2018).

4.1.3 Affective Neuroscience Personality Scales: Affective Roots of Personality

According to Affective Neuroscience, emotions based in the subcortical affective systems are the "primary processes", which are shaped by the "secondary processes" of learning and development, which end in cortical cognitive systems of "tertiary processes" (Panksepp, 1998; Panksepp and Solms, 2012). Although emphasizing the evolutionary priority of primary processes, affective neuroscience was fair to suggest a two-way (or circular) interaction within this nested brain-mind hierarchy, where bottom-up and top-down causations co-exist (Panksepp, 1998; Watt, 2017). By the end of the 20th Century, the attachment based neuroscientific researches and the neuropsychoanalytical approach revoiced Panksepp's "secondary processes" that subcortical affective systems are shaped by the influence of nurture, namely early life experiences and learning. (Panksepp, 1998; Schore,

1994; Solms & Turnbull, 2002). It became increasingly acknowledged that mothering styles shape the development of subcortical affective systems and subcortical-cortical networks of the infant. Each mother-infant bond is unique, in terms of which basic affects are reinforced and/or suppressed and in terms of its influence on affect regulation (Korkmaz and Njiokiktjien 2013; Narvaez et al. 2012; Panksepp and Biven 2012, Schore, 1994).

Panksepp built up a neurodevelopmental approach to personality and stated that personality is formed upon the strengths and weaknesses found in the "basic affective systems", which are initially regulated by the mother-infant interactions and early environmental experiences (Davis et al., 2003; Panksepp, 2011). Based on this bottom-up approach, the *Affective Neuroscience Personality Scales (ANPS)* was constructed in 2003 (Davis et al. 2003). ANPS measures the subcortical affective systems, in other words, the primary processes that are shaped by secondary processes and that are evolutionary older than the tertiary processes. As a psychometric tool born within the scientific awareness of 21st Century; ANPS stands objectively on an evolutionary theory, where "affect" is considered as the prior building block of personality. Previous personality theories- widely used in 20th Century- lacked such a strong evolutionary and neurodevelopmental ground and did not measure universally shared neural systems on which personality is built.

For instance, Big Five Model dated back to the "lexical approach" of Allport and Odbert who had prepared a list of personality describing adjectives based on the English dictionary. That adjectives list was later improved by Cattell and categorized in 1961 into five factors by two American Air Force researchers, namely Tupes and Christal in 1961 (John & Srivastava, 1999). Big Five factors were named as Extraversion, Agreeableness, Conscientiousness, Openness to Experience and Emotional Stability (cognitive control over emotions). In the last two decades, linguistic universality of the lexically derived Big Five started to be discussed and it was criticized to be based on Western cultural norms embedded

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in the English language (John & Srivastava, 1999). Constructed during the Zeitgeist of the Cold War when the world was extremely polarized, Big Five Model also produced findings that lead to consistent East-West polarizations; lower scores in the East and higher scores in the West (Gurven, Von Ruden, Massenkoff, Kaplan and Vie, 2013; Piedmont, Bain, McCrae, & Costa, 2002; Schmitt et al., 2007; Triandis, 1997). However, it is also argued that Big Five measures mostly the cognitive and behavioral characteristics of personality found in Western norms and oversees the universal subcortical affective characteristics (Ozkarar et al., 2018). Therefore, the polarized findings that are produced by linguistically derived Big Five are related more to the (post-linguistic) tertiary processes, rather than primary processes. Supporting this argument, our studies showed that ANPS comparisons between Turkey and Unites States (Özkarar-Gradwohl et al., 2014) and between Japan, Turkey and Germany (Özkarar-Gradwohl et al., 2018) did not show lower scores in the East and higher scores on the West, therefore did not lead to such East-West polarizations. Instead of that, each culture was found to have specific higher and/or lower scores on the basic affects shared by ANPS. As a conclusion, it seems that the lexically derived Big Five measures the tertiary processes (mostly based on Western values), whereas ANPS measures the primary processes that are universally shared and culturally regulated via secondary processes.

Neurodevelopmentally speaking, the affects of an infant exist before his/her language develops. Therefore, ANPS stands as a more fundamental tool, which has the privilege of assessing the primary processes embedded in the universally shared subcortical affective systems. ANPS measures six basic affective systems namely: SEEK, PLAY, CARE, FEAR, SADNESS and ANGER, with the addition of a ''Spirituality'' subscale, which may qualify as the highest human emotion (Davis et al. 2003). For the three positive affects; SEEK is defined as ''feeling curious, feeling like exploring, striving for solutions to problems'', PLAY is described as ''having fun, playing games involving physical contact, humor, laughter, being

generally happy and joyful'', CARE consists of ''nurturing, feeling softhearted toward animals and people in need, feeling empathy, feeling affection for and liking to care for others''. For the three negative affects; FEAR reflects the tendency for ''feeling anxious and tense, worrying, struggling with decisions, ruminating about past decisions, losing sleep, not typically being courageous'', SADNESS monitors ''feeling lonely, crying frequently, thinking about loved ones and past relationships, feeling distressed when not with loved ones'' and ANGER for ''feeling hotheaded, being easily irritated and frustrated, expressing anger verbally/physically, remaining angry for long'' (Davis et al., 2003). The basic affect LUST was not included in the ANPS, as it was thought that a reliable measurement of this affect via a self-administered questionaire would be complicated (Davis et al., 2003). In ANPS, Spirituality is defined as ''feeling connected to humanity and creation as a whole, striving for inner peace and harmony, searching for meaning in life'' (Davis et al. 2003), in short the intrinsic brotherhood and sisterhood of all human beings and living things. Spirituality was included in ANPS as a highest human emotion which will be important in future psychiatric research (Davis et al., 2003). Spirituality measured by ANPS focuses mostly on self-transcendent values, thus its operational definition is not equal to religiousness. The neuroscientific observation of self-transcendent states is still a new area of research. However, there is accumulating evidence that increased activation in amygdala and hippocampus is the common feature of most meditative states, in addition to increased levels of serotonin, melatonin, GABA and decreased levels of norepinephrine (Newberg & Iversen, 2003). Transient hypofrontality during altered states of consciousness is another topic open to discussion (Dietrich, 2003).

4.1.4 ANPS Standardization Studies in Different Cultures

The main findings of the original ANPS study (Davis et al. 2003) have been confirmed by the ANPS standardization studies in Spain, France, Turkey, Italy, Japan and Germany

(Abella, Panksepp, Manga, Bárcena, & Iglesias, 2011; Pahlavan, Mouchiroud, Zenasni, & Panksepp, 2008; Pingault, Pouga, Grèzes, & Berthoz, 2012; Özkarar-Gradwohl et al., 2014, Narita et al 2017; Pascazio et al., 2015; Reuter, Panksepp, Davis, & Montag 2017).

As the first common result; positive inter-correlations among positive subscales and positive inter-correlations among negative subscales were found also in Spanish, French, Turkish, Italian, Japanese and German samples; strengthening the proposition that both positive and negative affect might be higher-order cross-cultural personality factors (Davis et al. 2003). However, a modest but significant positive correlation between CARE and FEAR- a positive and a negative affect- was also observed in the original ANPS study (Davis et al. 2003), as well as in the Spanish, the French, the Turkish and the Japanese study (Abella et al. 2011; Ozkarar-Gradwohl et al., 2014; Pahlavan et al. 2008; Narita et al., 2017). In a way, the more you care the more you worry. It was discussed that the caring system might have interrelated psychodynamic and neurological substrates with the anxiety system keeping the caregiver alert to potential risks that may harm the ones that are cared for (Ozkarar-Gradwohl et al. 2014). On the other hand, contrary to the 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. Moreover, rarely observed significant correlations between some negative affects and positive affects were also reported (e.g. significant positive correlation between ANGER and SEEK in Turkish study). This implied that culture-specific inter-wirings of certain positive and negative affects may exist. As a summary, although positive and negative affects are higher-order personality factors, they do not seem to be mutually exclusive and totally polarized. The degree and type of inter-wirings of positive-negative affects may differ from culture to culture.

As the second common result, the gender effect obtained in the original study showing that females have higher scores than males on CARE and SADNESS (Davis et al.,

2003) was also detected in the Spanish, French, Turkish, Italian, and German studies (Abella et al., 2011; Montag, Widenhorn-Müller, Panksepp, & Kiefer 2016; Montag, Hahn, Reuter, Spinath, Davis, & Panksepp, 2016; Özkarar-Gradwohl et al., 2014; Pahlavan et al., 2008; Pascazio et al., 2015; Pingault et al., 2012), pointing to a potential female "resonance" with attachment (CARE) and separation distress (SADNESS). As an exception, this gender effect was found to be just the opposite for the Japanese sample, where the Japanese males had significantly higher CARE and SADNESS compared to Japanese females (for detailed cross-cultural gender effect see Figure 2;Özkarar-Gradwohl et al., 2018). Moreover; culture specific gender effects were also obtained; both Spanish and French females having higher scores than males on FEAR, Spanish females having higher scores than males on SEEKING, French females showing lower scores than males on PLAY (Abella et al. 2011; Pahlavan et al. 2008). In short, besides commonly shared gender effect findings on ANPS, certain culture specific gender effects did also exist. The gender effect on ANPS needs to be analyzed further by the help of future cross-cultural studies.

In addition to these two main factors, emotional valence (positivity-negativity) and gender effect, age also appears as a factor that must be taken into consideration in ANPS studies. As most of the standardization studies have been carried out with university students, the effect of aging on ANPS scores was examined firstly in the Turkish standardization study, which recruited almost 900 subjects with an age range from 18 to 63 years old (Özkarar-Gradwohl et al., 2014). The correlation results showed that as age goes up, all basic affect scores (except CARE, which remained the same) go down. The only subscale score which increasead as age increased was spirituality. Later, the Italian ANPS standardization study also analyzed the ANPS scores in different age groups and found quite similar results (Pascazio et al., 2015). Hence, as a person gets older, affects seem to cool down and spiritual view seems to mature. The age factor needs to be tested in other cultures in order to determine

whether this is a universal finding. Moreover, the newly appearing variable in ANPS studies seem to be the sample selection from urban or rural areas. Until today ANPS standardization studies have been carried out with university students in urban environments. However, Sindermann et al. (2017) investigated the influence of urban life and rural life on the shaping of basic affective systems in China and Germany, and found that these two living types have different influence on ANPS findings. Future studies are required to observe the effect of these two types on the development and regulation of basic affective systems.

The construct validity of ANPS has been well proved in the standardization studies by analyzing the significant correlations between ANPS subscales and Big Five Factors (e.g. Abella et al. 2011; Narita et al., 2017; Özkarar-Gradwohl et al., 2014). The study of Montag and Panksepp (2017) showed that similar correlation patterns between ANPS and Big Five Factors were observed in USA, Germany and China. FEAR, SADNESS, and ANGER were positively correlated with Neuroticism, high CARE and low ANGER were positively correlated with Agreeableness, SEEKING was positively correlated with Openness to Experience and PLAY was positively correlated with Extraversion. On the other hand; Japan, Turkey and Germany were found to carry both similar and culturally specific correlational patterns among ANPS and Big Five (Özkarar-Gradwohl et al., 2018). The suggestion that these correlational patterns among affective personality traits and Big Five need to be replicated across cultures needs further observation (Montag & Davis; 2018).

As a summary, ANPS standardization studies proved that ANPS is a reliable and valid tool to measure the affective roots of personality. In addition, it was documented that the basic affective systems underlying personality development have both universal and culturally specific properties, which are subject to gender effects. Therefore, the influence of culture on the regulation of basic affective systems was presented as a new research area that needs to be explored in detail (Özkarar-Gradwohl et al. 2014).

4.1.5 Cross-cultural Affective Neuroscience: How Does Culture Wire The Basic Affects?

In 2012, with the approval of Prof. Jaak Panksepp, the initiation of Cross-cultural Affective Neuroscience (CAN) was announced, as a new research field that aims to investigate the influence of culture on basic affective systems (Özkarar-Gradwohl, 2012). CAN based its rationale on a two-way interaction between Self and culture: (i) *universally shared subcortical affective systems are initially regulated uniquely in each mother-infant bond and subsequently by family models and culture, (ii) Culture, by effecting family models and mothering styles, influences the degree to which subcortical basic affective systems are reinforced or inhibited* (Initiation of Cross-cultural Affective Neuroscience, 2012). CAN claims that the influence of culture on the regulation of basic affective systems can be investigated by observing the cultural variations in (a) the level of emotional interdependency and inter-relatedness, (b) the types of reinforced or supressed affects, and (c) the types of affects that accompany interdependency and independency.

It is increasingly acknowledged that the role of mother-infant interaction styles in the biopsychosocial development of the self is universally important (Schore, 1994). In all cultures the mother-infant interaction is the primal biopsychosocial context where infants first experience "symbiotic union and relatedness" and then "separation-individuation" (Mahler et al. 2008). However; the onsets and durations of these developmental stages vary across cultures. The basic characteristics of mothering and parenting (duration of breast feeding or pumped milk feeding, onset of toilet training, duration of co-sleeping in the room of parents etc.) are timed differently by each culture. For instance, while breast feeding typically lasts around 6-12 months in individualistic cultures, it may extend up to 2 years in more collectivistic cultures (Lansinoh Global Breastfeeding Survey, 2016). Also guilt-feelings associated with absence of breast-feeding vary among mothers from different cultures; e.g.

Lansinoh worldwide survey reported that 91% of Turkish mothers feel guilty whereas only 39% of German mothers feel guilty if they do not breastfeed. Moreover, while the infant may be placed in a separate room to sleep independently after about half a year in individualistic cultures, co-sleeping with parents is more prolonged in collectivistic cultures (Mindell et al 2010; Shimizu 2014).

In line with these features, the collectivistic and individualistic cultural norms are probably influencing mothering styles and family models in different ways. Roland (1988; 1996) discusses that prolonged symbiotic Eastern mothering styles do not reinforce separation-individuation, thereby promote more permeable outer ego boundary (loose self-object boundaries) leading to higher intersubjective interchanges and affective exchanges. On the other hand, Western mothering styles reinforce separation individuation and promote more distinct and separate selves, with less permeable ego boundaries, hence lower intersubjective exchanges (Roland, 1988; 1996)). Consistently, interdependent family models, seen in eastern cultures, include extended families where emotional interdependencies are highly valued but personal autonomy is de-emphasized. On the other hand, independent family models, seen in western cultures, include nuclear families where personal autonomy is highly valued but interdependencies are de-emphasized (Mayer et al., 2012). For child rearing practices, the independent family models focus mainly on the personal autonomy of the child, and to a relatively smaller degree on interpersonal relationships and interdependence; whereas the interdependent family models focus more on the emotional inter-relatedness of the child and less on autonomy (Mayer et al., 2012).

Similar to these differences observed in mothering styles and family models, cross-cultural theories of self-development suggest that two types of self exist, for which several different names have been used in the literature; the "Collectivistic Self and Individualistic Self" (Triandis et al. 1988), "Interdependent Self and Independent Self" (Markus and

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Kitayama, 1991) or "Relational Self and Separate Self" (Fişek 2010; Kağıtçıbaşı 1996). In the prior, the interdependent self construals are taught to be reinforced, while on the latter the independent self-construals are taught to be reinforced (Markus and Kitayama, 1991). Interdependent self-construals are related to attending to maintain the social harmony, controlling internal states in order to promote the ideals of the social group and behaving based on social norms; whereas independent self-construals are related to attending to the self, expressing individual needs and autonomy and behaving based on individual internal attributes (Markus and Kitayama 1991; Triandis 1995).

Personality related neuroscientific studies also support these arguments (Han and Northoff, 2008; Luo and Han, 2014). In line with the notion that the self and the mother are more symbiotic for Easterners, but more separated for Westerners; a study by Zhu et al. (2007) found that Chinese show a substantial increase in the medial prefrontal cortex (MPFC) activation for both self judgement and mother judgment, whereas Westerners do not display such increased activation in the mother-reference condition. Similarly, subjects who endorse individualistic values are found to display higher MPFC activation to general self-descriptions, while subjects who endorse collectivistic values show higher MPFC activation to social-contextual self-descriptions (Chiao and Blizinsky 2010). Although cross-cultural theories of Self and cross-cultural neuroscientific studies of self are inclined to argue that two different types of self exist, The recent debate over world-wide self-construals comparisons emphasizes that theoretical generalizations like "collectivistic East versus individualistic West" must be avoided, as different combinations of interdependency-independency is found in each culture (Vignoles et al., 2016). Our recent study carried among Japan, Turkey and Germany also showed that as interdependent self-construals decrease from East to West, a westward increase in independent self-construals does not exist (Özkarar-Gradwohl et al., 2018). Following these findings, we suggested that rather than relying on theoretical

generalizations based on geographical localizations, self-construals must be explored empirically in each cross-cultural reasearch.

As stated in the first paragraph of this section, CAN claims that cultures do not influence only the level of emotional interdependency and relatedness, but the qualities of affect regulation as well. Cross-cultural emotion socialization studies show that parents promote or inhibit different emotions of the child, depending on their cultural norms and the gender of their child (Friedlmeier et al. 2011; Song and Trommsdorff; 2016). In a way, culture influences how parents will reinforce or suppress the basic affective systems of their boys/girls. Hence, how the primary processes will be shaped by secondary processes (learning and development) is highly open to the influence of cultural norms. In short, how the parents teach their boys/girls to regulate basic affects vary accross cultures. For instance, it is discussed that 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). It is also stated that in cultures where interdependency is highly valued, mothers express less anger towards their children and anger expression is widely discouraged in order to protect the inner harmony of the family and/or the social group against conflicts (Friesen, 1972; Roland, 1996; Holloway & Nagase, 2014).

Based on the findings that affect regulation varies across cultures, a cross-cultural ANPS research was carried out between Turkey and United States (Özkarar-Gradwohl et al. 2014). With the permission and the supervision of Prof. Jaak Panksepp and Prof. Kenneth Davis, the norms of the original American ANPS study were compared with the norms attained by the Turkish ANPS standardization study. While defining the two samples, American culture was considered as an individualistic culture where interdependency is lower than the Turkish culture's interdependency. On the other hand, Turkish culture was described as a bridging culture where interdependency coexists with independency (Fişek, 2017;

Kağıtçıbaşı, 2005; 2007). The findings showed that American subjects, regardless of gender, scored higher on positive affects compared to Turkish subjects. This was in line with Tsai's (2007) argument that high positive affect is encouraged in individualistic cultures, while keeping high positive affect under control is prefered in cultures where higher interdependency prevail. In other words, experiencing pleasurable emotions in Turkish society seemed to be allowed only up to a limit that will not damage the harmony of the group. Despite Americans' scoring higher on positive affects, Turkish and American males did not differ on negative affects. Moreover, it was found that American females had higher FEAR and SADNESS than Turkish females had (Özkarar-Gradwohl et al. 2014). Hence, reinforced positive affect did not necessarily prevent negative affect, as it should have been expected from the hedonistic philosophy of increasing joy and decreasing suffering. Lower FEAR and SADNESS reported by Turkish females compared to American females supported a previous finding of lower anxiety in Turkish females compared to American females on five factor model (Gülgöz, 2002). Our ANPS comparisons also showed that the Turkish females had higher ANGER scores than American females did. This finding was later confirmed in another study of ours, which will be discussed in the later paragraphs (Özkarar-Gradwohl et al., 2018).

As for the similarities between the two cultures; American and Turkish samples did not differ from eachother in terms of Spirituality measured by ANPS, which implied that spirituality must be considered as a universal primal affect with subcortical roots, which is immune to differences caused by religion. Another similarity observed is that the same gender effect was observed for both American and Turkish samples, where females displayed higher CARE, SADNESS and Spirituality compared to males (Özkarar-Gradwohl et al. 2014). Although females' higher CARE and SADNESS were confirmed in Spanish, French, Italian, and German ANPS studies (Abella et al., 2011; Montag, Widenhorn-Müller, Panksepp, &

Kiefer 2016; Montag, Hahn, Reuter, Spinath, Davis, & Panksepp, 2016; Pahlavan et al., 2008; Pascazio et al., 2015; Pingault et al., 2012), one should avoid premature generalizations that this points to a universal female "resonance" with attachment (CARE) and separation distress (SADNESS). As we have also stated that the Japanese males had significantly higher CARE and SADNESS compared to Japanese females; this might not be solely a female resonance, but it might be related to the duration/intensity of attachment to the mother. In terms of building up gender identity, it is known that girls stay attached with their mothers to build up gender identity while males separate earlier from the mother to build up male identity (Chodorow, 1994). If it is considered that oxytocin (the neuropeptide underlying CARE system) is the basic hormone that is promoted by maternal attachment, it needs to be explored whether prolonged symbiotic mothering styles may lead to higher oxytocin levels for both males and females in Eastern cultures. Oxytocin related neuroscientific studies also indicate an association between oxytocin receptor gene polymorphism and collectivistic norms where interdependency is reinforced (Luo and Han, 2014). The gender effect measured by ANPS needs to be explored further taking cultures' varying combinations of interdependency-independency into consideration.

Following the findings of this comparative ANPS study, it has been decided that rather than relying on theoretical generalizations of Eastern collectivism versus Western individualism, self-construals must be explored empirically in each cross-cultural ANPS reasearch. We carried out the first CAN research along a Euro-Asian spectrum among Japan, Turkey and Germany (JTG) and compared the results of Self-Construal Scales (SCS; which measure the levels of interdependency-independency), ANPS and Big Five Scales (B5S) (Özkarar-Gradwohl et al., 2018). The selection of JTG countries was from the most collectivistic to least collectivistic and with varying mothering styles and family models. Japanese family model is known as an interdependent family model, which is described as

focusing more on inter-relatedness and less on autonomy (Mayer et al., 2012). Japanese mothering style amplifies inter-relatedness and oneness, by a strong bond between the mother and child, frequent physical contact, high maternal responsiveness (Friedlmeier & Trommsdorff, 1998). Japanese mothering style suppresses anger expression towards the child in order to maintain the harmony and to avoid separation from oneness (Roland, 1996; Holloway & Nagase, 2014). On the other hand, Turkish family model is described as an emotionally interdependent family model, where emotional inter-relatedness is maintained while promoting autonomy at the same time (Fişek, 2017; Kağıtçıbaşı, 2005; 2007). Turkish upbringing style emphasizes the emotional relatedness while not suppressing separateness, which is also observable in Turkish mothers' affectionate protectiveness that coexists with mirroring anger towards an angry child (Özdemir, 2009). Lastly, German family model is known as an independent family model which focuses more on autonomy and less on inter-relatedness (Mayer et al., 2012). Emotion socialization studies state that German mothering style is based on perceiving the child as a separate being and is characterized by a more distant mother-child relationship which includes less physical contact (except high eye contact) and lower maternal responsiveness (Friedlmeier & Trommsdorff, 1998).

