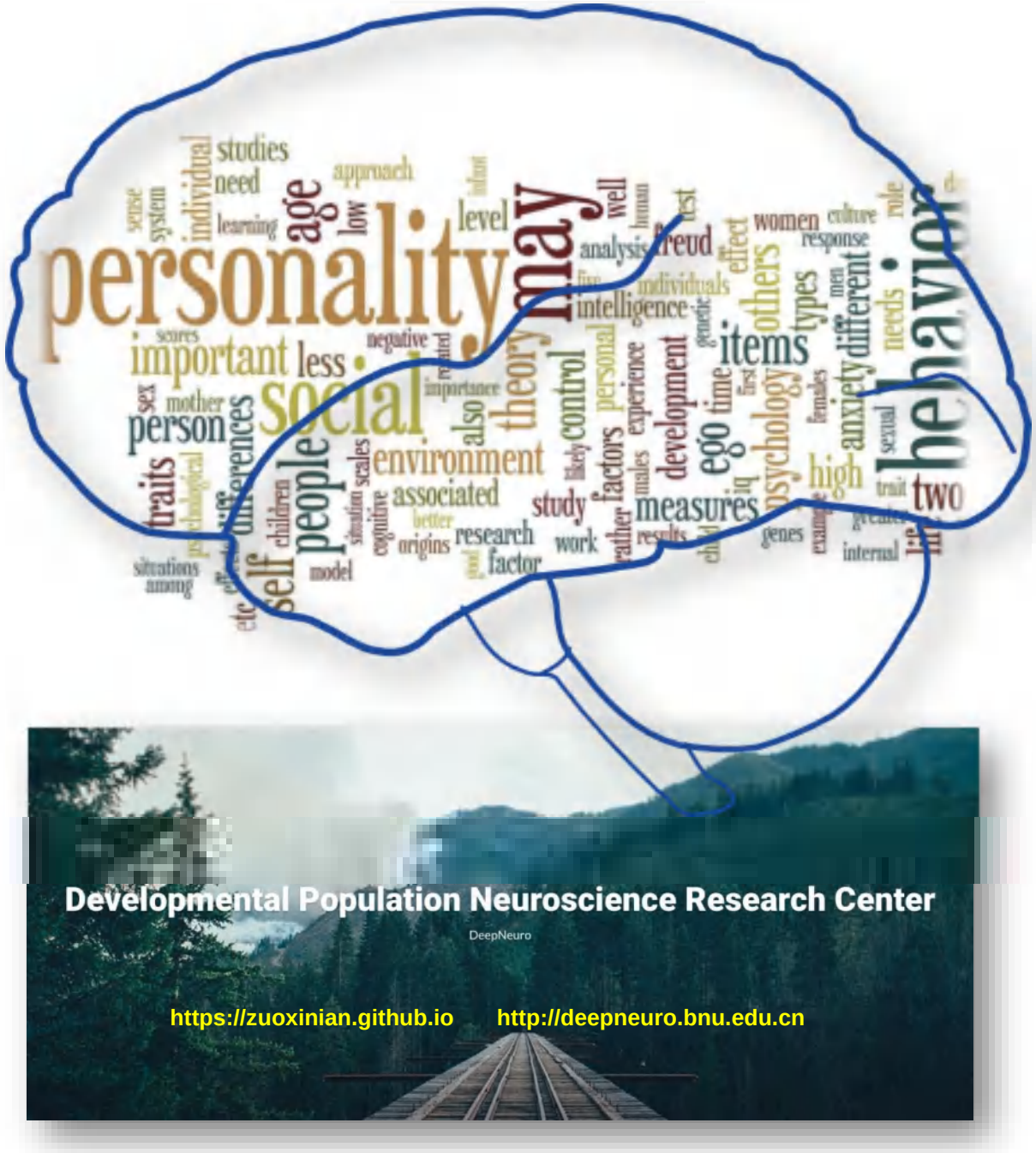

北京師範大學心理学部

Developmental Population Neuroscience

发展人口神经科学（脑与个性化行为）

左西年 (Xi-Nian Zuo)

Beijing Normal University

State Key Lab of Cognitive Neuroscience & Learning

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Chinese Data-sharing Warehouse for In-vivo Imaging Brain

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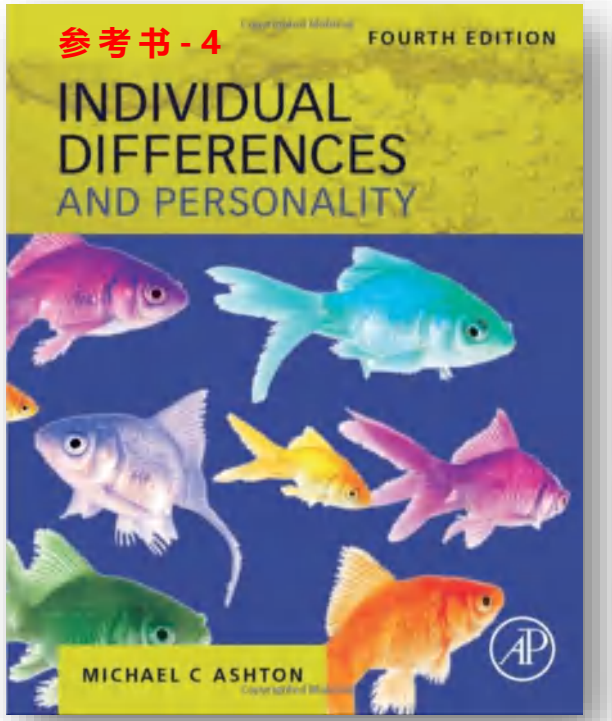
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AND PERSONALITY
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睚眦
霸下
蒲牢
负屃
狻猊
嘲风

Personality Inventories (CPI)

BOX 2.2 Some Widely Used Personality Inventories

When reading about personality research, you will often come across the names of several inventories that are widely used by psychologists. This box will give you some familiarity with these inventories and might be a useful reference, but there is no need to memorize its details. Although all of these instruments are structured personality inventories assessing normal personality variation, they differ in the response formats of their items (some are true/false, others use a five-point response scale, etc.) and in their length (from a few dozen to a few hundred items). (As a rule of thumb, it might take the average college student up to 10 min to respond carefully to 100 typical personality inventory items.)

The California Psychological Inventory

The California Psychological Inventory (CPI) was developed by Gough (1996) as a measure of various psychological characteristics that he found to be useful in predicting important outcome variables. This inventory contains over 400 items, which are grouped into 20 "basic" scales as well as various other scales that have been constructed more recently. The CPI was developed according to an empirical approach, and as noted before, this strategy

Personality Inventories (HPI)

BOX 2.2 Some Widely Used Personality Inventorie—cont'd

has sometimes been found to produce scales less valid than those produced by the rational strategy. However, the CPI scales have frequently been used in predicting important criterion variables (delinquent behavior, academic performance, etc.).

Incidentally, the construction of the CPI was guided in part by that of another inventory, called the Minnesota Multiphasic Personality Inventory (MMPI). The MMPI was also developed according to an empirical approach, but unlike the CPI, the MMPI was intended to measure characteristics associated with mental illness, rather than characteristics of normal variation.