Under the precious supervision of Prof. Jaak Panksepp and Prof. Ken Davis, the voluntary JTG project took approxiamately 5 years (including theoretical reviews, translation and standardizations of ANPS, sample recruitment, data collection, analysis, reporting) and led to several surprising findings (Özkarar-Gradwohl et al., 2018). As a bridging culture, Turkey seemed to maintain certain affective personality similarities with Japan on ANPS, while attuning more to Big Five personality factors displayed by Germany. SCS scores indicated that the level of interdependent self-construals decreased from East to West, with highest interdependency in Japan and lowest in Germany, however independent self-construals did not show a gradual westward increase. Highest independency was found in

Turkey, especially in Turkish females. This was in line with previous findings that Turkish females have higher independency than American and Canadian females (İmamoglu & Karakitapoglu-Aygun, 2004). Surprisingly, German independency was not significantly different from Japanese independency. Thus, theoretically widely accepted German individualism was not found to be based on higher independency, but on lower interdependency. As a summary, the Japanese sample fit to the theoretically well-known collectivistic culture where higher interdependency prevails. Turkish sample fit to the theoretically defined bridging culture where interdepency is maintained while reinforcing independency at the same time. On the other hand, German sample displayed an atypical individualistic culture where lower interdependency prevails, but no higher independency is detected (Özkarar-Gradwohl et al., 2018). German separation reinforcing upbringing style does not seem to bring higher independency but lower interdependency. Surprisingly, the level of independency that may stemm out from German separation reinforcing upbringing style and Japanese prolonged symbiotic mothering style do not seem to differ. This implies that neither the emphasis on early separation from the caregiver nor emphasis on prolonged attachment with the caregiver necessarily brings a sense of separateness. While the first seems to bring lower inter-relatedness, the second seems to bring higher inter-relatedness. Turkish pattern needs to be explored further in order to understand how "separation without detachment" can be provided.

JTG findings also indicated that the samples varied from each other in terms of the ANPS traits that correlated with inter-dependency and independency. This implies that the affect which is experienced during relatedness and separateness may vary across cultures. Different cultures may experience different affects during interdependency and independency. (Özkarar-Gradwohl et al., 2018). The ANPS comparisons of the JTG Project also brought out intriguing results. The females from the three countries seemed very similar on positive

affects, while showed more differences on negative affects. The Japanese females displayed the lowest ANGER scores, while the Turkish females displayed the highest ANGER. The same pattern was observed among the male samples; where Japanese males had the lowest ANGER and the Turkish males had the highest ANGER (Özkarar-Gradwohl et al., 2018). This was in line with the previously described upbringing styles; that Japanese mothers provide care with expressing minimum anger towards the child and protect the harmony of oneness against conflicts that may lead to separations. While in Turkish mothering styles care and anger co-exist, enabling the sense of separateness and inter-relatedness at the same time.

Moreover the JTG Project found that the Japanese sample had significantly higher FEAR scores than the Turkish and German samples (Özkarar-Gradwohl et al., 2018). This was in line with the higher social anxiety prevalence stated for Japan (Lim, 2013). For a person whose priority is maintaining the harmony of the group and who experiences a strong bonding to this oneness, even the idea of doing something wrong that will harm this harmony can cause high fear and anxiety. In this regard, separation-individuation focused Western psychotherapeutic goals may not fit to Eastern cultures (Fişek & Kağıtçıbaşı, 1999; Fişek, 2018; Kirmayer, 2007) or to cultures where independency is already high (Özkarar-Gradwohl et al., 2018). Even worse; these uni-culture goals, which are not culturally sensitive, may bring counter-indications and harm for the client. The modification of psychotherapy techniques and goals needs to be reconsidered in the light of CAN findings.

JTG findings also showed that the Japanese males had significantly the highest SADNESS scores on ANPS, which was in line with the high depression prevalence stated for Japan (Lim, 2013). Simplistic arguments such as those claiming that Japan has a depressed culture must be cautiously avoided, and culturally sensitive interpretations must be made. Because SADNESS is not a feeling to be avoided, but to be embraced and contained in Japanese existential philosophy (Chervenkova, 2017). SADNESS is a natural feeling for

Japanese people and Japan is one of the rare countries which thinks that emotions that can be expressed by a "powerful person" include also sadness (Mondillon et al., 2005).

Finally, compared to Turkish and Japanese males, German males had significantly the lowest scores on all affects (except ANGER and Spirituality) measured by ANPS (Özkarar-Gradwohl et al., 2018). Interestengly, such a significant emotion inhibition was not observed in German females, who did not show constantly lower affects compared to their Turkish and Japanese counterparts. On the other hand, German females had significantly lower scores on Spirituality, which is the affect underlying the highest form of attachment, namely attachment to all existence. It seems that it is not only the amount of affect that matters, but if this affective energy is cathected or not. Although Friedlmeier & Trommsdorff (1998) state that lower maternal sensitivity- responsiveness and physical contact observed in German mothers may have effects on the emotion internalizations of a child in later life, the effects seem to be different for male and female children. JTG authors suggested that in order to understand the reasons underlying the German males' emotion inhibition, it must be explored further how they are raised with a more rationalistic attitude that inhibits affects (Özkarar-Gradwohl et al., 2018). In addition, if Chodorow's (1994) gender identity theory is applied to these findings, it needs to be investigated whether separation reinforcing mothering styles may influence male and female children differently. The male child might have lesser chance to internalize the affects from the mother, compared to the female child who can still continue to internalize affect during gender identification. The emotion inhibition found in German males may also be discussed in terms of how separation reinforcing mothering style may influence the emotion expression of males more negatively than it does for females.

As for the JTG findings on Spirituality, Turkish sample, regardless of gender, displayed the highest Spirituality scores (Özkarar-Gradwohl et al., 2018). This was contrary to the finding that Turkish and American samples did not differ from each other on Spirituality

scores (Özkarar-Gradwohl et al., 2014). Therefore, we carried out further analysis on JTG data and found that the correlations between ANPS traits, Big Five traits and Spirituality show some interesting differences among these three countries. Therefore it was suggested that rather than simply comparing the levels of Spirituality on ANPS, the neural compositions that build up the characteristics of the spiritual experience need to be clarified in each culture (Özkarar-Gradwohl et al., 2018).

JTG supplied us a huge amount of information, therefore reporting all the findings in the first article was not possibile. The future JTG articles will be dedicated to (a) within cultures gender effects on ANPS, (b) within cultures and gender specific emotional valence (positivity-negativity) effects on ANPS intercorrelations, (c) within cultures and gender specific ANPS-SCS-B5S intercorrelations and their relation to Spirituality.

Although CAN is a new-born research field, the recently completed studies that are summarized above indicate clearly that each culture has a certain style to regulate the universally shared subcortical affective systems and these styles have both universal and culturally specific features. Davis & Montag (2019) suggests that how the regulation of subcortical affective systems is influenced by early life experiences is a topic to be explored further in affective neuroscience. In line with this statement, the present paper confirms that how the regulation of subcortical affective systems is influenced by culturally specific child-rearing styles can be investigated further by the help of CAN.

4.1.6 Guidelines and Suggestions for future CAN researches

The findings of the initial CAN researches, that are summarized in the present paper, provide the initial guidelines for future CAN researches:

1. The subcortical affective systems are the primary processes that are shared universally by all human beings (and mammalians). These primary processes are regulated uniquely in each mother-infant bond, family model and culture.

2. Based on the cultural regulation of affect, each culture has a unique affective personality profile. In line with this culture specific profile, each culture reinforces and/or suppresses certain affects.

3. The amount of experiencing an affect and the way of regulating an affect in relation to other affects are two different factors. The levels of experiencing an affect can be similar between two cultures, but handling this affect in relation to other affects may differ among these two cultures. Vice versa, the levels of experiencing an affect can be different between two cultures, however handling it in relation to other affects may be the same for both cultures. Therefore, rather than only comparing the levels of affects, observing the inter-correlations between affects is also important in order to understand how emotions are wired in relation to each other, in different cultures.

4. It is not only the amount of affect that matters, but whether this affect is cathected or not. The presence of the same levels of an affect in both cultures does not necessarily imply that this affect is invested into similar levels of intersubjectivity.

5. The types of affect that are cathected during attachment and separation may vary across cultures. Therefore, different cultures may experience different affects during states of interdependency and independency. As a conclusion, although scores of interdependency may be similar for two cultures, or scores of independency may be similar for two cultures; different affective compositions may be associated with this interdependency or independency.

Based on the recent CAN findings and the guidelines summarized above, certain suggestions can be made for future CAN researches. Firstly, age, gender, interdependency-independency levels need to be taken into consideration in all researches. Secondly, labelling Eastern countries as collectivistic and western countries as individualistic seems to be simplistic and invalid within the scientific awareness of the 21st Century. Therefore, CAN

researches need to maintain the principle of measuring interdependency-independency self-construals in order to empirically define the culture. Thirdly, the CAN studies must not only compare the level of the ANPS scores, but must also focus on how ANPS inter-correlations and ANPS-SCS correlations vary across cultures.

In order to strengthen CAN's theoretical framework, future researchers may integrate ANPS with empirical measurements of child-rearing styles and/or emotion socialization in different cultures. To enhance this aim, studies may be designed to relate ANPS findings not only with mothering styles, but also with fathering styles. Finally, the limitation that the cultural differences may also influence the patterns of filling in the questionnaires (e.g., tendency to fill towards the average or close to the extremes on a Likert scale, tendency to fill according to receive social approval etc.) must be taken into consideration.

4.1.7   Clinical Implications of CAN Researches

As for the clinical implications of CAN, the findings of this new-born research field may be utilized to modify psychotherapy techniques and goals according to the culture, in which they are applied. CAN helps to assess the unique afective personality profiles in relation to the unique interdependency-independency combinations in each culture. In line with these assessments, culture-specific therapeutic needs can be clarified and culturally sensitive therapy techniques can be selected (Özkarar-Gradwohl et al., 2018). It has been long discussed that the psychotherapy techniques, based on Euro-American values of individualism, need to be modified while working in collectivistic cultures (Kirmayer, 2007). It is argued that the Western ideal of separated-individuated individual can not be accepted as a universal therapeutic goal, as it may have contraindications for Easterners (Fişek, 2018). Therefore, clinicians are warned not to harm their clients with culturally inappropriate techniques (Fisek and Kagitcibasi, 1999). As a start, JTG Project recommended that with the

help of CAN findings, clinicians can start working on how to modify the therapy techniques according to their culture (Özkarar-Gradwohl et al., 2018). For instance, in a culture where interdependency and the fear of loosing social bonds due to self-assertiveness are so high, self-reflection oriented introspective non-verbal therapies rather than the talking cure may be opted. In a culture where anger expression and independency are so high, techniques that promote anger expression in the service of separation-individuation need to be avoided and instead of that the meaning of anger may be analyzed and resolved. In a culture where cognitive control over emotions is so high, emotive therapy techniques rather than solely cognitive techniques may be preferred (Özkarar-Gradwohl et a., 2018).

4.1.8 Ethical Vision of CAN

CAN ethical codes are constructed in line with Panksepp's affective legacy. The main principle is emphasizing the universalism of primary processes embedded in subcortical affective systems, while accepting the influence of culture on basic affects as the result of secondary and tertiary processes. Therefore, balancing and integrating both the universal and culturally specific findings is highly valued. Accepting the cross-cultural differences as parts of a "Whole" and avoiding the interpretation of findings for or against any country, race, religion or gender are the fundamentals of CAN's ethical vision. CAN intends to analyze the "global affective network" , therefore it suggests to focus on all the 4 directions; North, West, South, East, in contrast to the polarized 2 directional (East vs West) cognitive emphasis in the previous cross-cultural literature. It suggests that each culture is specialized in certain functions of affect regulation in our globe , thus the role of each culture is equally important and necessary. CAN researches can specify the affective personality profile of each culture and help to map the global affective network. The connectivity of the global affective network is a further topic which may be investigated by the help of the history of culture-gene interactions throughout history.

5.Chapter Five

5.1. Gender effects in personality: a cross-cultural affective neuroscience perspective[1]

5.1.1 Abstract

Despite enormous progress in understanding the neuroscientific elements that underpin the basic emotions, far less attention has been paid to individual differences. The Affective Neuroscience Personality Scales (ANPS) aim to measure these universally-shared subcortical affective systems on which personality is built: CARE, PLAY, SEEK, SADNESS, FEAR and ANGER. Gender differences have been reported in several previous ANPS studies, but no systematic review of these findings has yet been conducted. The present study reviewed ANPS gender effects in 15 countries: (from West to East) Canada, U.S.A., Portugal, Spain, France, Italy, Germany, Norway, Poland, Serbia, Turkey, Russia, China, Hong Kong, and Japan. The total sample size was $N = 6500$, composed of 38% males and 62% females. The mean age for the total sample was 26 years. The results showed that gender differences on the ANPS were variable, for different classes of basic emotions. These categories included emotions on which females scored universally higher (CARE and SADNESS); emotions that showed variability based on geography (FEAR and PLAY); and emotions that showed virtually no gender effect (SEEKING and ANGER). These findings can be interpreted in the light of biological universals, geographical variation caused by genetics, and cultural variation in emotion expression and regulation. The results were broadly consistent with gender effects reported in the Big Five personality literature, including a trend of gender differences increasing when moving from 'East' to 'West'. The paper reviews a range of suggestions for future research, including cultural data, genomic data and/or culture-gene interactions.

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[1] Özkarar-Gradwohl, F.G. & Turnbull, O.H. (2021). Gender Effect in Personality: A Cross-cultural Affective Neuroscience Perspective. Culture and Brain, https://doi.org/10.1007/s40167-021-00099-5.

5.1.2 Introduction

Feelings are at the centre of the mind, and underpin motivation, adding the mental 'colour' to the objects and choices of our lives. The last few decades have seen enormous gains in our understanding of these feelings, and indeed their biological basis. There is an emerging agreement in the literature that there are a number of basic emotions (broadly speaking 4 to 7 emotions), all mediated primarily by subcortical brain structures (Damasio & Carvalho, 2013; Eckman, 1992; Panksepp, 1998). Neuroscientifically, these emotion systems are organized in a bottom-up hierarchy, such that the more foundational elements (for example in the upper brain stem) seem dedicated to the core *experience* of emotion (Panksepp & Solms, 2012; Panksepp & Watt, 2011). Higher levels of the system (for example the amygdala) are dedicated to emotional memory. Finally, cortical brain areas, especially the various surfaces of the frontal lobes, seem to be involved in the control and management of emotions (Salas et al., 2014). In line with the literature, affective neuroscience defines the emotions based in these subcortical affective systems as "primary processes," which are shaped by the "secondary processes" of learning and development, which end in cortical cognitive systems as "tertiary processes" (Panksepp, 1998; Panksepp & Biven, 2012).

Despite enormous progress in understanding the neuroscientific elements that underpin the basic emotions, far less attention has been paid to individual differences in these emotions. This is, potentially, a critically important issue, given that variation in basic emotions may well underpin the central topic of individual differences and gender differences in personality (Montag & Panksepp, 2017). The Affective Neuroscience Personality Scales (ANPS) enable investigation of this topic, as a psychometric tool for measuring the basic emotions.

The Affective Neuroscience Personality Scales

Panksepp, the father of Affective Neuroscience, dedicated his life to demonstrating that the foundations of mental life and consciousness lie in the archaic layers of the brain (Panksepp, 1998; 2000, Panksepp and Solms, 2012). Viewed in this way, personality develops from the strengths and weaknesses found in the basic affective systems, which are initially regulated by the caregiver-infant attachment style, and other early (and to some extent later) environmental experiences (Davis et al., 2003; Davis & Panksepp, 2018; Panksepp and Watt, 2011). Based on this bottom-up neurodevelopmental approach, the ANPS was constructed in 2003 (Davis et al., 2003).

The ANPS seeks to measure the subcortical affective systems, which form the foundation of core feelings. This stands in contrast to previous approaches to personality, most notably the "Five Factor Personality" model (Costa and McCrae, 1992). This influential approach, with antecedents widely used in the twentieth century, lacked a strong evolutionary and neurodevelopmental basis, and is instead built by a lexical approach, based on factor analysis of large samples of questionairre data. The Five Factors are based on a top-down approach, focusing mostly on cognitions, behaviors and executive control over emotions. In contrast, the ANPS aims to measure the universally-shared subcortical affective systems on which personality is built, with categories of question based on a set of neurobiologically derived forms of 'natural kinds', shared by non-linguistic mammal species. This produces a 'bottom-up' approach, mapped on to the subcortical affective roots of personality, shaped by the caregiver-child interactions that predate language development (Panksepp, 1998).

The ANPS measures six basic affective systems (always written in uppercase in the affective neuroscience literature): CARE, PLAY, SEEKING, FEAR, SADNESS, and ANGER (Davis et al., 2003). For the three positive affects: CARE is defined as nurturing, feeling soft-hearted toward animals and people in need, feeling empathy, and feeling affection for and liking to care for others; PLAY is described as having fun, playing games involving

physical contact, humor, laughter, and being generally happy and joyful; SEEKING is defined as feeling curious, feeling like exploring, and striving for solutions to problems (Davis et al., 2003).

For the three negative affects: SADNESS monitors feeling lonely, crying frequently, thinking about loved ones and past relationships, and feeling distressed when not with loved ones, FEAR reflects the tendency for feeling anxious and tense, worrying, struggling with decisions, ruminating about past decisions, losing sleep, and not typically being courageous, and ANGER for feeling hotheaded, being easily irritated and frustrated, expressing anger verbally/physically, and remaining angry for long periods (Davis et al., 2003).

The ANPS original version, which was comprised of 110 items, has been revised slightly as ANPS 2.4, with 112 items (Davis & Panksepp, 2011) and these two forms are referred as the "long versions". The ANPS has been also abbreviated as the Brief ANPS (BANPS) (Barret et al, 2013) and ANPS-S (Pingault et al., 2012), which are named as the "short versions". Orri et al. (2016) has studied the longitudinal invariance and gender measurement invariance for ANPS 2.4 and BANPS. Their results showed that both versions have full longitudinal invariance, suggesting that ANPS measures personality traits that have long-term stability. The findings also showed partial scalar gender invariance for BANPS, and full scalar gender invariance for ANPS 2.4, demonstrating that males and females have a similar understanding of the items. Therefore, a statistically significant difference in the mean scores of males and females can be trusted to reveal real gender differences (Orri et al. 2016).

Comparing the results of the three versions (ANPS 2.4, ANPS-S, BANPS) applied to the same clinical sample, Geir et al. (2014), found that especially the BANPS did not systematically cover the full theoretical content of the long scales, for CARE and SADNESS. Finally, studies that used the ANPS in clinical populations with dysthymia, anxiety, borderline personality disorder, bipolar disorders, and with adult Autism spectrum conditions

(Savitz, Van der Merwe, & Ramesar, 2008a; J. Savitz, Van Der Merwe, & Ramesar, 2008b; Geier et al., 2014; Carré et al., 2015) also suggested meaningful links between certain subcortical affective systems measured by the ANPS and the specific characteristics of the clinical sample under investigation. These studies also demonstrate the clinical reliability of the ANPS.

Thus far, the ANPS has been translated into several languages: (in order of publication) Spanish, French, Turkish, Norvegian, Italian, Polish, Portuguese, Persian, Japanese, Chinese, German, Brazilian Portuguese, Serbian, Russian (Pahlavan et al., 2008; Abella et al., 2011; Pingault et al., 2012; Özkarar- Gradwohl et al., 2014; Geier et al., 2014; Pascazio et al., 2015; Cwojdzińska & Rybakowski, 2015; De Almeida, 2016; Amiri & Azad-Marzabadi, 2017; Narita et al., 2017; Sinderman et al., 2018; Reuter et al., 2017; Gurfinkel et al., 2018; Montag et al., 2019; Volf & Privodnova, personal communication) and has been also standardized for the Hong Kong and Canadian populations (Yu et al., 2016; Orri et al., 2016). All these ANPS standardization studies confirmed the main general findings of the original ANPS study, (Davis et al, 2003) and demonstrated that ANPS is a reliable and a valid tool.

Comparative ANPS studies have been also carried out to observe the influence of rural/urban settings and independent/interdependent cultures on basic affective systems. Sindermann et al. (2017) initiated the discussion that the rural life and the urban life might have different influences on the shaping of basic affective systems, measured by the ANPS. Cultures with varying levels of independent/interdependent self construals were also shown to influence the ANPS findings differently (Özkarar-Gradwohl et al., 2014; Özkarar-Gradwohl et al., 2018). These studies demonstrate that the regulation of basic affects can vary based on environmental settings and cultural norms.

Gender effects and the Big Five Factors

Thus far, the literature on gender effects on personality focuses mostly on the Big Five personality factors. These studies have the advantage of large sample sizes, but have (as described above) a poor mapping onto evolutionary subcortical affective systems. Notably, the factor analysis basis of the lexically driven Big Five opens the approach to variation based on cultural differences. Especially, the findings that are linked to West-East stereotyping (with Westerners scoring higher on Big Five factors, except Aggreableness) leads to debate regarding the probable low cultural immunity of the approach (McCrae, 2002; Schmitt et al., 2008; Gurven et al., 2013; Özkarar-Gradwohl, 2019).

Big Five cross-cultural meta-analysis points to three major findings. Firstly, females generally have significantly higher levels of Neuroticism (49/55 nations) and Agreeableness (34/55 nations) across most (but not all) nations. In addition, females had significantly higher levels of Extraversion (25/55 nations) and Conscientiousness (23/55 nations) in almost half of the countries (Schmitt et al, 2008). Gender differences in Openness to Experience were more mixed. Generally men scored higher than women in Openness to Experience (37/55 cultures, but only in 8 cultures was this difference statistically significant). In some cultures women's Openness to Experience was higher than men's (18/55 cultures, but only in 4 cultures was this difference statistically significant). Secondly, the national differences in males' scores seemed to be the primary contributor to gender differences in Big Five personality traits across cultures (Schmitt et al, 2008). Thirdly, the gender differences in Big Five personality traits have often been found to be larger in North America, South America, Europe, but narrower in Africa and South/Southeast Asia (Costa et al., 2001; McCrae, 2002; Schmitt et al., 2008). Schmitt et al. (2008) concluded that gender differences on the Big Five appear to diminish as one moves from Western to non-Western cultures.

The relationship between the Big Five and the ANPS subscales has been investigated in almost all ANPS standardization studies (Pahlavan et al., 2008; Abella et al., 2011;

Pingault et al., 2012; Özkarar-Gradwohl et al., 2014; Montag et al., 2016a,b; Montag and Davis, 2018). Marengo et al. (in preparation) carried out a meta-analysis on these findings, which showed moderate to strong positive correlations between Aggreeableness and high CARE / low ANGER, Neuroticism and SADNESS/ FEAR/ ANGER, Extraversion and PLAY/ SEEKING and finally Openness to Experience and SEEKING. These positive correlations probably point to the subcortical affective roots of the behaviors, cognitions, control over emotions measured by the Big Five factors. They also suggest probable gender effects that can be expected in the ANPS literature. As the most widespread gender effect for the Big Five is higher Agreeableness and Neuroticism in females, higher CARE and negative emotions in females might be also expected for the ANPS.

Regarding the cultural influences of gender effects on personality, Schmitt et al. state that "evolutionary psychologists do not expect evolved gender differences in personality to take precisely the same form and size across all cultures. Indeed, they expect human personality to be highly sensitive to ontogenetic and socioecological contexts, which may affect men's and women's personalities very differently" (2017). With a similar concern about gender effecst on emotions, Chaplin (2015) notes that the gender effect findings on emotions are derived primarily from studies in North America or North Western Europe, and she suggests that these gender effects should be investigated across a wider range of cultures.

Notably, the ANPS literature has a strength in this regard, because it reports the gender effect on personality and emotions, with studies distributed across a wide range of nations. However, no systematic review of all those gender effect findings on the ANPS has yet been conducted. The present review aims to survey the gender effects in all existing ANPS studies, in order to clarify the gender findings in basic emotions, as well as investigating any geographical variability.

5.2   Review Method

In order to review the gender effects in cross-cultural affective neuroscience, a literature search was conducted to find all the available published papers that utilized the ANPS, until May 2020. Initially, all papers that employed the ANPS were identified using the keyword "affective neuroscience personality scale/s". Secondly, these articles were checked to establish the tabulated sample sizes, ANPS means and standard deviations for males and females. 11 studies had tabulated this information, and were included in the review directly. 9 papers did not tabulate their results separately for gender, therefore the corresponding author was contacted in order to ask for the tables regarding gender differences. 5 did not reply and 1 no longer had access to the data. The remaining 3 provided the requested data and these were added to the sample (Portugal, Serbia, Hong Kong). One final paper (from Russia) is in preparation and the data were requested from the authors via personal communication. Finally, if more than one paper was published in a country, the choice of the article for that country was made in the favor of the paper which first presented a gender differences table. Also, in order to standardize the scalar gender invariance and content validity, the papers that utilized the longer versions (ANPS original and ANPS 2.4) were preferred rather than the shorter versions (ANPS-S and BANPS). When an overlap between samples was found in two articles, the earliest study was selected. Using this approach, only one paper from each country was included in our review, and multiple appearances of any nation in the Table was avoided.

At the end of this stepwise approach, 15 studies from 15 countries were included in our review Table, which is organized vertically from West to East (Canada to Japan). Emotions are presented horizontally, from the largest to the smallest effect size (CARE to ANGER). The Table summarizes the references, versions, sample sizes, age means, ANPS means and standard deviations, for each gender, together with t-test or ANOVA results and p values (see Table 1). We considered presenting this as a figure, but this is not appropriate for

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several reasons: three different ANPS versions have been used (see below for details); different Likert scales and calculations have been used in some countries (again see below for details); and for some studies (See Table 1 footnotes) there are limited data for non significant findings.

The total sample size was precisely N=6500, ranging from 81 (Cwojdzińska & Rybakowski, 2015) to 830 (Pingault et al. 2012). The total sample was composed of 37.5 % males (N=2440) and 62.5 % females (N=4060). The mean age of the samples ranged from 19.3 (Yu et al., 2016) to 39.8 (Volf & Privodnova, personal communication), with an average age of 25.7 for the total sample. Included studies were from North America (n=2; Canada & U.S.A.), Europe (n=9; Spain, Portugal, France, Italy, Germany, Norway, Poland, Serbia, Russia), and Asia (n=4; Turkey, Hong Kong, China, Japan). Among these studies, 7 used the original ANPS version (Davis et al., 2003), 7 used the ANPS 2.4 version (Davis & Panksepp, 2011), and the ANPS-S was used only once (Pingault et al., 2012). The vast majority of samples were recruited among the general population (n = 14), while only one sample was from a clinical population (Geier et al., 2014).

Importantly, different studies employed a range of Likert scales (from 0-3 to 1-6). We report the scores as recorded in the original papers. In all countries, subscale scores were calculated using the same technique for the ANPS original and the ANPS 2.4, based on 14 items for each subscale (7 normal and 7 reversed items). The resulting scores ranged between 15-31 for the studies who used the 0-3 Likert scale, and from 34-44 for those who used the 1-4 Likert scale. In Portugal, the ANPS-S was used, based on a 1-6 Likert scale, and the average subscale scores were calculated from 6 items for each subscale (ranging from 2.74 to 4.71). These variations in scoring methods make it inappropriate to compare the means between all countries, but have no effect on the statistical magnitude of the gender differences.

Table 1 Gender Effect on Affective Neuroscience Personality Scales Across Countries

Country / Reference	Sample Size M	F	Age Mean (SD)	CARE M	F	t/F, p	SADNESS M	F	t/F, p	FEAR M	F	t/F, p	PLAY M	F	t/F, p	SEEK M	F	t/F, p	ANGER M	F	t/F, p
CANADA* (1) Orri et al. (2016)	222	287	36.5 (5.8)	25.06 (5.65)	28.36 (5.28)	l.d. p<.001	16.82 (5.4)	20.3 (5.57)	l.d. p<.001	17.26 (6.62)	20.78 (7.06)	l.d. p<.001	28.02 (5.88)	26.88 (5.64)	l.d. p<.05	27.83 (5.19)	27.96 (4.98)	l.d. n.s.	15.21 (6.1)	16.49 (6.02)	l.d. p<.05
U.S.A Davis et al. (2003)	50	121	20.00 (3,5)	26.62 (.73)	31.07 (.46)	-5.23 P<.001	20.86 (.74)	22.94 (.43)	-2.54 P<.05	24.28 (.90)	25.64 (.58)	l.d. n.s.	28.68 (.66)	29.50 (.42)	l.d. n.s.	27.68 (.68)	26.31 (.35)	1.95 P<.1	23.96 (1.02)	23.80 (0.58)	l.d. n.s.
PORTUGAL (2)** De Almeida (2016)	153	289	32.4 (13.12)	4.23 (0.93)	4.53 (1.02)	6.24 P<.05	2.83 (1.07)	2.98 (1.15)	1.73 n.s.	3.28 (1.11)	3.70 (1.17)	13.34 P<.0001	4.71 (.78)	4.48 (.93)	6.54 P<.05	4.53 (.79)	4.63 (.84)	1.45 n.s.	2.74 (1.06)	3.21 (1.15)	18.22 P<.0001
SPAIN* Abella et al. (2011)	181	221	22.6 (3.43)	38.45 (5.07)	41.69 (5.41)	-6.14 P<.001	35.39 (4.40)	38.29 (5.14)	-5.98 P<.001	36.13 (4.04)	39.04 (4.92)	-6.36 P<.001	41.23 (5.64)	41.66 (5.40)	-.78 n.s.	39.02 (4.42)	40.41 (4.92)	-2.96 P<.005	34.35 (4.59)	34.86 (5.46)	-.99 n.s.
FRANCE Pingault et al. (2011)	375	455	20.6 (2.1)	24.51 (5.80)	27.61 (5.99)	l.d. P<.001	19.91 (6.14)	23.86 (5.85)	l.d. P<.001	20.81 (7.29)	24.97 (7.02)	l.d. P<.001	30.04 (5.46)	28.86 (5.75)	l.d. p<.01	27.27 (5.29)	27.47 (4.42)	l.d. n.s.	19.45 (7.19)	19.91 (7.37)	l.d. n.s.
ITALY* Giacolini et al. (2017)	219	406	28.92 (15.56)	27.59 (5.18)	30.85 (4.76)	-7.94 p<.001	22.57 (5.52)	26.25 (5.34)	-8.13 p<.001	23.67 (5.86)	27.45 (6.03)	-7.55 p<.001	27.72 (5.70)	26.68 (5.43)	2.24 p<.05	27.77 (5.44)	27.66 (4.95)	l.d. n.s.	22.01 (6.61)	21.65 (6.57)	l.d. n.s.
GERMANY* Sindermann et al. (2018)	93	159	21.67 (2.49)	39.08 (5.10)	43.10 (5.67)	-5.64 P<.001	32.87 (4.85)	35.52 (5.20)	-3.97 P<.001	35.26 (6.45)	37.83 (5.91)	-3.22 P=.001	43.31 (5.12)	42.68 (5.45)	l.d. n.s.	39.90 (4.21)	39.61 (4.43)	l.d. n.s.	35.59 (6.27)	36.87 (7.08)	l.d. n.s.
NORWAY (3) Geier et al., (2014)	124	422	32 (8)	24.56 (5.77)	28.86 (5.52)	l.d. P<.001	26.89 (5.63)	30.01 (5.50)	l.d. P<.001	27.56 (6.34)	29.63 (6.58)	l.d. P<.01	21.74 (7.28)	22.63 (6.55)	l.d. n.s.	21.64 (5.75)	21.43 (6.70)	l.d. n.s.	22.21 (7.56)	23.29 (7.86)	l.d. n.s.
POLAND* Cwojdzińska & Rybakowski (2015)	39	42	28.37 (8.46)	22.18 (4.98)	27.12 (4.61)	4.61 P<.001	18.46 (4.56)	23.61 (4.48)	5.10 P<.001	19.41 (6.18)	24.20 (6.36)	3.41 P=.001	l.d.	l.d.	l.d n.s..	l.d.	l.d.	l.d. n.s.	l.d.	l.d.	l.d. n.s.
SERBIA Montag et al. (2019)	57	283	20.94 (2.76)	26.19 (7.20)	29.43 (5.84)	l.d. p<.001	22.47 (6.07)	25.47 (6.58)	l.d. p<.005	23.19 (9.50)	24.22 (8.88)	l.d. n.s.	26.11 (7.78)	25.72 (6.56)	l.d. n.s.	29.67 (7.02)	28.73 (5.55)	l.d. n.s.	19.16 (7.46)	19.57 (7.64)	l.d. n.s.
TURKEY (4) Özkarar-Gradwohl et al. (2014)	212	433	21.66 (1.6)	25.32 (4.93)	28.16 (5.32)	6.53 P<.001	20.39 (4.47)	21.25 (4.33)	2.35 P<.05	22.87 (4.97)	23.34 (5.18)	l.d. n.s.	24.00 (5.54)	24.93 (4.48)	2.35 P<.05	25.21 (4.65)	24.81 (4.06)	l.d. n.s.	25.44 (5.97)	25.43 (5.51)	l.d. n.s.
RUSSIA Volf & Privodnova (in preparation)	177	207	39,80 (20.86)	38.10 (4.97)	41.18 (5.99)	-5.44 P<.0001	33.10 (5.20)	37.23 (5.22)	-7.75 P<.0001	34.27 (5.03)	38.01 (5.41)	-6.97 P<.0001	38.20 (5.69)	37.55 (5.65)	1.12 n.s.	39.25 (5.15)	39.72 (5.14)	-0.89 n.s.	33.18 (5.11)	33.66 (5.34)	-0.91 n.s.
CHINA* Sindermann et al. (2018)	93	159	21.67 (2.49)	38.30 (4.94)	38.21 (4.12)	l.d. n.s.	34.85 (4.64)	37.33 (4.24)	-4.32 P<.001	35.86 (4.02)	36.37 (4.67)	l.d. n.s.	38.73 (4.20)	37.56 (4.02)	2.20 P<.05	39.39 (3.76)	38.52 (3.95)	l.d. n.s.	35.69 (4.69)	36.31 (5.29)	l.d. n.s.
HONG KONG Yu et al. (2016)	225	443	19.27 (1.04)	41.81 (5.01)	43.77 (4.57)	-5.07 P<.001	33.13 (4.82)	33.44 (4.33)	-.857 n.s.	35.41 (6.15)	35.74 (5.38)	-.712 n.s.	41.33 (5.43)	42.24 (4.36)	-2.32 P<.05	40.80 (3.93)	40.82 (3.74)	-.091 n.s.	28.71 (5.60)	29.05 (5.19)	-.80 n.s.
JAPAN* Özkarar-Gradwohl et al. (2018)	209	144	19.47 (2.07)	26.53 (5.6)	24.56 (5.46)	-3.28 p=.001	24.84 (6.44)	22.20 (7.28)	-3.596 p.001	29.41 (6.58)	27.71 (7.0)	-2.351 p< .05	23.98 (6.16)	24.47 (5.74)	.76 n.s.	25.90 (5.88)	26.10 (5.60)	.31. n.s.	19.89 (7.14)	19.19 (7.70)	-.88 n.s.

Abbreviations: M stands for Males, F for Females, t/F for t-values and F values, SD for standard deviation, l.d. for limited data, n.s. for not significant.. (*) indicates the usage of the ANPS 2.4 version (Davis & Panksepp, 2011), (**) indicates the usage of ANPS-S version (Pingault et al., 2012), while the rest had the usage of original ANPS (Davis et al., 2003). **Notes: (1)** Canadian study applied ANPS 2.4 and BANPS to the same sample in different time intervals. Only the findings from the ANPS 2.4 at the 1st time interval have been added to this table. **(2)** Portuguese study revised the 1-4 Likert scale of ANPS-S into 1-6 Likert scale. **(3)** Norwegian study applied ANPS original, ANPS 2.4, and Brief ANPS (BANPS) to the same sample. Only the findings from ANPS original have been added to this table. **(4)** Turkish study included both student sample and adult sample, only the student sample, but not the adult sample, has been added to this table.

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5.3 Results

For CARE and SADNESS there were highly significant gender effects for most of the countries, all favouring higher scores for females. In 13 countries, females scored significantly higher than males on CARE (ranging from $p < .001$ to $p < .0001$, except Portugal with $p < .05$). The exceptions were Japan (significant in the direction of males) and China (no significant effect). In 12 countries females scored significantly higher on SADNESS (ranging from $p < .05$ to $p < .0001$). Exceptions were again Japan (significant in the direction of males), and Hong Kong (no significant effect). For FEAR, in 9 countries out of 15, females scored significantly higher (ranging from $p < .05$ to $p < .0001$). Yet again the exception was Japan (significant in the direction of males), and also Turkey, Hong Kong, China and Serbia (no significant effect).

Gender effects for PLAY were small in size and more mixed between genders. There were significantly higher PLAY scores in males in five countries, namely Portugal, France, Canada, Italy and China (ranging from $p < .01$ to $p < .05$). There were significantly higher scores for females in two countries, namely Turkey and Hong Kong (both $p < .05$) and no significant effect in seven countries. Finally, most countries did not show a significant gender effect on SEEKing and ANGER. 13 out of 15 countries showed no significant gender effect on SEEKing. Only exceptions were males scoring significantly higher in U.S. ($p < .1$) and females scoring significantly higher in Spain ($p < .005$). 13 out of 15 countries showed no significant gender effect on ANGER, with Canada and Portugal being the only exception where females scored significantly higher than males ($p < .05$ and $p < .0001$).

A second way of analysing the data is through the lens of geographic and cultural diversity. When the total number of significant results, across all emotions (n=48), were analyzed by continental groups, there is a broad trend of the number of significant results decreasing when moving from 'West' to 'East'. North America had the highest ratio of

significant gender effects (8 significant differences across 2 countries: Ratio 4). Europe had the second highest ratio of significant results (30 significant differences/9 countries: Ratio 3.3). Asia showed the lowest ratio of significant gender effects (10 significant differences/4 countries: Ratio 2.5).

There were three notable differences between the notionally 'Western' and 'Eastern' samples. Firstly; the gender effects in North America and Europe seemed more homogeneous, with a shared gender effect: where females had higher CARE, SADNESS and FEAR scores in almost all countries. In contrast, the gender effects in Asia were more heterogeneous, and there was no clear within-continent gender effect. Secondly; the clearest difference across continents was the absence of higher FEAR in females in Asia. Out of 10 total significant differences in FEAR, 9 were from North America and Europe, where females scored significantly higher than their male counterparts. In Asia, the only significant difference in FEAR was in Japan, but in the 'male-higher' direction. In short, the trend, from East to West, was for females to have higher FEAR than their male counterparts. Thirdly, out of 7 significant differences in PLAY, 4 out of 10 Western countries showed higher PLAY in the male direction, while 2 out of 4 Eastern countries showed higher PLAY in the female direction (with the exception of China having higher PLAY in males).

5.4   Discussion

The results of this literature review showed that the gender differences on the ANPS were variable for different classes of basic emotions. Our findings included some emotions on which females scored universally higher, some emotions that showed variability based on geography, and some emotions that showed virtually no gender effect.

Virtually Universal Gender Effects

Regarding the first class of emotions, the results showed the most widespread gender effects for CARE and SADNESS. Here females showed significantly higher scores compared

to their male counterparts in almost all countries. In other words, females of almost all nations reported scores suggesting higher levels of caring, nurturing and empathy. On average, they feel more distressed and lonely when separated from their loved ones, in comparison to males. This common gender effect points to a greater female 'resonance' with items linked to attachment (CARE) and separation distress (SADNESS).

This is also consistent with the affective neuroscience literature suggesting that female mammals show more behaviors linked to attachment and separation distress, and greater activation in the anterior cingulate gyrus (Panksepp, 1998; 2012). Higher levels of the attachment neuropeptide oxytocin, and lower rates of serotonin synthesis found in females seem to function as some of the neurobiological mechanisms underlying these higher CARE and SADNESS scores (Nishizawa et al., 1997; Panksepp, 1998, 2012). These findings are also in line with the widely accepted gender identity formation theory (Chodorow, 1994; Hartwell et al., 1992; Kağıtçıbaşı, 2005) that women build their identities on relatedness, and men on separateness. On the other hand, the absence of higher CARE and SADNESS scores in the females of China and Japan needs to be investigated further, to see whether the collectivistic culture effect, that reinforces relatedness and discourages separateness (Kağıtçıbaşı, 2005; 2007), may influence this virtually 'universal' gender effect (Özkarar-Gradwohl, 2019).

Finally, this almost universal gender effect on the ANPS, of higher CARE and SADNESS scores in females, corresponds to the most widespread gender effect on the Big Five, manifested in higher Agreeableness and Neuroticism scores in females (Schmitt et al., 2008). The Big Five and ANPS correlations show that Agreeableness is positively correlated with CARE, and Neuroticism with the negative basic affects measured by the ANPS (Montag & Davis, 2018; Marengo et al., in preparation). These correlations indicate that the Big Five

dimensions of Agreeableness and Neuroticism might be subcortically rooted into CARE and SADNESS systems, which seem to be more activated in females internationally.

Geographical Gender Effects

The findings of the present review also produced to a second class of emotions, namely FEAR and PLAY, that showed gender effect variability based on geography. While most females in North America and Europe had higher FEAR scores than their male counterparts (in 9 countries out of 11), the total absence of higher average FEAR scores in Asian females was remarkable. In other words, while on average most Western females seemed to feel more anxious, tense, worried, indecisive and less courageous than their male counterparts, most Asian females and males had similar levels of anxiety. How the collectivistic culture effect (emphasizing relatedness) and individualistic culture effect (emphasizing separateness and autonomy) might regulate the experience of anxiety (FEAR) needs to be explored further.

The well-known cross-cultural finding that the West, despite its higher report of subjective well-being, has a higher prevalance of mood and anxiety disorders compared to the East (De Vaus et al., 2017) has caused several different discussions in the literature. One line of argument suggests that Western individualism causes loneliness, isolation and lower social support, which in turn leads to higher anxiety. An alternative perspective is that Eastern holistic thinking helps people to accept all emotions, including the negative ones, which in turn leads to better coping with anxiety (Chen, 1996; De Vaus et al., 2017). However, neither of these arguments have ever been linked to neurobiological evidence. Current cross-cultural neuroscience supplies the empirical evidence that there is an association between collectivistic cultural values and short allelic frequency of the serotonin transporter polymorphism (Chiao & Blizinsky, 2010), and A allelic frequency of the oxytocin receptor gene polymorphism (Luo & Han, 2014). Thus, the serotonergic and oxytocinergic systems, which are related to anxiety

and mood disorders, appear to be mediated by collectivistic cultural values, resulting in a lower prevalance of mood and anxiety disorders (Chiao & Blizinsky, 2010; Luo & Han, 2014).

Future studies are required to clarify how culture effects, and genetic effects interact to produce these anxiety level differences between East and West. Genomic data suggests that the migration and admixture of populations (starting in Africa 300 000 years ago and moving to Asia, the Middle East, Europe and lastly the Americas some 20 000 years ago) have played a large part in generating cultural and genetic diversity (Nielson et al., 2017). Current studies on immigration also discuss the negative influence of separation anxiety on immigrants (Van Ecke, 2005). How certain geographies are genetically more vulnerable to anxiety might also be related to culture-gene coevolution during the historical migration of people, where different levels of separation anxiety may have been transmitted across generations.

On the other hand, for the PLAY subscale the findings show more complicated variations across different nations. While 4 out of 10 Western countries showed significantly higher PLAY scores in the male direction, 2 out of 4 Eastern countries showed significantly higher PLAYscores in the female direction. Although this might be discussed as a modest trend for higher PLAYscores in Western males, in contrast to higher PLAYscores in Eastern females, evidence based on these sample sizes are not sufficient for such generalizations. The higher PLAY scores in Chinese males also contradicts such an overgeneralized trend. Therefore, it can be only said that cultures vary in terms of which gender is more 'playful' and that the underlying reasons need to be analyzed further.

Another way of analyzing this cross-cultural variation on the gender effect for PLAY is to observe how PLAY is connected to other basic emotions in different cultures. In other words, which other emotions co-exist with playful experiences, like being generally happy, joyful and humorous, having fun, laughing, and playing games involving physical contact.

Although gender specific intercorrelations are mostly unavailable in the literature, the intercorrelations of the ANPS subscales with total samples can provide us with a general picture. It has been repeatedly shown that PLAY is positively correlated with the other two positive emotions, namely CARE and SEEKing in most countries, such as (in order of publication) U.S.A, Spain, France, Turkey, Portugal, Italy, Japan, Iran, Serbia, Austria (Davis et al., 2003; Abella, 2011; Pingault et al., 2012; Özkarar-Gradwohl et al., 2014; De Almeida, 2016; Giacolini, 2017; Narita et al., 2017; Amiri, 2017; Hiebler-Ragger, 2018; Montag et al. 2019). Therefore, for almost all cultures, playfulness is a social interaction style with the ones whom we CARE and SEEK for, and we feel happier and more joyful when surrounded by them.