The Hogan Personality Inventory

The development of the Hogan Personality Inventory (HPI) (Hogan & Hogan, 1995) was inspired in large part by the CPI, but Hogan's inventory is aimed more directly at the prediction of variables associated with job performance. The HPI contains slightly more than 200 items, which are grouped into many short scales that measure specific characteristics, and also into several longer scales that measure broader characteristics. This inventory has been widely used in predicting various aspects of job performance.

Personality Inventories (PFQ & EPQ)

The 16 Personality Factors Questionnaire

The 16 Personality Factors Questionnaire (16PF) (Conn & Rieke, 1994) was originally constructed in 1949 by Cattell, whose factor-analytic research suggested to him that a set of 16 traits would summarize personality characteristics. (As such, the 16PF is perhaps the only major inventory to have been developed using the factor-analytic approach. Although other psychologists have decided what traits to measure on the basis of factor analyses, they have usually used the rational approach when actually constructing the scales of their inventories.) Earlier versions of the 16PF were often criticized for the low internal-consistency reliabilities of their scales, but the scales have been improved in the most recent version of the 16PF (Conn & Rieke, 1994), which contains nearly 200 items. The 16 scales of this inventory can be combined into five broader factors that assess more general personality characteristics. (Note, however, that one of the 16PF scales is actually not a self-report personality scale at all, but rather an intelligence test.) The 16PF has been used in personality research and in contexts such as school and the workplace.

The Eysenck Personality Questionnaire and Eysenck Personality Profiler

A series of questionnaires of varying length was developed by Eysenck (Eysenck & Eysenck, 1975; Eysenck & Wilson, 1991) to measure the three personality characteristics that he believed were the basic dimensions of personality, each governed by its own structures in the brain and nervous system (see Chapter 5). Eysenck's scales have been widely used in studies of the biological basis of personality.

Personality Inventories (MBTI)

The Myers–Briggs Type Indicator

The Myers–Briggs Type Indicator (MBTI) (Myers & McCaulley, 1985) is loosely based on a theory of psychological "types" developed by the Swiss psychologist Carl Jung. The MBTI consists of nearly 100 self-report items that each contain two statements; the respondent chooses which statement best describes him or her.

The MBTI assesses four characteristics. Unlike most other inventories, people do not obtain numerical scores for each characteristic, but instead are assigned to one pole or another of each characteristic. For example, instead of obtaining a certain score on the extraversion scale, an individual is declared as an "extravert" (E) if he or she answers most questions in the extraverted direction, or alternatively is declared as an "introvert" (I) if he or she answers most questions in the introverted direction. (Sometimes, a difference in response to one question could make the difference between being declared, say, an extravert as opposed to an introvert.) On the basis of this method of scoring, each person is assigned one of 16 possible "types" based on the combination of his or her results for the four scales.

The MBTI has not been widely used in psychological research but it has been used very widely in business settings, for example, in seminars aimed at improving employees' self-understanding and understanding of each other. Moreover, some studies have shown some support for the construct validity of the MBTI (McCrae & Costa, 1989). However, one shortcoming of the MBTI is that it loses a great deal of precision by describing people in terms of only two levels of each characteristic rather than in terms of a more specific score on each characteristic. For example, consider a person who is slightly on the "extraverted" side of the boundary between extraverts and introverts: This person would actually be more similar to a slightly "introverted" person than to an extremely "extraverted" person. (In the same way, suppose that we had to describe everyone's height as being either "tall" or "short." A "tall" 5-foot-10 person would actually be much closer in height to a "short" 5-foot-6 person than to a "tall" 6-foot-6 person.)

Personality Inventories (TCI & MPQ)

The Temperament and Character Inventory

The Temperament and Character Inventory (TCI) was developed by Cloninger, Przybeck, Svrakic, and Wetzel (1994) to measure the basic dimensions of Cloninger's biological model of temperament (described in Chapter 5), as well as additional dimensions of "character," whose biological bases are thought to be less direct. Several versions of the TCI have been used widely in research, particularly in studies of the biological basis of personality; the more recent versions generally contain between 200 and 300 items, and measure roughly 30 narrower personality traits that are grouped into seven scales representing the broader temperament and character variables. The TCI scales have been widely used in studies of the biological basis of personality.

The Multidimensional Personality Questionnaire

The Multidimensional Personality Questionnaire (MPQ) was constructed by Tellegen (2016) to assess a variety of traits of normal personality variation. This questionnaire contains nearly 300 items and measures 11 traits, which are classified into three groups intended to represent basic dimensions of personality. The MPQ scales have been widely used in studies of emotions, impulsivity, and imagination.

Personality Inventories (ZKA & JPI)

The Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ)

The Zuckerman-Kuhlman-Aluja Personality Questionnaire (ZKA-PQ; Aluja, Kuhlman, & Zuckerman, 2010; see earlier version by Zuckerman, 2002) was developed as a self-report measure of the biologically based "alternative five" factors proposed as basic personality dimensions (see Chapter 5). The long form of the ZKAPQ contains 200 items, with scores being reported for the five factors and also for four narrower trait ("facet") scales within each of those factors. A short form consisting of 80 items is also available (Aluja et al., 2020). The ZKAPQ has been widely used in studies of the biological basis of personality.

The Jackson Personality Inventory—Revised and Personality Research Form

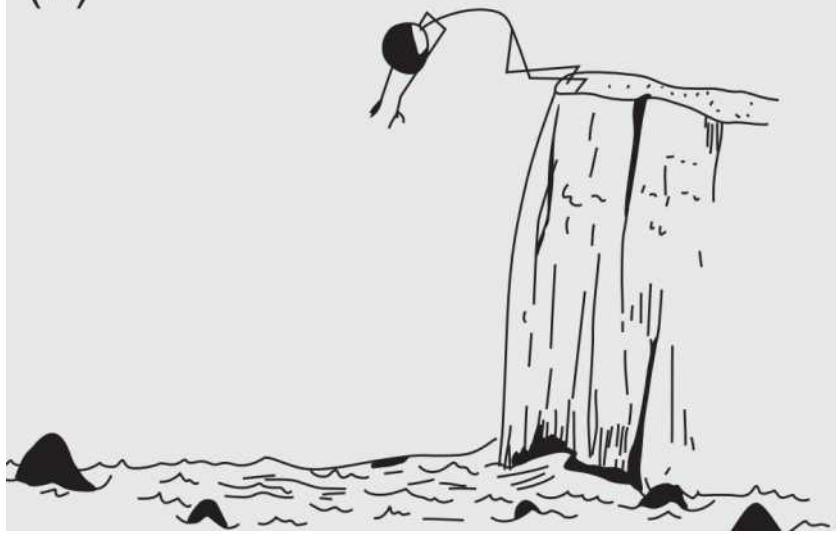
These two instruments (Jackson, 1984b, 1994) were originally developed during the 1960s by Jackson, who employed a rational strategy carried out using very large numbers of items and very large participant samples. Each of the resulting inventories contains 300 or more items, which are grouped into 15 scales (Jackson Personality Inventory—Revised, JPI-R) and 22 scales (Personality Research Form, PRF) measuring a wide variety of traits. Although the JPI-R and PRF scales are not usually grouped into broader scales representing broad personality factors, those scales span a very wide variety of personality characteristics, and some research suggests that the PRF and JPI-R in combination can assess all of the major dimensions of personality (e.g., Ashton, Jackson, Helmes, & Paunonen, 1998).