In contrast, the intercorrelations of PLAY with *negative* emotions show more variance across countries. These intercorrelations vary between a negative correlation with all three negative emotions, namely SADNESS, FEAR and ANGER (in Portugal), negative correlation with only SADNESS and FEAR (e.g. France, Norway, Turkey, Italy, Japan, Serbia), no correlation at all with negative emotions (e.g. in U.S.A.), and positive correlation with FEAR (e.g. in Spain, Iran, Austria). These findings suggest that in different cultures, a different set of negative emotion/s may lead us to withdraw from or engage in being playful with those close to us. Only in the U.S.A. does feeling playful and joyful seem to be disconnected from the presence of negative emotions. However, again, more detailed investigations, with larger sample sizes and gender specific intercorrelations, are required to clarify the influences of culture and of gender on the PLAY system.

Virtually Universal Gender Similarities

In the final class, there were two basic emotions for which there were no notable gender effects, namely SEEKING and ANGER. In relation to SEEKING, there was almost no significant gender effect, with only one example from the U.S.A., where males had slightly

higher SEEKING scores, and one example from Spain where females had higher SEEKING scores. Besides these two, 13 out of 15 countries showed a gender equivalence in terms of SEEKING. Females and males did not differ from each other in terms of their levels of feeling curious, enjoying exploration and striving for solutions to problems etc.

Panksepp describes the SEEKING system as a passageway from homeostasis to emotion: whatever a mammalian needs in order to restore its homeostasis (e.g. food, water, safety, play, care, lust, information etc.), it turns its attention to the outer world and seeks for this need (Panksepp & Watt, 2011; Watt, 2017). This is usually regarded as the most fundemantal of the basic emotions, and gender differences in mammal species are not reported for this system. It is not clear what causes the occasional gender differences in the samples reported above, such as the U.S.A. and Spain. In addition, it must be noted that the literature on the neurobiology of gender differences on SEEKING related dopaminergic system is underexplored. However, there are studies showing that the dopaminergic reward system of females is more sensitive to prosocial (shared) rather than selfish rewards, whereas the opposite is true for males (Soutschek et al., 2017). Therefore, it might be better to explore the gender differences in the styles of SEEKING (socially related style vs autonomous style), rather than the levels of SEEKING scores.

The second observed gender similarity was a surprising finding for ANGER, with no significant gender effect (13/15 countries), except for higher scores for females in Canada and Portugal. How might one explain the paradox of no gender effect in *reported* ANGER, but the higher levels of violent behaviors in males frequently cited in the criminology or the affective neuroscience literature? (Volavka, 1995; Panksepp, 1998, 2012; Solms and Turnbull, 2002). A meta-analysis of sex differences in agression (Archer, 2004) shows no gender difference for verbal aggression, but large gender differences for physical aggression, in the male direction (Archer, 2004). As the ANGER items on the ANPS do not focus on physical agression but on

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the level of *experienced* anger, the absence of a gender effect is actually in line with the general literature on anger.

Males and females can experience similar levels of anger, which appear to result from testesterone derived offensive anger, or oxytocin derived defensive anger (Panksepp, 1998; Bosch et al., 2005). However, violent agressive behavior seems to have a more complicated neural basis. The expression of testosterone receptors in the male brain begins in embryonic life, by the seventh to eighth week of pregnancy. Increasing testosterone levels in the fetus induces anatomical changes, that lead to the sexual differentiation of the male brain, for example in the amygdala (Panksepp, 1998; Solms & Turnbull, 2002). Studies on violent behavior show that the level of violence increases as the level of basal testosterone increases. Lower tryptophan hydroxylase in males, which catalyzes serotonin, is also associated with lower control over impulsive agression (Volavka, 1995). Clearly, it will be interesting to link these neurobiological findings to individual differences in experienced and expressed anger.

Moreover, ANGER seems to function differently to other negative emotions, in terms of its relation to attachment and separation systems. While ANGER typically functions in the service of separation, FEAR and SADNESS function to avoid the separation risk, and for mourning after a separation. Although the most widespread gender effect on the Big Five is higher Neuroticism in females (49/55 countries), and although the correlations between the Big Five and the ANPS indicate a positive correlation between Neuroticism and all negative emotions, ANGER is the negative emotion that correlates *the least* with Neuroticism (Marengo et al., in preparation). Thus, the gender effect results for the ANPS deviate from those of the Big Five in the absence of a gender effect on ANGER. It may be that females and males experience the same levels of ANGER during disputes, that lead to the feeling of separateness. However, (as discussed above) the females suffer more from anxiety and depression in relation to separation relevant situations.

5.5   Conclusion

The question of gender differences in personality has been investigated for many decades, particularly in the Big Five literature, and has produced several reliable findings. The ANPS approach offers the possibility to bridge these findings to neurobiology. Gender effect findings of the present cross-cultural ANPS review are mostly consistent with the gender effect findings of the Big Five literature (Costa et al., 2001; Schmitt et al., 2008, 2017). Firstly, the most universal gender effects are higher CARE, and SADNESS scores in females, which correspond to higher Agreeableness and Neuroticism in females, measured by the Big Five. Higher FEAR scores in females, in Western countries, is also consistent with the higher Neuroticism scores in females.

Secondly, in line with the Big Five literature, a broad trend of gender differences increasing when moving from 'East' to 'West' is also observed in the present ANPS review. For this trend, it had been argued that 'natural' (neurobiologically derived?) personality traits of males and females might be less constrained in gender egalitarian nations, which provide equal access to education and economic wealth (Costa et al., 2001; Schmitt et al., 2017). Neurodevelopmental research demonstrates that self-development is neuropsychologically shaped by the nature-nurture interaction, mostly within the first six years of life, before the start of formal education, or work (Schore, 1994; Solms & Turnbull, 2002). The reasons for the Westward increase in gender differences on personality can be also explored by the help of cultural data, genomic data and/or culture-gene interactions.

We should also be cautious about simple generalizations. The unit of analysis may have to be more precise and better understood than simply nations or geographic regions. For example, Hong Kong, mainland China and Japan are geographically East Asian but differ in many dimensions such as ethnic diversity levels, collectivisim-individualism profiles, belief systems, and history of interaction with Western cultures. These factors may explain the

differences in gender effect findings that exist even between these three East Asian studies. Other factors like generational effects and cultural change over time may also be important variables.

The link between neurobiology and individual differences is entering a phase of enourmous potential. In this context, the ANPS seems to be a promising neurodevelopmental tool, to observe the influence of nature-nurture interactions on personality traits. The present cross-cultural affective neuroscience review is the beginning of the investigation of the interaction of gender effects and culture effects on affective personality profiles. These future studies of personality may focus more on the influence of biological universals, geographical variation caused by biology, and culture.

6.Chapter Six

6.1. A meta-analysis on individual differences in primary emotional systems and Big Five personality traits[1]

6.1.1 Abstract

The Affective Neuroscience Personality Scales (ANPS) were constructed as a self-report assessment to measure individual differences in Panksepp's cross-species primary emotional systems: SEEKING, PLAY, CARE, and FEAR, SADNESS, ANGER. Beginning with the first published work on ANPS in 2003, individual differences on ANPS measures of these six primary emotional systems have been consistently linked to Big Five (B5) personality traits. From a theoretical perspective, these primary emotional systems arising from subcortical regions, shed light on the nature of the B5 traits from an evolutionary perspective, because each of these primary emotional systems represent a tool for survival endowing mammalian species with inherited behavioral programs to react appropriately to complex environments. The present work revisited 21 available samples where both ANPS and B5 measures have been administered. Our meta-analytical analysis provides evidence that high SEEKING relates to high Openness, high PLAY to high Extraversion, high CARE/low ANGER to high Agreeableness, and high FEAR/SADNESS/ANGER to high Neuroticism. This seems to be true regardless of the ANPS inventory chosen, although much more work is needed in this area. Associations between primary emotional systems and Conscientiousness were in the lower effect size across all six primary emotions; supporting the idea that Conscientiousness rather seems to be less directly related with subcortical primary emotions and likely is the most cognitive/cortical personality construct out of the B5. In sum, the present work underlines the idea that individual differences in primary emotional systems represent evolutionarily ancient foundations of human personality, given their a) meaningful links to the prominent B5 model and b) their origins lying in subcortical areas of the human brain.

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[1] Marengo, D., Davis, K. L., Özkarar-Gradwohl, F.G., & Montag, C. (2021). A meta-analysis of associations between individual differences in primary emotional systems as assessed with the Affective Neuroscience Personality Scales and Big Five Personality Traits. *Scientific Reports, 11,* 7453.

6.1.2 Introduction

Personality could be described as relatively stable motivational, emotional, cognitive and behavioral traits of a person impacting on many important life variables ranging from health behavior, longevity, job performance to vulnerability for affective disorders (for an overview see Montag & Elhai, 2019). Of note, defining personality still remains a highly controversial topic, as a recent discussion paper shows (Baumert et al., 2017). Beyond clinical and lexical approaches to study human personality (e.g. Davis & Panksepp, 2018; Hopwood, 2018; McCrae & John, 1992), many theories attempt to explain the biological basis of personality, including Gray's reinforcement sensitivity theory, Cloninger's biosocial theory of personality, or Eysenck's PEN model (Montag et al., 2012).

A relatively new addition to biopsychological-oriented theories of personality has been Panksepp's Affective Neuroscience Theory (Davis et al., 2003; Davis & Panksepp, 2011). By means of many approaches, including electrical brain stimulation, lesion studies and pharmacological challenges, Panksepp carved out seven primary emotional systems, all being homologously conserved across the mammalian brain (Panksepp, 1998). The homologous conservation of such primary emotional systems across different mammalian species speaks for the idea that such systems endow their carriers with evolutionary advantages - each primary emotional system can be seen as a tool for survival. On the positive side of emotions Panksepp mapped the neuroanatomy and biochemistry underlying the primary emotional systems he labeled SEEKING, LUST, CARE, and PLAY, whereas on the negative side ANGER, FEAR and SADNESS have been similarly illuminated by Panksepp's research group. In short, these systems provide evolutionary advantages, as they endow mammals with energy to seek for food or a partner (SEEKING), reproduce and transfer one's own genome (LUST), secure the upbringing of their offspring (CARE) and a system for learning social competencies and motoric skills (PLAY). The negative primary emotional systems help to

bring mammals out of the danger zone with a fight system to guard significant resources including one's own offspring (RAGE/ANGER, a flight/freezing program to cope with physical dangers (FEAR), and maintain protective social contact and avoid separation from caregivers and loved ones resulting in separation distress (SADNESS). For readers interested in the brain structures and neurotransmitter/neuropeptides underlying these primary-process emotional action systems we refer to Panksepp's seminal work called Affective Neuroscience (Panksepp, 1998) or to a more recent summary (Montag & Panksepp, 2016). Also, a detailed introduction into principles of Pankseppian Affective Neuroscience is beyond this brief article, and the interested reader could find an overview in (Davis & Montag, 2019).

Based on the Affective Neuroscience Theory (Davis et al., 2003), the *Affective Neuroscience Personality Scales* (ANPS) assess six of the seven primary emotional systems via self-report, namely SEEKING, ANGER, FEAR, CARE, SADNESS and PLAY. LUST has not been included in the ANPS self-report inventory, given the chance that filling in items on one's own sexuality could elicit socially desirable answers with a negative spill-over effect on the answers given on the remaining items of the questionnaire.

Accepting the limitations that subcortically-based primary emotions are pre-propositional and that a language-based assessment must necessarily operate in a more tertiary cerebral space, when writing the ANPS items the goal was to ask questions that addressed personal emotional feeling and their behavior elaborations as directly as possible (Davis et al., 2003). In contrast to most personality assessments, items were avoided that required making more cognitive judgments such as "I prefer spending time at a popular beach to an isolated nature reserve" or social comparisons such as "I am more energetic than other people." More "projective" items such as "I believe that ..." were also avoided. The intention was to position people in affective space.

The ANPS illustrates that Pankseppian primary emotional systems do not operate at same strength level in all mammals (including sapiens). Instead, although these primary emotional systems operate in all mammals, they do this to varying energy levels. Montag & Panksepp (2017, p. 10) discuss in detail the evolutionary advantage, from a species perspective, of the fluctuation selection concept. They summed up: "The term fluctuation selection (see also Nettle, 2009, p. 64) illustrates that not always is the same trait associated with higher survival, but rather that the trait that is best adapted varies with environmental changes." Hence, it is good from a species perspective to always have a reservoir of different operating primary emotional systems in the genomic pool, as some of one's own species will likely be able to adapt to unforeseen changes in the environment.

In the original work by Davis and colleagues (2003), the ANPS was validated against a reduced set of Goldberg's Big Five personality markers, which measured Extraversion, Agreeableness, Conscientiousness, Emotional Stability (opposite of Neuroticism), and Openness to Experience. The Big Five were seen to represent a theory-free and widely accepted approach to personality assessment. Further, it was hypothesized that studying the lexically derived Big Five personality traits in relation to the Affective Neuroscience Theory, could shed light on evolutionary aspects of the Big Five, namely, which evolutionary ancient brain systems are linked to the Big Five. It could be observed in this early work that SEEKING and Openness to Experience were strongly positively related and the same was true for PLAY and Extraversion. Beyond that, high CARE and low ANGER have been robustly linked to higher Agreeableness, while lower FEAR/ANGER/SADNESS have been linked to higher Emotional Stability. Subsequently, similar observations also have been observed in German, Chinese, French, Italian, Spanish, Turkish and Serbian samples (Montag & Panksepp, 2017; Abella et al., 2011; Giacolini et al., 2017; Montag et al., 2019; Özkarar-Gradwohl et al., 2014; Pahlavan et al., 2008).

To sum up our points so far: Primary-process emotional systems are phylogenetically ancient brain systems that arise from subcortical brain regions. In contrast, the Big Five factors have been derived from the statistical analysis of language. This lexical approach speaks in general for a more cerebrally-oriented approach to understanding personality. Viewing the relationship between the ANPS and Big Five scales from an evolutionary brain development framework could begin the process of understanding individual differences in Panksepp's primary emotional action systems as bottom-up neurobiological underpinnings of the Big Five personality traits (for a more extensive discussion, see (Davis & Panksepp, 2018), and more recently, Montag & Davis, 2020).

We acknowledge that the present meta-analysis provides only correlational evidence for this hypothesis. However, additional supportive evidence comes from clinical research–especially for the SADNESS scale as perhaps the most clinically relevant of the ANPS scales. Consistent with affective neuroscience predictions (Panksepp & Watt, 2011), Montag and colleagues (2017) reported that in a group of 55 clinical inpatients being treated for depression the strongest correlation between the Beck Depression Inventory-II and the ANPS scales was with the SADNESS scale (r=.53, p<.001). This finding that the ANPS SADNESS scale was most strongly related to depression was replicated by Fuchshuber and colleagues (2019) who applied path analysis to a large sample (n=616 including 147 diagnosed with depression) showing that depressive symptoms as measured by the Brief Symptom Inventory were again most strongly predicted by the ANPS SADNESS scale (beta=.52).

Further evidence that ANPS scales are associated with biologically-based psychopathology comes from a pair of studies on bipolar disorder. Savitz and colleaguesl (2008a; 2008b) studied 300 individuals from 47 families including five subgroups: 58 Bipolar I cases, 27 Bipolar II cases, 58 with recurring major depression, 45 with a single depressive episode, and 88 unaffected family members). As expected, in the first study (Savitz et al.,

2008a), they found that Bipolar I diagnosed individuals scored the highest on the ANPS SADNESS scale and significantly higher than unaffected relatives. In the second study with four cases dropping out (Savitz et al., 2008b), Bipolar II diagnosed individuals predictably scored highest on the ANPS ANGER scale and significantly higher than unaffected relatives. In both studies, ANPS SADNESS and ANGER score decreases in each of the family subgroups were consistent with their pathological severity. Lastly, the SADNESS scale has also been anatomically linked to the amygdala resting state activity in a functional connectivity analysis (Deris et al., 2017), which is consistent with affective neuroscience theory (Panksepp, 1998, pp. 267-268).

The evidence linking the ANPS to Panksepp's primary emotions and explicitly showing how the activity of these primary emotional systems function as a bottom up subcortical foundation of the Big Five personality traits are in early stages. However, we believe these hypotheses to be highly relevant to an understanding of the biological basis of personality and offer this ANPS-Big Five meta-analysis as a valuable step in that direction.

Since the initial publication of the ANPS in 2003, many studies have investigated the ANPS in the context of different Big Five versions (e.g. NEO-FFI, NEO-PI-R, BFI or TSDI). Moreover, different versions of the ANPS have been administered in these Big Five-ANPS works, namely, the 2003 original ANPS version and the ANPS 2.4 (Davis & Panksepp, 2011). Beyond that, several short forms exist: B-ANPS or ANPS-S. Recently, a short adjective based ANPS-AR has been published (Montag & Davis, 2018). Please also note that the ANPS is available in many languages, including Spanish, French, German, Turkish, Norwegian, Italian, Polish, Portuguese, Brazilian Portuguese, Chinese, Japanese, Serbian, Persian and soon to be in Hungarian and Dutch. This all said, the present study aims to investigate the overall strength between ANPS-Big Five associations by conducting a meta-analysis on the available data stemming from studies conducted all over the world.

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Additionally, we explore the use of different assessments of Big Five personality traits as a source of heterogeneity in reported associations, focusing in particular on potential differences between studies using the NEO Inventories vs. alternative operationalizations of the Big Five model.

From the literature review, we expected that high SEEKING is associated with high Openness to Experience, high PLAY with high Extraversion, low ANGER and high CARE with high Agreeableness and high FEAR, SADNESS and ANGER with high Neuroticism. From correlation strength we expect ANGER to be less strongly associated with Neuroticism than the FEAR/SADNESS associations. Regarding SEEKING in the literature, associations with Extraversion turned out to be more heterogenous, but we nevertheless expected a positive association. Finally associations with Conscientiousness and primary emotions should be in the lower area due to Conscientiousness being the most cerebrally-focused personality dimension out of the Big Five personality measures.

6.2 Method

6.2.1 Literature Search

In order to identify papers investigating the association between ANPS and Big Five personality traits, we followed PRISMA guidelines (Moher et al., 2015) and implemented a study selection strategy based on predetermined eligibility criteria and involving literature searches in the Scopus, ISI Web of Science, and PubMed citation databases. In order to keep the search results as broad as possible, in querying the databases we looked for all papers mentioning use of ANPS instruments using the following strings of keywords: *"affective neuroscience personality scale"* OR *"affective neuroscience personality scales"*.

The database search was finalized in April 2020. An additional search was performed by inspecting citations within publications identified as eligible to be included in this meta-analysis. A flowchart illustrating the selection process is shown in Figure 1.

Figure 1 Flow chart of study selection
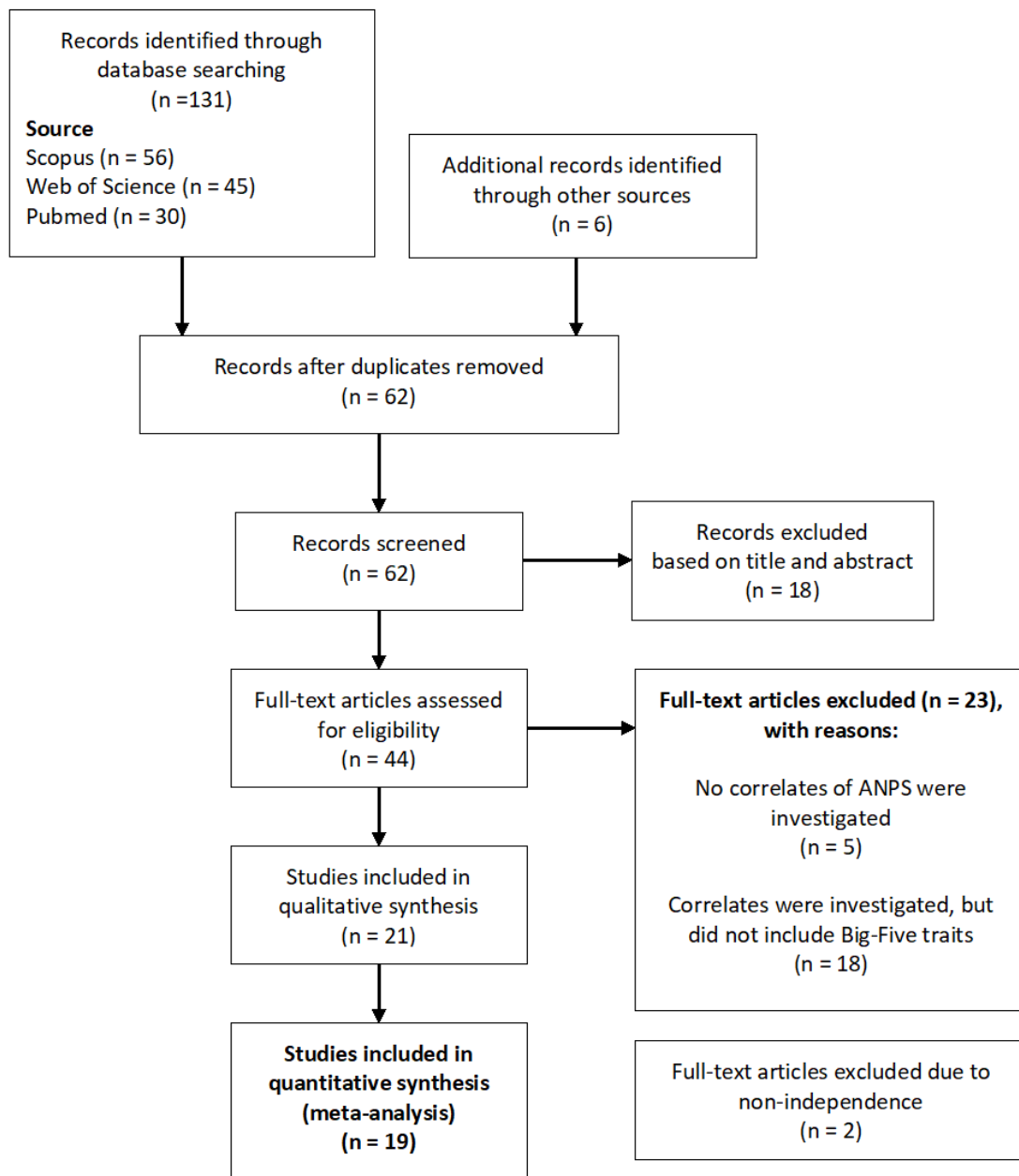
6.2.2   Inclusion and exclusion criteria

Papers identified through database and reference searches were screened for the following inclusion criteria: 1. Studies had to include assessments of both ANPS and Big Five personality traits; 2. Studies had to provide information about the effect size of the association between ANPS and Big Five personality traits.