Personality Inventories (NPQ)

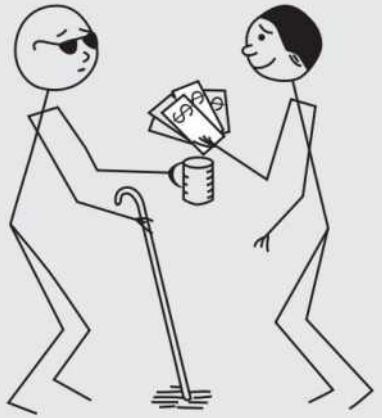
The Nonverbal Personality Questionnaire

The Nonverbal Personality Questionnaire (NPQ) (Paunonen, Jackson, & Keinonen, 1990) differs from all of the other inventories considered here in that its items are cartoon sketches rather than written statements. Each item shows a stick figure drawing of a person performing some behavior, and the individual who responds to the inventory is asked to indicate how likely he or she would be to perform the kind of behavior shown in the drawing. The NPQ scales were developed to measure the same traits as those of the PRF, and have shown levels of reliability and validity approaching those of the original scales. Fig. 2.1 shows two example items from the NPQ, which contains 136 items.

(A)



(B)



Personality Inventories (NEO)

The NEO Personality Inventory Revised and NEO Five-Factor Inventory

The NEO Personality Inventory Revised (NEO-PI-R) (with its earlier version, the NEO-PI) and the NEO Five-Factor Inventory (NEO-FFI) were developed to measure five major dimensions of personality (Costa & McCrae, 1985, 1992b). The NEO-PI-R is the longer inventory, with 240 items that are grouped into 30 scales measuring narrower personality traits (called "facets"), with those scales in turn grouped into the five scales measuring broader characteristics: Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C). (See Chapter 3 for descriptions of the 30 scales.) The NEO-FFI is a shorter, 60-item inventory that measures the five broad dimensions only. The scales of both questionnaires have been very widely used in personality research. More recent editions have been published as the NEO-PI-3 and the NEO-FFI-3 (McCrae & Costa, 2010).

Other researchers have also developed questionnaires intended to measure the same 30 facet traits and five factors as those of the NEO instruments, but using different items (selected from the International Personality Item Pool described below). These measures are of varying lengths; for example, two separate 120-item IPIP-NEO versions have been developed (Johnson, 2014; Maples, Guan, Carter, & Miller, 2014).

Personality Inventories (BFI)

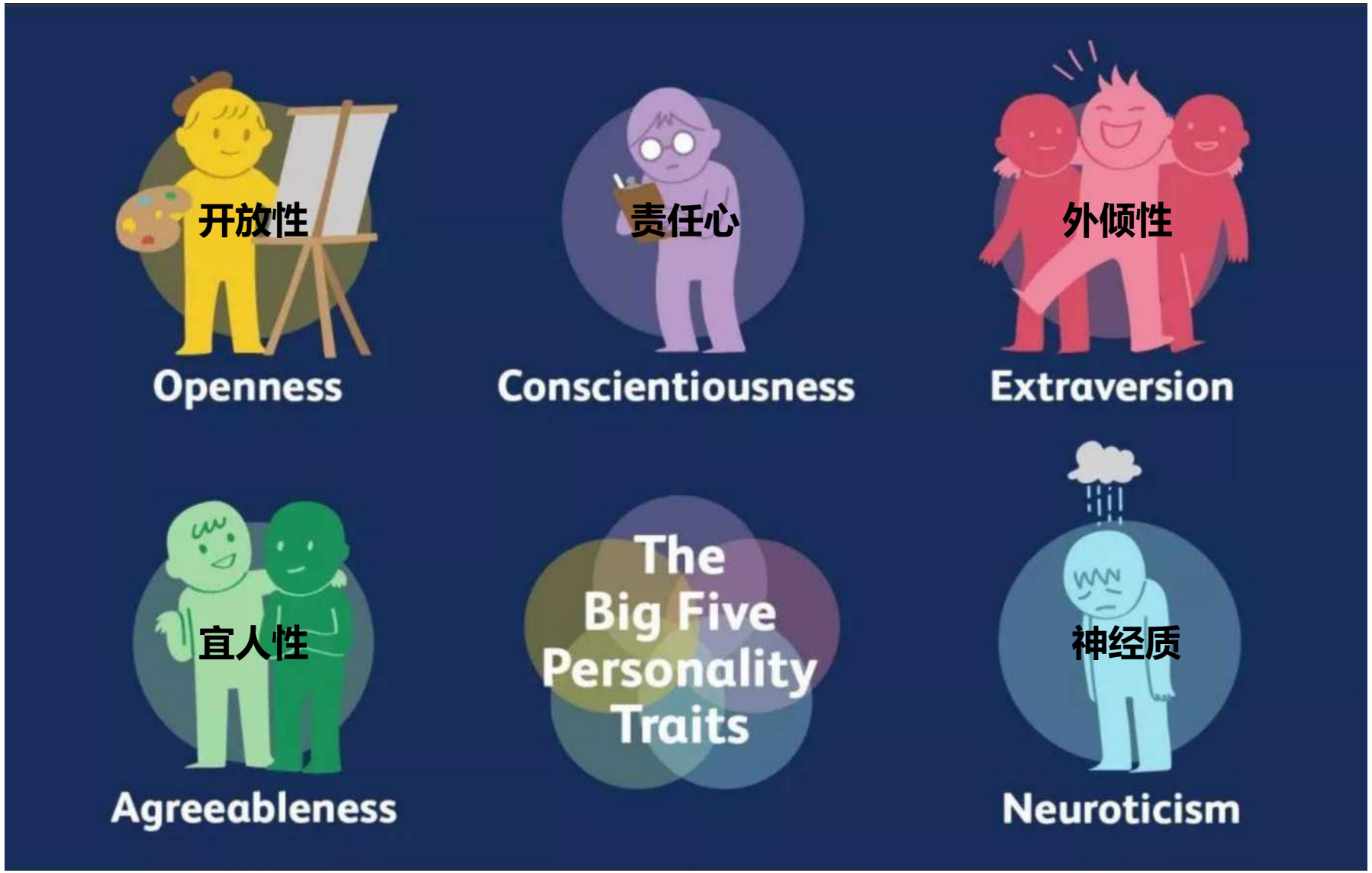
The Big Five Inventory

The Big Five Inventory (BFI) (John, Donahue, & Kentle, 1991) was developed as a short measure of the Big Five factors (see Chapter 3 and the above description of the "NEO" inventories). The original BFI consisted of 44 items, but the recently revised version (the BFI-2) now contains 60 items and also includes three facet-level trait scales within each of the broader Big Five scales (Soto & John, 2017). The BFI and BFI-2 have been very widely used in personality research.

The Big Five Aspect Scales

The Big Five Aspect Scales (BFI) (DeYoung, Quilty, & Peterson, 2007) is a 100-item questionnaire that measures two traits (called "aspects") within each of the Big Five factors (see Chapter 3). It has also been widely used in personality research.

Personality Inventories (OCEAN)



Personality Inventories (HEXACO & IPIP)

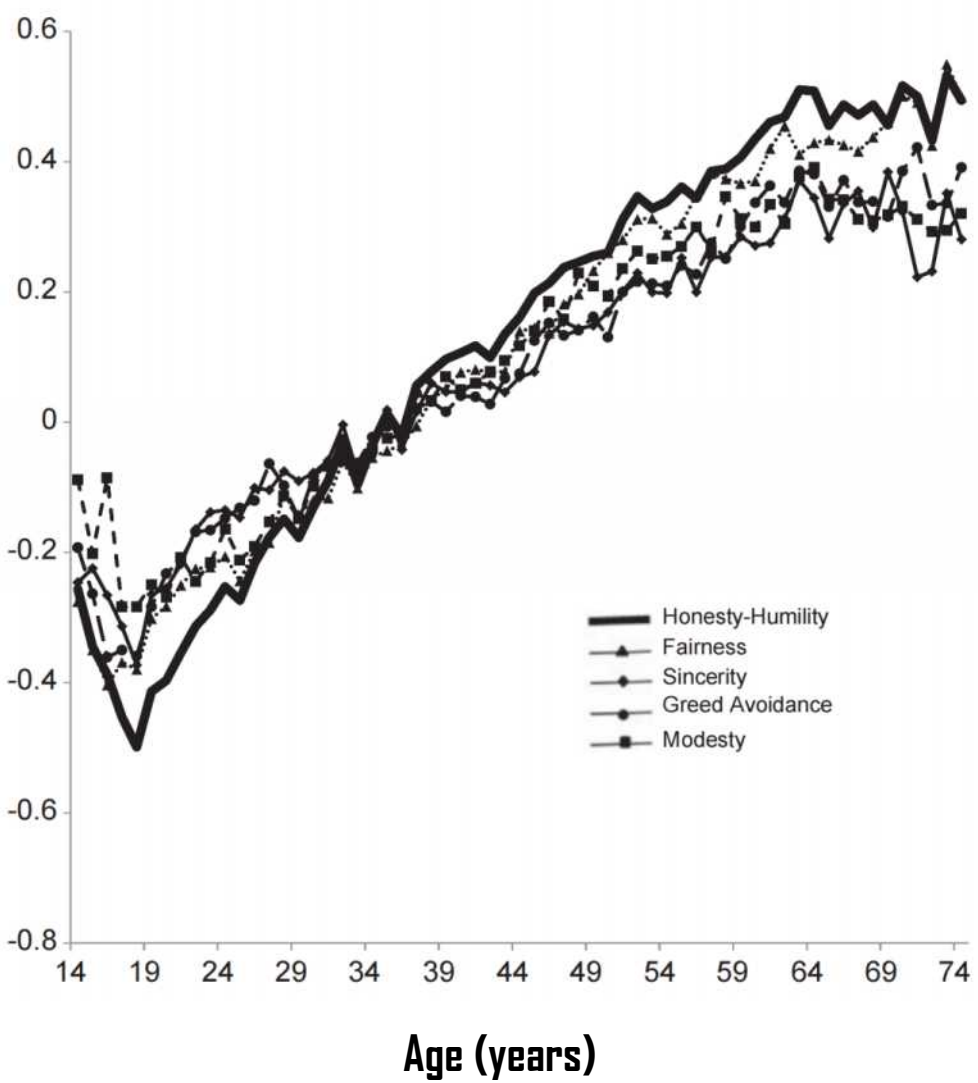
The HEXACO Personality Inventory—Revised

The HEXACO Personality Inventory—Revised (HEXACO-PI-R) was constructed recently (Ashton & Lee, 2009a; Lee & Ashton, 2004, 2006, 2013, 2018) to measure the six dimensions of personality that were found in personality research conducted in various cultures. The HEXACO-PI-R has forms of three lengths: 200 items, 100 items, and 60 items. The items of each form are grouped into scales measuring narrower personality traits. These scales are in turn grouped into broader scales measuring the six dimensions called Honesty–Humility (H), Emotionality (E), Extraversion (X), Agreeableness (A), Conscientiousness (C), and Openness to Experience (O). (See Chapter 3 for descriptions of the scales.) The HEXACO-PI-R scales have increasingly been widely used in personality research.

The International Personality Item Pool

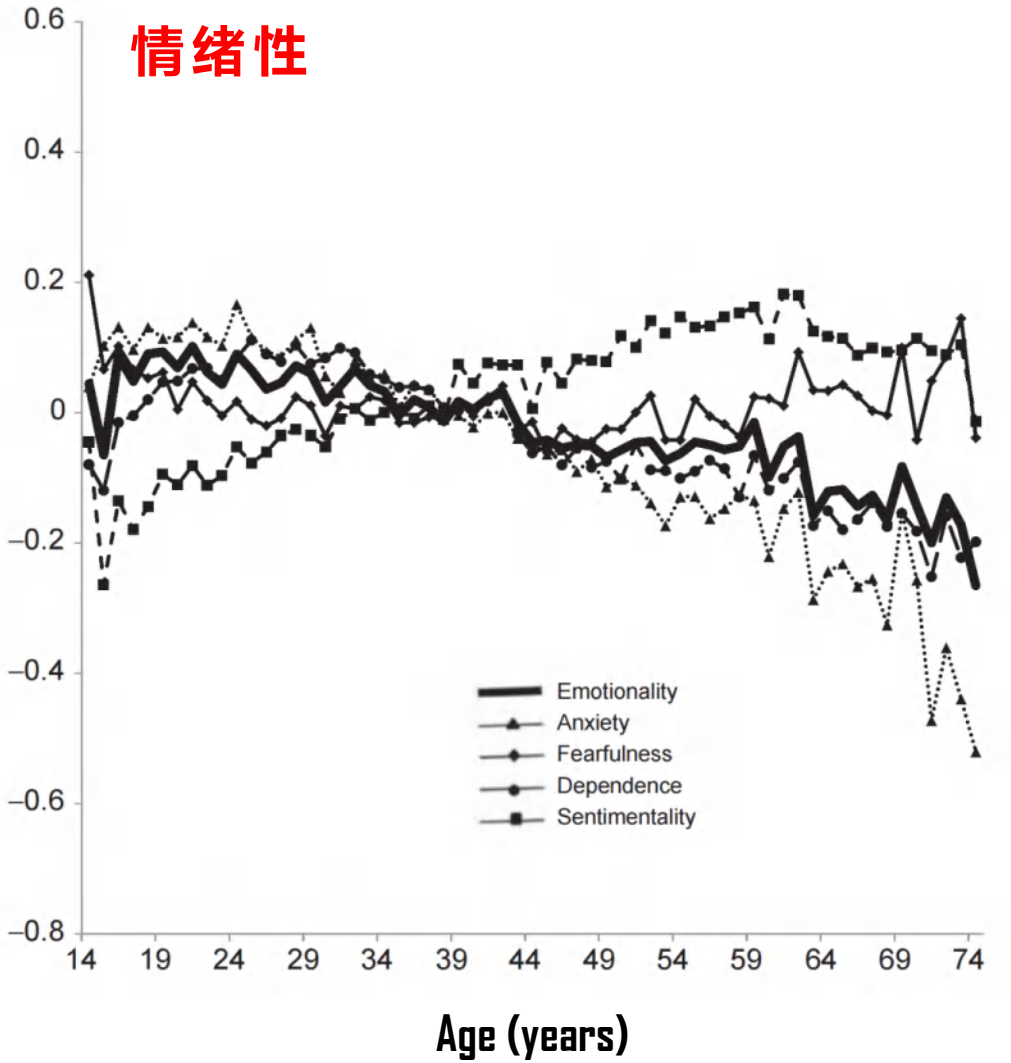
The International Personality Item Pool (IPIP) (Goldberg, 1999) is actually not a personality inventory, but rather a list of personality questionnaire items that has been developed on an ongoing basis since the early 1990s. (The IPIP website is found at http://ipip.ori.org.) The IPIP contains over 2000 different items, and these items are grouped together into short scales (generally about 10 items each) to measure a variety of personality characteristics, including the "Big Five" (described in Chapter 3) and many others. In particular, Goldberg has provided lists of items that he has selected to measure each of the traits assessed by most of the published inventories listed earlier. Each scale can be administered separately or in combination with other scales, as desired by the researcher. Table 2.1 shows some example IPIP items. (Note that these items, unlike those of most personality questionnaires, generally omit the pronoun "I" at the beginning of each self-report statement.)