Exclusion criteria were the following: 1. Studies were excluded from quantitative analyses if we could not retrieve effect size information by inspecting the paper, and this

information could not be obtained from the authors; 2. Non-independence of collected data. Studies were considered as non-independent when fulfilling the following criteria: 1. Studies were performed on samples including the same group of participants, and 2. Effect-sizes were computed between the same ANPS and Big Five measures. When two or more studies were found to be non-independent according to these criteria, we selected the study performed on the largest sample for the purpose of inclusion in the quantitative analyses. When a complete overlap between samples was found, we selected the earliest study.

6.2.3 Strategy of Analyses

For the purpose of this study, we use Pearson's correlation coefficients as the effect-size of choice for representing the relationship between ANPS and Big Five personality traits. In the case we could not collect Pearson's correlations by inspecting the paper (e.g., examined correlations were not reported in full in the results section), we contacted the authors of the study and asked them to provide us with missing correlations.

We conducted a separate meta-analysis for each combination of ANPS and Big Five trait, resulting in a total of the 30 distinct meta-analyses (6 ANPS × 5 Big Five traits). We performed the meta-analyses using a random-effects model, as we expected significant heterogeneity in effect-sizes due the varying characteristics of questionnaires used to assess Big Five personality, as well as due to the diversity of cultural and demographic characteristics of the samples. For the purpose of meta-analytical computations, we decided not to transform correlations into Fisher's z scores because this transformation leads to an overestimation of associations when compared with the original correlation metric (hunter et al., 1982).

Heterogeneity of effect-size was determined using the following statistics: the Q test of heterogeneity, the T^2 and T statistic statistics (i.e., between-study variance and standard deviation of effect-sizes), and the I^2 statistic representing of proportion variance in observed

effects due to true heterogeneity (as opposed to random sampling error). In discussing

emerging meta-analytic correlations, we refer to Cohen's well-known classification of

correlation effect-sizes, and distinguish between small ($.10 \leq r < .30$), medium ($.30 \leq r < .50$),

and strong correlations ($r \geq .50$).

Next, we evaluate the impact of the different operationalizations of the Big Five model

as a source of heterogeneity. More in detail, we use the Q test for heterogeneity to compare

correlations between ANPS and Big Five traits emerging from studies employing NEO

inventories to assess the Big Five traits, and studies employing other Big Five

operationalizations. Please note that because we expected that relevant differences might exist

across these groups in terms of cultural and demographic characteristics of recruited samples,

in performing the Q tests we do not assume homogeneity of variances of effect sizes across

these groups (i.e., we use separate estimates of T^2, as opposed to a pooled estimate).

Finally, we inspected results for potential publication bias by investigating the existence

of asymmetry in the funnel plots visualizing the association between studies' effect sizes and

their relative standard error. For detecting asymmetry of the funnel plots, estimation was

performed on transformed effect sizes (Fisher's Z transformation). Symmetry of the funnel

plot was determined using Egger's intercept test (Sterne & Egger, 2001). If the Egger's test

detected a significant asymmetry in the funnel plot, we used Duval and Tweedie's Trim and

Fill procedure (Duval & Tweedie, 2000) to impute effect-size data for potentially missing

studies and compute the unbiased meta-analytical correlation. All analyses were performed

using Comprehensive Meta-analysis 3 (Borenstein et al., 2005).

6.3   Results

Overview of included studies

In total, we identified 21 documents including data on both ANPS and Big Five

personality scales. After inspection for non-independence, we found n = 8 document included

non-independent studies, i.e., studies that were performed on samples including overlapping participants assessed using the same set of ANPS and Big Five measures (Davis et al., 2003; Davis & Panksepp, 2011; Montag & Panksepp, 2017; Özkarar-Gradwohl et al., 2014; Özkarar-gradwohl et al., 2018; Plieger et al., 2014; Reuter et al., 2017; Sindermann et al., 2018). The study by Montag and Panksepp (2017) included information about German and Chinese samples that overlapped with two samples examined in Sindermann and colleagues (Sindermann et al., 2018). To resolve the issue, we selected the largest German sample (i.e., the sample examined in Montag & Panksepp, 2017), and the largest Chinese sample (i.e., the sample examined in Sterne & Egger, 2001). Next, we found an overlap existed in the German samples examined in studies by Özkarar-Gradwohl and colleagues (Özkarar-Gradwohl et al., 2018), Plieger and colleagues (2014), and Reuter and colleagues (2017), which we resolved by selecting the study with the largest sample (Reuter et al., 2017). However, while all participants from the sample in Reuter and colleagues (2017) were assessed using paper and pencil questionnaires, a subset (N=71) of the German sample examined in (Özkarar-Gradwohl et al., 2018) was assessed via online questionnaires, therefore showing no overlap. This subset was retained in the dataset for the purpose of performing the meta-analytical calculations. We also found two papers by Özkarar-Gradwohl and colleagues (2014; 2018), which included analyses performed on the same sample of Turkish participants; in this case, we selected the earliest study (Özkarar-Gradwohl et al., 2014) for inclusion in the meta-analysis. Finally, we found that two studies Davis and colleagues (2003) and Davis and Panksepp (2011) presented results from the same sample; again, the earliest study (2003) was selected for inclusion.

Eventually, we ended up with 19 documents, including data on both ANPS and Big Five personality collected on 21 independent samples, resulting in 612 distinct effect sizes representing the association between ANPS and Big Five personality scales. For all selected studies we were able to retrieve effect-size information about the association between all the

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ANPS behavioral scales (ANGER, CARE, FEAR, PLAY, SADNESS, and SEEKING) and

Big Five traits (Agreeableness, Conscientiousness, Extraversion, Neuroticism, and Openness),

except for a study by Yu (2018), which only reported information about ANPS scales and two

Big Five traits (Agreeableness, Consciousness). Characteristics of selected studies are

reported in Table 1.

Mean sample size was 465.63, ranging from 52 (Sindermann et al., 2018) to 1,837

participants (Reuter et al., 2017), with an overall combined sample size of 10,244 individuals.

The majority of samples were recruited among the general population (n=19), while a

minority (n=2) were clinical samples. Included studies varied in terms of nationality: the

majority of studies were performed on samples recruited in Germany (n=6), followed by USA

(n=3), Hong-Kong (n=2), Italy (n=2), Austria (n=1), China (n=1), France (n=1), Japan (n=1),

Poland (n=1), Serbia (n=1), Spain (n=1), and Turkey (n=1).

In the selected studies, ANPS scales were assessed using the original ANPS version

(n=8) (Davis et al., 2003), the revised ANPS 2.4 (n=12) (Davis & Panksepp, 2011), and the

Brief ANPS (n=1) (Barrett et al., 2010). In selected studies, Big Five traits were assessed

using either original or revised versions of the following Big Five personality questionnaires:

the Big Five Inventory (n=6 ; BFI) (John et al.,2008), NEO-Five Factor Inventory (n=5;

NEO-FFI; n=1 NEO-FFI-R) (Costa & McCrae, 1992), the NEO Personality Inventory (n=1;

NEO PI-R) (Costa & McCrae, 1992), the Big Five Scales (n=5; B5S) (Davis et al., 2003), and

the Big Five short scales (n=2) (Olaru et al., 2015), and Big Five scales from the Internet

Personality Item Pool (n=1).

Table 1 Characteristics of studies included in the meta-analysis

Study	Sample characteristics			Self-report assessment	
	Country	Type of Sample	N	ANPS	Big Five
Abella et al., 2011 [14]	Spain	General population	397	ANPS - 112	NEO-FFI-R
Barrett et al., 2010 [45]	USA	General population	226	ANPS - 110	BFI
Barrett et al., 2013 [38]	USA	General population	1096	BANPS	BFI
Cwojdzińska & Rybakowski, 2016 [46]	Poland	General population	81	ANPS - 112	NEO-FFI
Davis et al., 2003 [7]	USA	General population	171	ANPS - 110	B5S
Giacolini et al., 2017 – Study 1 [15]	Italy	Clinical sample	180	ANPS - 112	BFI
Giacolini et al., 2017 – Study 2 [15]	Italy	General population	523	ANPS - 112	BFI
Hiebler-Ragger et al., 2018 [47]	Austria	General population	167	ANPS - 110	BFI
Montag & Davis, 2018 [26]	Germany	General population	182	ANPS - 110	Big Five short-scale
Montag & Panksepp, 2017 [12]	Germany	General population	687	ANPS - 110	NEO-FFI
Montag et al., 2019 [16]	Serbia	General population	340	ANPS - 112	NEO-PI-R
Montag et al., 2020 [48]	Germany	General population	850	ANPS - 110	BFI
Özkarar-Gradwohl et al., 2014 [17]	Turkey	General population	327	ANPS - 110	B5S
Özkarar-Gradwohl et al., 2018 – Study 1 [32]	Germany	General population	71	ANPS - 110	B5S
Özkarar-Gradwohl et al., 2018 – Study 2 [32]	Japan	General population	353	ANPS - 112	B5S
Pahlavan et al., 2008 [18]	France	General population	412	ANPS - 110	BFI
Reuter et al., 2017 [34]	Germany	General population	1837	ANPS - 110	NEO-FFI
Sindermann et al., 2018 [37]	Germany	Clinical sample	52	ANPS - 110	NEO-FFI
Sindermann, Luo, et al., 2018 [35]	China	General population	615	ANPS - 112	Big Five short-scale
Yu, 2018 [36]	Hong-Kong	General population	157-159[a]	ANPS - 110	NEO-FFI [b]
Yu, 2016 [49]	Hong-Kong	General population	655-668[a]	ANPS - 110	NEO-FFI

Note. ANPS: Affective Neuroscience Personality Scales; BANPS: Brief Affective Neuroscience Personality Scales; B5S: Big Five Scales; BFI: Big Five Inventory; NEO-FFI: NEO Five-Factor Inventory; NEO Five-Factor Inventory-R: NEO Five-Factor Inventory-Revised. [a] In these studies, sample size varied based on the specific combination of ANPS and Big Five scales examined. [b] Only the Agreeableness and Conscientiousness traits were assessed in the study.

Meta-analytic computations:

Mean effect size

In order to establish the magnitude of associations between ANPS and Big Five personality scales, we conducted 30 separate meta-analyses, one for each combination of ANPS and Big Five scales. Because one study did not include information about all Big Five traits, the number of effect sizes included in the meta-analyses varied depending on the specific Big Five trait (Openness: n=20; Conscientiousness: n=21; Extraversion: n=20; Agreeableness: n=21; Neuroticism: n=20).

For each combination of ANPS and Big Five personality scales, forest plots of meta-analytical correlations are presented in Figure 2; the meta-analytic correlations are also presented in Table 2, alongside Q tests for heterogeneity, T^2 and I^2 statistics. Given the large number of examined study-level effect-sizes (n = 612), these are visualized in Table 2.

Overall, we found the ANGER component of the ANPS showed a moderately positive meta-analytical correlation with Neuroticism, a small negative correlation with Conscientiousness, and a moderate negative correlation with Agreeableness. The meta-analytical correlation for the associations between ANGER and Extraversion was not significant, while the association with Openness was negative and negligible in size, but statistically significant.

Regarding the CARE component of the ANPS, findings showed small positive meta-analytical correlations with the Extraversion, Openness and Conscientiousness traits, and a moderate correlation with the Agreeableness trait. The meta-analytical correlation between CARE and Neuroticism was not significant.

Figure 2 Forest-Plots of Meta-Analytic Correlations between ANPS and Big Five Personality scales
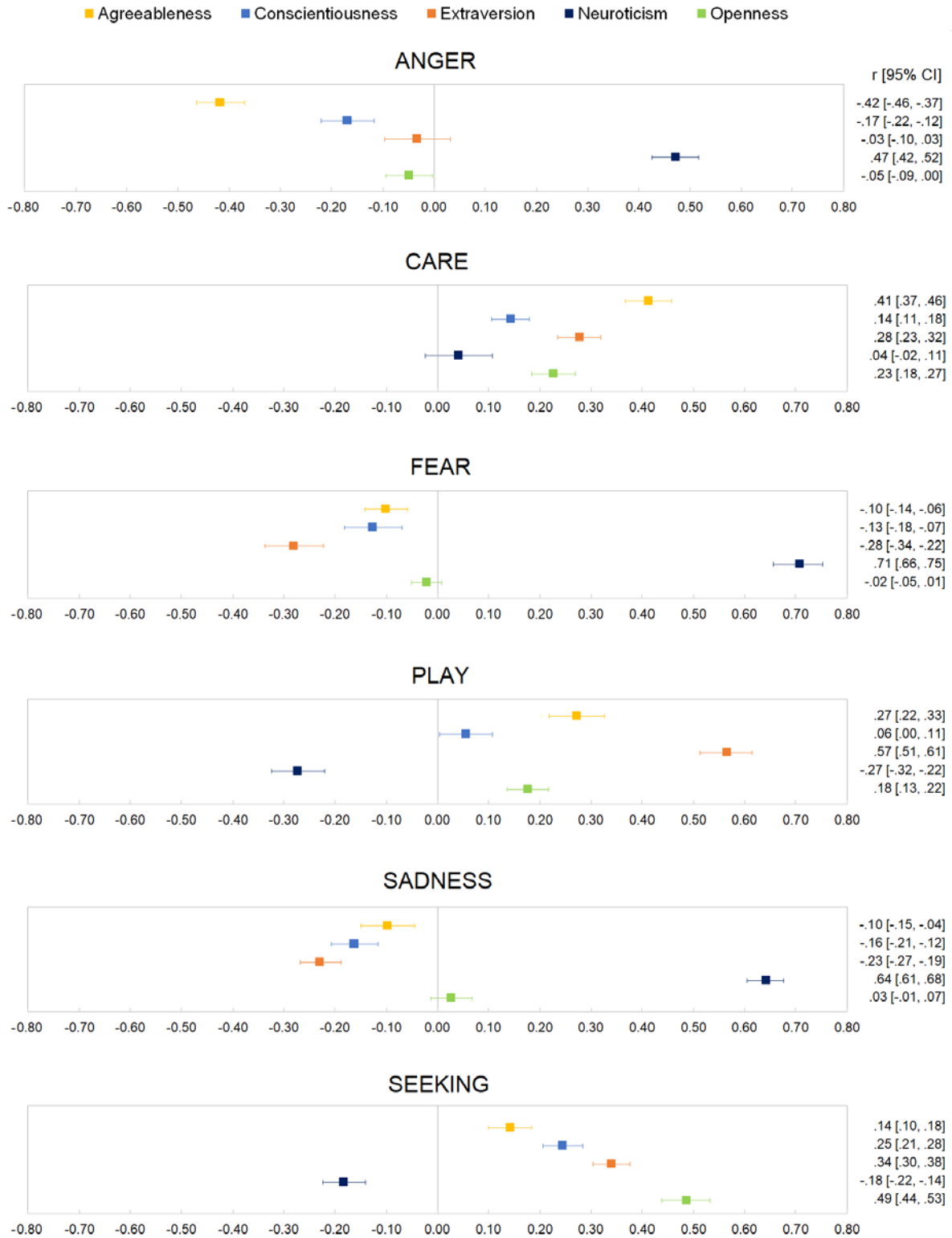
ANPS	Big Five	r	[95 % CI]		Q	df	p	i^2	τ^2	τ
ANGER	Agreeableness	-.42	-.46	-.37	134.53	20	<.01	85.13	0.01	0.12
	Conscientiousness	-.17	-.22	-.12	114.88	20	<.01	82.59	0.01	0.11
	Extraversion	-.03	-.10	.03	163.14	19	<.01	88.35	0.02	0.13
	Neuroticism	.47	.42	.52	138.29	19	<.01	86.26	0.01	0.12
	Openness	-.05	-.09	.00	81.03	19	<.01	76.55	0.01	0.09
CARE	Agreeableness	.41	.37	.46	124.15	20	<.01	83.89	0.01	0.11
	Conscientiousness	.14	.11	.18	56.58	20	<.01	64.65	<0.01	0.07
	Extraversion	.28	.23	.32	80.65	19	<.01	76.44	0.01	0.09
	Neuroticism	.04	-.02	.11	172.30	19	<.01	88.97	0.02	0.14
	Openness	.23	.18	.27	77.83	19	<.01	75.59	0.01	0.08
FEAR	Agreeableness	-.10	-.14	-.06	71.83	20	<.01	72.16	0.01	0.08
	Conscientiousness	-.13	-.18	-.07	138.53	20	<.01	85.56	0.01	0.12
	Extraversion	-.28	-.34	-.22	154.56	19	<.01	87.71	0.02	0.13
	Neuroticism	.71	.66	.75	390.88	19	<.01	95.14	0.04	0.21
	Openness	-.02	-.05	.01	33.39	19	.02	43.10	<0.01	0.04
PLAY	Agreeableness	.27	.22	.33	145.48	20	<.01	86.25	0.01	0.12
	Conscientiousness	.06	.00	.11	112.11	20	<.01	82.16	0.01	0.10
	Extraversion	.57	.51	.61	230.21	19	<.01	91.75	0.03	0.16
	Neuroticism	-.27	-.32	-.22	122.52	19	<.01	84.49	0.01	0.11
	Openness	.18	.13	.22	68.05	19	<.01	72.08	0.01	0.08
SADNESS	Agreeableness	-.10	-.15	-.04	120.60	20	<.01	83.42	0.01	0.11
	Conscientiousness	-.16	-.21	-.12	87.91	20	<.01	77.25	0.01	0.09
	Extraversion	-.23	-.27	-.19	68.74	19	<.01	72.36	0.01	0.08
	Neuroticism	.64	.61	.68	146.00	19	<.01	86.99	0.02	0.12
	Openness	.03	-.01	.07	61.21	19	<.01	68.96	0.01	0.07
SEEKING	Agreeableness	.14	.10	.18	75.08	20	<.01	73.36	0.01	0.08
	Conscientiousness	.25	.21	.28	70.93	20	<.01	71.80	0.01	0.08
	Extraversion	.34	.30	.38	63.71	19	<.01	7.18	0.01	0.07
	Neuroticism	-.18	-.22	-.14	69.44	19	<.01	72.64	0.01	0.08
	Openness	.49	.44	.53	152.70	19	<.01	87.56	0.02	0.13

Table 2 Meta-analytic correlations between ANPS and Big Five personality: Central tendency and heterogeneity statistics

The FEAR component of the ANPS showed a strong positive meta-analytical correlation with Neuroticism, and small negative meta-analytical correlations with the Extraversion, Conscientiousness, and Agreeableness traits. The meta-analytical correlation between FEAR and Openness was not significant.

The PLAY component of the ANPS showed a strong positive meta-analytical correlation with Extraversion, and small positive meta-analytical correlations with the Agreeableness and Openness traits. Additionally, a small negative meta-analytical correlation emerged between PLAY and Neuroticism. The meta-analytical correlation between the PLAY component and Conscientiousness was positive, but negligible in size.

Concerning the SADNESS component of the ANPS, we found a strong positive meta-analytical correlation with Neuroticism, and small negative meta-analytical correlations with Extraversion, Conscientiousness, and Agreeableness. The meta-analytical correlation between SADNESS and Openness was not significant.

Regarding the SEEKING component of the ANPS, we found moderate positive meta-analytical correlations with Openness and Extraversion, small positive meta-analytical correlations with Conscientiousness and Agreeableness, and a small negative meta-analytical correlation with Neuroticism.

Looking at heterogeneity statistics, we found the results of Q tests were significant for all combination of ANPS and Big Five traits, supporting the use of the random effect model to compute the meta-analytical correlations. Still, it is worthy to note that for all trait combinations, T^2 ranged between 0.01 and 0.04, indicating low between-study heterogeneity (i.e., between-study variance in effect-sizes). Additionally, for all combinations, observed dispersion of effect sizes was largely due to true heterogeneity, as opposed to sampling error $(95.36 \geq I^2 \geq 45.31)$.

Finally, we look at the impact of different operationalization of the Big Five model on meta-analytic correlations between ANPS and Big Five personality traits. Results of Q tests, as well as emerging meta-analytical correlations, are shown in Table 3. Meta-analytic correlations between ANGER and Agreeableness, as well as between PLAY and both Extraversion and Neuroticism, and between SEEKING and Neuroticism, were significantly stronger in size among studies employing NEO inventories (i.e., NEO-FFI, NEO-FFI-R, and NEO-PI-R inventories) when compared with studies using different Big Five operationalizations (e.g., the BFI, B5S, and Big Five Short Scales assessments). Remaining ANPS-Big Five correlations showed no significant differences across the two groups of studies.

Publication bias:

We inspected the funnel plots of standard error versus the correlation. Egger's regression tests (Table 4) indicated no significant evidence of asymmetry in the funnel plot for all combinations of ANPS and Big Five scales, except for the association between the FEAR component of the ANPS and Neuroticism. In this case, because of this potential indication of publication bias, we used the Duval and Tweedie's procedure to detect potential missing studies on each side of the funnel plot: the procedure detected no (n = 0) missing effect-sizes (i.e., studies) on the left side and right side of the funnel plot. Overall, this step of analysis indicated no significant indications of publication bias were present in the examined literature.