Developmental Changes of Personality (HEXACO)



Developmental Changes of Personality (HEXACO)

情绪性



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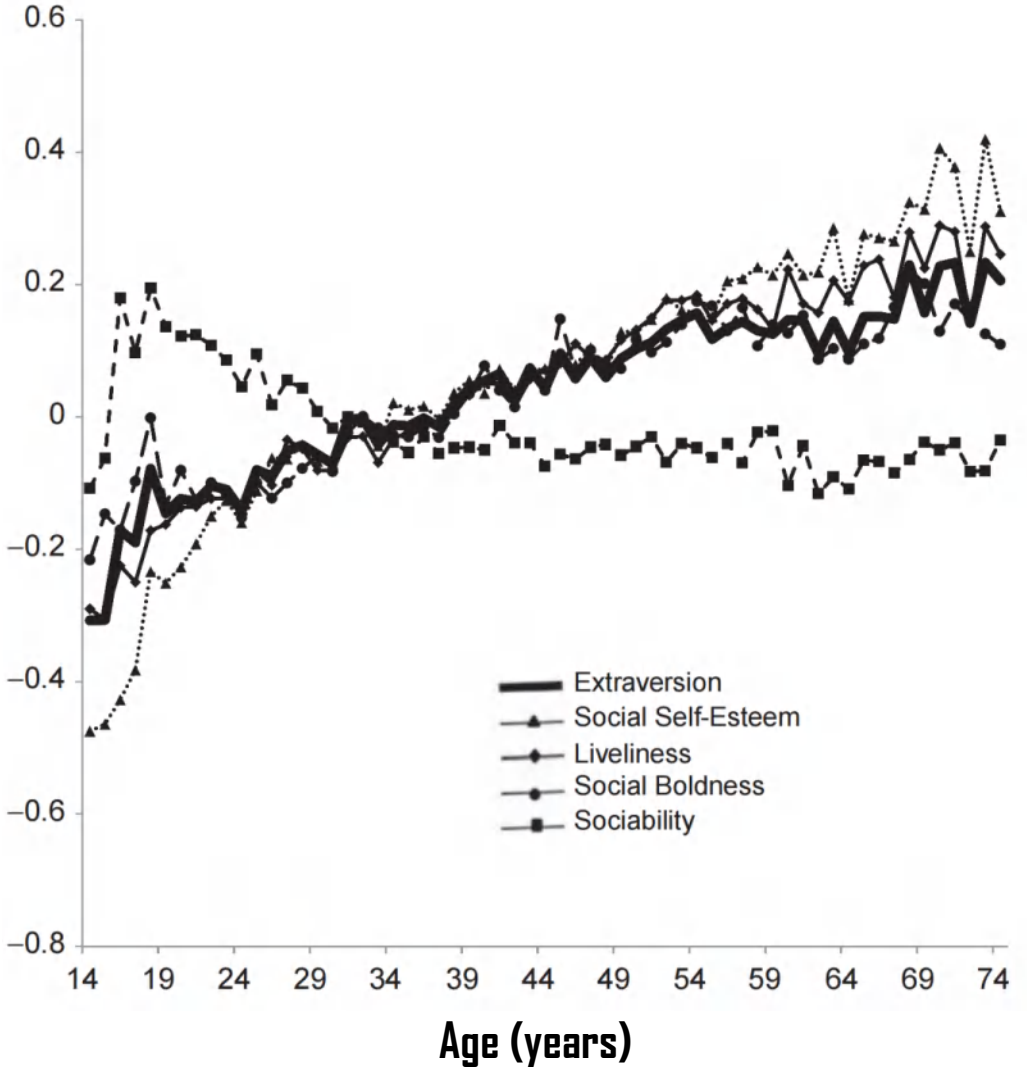
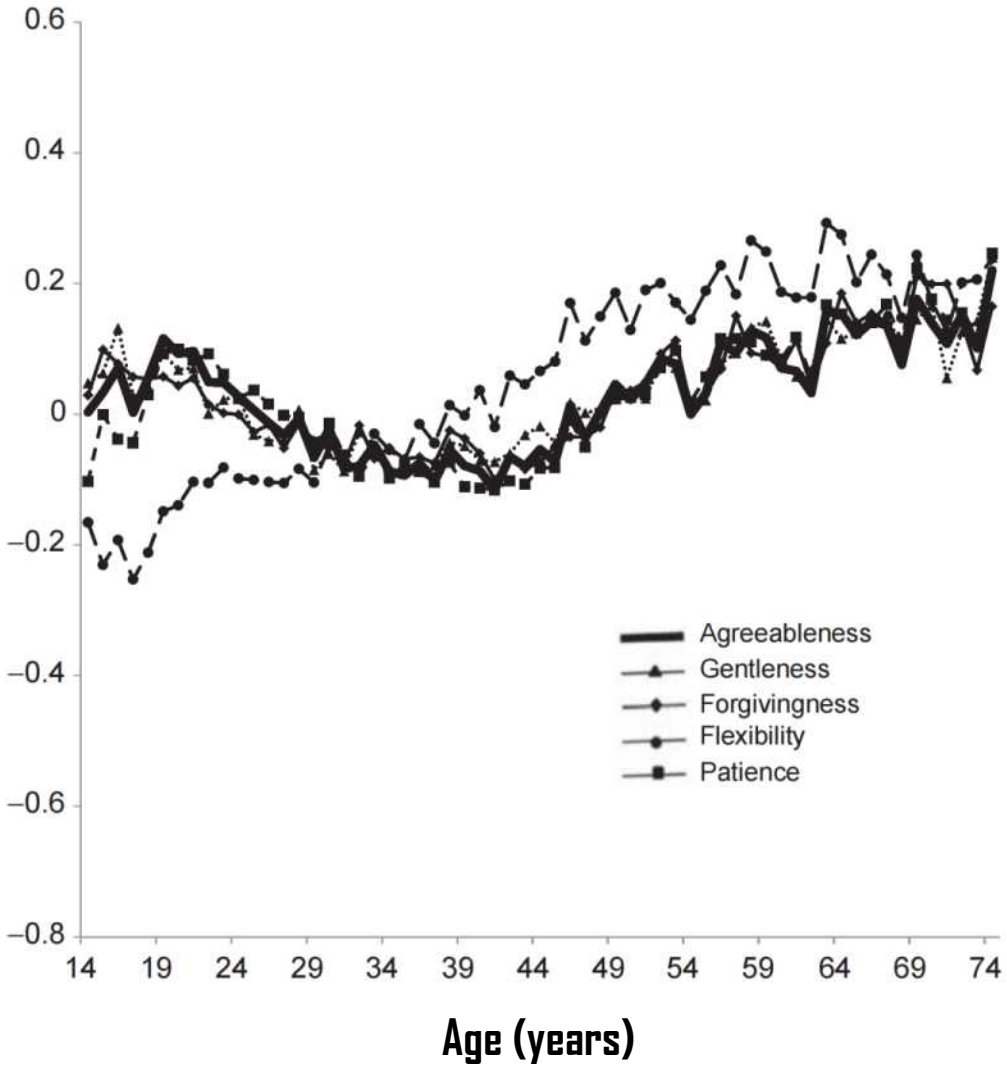