Table 3 Meta-analytic correlations between ANPS and Big Five personality traits by Big Five operationalization

ANPS	Big Five	Correlation		Heterogeneity test		
		NEO Inventories	Other	Q	df	p
ANGER	Agreeableness	-0.47	-0.38	4.07	1	0.04
	Conscientiousness	-0.17	-0.17	0.00	1	0.95
	Extraversion	-0.10	0.00	2.96	1	0.09
	Neuroticism	0.42	0.50	2.78	1	0.10
	Openness	-0.03	-0.06	0.29	1	0.59
CARE	Agreeableness	0.38	0.44	1.50	1	0.22
	Conscientiousness	0.15	0.14	0.03	1	0.86
	Extraversion	0.31	0.26	1.32	1	0.25
	Neuroticism	0.02	0.05	0.17	1	0.68
	Openness	0.28	0.20	2.31	1	0.13
FEAR	Agreeableness	-0.08	-0.11	0.37	1	0.54
	Conscientiousness	-0.10	-0.14	0.41	1	0.52
	Extraversion	-0.28	-0.28	0.01	1	0.92
	Neuroticism	0.73	0.70	0.33	1	0.57
	Openness	-0.01	-0.03	0.20	1	0.66
PLAY	Agreeableness	0.21	0.31	2.52	1	0.11
	Conscientiousness	0.08	0.04	0.40	1	0.53
	Extraversion	0.64	0.52	8.04	1	< 0.01
	Neuroticism	-0.35	-0.23	5.13	1	0.02
	Openness	0.18	0.17	0.02	1	0.89
SADNESS	Agreeableness	-0.08	-0.11	0.34	1	0.56
	Conscientiousness	-0.13	-0.18	0.59	1	0.44
	Extraversion	-0.23	-0.23	0.00	1	0.98
	Neuroticism	0.67	0.63	1.27	1	0.26
	Openness	0.06	0.00	1.50	1	0.22
SEEKING	Agreeableness	0.09	0.17	3.56	1	0.06
	Conscientiousness	0.26	0.24	0.38	1	0.54
	Extraversion	0.38	0.32	2.70	1	0.10
	Neuroticism	-0.24	-0.15	5.73	1	0.02
	Openness	0.47	0.50	0.37	1	0.54

Table 4 Publication bias analyses: Egger's regression test for funnel plot asymmetry

ANPS	Big Five	Intercept	95 % CI		t	df	p
ANGER	Agreeableness	-0.02	-2.98	2.93	0.02	19	0.49
	Conscientiousness	-0.18	-2.91	2.55	0.14	19	0.45
	Extraversion	1.58	-1.80	4.95	0.98	18	0.17
	Neuroticism	2.98	0.15	5.81	2.22	18	0.02
	Openness	1.13	-1.25	3.51	1.00	18	0.17
CARE	Agreeableness	-0.50	-3.33	2.33	0.37	19	0.36
	Conscientiousness	-0.18	-2.09	1.74	0.20	19	0.42
	Extraversion	-0.08	-2.51	2.36	0.07	18	0.47
	Neuroticism	0.45	-3.11	4.00	0.26	18	0.40
	Openness	0.61	-1.77	2.98	0.54	18	0.30
FEAR	Agreeableness	-1.13	-3.22	0.96	1.13	19	0.14
	Conscientiousness	0.39	-2.61	3.38	0.27	19	0.39
	Extraversion	0.89	-2.46	4.23	0.56	18	0.29
	Neuroticism	-0.64	-5.99	4.72	0.25	18	0.40
	Openness	0.79	-0.73	2.31	1.09	18	0.14
PLAY	Agreeableness	-1.03	-4.06	2.01	0.71	19	0.24
	Conscientiousness	-0.66	-3.34	2.02	0.52	19	0.31
	Extraversion	-0.82	-4.92	3.27	0.42	18	0.34
	Neuroticism	1.26	-1.68	4.20	0.90	18	0.19
	Openness	0.91	-1.28	3.11	0.88	18	0.20
SADNESS	Agreeableness	0.28	-2.52	3.08	0.21	19	0.42
	Conscientiousness	0.24	-2.15	2.62	0.21	19	0.42
	Extraversion	1.24	-0.93	3.40	1.20	18	0.12
	Neuroticism	-1.38	-4.59	1.82	0.91	18	0.19
	Openness	0.55	-1.56	2.66	0.55	18	0.29
SEEKING	Agreeableness	-0.45	-2.65	1.75	0.42	19	0.34
	Conscientiousness	0.99	-1.10	3.09	0.99	19	0.17
	Extraversion	-0.22	-2.38	1.95	0.21	18	0.42
	Neuroticism	1.40	-0.75	3.56	1.37	18	0.09
	Openness	0.58	-2.76	3.93	0.37	18	0.36

6.4 Discussion

The aim of the present meta-analysis was to investigate how the Affective Neuroscience Personality Scales (ANPS) map onto the Big Five personality traits. The investigation of 21 samples with 612 effect sizes available led to a clear picture. As observed in Montag & Panksepp (2017) and in the original ANPS study (Davis et al., 2003), links

between higher ANGER, SADNESS, FEAR and higher Neuroticism are robust with the highest effect sizes describing the association with SADNESS and FEAR. High SEEKING scores linked to high Openness to Experience. High CARE and low ANGER map onto high Agreeableness, whereas higher PLAY is strongly associated with higher Extraversion.

Considering the effort to measure the expression of primary mammalian emotions with the ANPS versus the derivation of the Big Five from the statistical analysis of descriptive adjectives, the original paper (Davis et al., 2003) suggested that the Big Five "represents a human language reconfiguration of underlying primary affective systems into useful phenotypic descriptive systems" (Davis et al., 2003, p. 67). However, the risk in the Big Five "lumping" is the potential for clouding the important impact each of these separate emotional forces have in our lives.

In this context, we also mention a moderately strong association in this meta-analysis between higher SEEKING and higher Extraversion, which had been observed previously, for example in (Montag & Panksepp, 2017a; 2017b). Such a correlation pattern is also in line with the idea that Extraversion is also linked to what cognitive neuroscientists would call "reward processing" (for a discussion see Smillie, 2013), with the SEEKING system being of high relevance as an energetic "Go get it system". Yet, it is also possible that the Extraversion / SEEKING correlation is derived from Five Factor Model data with adjective-based lexically derived Big Five type assessments showing more modest Extraversion / SEEKING correlations. However, additional studies will be required to answer such questions.

We believe our findings to be remarkable from different perspectives. First of all, different Big Five and ANPS measures have been used in the present work (although preliminary, we see in the present meta-analysis stronger associations with the NEO-inventories in contrast to the remaining group of Big Five inventories which use adjectives, perhaps reflecting that both the ANPS and the NEO-PI-R inventories work with formulated

items). Despite the variety of measures used, the overall pattern of associations carved out strongly supports the idea of robust links between language measures of primary emotional systems and the Big Five with the exception of Conscientiousness, likely being the most cerebral dimension of the Big Five and that has so far only been observed in highly encephalized primates. Nevertheless, our summary at this point is limited by the fact that the SEEKING scale had the highest correlation with Conscientiousness at .25 (but still accounted for rather small proportion of variance). Conscientiousness might be seen as a personality trait that is not strongly linked to primary emotional systems, but clearly impacting upon the activity levels of these systems: Higher Conscientiousness might go along with higher top-down control of primary emotional systems.

Second, the present findings are noteworthy, because the investigated samples stem from around the globe, with many samples from Asia (China, Hong Kong, Japan and Eurasian Turkey), but also Europe (France, Germany, Italy, Poland, Spain, Serbia) and the USA. In so far, we believe that the findings observed here are indeed supportive of "a global ancestral neuro-biological effect" as described in Montag & Panksepp, 2017a (p. 6). But again, the present meta-analysis does not deal with neuroscientific experimental manipulations, but "only" correlational questionnaire data assessing individual differences in the Big Five personality traits and primary emotional systems. This said, the investigation of the Big Five personality traits in relation to Pankseppian Affective Neuroscience Theory framework seems to shed light on the evolutionary foundations of personality as measured by the Big Five. We mentioned earlier that primary emotional systems have been homologously observed across the mammalian brain, as they endow mammals with tools for survival. Still, individual differences in primary emotional systems exist – meaningfully covarying with (four out of the) Big Five as presented in this work - probably best understood with the concept of fluctuation selection. In other words: From a general psychologist's perspective it makes

evolutionary sense that all mammals are endowed with primary emotional systems, but from a personality psychologist's perspective this also makes sense, because in some niches different operating levels of a primary emotional system might be favorable.

Third, the overlap between Panksepp's primary emotional systems and the Big Five provide researchers a route to study the biological basis of the Big Five. Whereas the Big Five personality traits have been merely described using a lexical approach and therefore do not guide researchers towards an understanding of their biological bases, the substantial overlap of primary emotional systems and the Big Five – as described in this paper – show that neuroanatomical / neurochemical knowledge about the primary emotional systems might also guide neuroscientific studies on the Big Five (how to apply AN theory for such a research endeavor, please see Montag & Panksepp, 2017b). But again, the present research must be supplemented by neuroscientific techniques and needs further evidence that the ANPS adequately captures the neurobiology of the primary emotional systems as described by Panksepp in much detail (Panksepp, 1998). As some primary emotional systems are not uniquely associated with one Big Five personality trait, (e.g. ANGER negatively links to Agreeableness and positively to Neuroticism), it will be also of high interest to understand the brain mechanisms leading to multiple primary emotional brain systems being combined in different personality traits – likely via different excitatory or inhibitory effect levels.

What are the future directions? Only recently, researchers became interested in investigating the ANPS and the Big Five also on the facets level (Montag et al., 2019; Montag & Davis, 2018). For instance, Montag et al. (2019) observed a particular strong association between Neuroticism's facet anger hostility and ANGER (0.69). Regarding the primary emotional system of CARE relations with Agreeableness facets tender-mindedness (0.48) and altruism (0.46) were pronounced. As only very few investigations have been carried out in this area, many more studies need to be published with such a research focus to understand

whether primary emotional systems based on the background of Pankseppian AN theory are multifaceted and if so linked to Big Five facets. Although the ANPS has been translated into many languages already (see introduction), we want to encourage researchers to translate the ANPS also to further languages and ideally validate it with the Big Five (as presented in this work). Finally, other personality theories or extensions of the Big Five model need to be more strongly linked to AN theory. For instance, the work by Knezevic and colleagues (2019) investigated the ANPS in the context of the HEXACO model, thereby also investigating how Honesty/Humility is linked to individual differences in primary emotional systems.

Beyond that most studies in the field are correlational and it would be highly interesting to see longitudinal works assessing covariations between primary emotional systems and the Big Five across the life span (at best also supplemented by neuroscientific data). Concluding, the present meta-analysis provides solid evidence for the idea that primary emotional systems as measured by the ANPS are meaningfully linked with the Big Five personality traits. Moreover, studying individual differences of the Big Five personality traits using a Pankseppian Affective Neuroscience Theory framework also provides researchers an evolutionary approach to understand the lexically derived Big Five personality constructs.

7.Chapter Seven

7.1. General Discussion:

The literature on the ANPS (Davis et al., 2003) has seen a worldwide development in the last two decades, with standardization studies in several countries and with clinical studies on psychological disorders (Davis & Panksepp, 2018, for a review). Thanks to this development, the personality literature also improved by acknowledging the role of emotions in personality and its evolutionary subcortical affective roots (Montag & Davis, 2018; Montag & Panksepp, 2017). The emotional brain, as the basic mediator between the body and the external influences, is at the heart of this approach. Today, it is better understood that strengths and weaknesses found in the subcortical affective systems may be the epigenetic predictors of personality traits (Davis & Panksepp, 2011; 2018; Montag & Panksepp, 2017).

Montag and Panksepp (2017) emphasize the paradigm shift towards a holistic approach to personality, as discussed in the Introduction: "We must better envision how both nature and nurture, as interacting partners rather than distinct units, create our various psychological strengths and weaknesses." (p.7). The affective roots of personality do not only bring *nature and nurture* together, they also bring back the acknowledgement of the influence of the *ancestors* on body and mind (via genetic and cultural transmissions). Panksepp, like an archaeologist of the mind, excavated the ancestral sources of feelings and brought back the ancestors to the field of personality (Panksepp & Biven, 2012). Following this holistic route that unites nature and nurture, and accepts the past ancestoral influences on present, there are still many aspects to be studied in the ANPS field.

This thesis aimed to adress the three core areas that need to be developed in the ANPS literature: the effect of culture, the effect of gender, and the cross-cultural relationship between the ANPS and the Big Five Scales (B5S). The 5 publications (Özkarar-Gradwohl et al., 2014; Özkarar-Gradwohl et al., 2018; Özkarar-Gradwohl, 2019; Özkarar-Gradwohl &

Turnbull, 2021; Marengo et al., 2021), that are reported in Chapters Two to Six, analyzed these missing parts in the literature. The Discussion will address the most important findings observed across these publications. These are: the *universal similarities* in personality (based on Chapters Two, Three, Four, and Six), the *cultural differences* (based on Chapters Two, Three, Four, Five, and Six), and the effects of *connectedness and separateness* (Chapters Three and Four). Finally, the Discussion will present the limitations based on sampling problems, and suggest future directions for neuroscientific, developmental and clinical studies in cross-cultural affective neuroscience.

7.1.1. Universal Similarities

As discussed in the Introduction, in the last two decades, the personality literature started to acknowledge the universally shared subcortical affective roots of personality (Montag & Davis, 2018; Montag & Panksepp, 2017). One way to assess the universalism of these affective origins was to carry out reliability and validity studies of the ANPS in different cultures. Thus far, the ANPS has been translated into at least 15 languages (see Chapter One). As Chapter Four summarizes, the main findings of the original ANPS study, in regard to reliability and validity (Davis et al., 2003), have been confirmed by all these ANPS standardization studies (as well as by Chapters Two and Three). However, systematic reviews about the universal findings in reliability and validity of the ANPS were missing. In order to demonstrate the universal roots of personality, these missing issues were adressed in Chapters Two, Three, Four and Six.

Chapter Four presents a literature review of *the reliability of the ANPS* (summarizing the findings also from Chapter Two and Chapter Three), based on *the intercorrelations of its subscales* across different cultures. Previously, the original study in the U.S. had shown that positive inter-correlations among both positive and negative affects do exist (Davis et al.,

2003). Based on the American findings, it was suggested that both positive and negative affect might be higher-order universal personality factors, as argued in Osgood's (1952) atlas of affective states (see Davis et al., 2003). Chapter Four observed this finding across different cultures and demontrated that positive inter-correlations among both positive and negative affects do not exist only in the original American sample, but also in Spanish, French, Turkish, Italian, Japanese, and German samples. By emphasizing the universal reliability of the ANPS, this common finding across cultures strengthens the proposition that positive and negative valence is a higher-order factor.

Can these opposing emotional valences interact? Panksepp suggested that that the CARE system might have inter-related substrates with the separation-anxiety (FEAR) system, in all mammals (Panksepp 1998; 2011). Confirming this suggestion, these two systems were found to be positively correlated in the original ANPS study (Davis et al., 2003). However this finding was not cross-culturally analyzed. Chapter Four (summarizing the findings also from Chapter Two and Chapter Three) shows that a significant positive correlation between CARE and FEAR was not only found in the American sample, but in the Spanish, French, Turkish, and Japanese studies as well (Abella et al., 2011; Davis et al., 2003; Narita et al., 2017; Özkarar-Gradwohl et al., 2014; Pahlavan et al., 2008). This cross-cultural common finding amplifies the universalism of the view that the attachment and separation-anxiety systems (CARE and FEAR) might have inter-related substrates (Panksepp 1998; 2011). As discussed later, this virtually universal finding also presents neuroscientifc support for the cultural suggestion that the interdependency and independency self-construals are not mutually exclusive, but complementary (Kağıtçıbaşı 1996; 2005; 2007).

On the other hand, Chapter Four (again summarizing findings from Chapters Two and Three) also underlied some culture-specific inter-correlations of certain positive and negative affects (other than CARE and FEAR). Although positive and negative affects are higher-order

personality factors across cultures, they do not seem to be totally polarized in each culture. It is possibile that the degree and type of inter-correlations of positive-negative affects may differ from culture to culture. How the culture accepts the positive-negative affects might be a variable that leads to these variations. Chapters Two and Three suggested that (broadly speaking) the hedonistic philosophy in Western cultures might lead to higher polarization of positive and negative affects, while Eastern connectivity philosophy might allow the holistic experience of all affects simultaneously (Özkarar-Gradwohl et al., 2014, Özkarar-Gradwohl et al., 2018; Spencer-Rodgers et al., 2010b). Increased emotional complexity and dialectical thinking in Eastern cultures, compared to the American culture, have been also reported in recent cultural studies (Peng & Nisbett, 2000; Spencer-Rodgers et al., 2010a; 2010b). So far, higher inter-correlations of positive and negative affects (thus, lesser affective polarization) was reported in the Japanese ANPS study (see, Narita et al., 2017). Therefore, future cross-cultural ANPS research is required to examine these hypothesis.

However, we must also consider the possibility that these variations between countries reflect *reliable* differences rather than resulting from a problem of multiple comparisons. This issue clearly requires further research, but can also be adressed by considering or comparing multiple ANPS studies in the same nation. However, none of the studies mentioned above presented the comparison of ANPS inter-correlations in different samples within the same nation. They presented the ANPS inter-correlations only in their original standardization study. Clearly, future research is required to demonstrate the reliability of the ANPS cross-culturally.

With regard to the affective-cognitive links of personality, the original study had measured the *construct validity* of the ANPS, in relation to the Big Five Scales (B5S) (Davis et al., 2003). Chapter Four demonstrated that the construct validity of ANPS has been well established in several standardization studies as well, by analyzing the significant correlations

between ANPS and B5S (e.g., Abella et al., 2011; Narita et al., 2017; Özkarar-Gradwohl et al., 2014). It also attracted attention to the cultural study of Montag and Panksepp (2017), which showed that similar correlation patterns between ANPS and Big Five Factors were observed in the U.S., Germany, and China. FEAR, SADNESS, and ANGER were positively and reliably correlated with Neuroticism, high CARE and low ANGER were positively correlated with Agreeableness, SEEKing was positively correlated with Openness to Experience, and PLAY was positively correlated with Extraversion. On the other hand, Chapter Three presents findings where Japan, Türkiye, and Germany were found to carry both similar and culturally specific correlational patterns among the ANPS and B5S (Özkarar-Gradwohl et al., 2018). Montag & Davis (2018) suggested that these correlational patterns among affective personality traits and the Big Five factors need to be replicated across cultures.

This again raised the question, discussed above in relation to reliability, that the literature has not replicated the findings more than once in a single country. Fortunately, this problem of reliability does not apply to the findings related to validity. Chapter Six presents the research which supplied such a meta-analysis over all studies that include ANPS-B5S findings. In order to bridge the Big Five literature and the ANPS literature, a meta-analysis was carried out with 21 samples from 12 countries (Marengo et al., 2021). Significant relationships were obtained between high SEEKing and high Openness; high PLAY and high Extraversion; high CARE/low ANGER and high Aggreeableness; and high FEAR/SADNESS/ANGER and high Neuroticism. However, no significant relationship for Conscientiousness and the ANPS was obtained (Marengo et al., 2021). This meta-analysis was the first study in the literature to show that the cortical cognitive Big 5 factors can be consistently mapped onto the subcortical affective roots measured by the ANPS.

In summary, across a number of studies (Chapters Two, Three, Four, and Six), the universalism of subcortical affective traits, higher order personality factors, and the relation of attachment and separation systems (CARE and FEAR) has been established. All these support the Pankseppian view that the affective roots of personality lie in the subcortical affective systems, universally shared by all mammals. Moreover, the universal links between these subcortical affective personality traits and the cortical cognitive Big Five traits were demonstrated. Further work is clearly required to better clarify the reliability issues within individual countries, and the cross-cultural comparison of the ANPS intercorrelations. However, the validity of the ANPS seems very well established cross-culturally.

7.1.2. Cultural Differences

The International Association for Cross-Cultural Psychology (IACCP) was founded in 1972, at the time when original universality studies, which showed similarities across cultures, were being published (for a review see Matsumoto & Wilson, 2022). By the end of the 20th century, studies that discuss both similarities and differences had appeared (Matsumoto & Wilson, 2022). By the start of the 21st century, the field of cultural neuroscience emerged and attracted attention to the fact that almost 90 % of the fMRI publications (in the last two decades) come from Western countries (Chiao & Blizinsky, 2009; Chiao et al., 2013; Chiao, 2017; Matsumoto & Wilson, 2020). For the 50th anniversary of IACCP, it was emphasized "We encourage cross-cultural personality psychologists to go beyond imposed etic studies that seek primarily to confirm Western models in other contexts. The kinds of insights that more integrative emic and etic approaches can bring to the study of psychology across cultures are highlighted…" (Thalmayer et al., 2022, pp 1). The universal findings in the ANPS literature were well established, as summarized in the previous section (see 7.1.1.). In order to build up an approach that integrates the etic and the emic, the culture-specific findings for the ANPS will be elaborated in this section.

As summarized in the Introduction, the nature-nurture influences over personality has been long debated throughout the history of mankind (see Chapter One). A recent meta-analysis of twin studies in the personality literature (over 50 years) demonstrated that about 50% of individual differences can be influenced by genetic factors, and the remaining 50% by the environmental factors (Polderman et al., 2015, also see Johnson et al., 2008 for twin studies for B5S). Consistent with these findings in epigenetics, the first twins study, in the field of ANPS, which investigated the influence of *genetics* and the *environment* on individual differences, found that each scale of the ANPS was influenced by genetics and environment to a varying degree (Montag et al., 2016). While the highest heritability estimates were observed for FEAR, CARE and PLAY (beyond .50, and maximum for PLAY with .69), the lowest heritability estimates were for SEEK, ANGER and SADNESS (around .40). Influences of environmental factors were found to explain the remaining part of the variance (Montag et al., 2016).

Montag's study demonstrated that the ANPS has the potential to assess both the *universal genotypes* and the *culturally specific phenotypes.* However, it was carried out only on a German sample (2016), and not yet repeated in other cultures. The influence of culture (and gender) on personality was previously investigated for the Big Five Factors across 55 nations and well-established by a meta-analysis (Schmitt et al., 2007; Schmitt et al., 2008). However, although the ANPS has been translated into several languages (see Chapter One), only the universal findings were emphasized. Cross-cultural comparisons of the ANPS studies have not yet been observed. Chapter Four raises the issue that besides the universal findings that run across these studies, the culture specific findings need to be analyzed in detail.

Chapters Two, Three, Four, Five, and Six included these cross-cultural affective neuroscience studies, which represent the initiation of the field of cross-cultural affective neuroscience (Özkarar-Gradwohl, 2012). This addresses the universal and cultural findings

from several different perspectives. The universal findings, regarding the reliability and validity of the affective personality traits, have been summarized in the previous section (see 7.1.1, based on Chapters Two, Three, Four, and Six). In short, these were the positive inter-correlations among both positive and negative subscales, a positive correlation between CARE and FEAR, and the almost universal relationship between the ANPS and the B5S. Moreover, Chapter Five reported the universal gender effects on the ANPS, such as higher CARE and SADNESS for females, and equal levels of SEEKING and ANGER for both genders (Özkarar-Gradwohl & Turnbull, 2020).

Chapters Two, Three, Four, and Five were the cross-cultural affective neuroscience studies, which compared the influence of culture on the ANPS. They pointed also to the presence of cultural phenotypes, besides the findings that might be related to universal genotypes. Chapter Two presented the first cross-cultural ANPS research between U.S. and Türkiye (Özkarar-Gradwohl et al., 2014), and Chapter Three included the first Euro-Asian ANPS research between Japan, Türkiye and Germany (Özkarar-Gradwohl et al., 2018). These two empirical studies reported several significant differences among cultures, in terms of basic emotions measured by the ANPS.