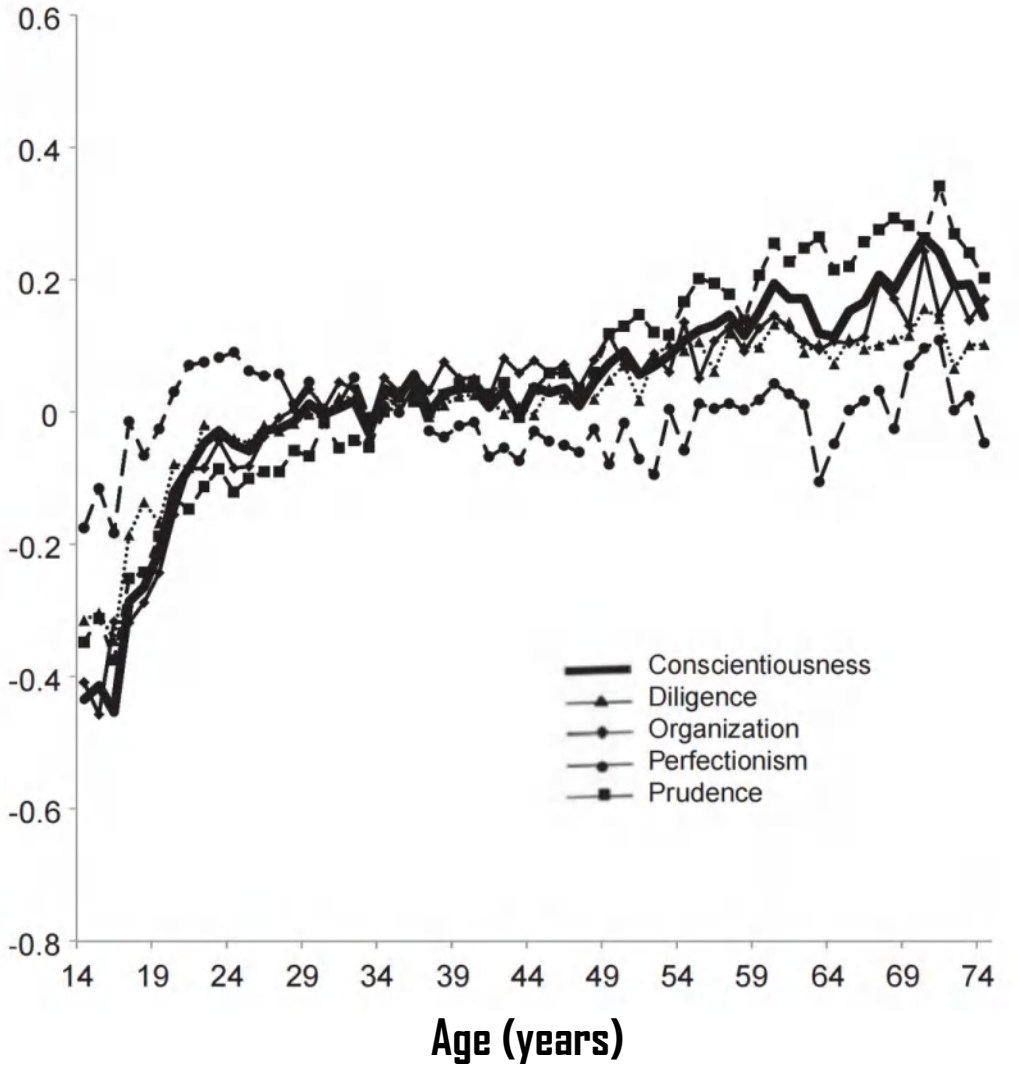
外向性

Developmental Changes of Personality (HEXACO)