These differences were discussed in line with the cultural norms and mothering styles observed for each culture. For instance, the higher positive affects observed in American subjects were interpreted in terms of hedonistic philosophy in Western individualism (Özkarar-Gradwohl et al., 2014). The higher FEAR and SADNESS reported by Japanese subjects was evaluated in terms of holistic Eastern philosophy, which accepts depressive mood as normal (Özkarar-Gradwohl et al., 2018). The lower ANGER found in the Japanese sample was discussed in terms of collectivism (high interdependency/low independency), which prohibits ANGER in order to protect the group harmony (Özkarar-Gradwohl et al., 2018). The overall lower affects reported by German males were discussed in line with

German rationalism in their upbringing style (Özkarar-Gradwohl et al., 2018). The higher ANGER reported for the Turkish females (compared to American, Japanese, and German females) and Turkish males (compared to Japanese and German males) was again argued to be related to the Turkish upbringing style, where CARE and ANGER co-exist (Özkarar-Gradwohl et al., 2014; Özkarar-Gradwohl et al., 2018). The findings were also considered in terms of the separation-reinforcing mothering styles in the West (for the U.S. and German samples), the symbiotic mothering styles in the East (for the Japanese sample), and the separation without detachment style in Türkiye (Özkarar-Gradwohl et al., 2014 Özkarar-Gradwohl et al., 2018).

These initial cross-cultural ANPS studies (Chapters Two and Three) suggested that certain cultural phenotypes do exist. However, these comparisons were carried out only between two (U.S. and Türkiye) or three cultures (Japan, Türkiye, and Germany). Chapter Four emphasized the necessity of a systematic observation of cross-cultural ANPS findings with a larger sample size, especially for gender effects (Özkarar-Gradwohl, 2019). Chapter Five provided this large-scale cross-cultural review, by analyzing the gender effects on the ANPS across 15 countries, for 6500 subjects (Özkarar-Gradwohl & Turnbull, 2021). This was the first systematic review to analyze the effect of gender on ANPS across cultures, and it also verified that the ANPS has the potential to assess both the universal genotypes and cultural phenotypes (see Chapter Five).

Almost universally, females scored higher on CARE and SADNESS, and the genders did not differ on SEEKING and ANGER (Özkarar-Gradwohl & Turnbull, 2021). Besides these almost universal findings, two basic emotions (FEAR and slightly PLAY) showed variability based on geography (Özkarar-Gradwohl & Turnbull, 2021). This review discusses the question of whether the higher oxytocin and lower serotonin levels for females was linked to higher CARE and SADNESS in females. Morever, the separation anxiety accumulated

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during migration of people was discussed for higher FEAR in Western females (see Chapter Five). The findings of Chapter Five highlighted that the gender effect must always be taken into consideration in cross-cultural affective neuroscience studies (which was foreseen in Chapter Four). How both genders (and different cultures) experience connectedness (interdependency) and separateness (independency) differently was included in the discussions.

In sum, the discussion of all these cross-cultural affective neuroscience studies mentioned above was based on the cultural norms (collectivistic vs. individualistic), family models (independent vs interdependent), mothering styles (separation reinforcing vs. symbiotic) and emotion socialization methods (reinforcement and suppression of certain emotions) found in different cultures. Unfortunately, this field remains in an early stage of development, and little empirical assessment regarding these variables were carried out in these studies. Chapters Three and Four addressed the solutions of this issue, which will be summarized in the next section.

7.1.3. Connectedness and Separateness

How an individual experiences connectedness and separateness (autonomy) seems to be related to the regulation of affective, cognitive and behavioral dimensions of personality. The two main variables that influence connectedness and separateness appear to be culture and gender (Aboim, 2010; Bekker, Arends-Tóth, & Croon, 2011; Bekker & Van Assen, 2008; Chodorow, 1989; Hofstede, 2011; Hofstede & McCrae, 2004; Kağıtçıbaşı, 2005; Singelis, 1994; Triandis, 1995; Triandis & Suh; 2002; Van Assen & Bekker, 2009). Different cultures and genders experience these existential dimensions differently. It is widely acknowledged that Eastern cultures (and females) have higher connectedness, whereas Western cultures (and males) have higher separateness (e.g. Aboim, 2010; Chodorow, 1989; Hofstede, 2011;

Hofstede & McCrae, 2004; Kağıtçıbaşı, 2005; Triandis, 1995; Triandis & Suh, 2002; Van Assen & Bekker, 2009).

As regards culture, the 50 year literature of cross-cultural psychology has extensively investigated the influences of connectedness and separateness (autonomy) on individual differences (Hofstede, 2011; Hofstede & McCrae, 2004; Markus & Kitayama, 2010; Matsumoto & Wilson, 2022; Thalmayer et al., 2022; Triandis & Suh; 2002). However, most of these studies defined their samples simply by the geographical location of the culture (East or West). Whichever variable was investigated, the geography became the destiny of the discussions of these studies, without the objective assessment of connectedness and separateness (e.g. interdependent and independent self construals) for each sample (for criticisms see, Kirmayer, 2012; Voronov & Singer, 2002).

While the first cross-cultural affective neuroscience study (Chapter Two) used this geographical marker in the cultural definition of the samples, Chapter Three introduced a development in the methodology (Özkarar-Gradwohl et al., 2018). To evaluate connectedness and separateness, the study added *the assessment of interdependent and independent self-construals,* and analyzed their relation to the ANPS and B5S in Japan, Türkiye and Germany (Özkarar-Gradwohl et al., 2018). Thanks to this addition, it was found that the level of interdependent self-construals (connectedness) decreased from East to West, with the highest interdependency in Japan and lowest in Germany. However, independent self-construals (separateness) did not show a gradual westward increase (Özkarar-Gradwohl et al., 2018). Surprisingly, the highest independency was found in Türkiye, especially in Turkish females. This was in line with previous findings that Turkish females have higher independency than American and Canadian females (İmamoglu & Karakitapoglu-Aygun, 2004). Unexpectedly, German and Japanese independency (separateness) was not significantly different. Thus, the widely accepted German individualism was not found to be based on higher separateness, but

on lower connectedness. The inclusion of this assessment brought out the discussion that cultures must not be named as collectivistic or individualistic, just based on assumptions due to their geographical locations. Instead, *the objective assessment of connectedness and separateness* must be carried out in each cross-cultural affective neuroscience study (see Chapter Four, Özkarar-Gradwohl, 2019).

The ANPS and B5S findings of this Euro-Asian study (Chapter Three) were also interpreted in relation to these objective assessments of connectedness and separateness. While the links between the ANPS and the B5S are clearly established (Chapter Six, Marengo et al., 2021), Chapter Three demonstrated that the loadings of ANPS and B5S traits on self construals may vary across cultures (Özkarar-Gradwohl et al., 2018). The most striking finding was that while subscales from both ANPS and B5S load on self-construals in Japan and Türkiye, mostly the B5S loaded on self-construals in Germany (Özkarar-Gradwohl et al., 2018). The results also showed that different affects and cognitions may lead to behaviors of connectedness and separateness in different cultures. For instance, for *separateness-independency*, the common positive Big Five predictor, shared by all the three samples, was Extraversion. However the affects underlying the separateness-independent self-construals vary across cultures. It appeared that Turks utilized ANGER, and the Japanese utilized SEEK and Spirituality in the service of separateness. On the other hand, it seemed that FEAR suppressed Japanese separateness, while PLAY suppressed German separateness. In short, these data suggest that different emotions triggered independent self-construals in these three cultures (Özkarar-Gradwohl et al., 2018).

As for connectedness-*inter*dependency, the common negative Big Five predictor was Openness to Experience. However the remaining affective and cognitive predictors showed several differences. For German connectedness FEAR and Agreeableness were positive predictors, and Emotional Stability (and Openness to Experience) were negative predictors.

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For Japanese connectedness CARE, PLAY, and Spirituality were positive predictors and Extraversion (and Openness to Experience) were negative predictors. Finally, for Turkish connectedness, SADNESS, Spirituality, and Agreeableness were positive predictors, and ANGER (and Openness to Experience) were negative predictors. All these results may indicate that different emotions and cognitions can trigger the similar behaviors of connectedness and separateness in different cultures. Clearly, this is an important topic for research in the future.

Alltogether, these findings showed that entire cultures must not be named as collectivistic or individualistic, just based on assumptions due to their geographical locations. Instead, their levels of connectedness and separateness must be objectively asssessed. Moreover, although there are universal connections between the affective personality traits (measured by ANPS) and the cognitive personality traits (measured by the B5S), culture-specific variations do exist in how these two dimensions effect connectedness and separateness.

As regards gender, how different genders experience connectedness (interdependency) and separateness (independency) seems to be a second crucial variable that regulates the affect, cognition and behavior dimensions of personality. Chapter Five (Özkarar-Gradwohl & Turnbull, 2021) discussed that the universal female superiority in CARE and SADNESS, was consistent with the affective neuroscience literature suggesting that female mammals show more behaviors linked to attachment (connectedness) and separation distress (Panksepp 1998). It is also widely acknowledged that females have higher relatedness, whereas males have higher autonomy (e.g. Bekker & Van Assen, 2008; Chodorow, 1989; Fişek, 2009; 2018; Van Assen & Bekker, 2009). It has been argued that the female identity is based on staying in relatedness and identifying with the mother, whereas the male identity is based on separating from the mother and identifying with the father (see Chapter Three, Four, Five).

In line with these arguments, the collectivistic culture effect (emphasizing connectedness) and individualistic culture effect (emphasizing separateness and autonomy) might influence the gender differences on personality in different ways. Interestingly, gender differences on Big Five personality factors (Schmitt et al. 2017) and on Affective Neuroscience Personality Traits (see Chapter Five, Özkarar-Gradwohl & Turnbull, 2021) seem to increase when moving from East to West. In other words, in Eastern cultures which emphasize connectedness, males and females differ less in terms of their personality traits.

Chapter Five had shown that the most striking gender difference on affective personality traits (between Eastern and Western samples) is for FEAR (thus, separation anxiety). While most females in North America & Europe had higher FEAR scores than their male counterparts (in 9 countries out of 11), the total absence of higher average FEAR scores in Asian females was remarkable. The fact that Western females have higher FEAR scores than their male counterparts has been discussed in terms of separation anxiety experienced in the individualistic cultures. As discussed in Chapter Five, the philosophy of connectivity which seems to be maintained in Eastern cultures (but supressed in the West), appears to have a preventive influence against separation anxiety (De Vaus et al. 2017). This argument is also supported by neurogenetical studies which show that the serotonergic and oxytocinergic systems (which are related to mood and anxiety disorders) appear to be mediated by collectivistic cultural values (Chiao and Blizinsky, 2010; Luo and Han 2014).

As discussed in Chapter 5, genomic data suggests that the migration and admixture of populations (starting in Africa 300,000 years ago and moving to Asia, the Middle East, Europe and lastly the Americas some 20,000 years ago) have played a large part in generating cultural and genetic diversity (Nielsen et al. 2017). Current studies on immigration also discuss the negative influence of separation anxiety on immigrants (Van Ecke 2005). How certain geographies are genetically more vulnerable to anxiety might also be related to

culture-gene coevolution during the historical migration of people, where different levels of separation anxiety may have been transmitted across generations (Özkarar-Gradwohl & Turnbull, 2021).

On the other hand, Chapter Five indicated that the most remarkable absence of gender effect was for ANGER. Virtually universally, in 13 out of 15 countries, females and males did not differ from each other in terms of their ANGER scores. However, the levels of ANGER were found to differ across cultures (see Chapters Two and Three), where higher suppression of ANGER was observed in cultures with higher interdependecy (connectedness), and lower ANGER suppression in cultures with higher independency (separateness). In short, the levels of ANGER (as an affect which disrupts connectedness and activates separateness) did not differ between genders, but did differ across cultures.

Future cross-cultural affective neuroscience studies are required to clarify how the *main effects of culture and gender* interact to produce the individual differences on personality. It might be the case that in Eastern cultures, where connectivity philosophy reinforces relatedness for both genders, the main effect of culture overrides the main effect of gender. On the other hand, the main effect of gender may be amplified more in the Western cultures, where separateness (a male characteristic) is more reinforced. To observe these main effects, further studies need to measure their interaction effects as well.

7.1.4. Limitations

In the last two decades, cultural neuroscience and cultural psychology are on the rise, with increasing holistic approaches to personality, that integrate nature and nurture (e.g. Chiao, 2009; 2017; Giordano, 2010; 2019; Matsumoto & Hwang, 2012; Matsumoto & Wilson, 2020; Montag & Panksepp, 2017; Montag et al., 2016; Reuter, 2014). In line with this Zeitgeist, cross-cultural affective neuroscience is also a future promising field that may

contribute to this holistic synthesis (Özkarar-Gradwohl et al., 2014; Özkarar-Gradwohl et al., 2018; Özkarar-Gradwohl, 2019; Özkarar-Gradwohl & Turnbull, 2021; Marengo et al., 2021). The work reported in this thesis has provided an important foundation regarding the influence of culture on affective neuroscience personality traits. However, the general limitations that apply to cultural sciences (e.g. Kirmayer, 2012; Thalmayer et al., 2022; Vignoles et al., 2016; Voronov & Singer, 2002) do also apply to these cross-cultural affective neuroscience studies. The three main categories of limitations identified by the field (problems of sampling, problems of instrumental challenges, and procedures) will be discussed in this section.

The first limitation is the issue of sampling problems. This includes variables such as sample size, age, education, gender, urban/rural background, ethnicity within country, and psychological health state. The present studies have some of the limitations in sampling which are found in other cross-cultural studies as well. As discussed below, some of these variables are very well controlled and others less so.

The best controlled two variables, in all the studies presented in this thesis, were sample size and gender. As regards sample size, these were equivalent or larger than those in the field. Total sample sizes were 890 subjects in Chapter Two, 902 in Chapter Three, 6500 in Chapter Five, and 10244 in Chapter Six. Moreover, gender was the second best controlled variable across these studies. Gender ratios for females across these studies were 66% in Chapter Two, 52% in Chapter Three, and 62% females in Chapter Five. These gender variables were investigated in each study (except Chapter Six, Marengo et al., 2021) and formed the basis for the review in Chapter Five. As gender effects on ANPS are very well established (over 15 countries) by Chapter Five (Özkarar-Gradwohl & Turnbull, 2021), gender must be always examined as a covariable in cross-cultural affective neuroscience studies.

An aditional three variables were incompletely controlled for (age, education, and trans-generational differences). As regards age, mostly university students were recruited (Chapters Three, Five, and Six). The student and adult groups were compared only in the Turkish-American ANPS study (Chapter Two, Özkarar-Gradwohl et al., 2015). Based on these comparisons, Chapter Two reported that all the affective scores (except CARE) decrease, while Spirituality increases with age. Ideally, in order to control the influence of age as a covariable, samples might have included a wider range of age groups. As regards education, because the samples included mostly university students (except Chapter Two), this variable was also not controlled for. Having a wider range of age groups in future studies may enable the measurement of transgenerational differences, as well as the influence of education, on the regulation of affective personality traits.

For three variables (urban/rural background, ethnic groups within the country, and psychological health state), it was not possible to assess potentially important demographic issues. The studies presented in this thesis lacked the comparisons of subjects from urban/rural backgrounds within the same country, a problem which applies to almost all studies in the cross-cultural field. It has been reported that, having an urban or rural life influences affective personality traits in different ways (see Sindermann et al. 2017), so, ideally cross-cultural affective neuroscience studies must also analyze this variable. Optimally, this analysis might be combined with comparisons of different ethnic groups within the same country. The final sampling issue is the influence of psychological health on the ANPS, which has been investigated in some studies (e.g. Carre et al., 2015; Geier et al., 2014; Savitz et al. 2008a, b). However, the cross-cultural affective neuroscience studies in this thesis have not considered this variable. Ideally, psychological health assessment may be integrated to sampling procedures, in order to control the influence of this covariable. In sum,

optimally future studies need to include age, education, gender, urban/rural background, ethnicity within country, and psychological health state within the demographic variables.

The second category of limitations are the instrumental challenges. The ANPS is a psychometric tool, based on subjective self-reports, and it naturally has the limitations that apply to all self-report questionairres. An important issue to be resolved is whether the self-reports reflect the levels of experienced affect, or if they reflect the affects which are allowed to be expressed by the culture (e.g. social desirability effects). Integrating neuroscientific methods with the ANPS studies may cross-check this issue of social desirability, which is a limitation of all self-report instruments. In addition, the original ANPS has reported low reliabilities for some subscales, namely SEEK and PLAY (Davis et al., 2003). To increase the overall reliability of ANPS, updated versions were developed, such as ANPS 2.4, BANPS, and finally the ANPS 3.1 (Montag et al., 2021). Future studies might consider to utilize ANPS 3.1, as findings show that its application will lead to more reliable outcomes.

The ANPS assesses solely the affective component of personality, and does not measure the cognitive/behavioral components. In contrast, the B5 measures mostly the cognitive/behavioral components, but not the affects. Hence, using both measures can be a complementary solution to observe the wider dimensions of personality. Finally, the content of the ANPS can be improved also by the inclusion of secondary emotions. The ANPS assesses the primary basic affects, but it does not cover the secondary (cognitive type) emotions, such as shame/guilt or pride. The inclusion of items related to these secondary emotions may enable us to see the links of primary and secondary emotions in different cultures, and help enhance the cross-cultural ANPS discussions. In sum, these are substantial instrumental challenges. However, they are scientifically important and can hopefully be addressed over the next few years.

The third category of limitation is based on procedural problems. These include lack of: comparative analysis of inter-correlations, interdependency-independency assessments, loadings of ANPS and B5S on self-construals, and developmental and neuroscientific investigations. Some of these procedures were, to some extent, integrated into the studies presented in this thesis. Others have been mentioned only in the discussion sections.

As discussed in the previous section (see 7.1.3), defining countries as collectivistic or individualistic based on their geographical location is a procedural problem, seen widely in cross-cultural studies. A meta-analysis on Self-Construal Scales over 55 cultural groups showed that "a simple contrast between independence and interdependence does not adequately capture the diverse models of selfhood that prevail in different world regions. Cultural groups emphasize different ways of being both independent and interdependent…" (pp 7, Vignoles et al., 2016). In this thesis, Chapter Three presented the only study that tackled this issue and demonstrated that the objective assessment of connectedness-separateness (interdependency-independency) makes an important contribution when empirically defining the cultural characteristics of the samples. Future cross-cultural studies need to define the cultural characteristics of their samples based on objective assessments, but not on stereotypes of geographical locations.

Another issue is the problem of comparing only raw scores, but ignoring the underlying variables that make up those scores. For example, the studies in this thesis have shown that two samples might have the same subscale scores, but the underlying subscale intercorrelations might be different (See Chapters Two and Three). Therefore, comparing only levels of affects between samples is not enough, ideally the affect intercorrelations need to be investigated and compared as well (see Chapter Three). Finally, Chapter Three also showed that the two samples might have similar scores on interdependency and independency, but the loadings of ANPS and B5S on these self-construals might differ. In sum, ideally, the

investigation of interactions between the affective personality traits, Big Five traits, and self-construals seems to give us a more holistic comprehension of cross-cultural individual differences.

Finally, to improve the quality of science in this field, developmental and neuroscientific investigations need to be directly integrated into research, not merely included in the discussion sections. Notably, all the studies reported in this thesis, used the ANPS (which is based on subjective self-report) as the main instrument. However, as all self-reports are limited in terms of objectivity, the ANPS faces the same limitation too. In order to base the cross-cultural affective neuroscience discussions on more objective grounds, developmental methods (like the assessment of mother-child attachment styles, family models, and emotion socializations) can be added to the procedures. This may clarify the concrete links between enviromental factors (nurture) and affective personality traits. Moreover, neuroscientific methods (like brain imaging, focal lesion studies, and psychopharmacology) can also help to increase the objectivity of the theoretical assumptions. So far, the only lesion study (combined with the ANPS) was about anosognosia (Turnbull et al., 2004). The inclusion of neuroscientific methods may help to detect the concrete links between biological factors (nature) and affective personality traits.

As summarized in this section, the methodological limitations in sampling and procedures need to be improved in future cross-cultural affective neuroscience studies. Working on these limitations will improve the future direction of this new-born field.

7.1.5. Future Directions

Suggestions for future research have been made throughout each chapter of this thesis. The previous section (7.1.4.) has also emphasized the areas that might be improved in these future studies. In addition to these previously made suggestions, this section will highlight

new research themes to include, based on the main ideas and concepts of the *overall* thesis. These recommendations are grouped into two categories: 1. Global affective mapping, and 2. Grounding the affective map.

1. Global Affective Mapping

This thesis has presented empirical evidence that individual differences lie in universally shared basic affective systems, which are regulated differently by each culture. By comparing two (e.g. Chapter Two) or three countries (e.g. Chapter Three), it was demonstrated that each culture may have a unique affective personality profile. Moreover, the review of 15 countries (see Chapter Five) showed that universal similarities and geographical differences (in gender effects) can be traced across cultures. Based on these findings, the establishing of a global affective map may be an intriguing avenue for further investigation.

How might such a map be developed? Firstly, by standardizing the scores gathered by different versions of the ANPS (e.g. long version, short version), and comparing the standardized z-scores across a very wide range of cultures. The outcome might be presented as a heat map, the better to capture gradual changes across geographies. This can facilitate observing the cultural effects on ANPS on a larger scale, with a networking approach. Such a global affective mapping might also help to detect regional similarities, where genetic variations prevail (e.g. Northern Europe versus Southern Europe). The validation of this global affective map can be supplied by its correlations to the global Big Five findings (Schmitt et al., 2007; Schmitt et al., 2008), and Self-Construal findings (Vignoles et al., 2016).

This approach might also help cross-cultural studies to evolve beyond Western-Eastern polarizations, by adding the Northern-Southern comparisons. The inclusion of all four directions might shift the future discussions too, for example to the Northwest-Southeast axis.

As mentioned in Chapter Three, to visualize the ANPS findings on such a holistic map may increase the awareness regarding *global affective networks*, where each cultural pool (in line with the genetic pool) has an equally important and specific role (as stated in Boas' cultural relativism, for a review see Brown, 2008). Such a future project might support a better scientific understanding of the specific roles of the cultural affective personality profiles, within universal affective networks.

2. Grounding the Affective Map

The process of "grounding" the global affective map is the extent to which the ANPS findings can be integrated with surrounding research fields. There might be several examples of the fields which are relevant to the ANPS. This section will address how this affective map can be grounded (within a country, regionally and/or globally), with the help of developmental and neuroscientific confirmative methods.