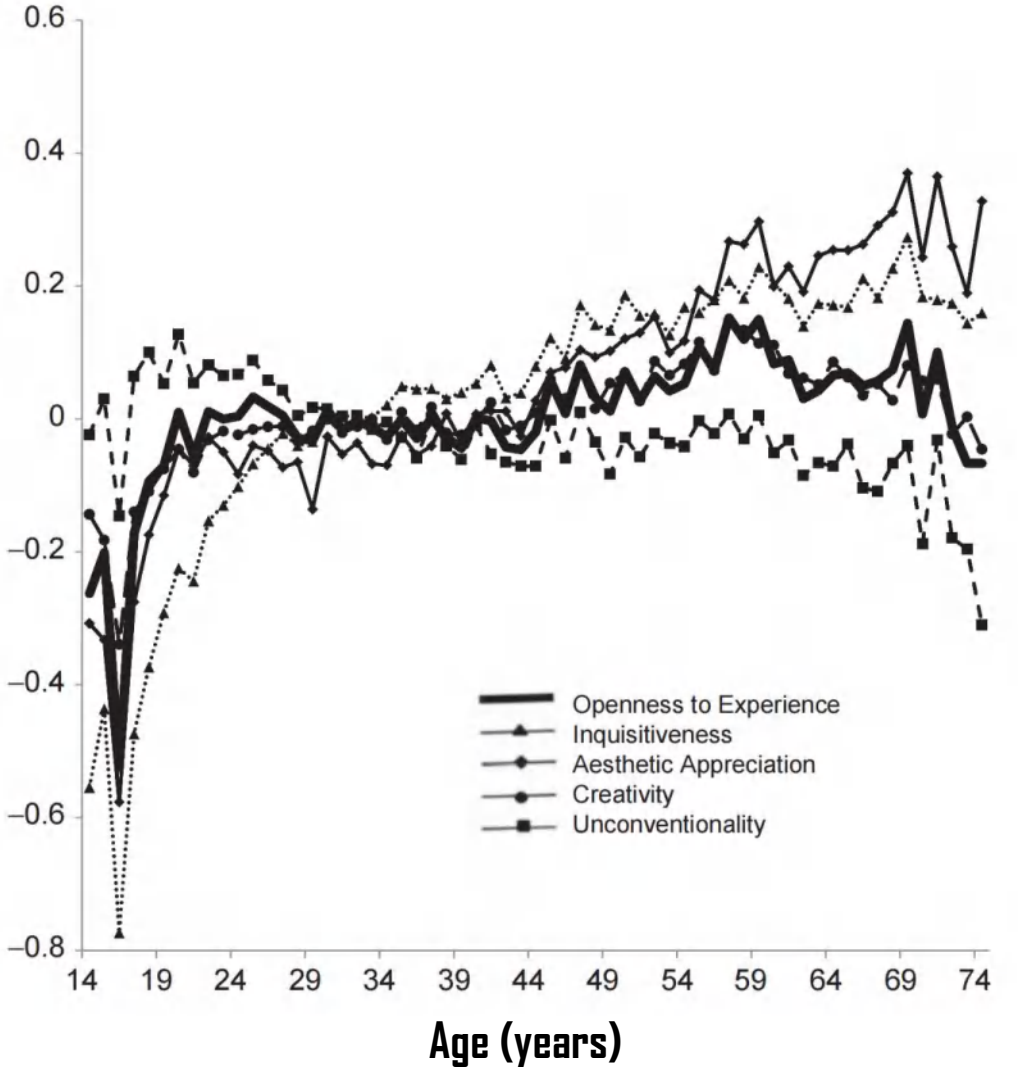
宜人性

Developmental Changes of Personality (HEXACO)



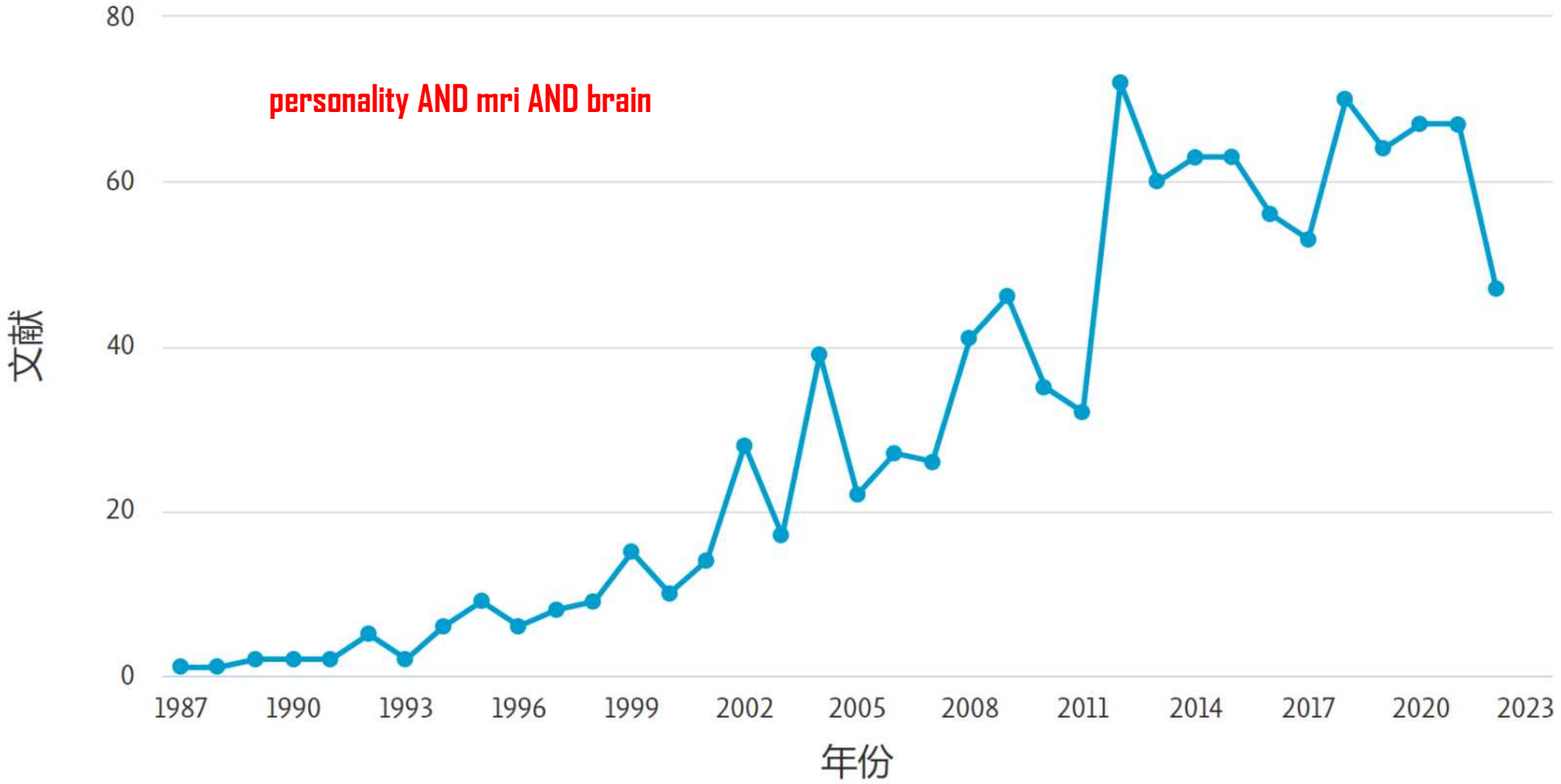
尽职性

Developmental Changes of Personality (HEXACO)