Firstly, the ANPS findings might be combined with developmental variables in order to see to what extent these nurture variables are the predictors of affective personality profiles. These variables might include duration of breast-feeding, onset of toilet training, co-sleeping in parents' room, maternal and paternal attachment syles, and emotion socializations etc. These variables are already easy to measure and widely used (e.g. Ainsworth & Bowlby, 1991; Bowlby, 1958; Bowlby, 1988; Friedlmeier & Trommsdorf, 1998; Friedlmeier et al. 2011; Song and Trommsdorff; 2016). All that is required is that ANPS data are collected for the same participants. Such a developmental grounding method might support the main premises of cross-cultural affective neuroscience, by enlightening the influence of nurture on basic affective systems.

Secondly, the neuroscientific data might also be integrated to the cross-cultural affective neuroscience studies. These might include neuro-anotomical variables such as the

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size of the amygdala, hypothalamic nuclei, and the anterior cingulate cortex. They may also include neuro-functional data, such as the activation of the amygdala, hypothalamic nuclei, anterior cingulate cortex. A final approach can be neurochemical, for example modifying levels of dopamine, serotonin, or the opiates. Again, these variables have been already widely measured (e.g. Cannon, 1927; Davidson, 1992; LeDoux, 1996; MacLean, 1949; Panksepp, 1998; Rolls 1999), but all that is required is that ANPS data are collected for the same participants. Such a neurological grounding method can supply the neurological evidence for cross-cultural affective neuroscience. In sum, the grounding of the global affective map by these developmental and neuroscientific methods can enhance the validity of the assumptions of this new-born field.

7.1.6. Conclusion

This thesis began by reviewing the approaches to personality throughout history, and across geographies. This review demonstrated that the focus on two variables, external influences and internal bodily localizations, have been a recurrent topic throughout history. By summarizing the modern approaches to personality, the thesis also showed that this repeated topic, related to nurture and nature, has been maintained in the current literature. The review suggested that the affective roots of personality (explored by the ANPS) sought to re-integrate *nature and nurture* (Panksepp & Biven, 2012). The ANPS literature has emphasized that individual differences found in the subcortical affective systems may be the epigenetic predictors of personality traits (Davis et al., 2003; Davis & Panksepp, 2011; 2018; for a review; Montag & Davis, 2018; Montag & Panksepp, 2017).

A series of cross-cultural affective neuroscience studies, presented in this thesis, investigated a range of topics that have not been studied (culture, gender, and the global relation of ANPS to B5S). In five scientific papers (Chapters Two to Six), the thesis explored

a number of cultural differences, in addition to universal similarities. This thesis showed that culture plays an important role in the regulation of basic affective systems, as assessed by the ANPS. Besides the main effect of culture, an interesting finding was that gender has an outstanding and selective effect on affective personality traits.

In sum, this thesis showed that cross-cultural affective neuroscience is a promising field, whose basic premises seem reliable and valid. This initial confirmation is encouraging for further explorations. Future investigations are required, on the interaction between culture and gender, especially in cultural settings which differ in connectedness and separateness. It seems clear that this new field is investigating critical topics relating to culture and its biological basis. Critically, the field also has the tools available to carry out this important work.

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Appendix A - Affective Neuroscience Personality Scale (Chapters Two, Three, Five, and Six)

1= Strongly Agree

2= Agree

3= Disagree

4= Strongly Disagree

……1. Almost any little problem or puzzle stimulates my interest.

……2. People who know me well would say I am an anxious person.

……3. I often feel a strong need to take care of others.

……4. When I am frustrated, I usually get angry.

……5. I am a person who is easily amused and laughs a lot.

……6. I often feel sad.

……7. Feeling a oneness with all of creation helps give more meaning to my life.

……8. I make an effort to remain aware of my feelings and emotions.

……9. I do not get much pleasure out of looking forward to special events.

…..10. I do not often struggle over making decisions.

…..11. I think it is ridiculous the way some people on around baby animals.

…..12. If I am blocked from getting what I want, I usually just accept it.

…..13. My friends would probably describe me as being too serious.

…..14. I seem to be affected less by personal rejection than most people.

…..15. The meaning in my life does not come from feeling connected to other living things.

…..16. I will gossip a little at times.

…..17. I really enjoy looking forward to new experiences.

…..18. I often think of what I should have done after the opportunity has passed.

…..19. I like taking care of children.

…..20. My friends would probably describe me as hotheaded.

…..21. I am known as one who keeps work fun.

…..22. I often have the feeling that I want to cry.

…..23. I am often spiritually touched by the beauty of creation.

…..24. When listening to music, I sometimes become so absorbed in the music that I lose track of everything else going on around me.

…..25. I like to set very practical goals rather than grandiose plans.

…..26. I would not describe myself as a warrior.

…..27. Caring for a sick person would be a burden for me.

…..28. I cannot remember a time when I became so angry that I wanted to break something.

…..29. I generally would not enjoy vigorous games which required physical contact.

…..30. I seem to be less sad than most other people.

…..31. I rarely rely on spiritual inspiration to help me meet important challenges.

…..32. I always tell the truth.

…..33. Seeking an answer is as enjoyable as finding the solution.

…..34. I am frequently more tense inside than others realize.

…..35. I love being around baby animals.

…..36. When I get angry, I often feel like swearing.

…..37. I usually think about good times and have happy thoughts.

…..38. I often feel lonely.

…..39. For me, experiencing a connection to all of life is an important source of inspiration.

…..40. I like to take pleasure in small things, such as the colors in soap bubbles.

…..41. I often feel little eagerness or anticipation when thinking about my goals.

…..42. I have very few fears in my life.

…..43. I do not especially enjoy being around children.

…..44. When I am frustrated, I rarely become angry.

…..45. I dislike humor that gets really silly.

…..46. I am very attached to my family.

…..47. For me, spirituality is not a primary source of inner peace and harmony.

…..48. Sometimes I feel like swearing.

…..49. I enjoy anticipating and working toward a goal almost as much as achieving it.

…..50. I sometimes can not stop worrying about my problems.

…..51. I often feel softhearted towards stray animals.

…..52. When someone makes me angry, I tend to remain fixed up for a long time.

…..53. People who know me would say I am a very fun-loving person.

…..54. I often think about people I have loved who are no longer with me.

…..55. Contemplating spiritual issues, often fills me with a sense of intense awe and possibility.

…..56. I have never attempted to express myself by writing poetry.

…..57. I am usually not interested in soling problems and puzzles just for the sake of solving them.

…..58. My friends would say, that I am courageous and that it takes a lot to frighten me.

…..59. I would generally consider pets in my home to be more trouble than they are worth.

…..60. People who know me well would say I almost never become angry.

…..61. I do not particularly enjoy kidding around and exchanging "wisecracks."

…..62. It does not particularly sadden me when friends or family members are disapproving of me.

…..63. My sense of significance and purpose in life do not come from my spiritual beliefs.

…..64. I have never "played sick" to get out of something.

…..65. My curiosity sometimes drives me to do things that others might consider a waste of time.

…..66. I often worry about the future.

…..67. I feel sorry for the homeless.

…..68. I tend to get irritated if someone tries to stop me from doing what I want to do.

…..69. I feel happiness most of the time.

…..70. I tend to think about losing loved ones often.

…..71. I feel a connection with the rest of humanity motivates me to make more ethical choices.

…..72. I am not typically impressed by poetic language or fancy speech.

…..73. I rarely feel the need just to get out and explore things.

…..74. There are very few things that make me anxious.

…..75. I do not like to feel "needed" by other people.

…..76. I rarely get angry enough to want to hit someone.

…..77. I do not tend to see the humor in things many people consider funny.

…..78. Moving away from my friends would not upset me.

…..79. The goals I set for myself are not influenced by my spirituality.

…..80. There have been times in my life when I was afraid of the dark.

…..81. Whenever I am in a new place, I always like to explore the area and get a better feel for my surrounding.

…..82. I often worry about whether I am making the correct decision.

…..83. I frequently do little things for others that make them feel good.

…..84. When things do not work out the way I want, I sometimes feel like kicking or hitting something.

…..85. I enjoy all kinds of games including those with physical contact.

…..86. I frequently feel distressed when I cannot be with my friends.

…..87. Spiritual inspiration helps me transcend my limitations.

…..88. While watching a movie or the like, I may become so involved it is as if I were actually part of it.

…..89. I am not the kind of person that likes probing and investigating problems.

…..90. I rarely worry about my future.

…..91. I do not especially want people to be emotionally close to me.

…..92. I hardly ever become angry at someone that I feel like yelling at them.

…..93. I enjoy playing games less when it is just for fun and there is no clear winner.

…..94. I rarely think about people or relationships I have lost.

…..95. The suggestion to "Treat other people as they want to be treated" does not arouse strong feelings in me.

…..96. I have never intentionally told a lie.

…..97. I often feel like I could accomplish almost anything.

…..98. I often feel nervous and have difficulty relaxing.

…..99. I am a person who strongly feels the pain of other people's losses.

…100. Sometimes little quirky things people do really get on my nerves.

…101. I see life as being full of opportunities to have fun.

…102. I am a person who feels sorrow and the pain of loss strongly.

…103. I sometimes feel "chills" or "goosebumps" when listening to music.

…104. It often seems that life has no meaning.

…105. I am not an extremely inquisitive person.

…106. I almost never lose sleep worrying about things.

…107. I am not particularly affectionate.

…108. When people irritate me, I rarely feel the urge to say nasty things to them.

…109. Playing games with other people is not especially enjoyable for me.

…110. I am almost always happy to interact with other people.

Appendix B - Affective Neuroscience Personality Scale 2.4 (Chapters Three, Five, and Six)

1= Strongly Disagree

2= Disagree

3=Agree

4= Strongly Agree

……1. Almost any little problem or puzzle stimulates my interest.

……2. People who know me well would say I am an anxious person.

……3. I often feel a strong need to take care of others.

……4. When I am frustrated, I usually get angry.

……5. I am a person who is easily amused and laughs a lot.

……6. I often feel sad.

……7. Feeling a oneness with all of creation helps give more meaning to my life.

……8. I like to be the one in a group making the decisions.

……9. I do not get much pleasure out of looking forward to special events.

…..10. I am not frequently jittery and nervous.

…..11. I think it is ridiculous the way some people carry on around baby animals.

…..12. I never stay irritated at anyone for very long.

…..13. My friends would probably describe me as being too serious.

…..14. I seem to be affected very little by personal rejection.

…..15. Feeling like a part of creation is not an important source of meaning for my life.

…..16. I will gossip a little at times.

…..17. I really enjoy looking forward to new experiences.

…..18. I often think of what I should have done after the opportunity has passed.

…..19. I like taking care of children.

…..20. My friends would probably describe me as hotheaded.

…..21. I am known as one who keeps work fun.

…..22. I often have the feeling that I am going to cry.

…..23. I am often spiritually touched by the beauty of creation.

…..24. I usually avoid activities in which I would be the center of attention.

…..25. I am usually not highly curious.

…..26. I would not describe myself as a worrier.

…..27. Caring for a sick person would be a burden for me.

…..28. I cannot remember a time when I became so angry that I wanted to break something.

…..29. I generally do not like vigorous games which require physical contact.

…..30. I rarely become sad.

…..31. I rarely rely on spiritual inspiration to help me meet important challenges.

…..32. I always tell the truth.

…..33. Seeking an answer is as enjoyable as finding the solution.

…..34. I often cannot fall right to sleep because something is troubling me.

…..35. I love being around baby animals.

…..36. When I get angry, I often feel like swearing.

…..37. I like to joke around with other people.

…..38. I often feel lonely.

…..39. For me, experiencing a connection to all of life is an important source of inspiration.

…..40. When I play games, it is important for me to win.

…..41. I usually feel little eagerness or anticipation.

…..42. I have very few fears in my life.

…..43. I do not especially like being around children.

…..44. When I am frustrated, I rarely become angry.

…..45. I dislike humor that gets really silly.

…..46. I never become homesick.

…..47. For me, spirituality is not a primary source of inner peace and harmony.

…..48. Sometimes I feel like swearing.

…..49. I enjoy anticipating and working towards a goal almost as much as achieving it.

…..50. I sometimes cannot stop worrying about my problems.

…..51. I feel softhearted towards stray animals.

…..52. When someone makes me angry, I tend to remain fired up for a long time.

…..53. People who know me would say I am a very fun-loving person.

…..54. I often think about people I have loved who are no longer with me.

…..55. Contemplating spiritual issues often fills me with a sense of intense awe and possibility.

…..56. If my peers have outperformed me, I would still be happy, if I have nearly met my goals.

…..57. I am usually not interested in solving problems and puzzles just for the sake of solving them.

…..58. My friends would say that it takes a lot to frighten me.

…..59. I would generally consider pets in my home to be more trouble than they are worth.

…..60. People who know me well would say I almost never become angry.

…..61. I do not particularly enjoy kidding around and exchanging "wisecracks."

…..62. It does not particularly sadden me when friends or family members are disapproving of me.

…..63. My sense of significance and purpose in life does not come from my spiritual beliefs.

…..64. I have never "played sick" to get out of something.

…..65. My curiosity often drives me to do things.

…..66. I often worry about the future.

…..67. I feel sorry for the homeless.

…..68. I tend to get irritated if someone tries to stop me from doing what I want to do.

…..69. I am very playful.

…..70. I tend to think about losing loved ones often.

…..71. Feeling a connection with the rest of humanity motivates me to make more ethical choices.

…..72. When I play games, I do not mind losing.

…..73. I rarely feel the need just to get out and explore things.

…..74. There are very few things that make me anxious.

…..75. I do not like to feel "needed" by other people.

…..76. I rarely get angry enough to want to hit someone.

…..77. I do not tend to see the humor in things many people consider funny.

…..78. I rarely have the feeling that I am close to tears.

…..79. The goals I set for myself are not influenced by my spirituality.

…..80. There have been times in my life when I was afraid of the dark.

…..81. Whenever I am in a new place, I like to explore the area and get a better feel for my surroundings.

…..82. I often worry about whether I am making the correct decision.

…..83. I am the kind of person that likes to touch and hug people.

…..84. When things do not work out the way I want, I sometimes feel like kicking or hitting something.

…..85. I like all kinds of games including those with physical contact.

…..86. I frequently feel downhearted when I cannot be with my friends or loved ones.

…..87. Spiritual inspiration helps me transcend my limitations.

…..88. I am not satisfied unless I can stay ahead of my peers.

…..89. I am not the kind of person that likes probing and investigating problems.

…..90. I rarely worry about my future.

…..91. I do not especially want people to be emotionally close to me.

…..92. I hardly ever become so angry at someone that I feel like yelling at them.

…..93. I do not frequently ask other people to join me for fun activities.

…..94. I rarely think about people or relationships I have lost.

…..95. My choices are not guided by a sense of connectedness with all of life.

…..96. I have never intentionally told a lie.

…..97. I often feel like I could accomplish almost anything.

…..98. I often feel nervous and have difficulty relaxing.

…..99. I am a person who strongly feels the pain of other people.

…100. Sometimes little quirky things people do really annoy me.

…101. I see life as being full of opportunities to have fun.

…102. I am a person who strongly feels the pain from my personal losses.

…103. When working on a project, I like having authority over others.

…104. Being embarrassed or looking stupid are among my worst fears.

…105. I am not an extremely inquisitive person.

…106. I almost never lose sleep worrying about things.

…107. I am not particularly affectionate.

…108. When people irritate me, I rarely feel the urge to say nasty things to them.

…109. Playing games with other people is not especially enjoyable for me.

…110. It would not bother me to spend the holidays away from family and friends.

…111. Striving to be better than my peers is not important for me.

…112. Fear of embarrassment often causes me to avoid doing things or speaking to others.

Appendix C - Affective Neuroscience Personality Scale – Short / ANPS-S (Chapter Five)

1= Strongly Disagree

2= Disagree

3=Agree

4= Strongly Agree

…..1. I really enjoy looking forward to new experiences.

…..2. I am usually not highly curious.

…..3. My curiosity often drives me to do things.

…..4. I rarely feel the need just to get out and explore things.

…..5. Whenever I am in a new place, I like to explore the area and get a better feel for my
surroundings.

…..6. I am not an extremely inquisitive person.

…..7. I often feel a strong need to take care of others.

…..8. I like taking care of children.

…..9. Caring for a sick person would be a burden for me.

….10. I do not especially like being around children.

….11. I am a person who strongly feels the pain of other people.

….12. I am not particularly affectionate.

….13. I am a person who is easily amused and laughs a lot.

….14. I do not particularly enjoy kidding around and exchanging "wisecracks."

….15. I am very playful.

….16. I do not tend to see the humor in things many people consider funny.

….17. I like all kinds of games including those with physical contact.

….18. Playing games with other people is not especially enjoyable for me.

….19. When I am frustrated, I usually get angry.

….20. My friends would probably describe me as hotheaded.

….21. When I am frustrated, I rarely become angry.

….22. People who know me well would say I almost never become angry.

….23. I hardly ever become so angry at someone that I feel like yelling at them.

….24. When people irritate me, I rarely feel the urge to say nasty things to them.

….25. People who know me well would say I am an anxious person.

….26. I am not frequently jittery and nervous.

….27. I would not describe myself as a worrier.

….28. I have very few fears in my life.

….29. My friends would say that it takes a lot to frighten me.

….30. There are very few things that make me anxious.

….31. I often feel sad.

….32. I often have the feeling that I am going to cry.

….33. I rarely become sad.

….34. I often feel lonely.

….35. I often think about people I have loved who are no longer with me.

….36. I tend to think about losing loved ones often.

Appendix D – Brief Affective Neuroscience Personality Scale - BANPS (Chapter Six)

1= Strongly disagree

2= Disagree

3= Neither agree nor disagree

4= Agree

5= Strongly agree

…..1. People who know me would say I am a very fun-loving person.

…..2. When I am frustrated, I usually get angry.

…..3. I am usually not highly curious.

…..4. I am the kind of person that likes to touch and hug people.

…..5. I rarely get angry enough to want to hit someone.

…..6. I rarely worry about my future.

…..7. I rarely become sad.

…..8. I seldom experience sadness or despair.

…..9. I am very playful.

….10.I often have the feeling that I am going to cry.

….11.My friends would probably describe me as hotheaded.

….12. I do not feel lonely very often.

….13. I like to kid around with other people.

….14. I often feel the urge to nurture those closest to me.

….15. I often worry about the future.

….16. I am not particularly affectionate.

….17. There are very few things that make me anxious.

….18. I often feel lonely.

….19. I am a person who is easily amused and laughs a lot.

….20. People who know me well would say I almost never become angry.

….21. I am usually not interested in solving problems and puzzles just for the sake of solving

them.

….22. I do not particularly enjoy kidding around and exchanging "wisecracks."

….23. I sometimes cannot stop worrying about my problems.

….24. I hardly ever become so angry at someone that I feel like yelling at them.

….25. I am not an extremely inquisitive person.

….26. When someone makes me angry, I tend to remain fired up for a long time.

….27. I do not especially want people to be emotionally close to me.

….28. My curiosity drives me to do things.

….29. My friends would probably describe me as being too serious.

….30. I have very few fears in my life.

….31. I enjoy finding new solutions to problems.

….32. I often feel sad.

….33. I like to think outside of the box.

Appendix E - Big Five Scale (Chapters Two, Three, and Six)

1= Extremely Inaccurate	**6= Slightly Accurate**
2= Very Inaccurate	**7= Quite Accurate**
3= Quite Inaccurate	**8= Very Accurate**
4= Slightly Inaccurate	**9= Extremely Accurate**
5= Neither	

…1. Energetic

…2. Helpful

…3. Neat

…4. Introspective

…5. Untroubled

…6. Reserved

…7. Demanding

…8. Undependable

…9. Complex

…10. Anxious

…11. Talkative

…12. Cooperative

…13. Efficient

…14. Unreflective

…15. Composed

…16. Introverted

…17. Cold

…18. Unsystematic

…19. Imaginative

…20. Touchy

…21. Assertive

…22. Pleasant

…23. Careful

…24. Not inquisitive

…25. Unruffled

…26. Shy

…27. Kind

…28. Disorganized

…29. Unintelligent

…30. Relaxed

…31. Verbal

…32. Rude

…33. Prompt

…34. Innovative

…35. Self-pitying

…36. Bashful

…37. Generous

…38. Inefficient

…39. Unimaginative

…40. Nervous

…41. Active

…42. Unsympathetic

…43. Practical

…44. Deep

…45. Not perturbable

…46. Untalkative

…47. Considerate

…48. Inconsistent

…49. Not perceptive

…50. Irritable

…51. Vigorous

…52. Harsh

…53. Systematic

…54. Uncreative

…55. Moody

…56. Timid

…57. Warm

…58. Sloppy

…59. Intellectual

…60. Not envious

…61. Extraverted

…62. Uncooperative

…63. Organized

…64. Philosophical

…65. Jealous

…66. Quiet

…67. Sympathetic

…68. Careless

…69. Creative

…70. Temperamental

Appendix F - Self Construal Scale (Chapter Three)

1= Strongly Disagree

2= Disagree

3= Somewhat Disagree

4= Don't agree or

    Disagree

5= Agree Somewhat

6= Agree

7= Strongly Agree

____1. I enjoy being unique and different from others in many respects.

____2. I can talk openly with a person who I meet for the first time, even when this person is much older than I am.

____3. Even when I strongly disagree with group members, I avoid an argument.

____4. I have respect for the authority figures with whom I interact.

____5. I do my own thing, regardless of what others think.

____6. I respect people who are modest about themselves.

____7. I feel it is important for me to act as an independent person.

____8. I will sacrifice my self interest for the benefit of the group I am in.

____9. I'd rather say "No" directly, than risk being misunderstood.

____10. Having a lively imagination is important to me.

____11. I should take into consideration my parents' advice when making education/career plans.

____12. I feel my fate is intertwined with the fate of those around me.

____13. I prefer to be direct and forthright when dealing with people I've just met.

____14. I feel good when I cooperate with others.

____15. I am comfortable with being singled out for praise or rewards.

____16. If my brother or sister fails, I feel responsible.

____17. I often have the feeling that my relationships with others are more important than my own accomplishments.

____18. Speaking up during a class (or a meeting) is not a problem for me.

____19. I would offer my seat in a bus to my professor (or my boss).

____20. I act the same way no matter who I am with.

___21. My happiness depends on the happiness of those around me.

___22. I value being in good health above everything.

___23. I will stay in a group if they need me, even when I am not happy with the group.

___24. I try to do what is best for me, regardless of how that might affect others.

___25. Being able to take care of myself is a primary concern for me.

___26. It is important to me to respect decisions made by the group.

___27. My personal identity, independent of others, is very important to me.

___28. It is important for me to maintain harmony within my group.

___29. I act the same way at home that I do at school (or work).

___30. I usually go along with what others want to do, even when I would rather do something different.