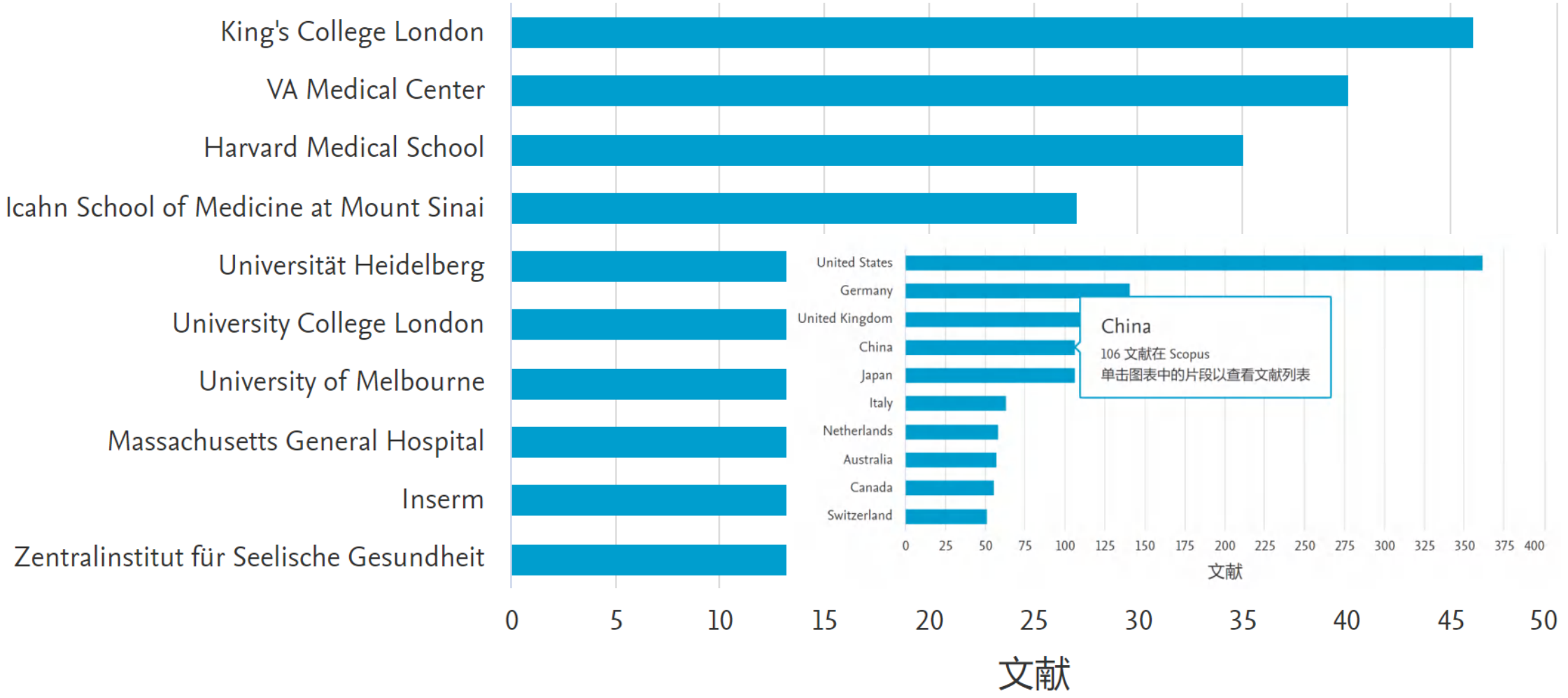


经验的开放性

Brain-Personality Association Studies (BPAS)



Brain-Personality Association Studies (BPAS)



Brain-Personality Association Studies (BPAS)

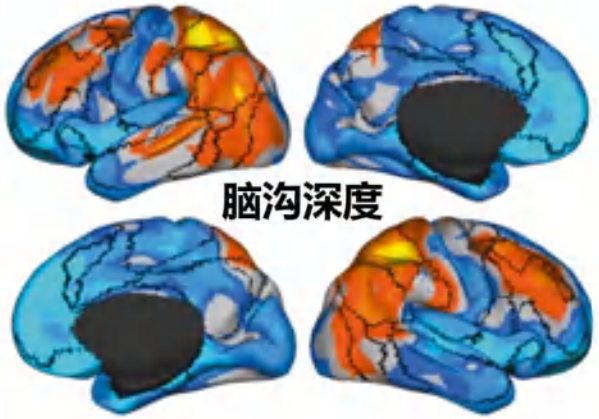
看见“与众不同”的自己:人格与脑成像

苏学权 / 南宁师范大学教育学部初等教育学院副教授
左西年 / 北京师范大学认知神经科学与学习国家重点实验室教授

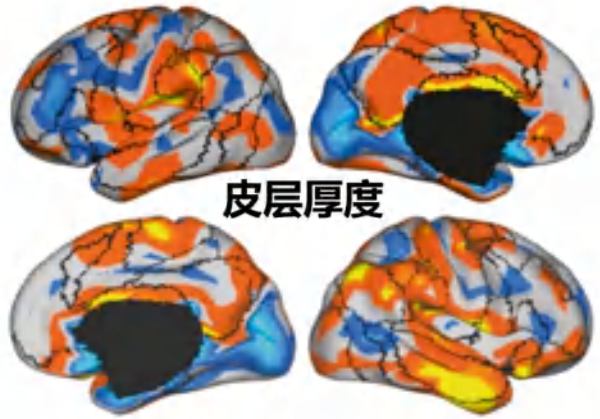
人格是指一个人总体的精神活动（思维、情感和行为）模式，强调在行为、认知、情感等方面有别于他人的独特特性，即个体差异或通常所说的“与众不同”。人格的科学研究证实:人格的形成同时受到先天和后天的影响，先天主要是由遗传因素决定的个人素质，而后天则是由发育与习得性等环境和文化因素的有机结合。在教育实践中，悠久的中华文明很早就提倡“因材施教”的教学方针，体现了人格心理学对于个体发展的重要性。研究人格的生物学规律，不仅可为教育的发展提供客观证据，更可为广大的教育工作者提供科学指导，提前发现人格障碍并实施针对性干预。

Brain-Personality Association Studies (BPAS)

人脑网络

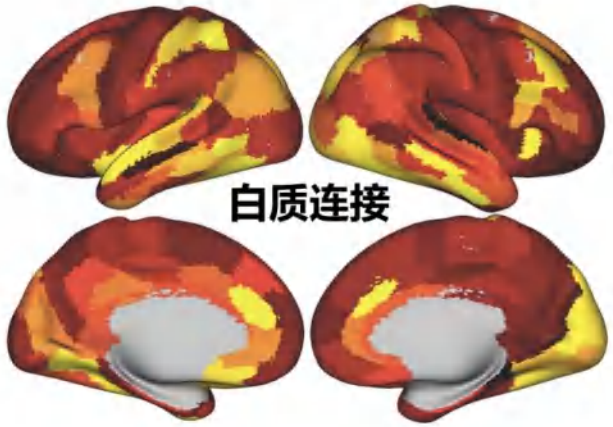


脑沟深度



皮层厚度

视觉网络　体感运动网络　背侧注意网络　腹侧注意网络　额顶控制网络　边缘系统　默认模式网络



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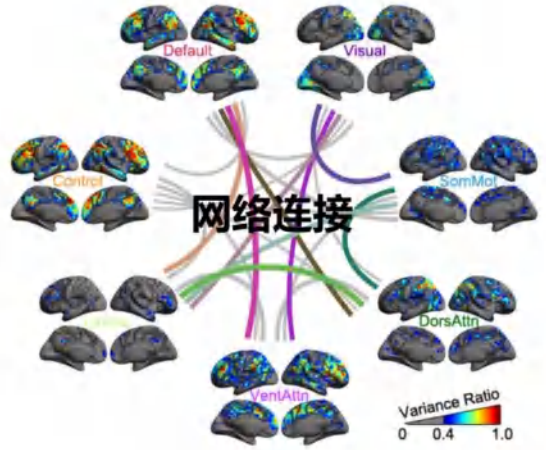

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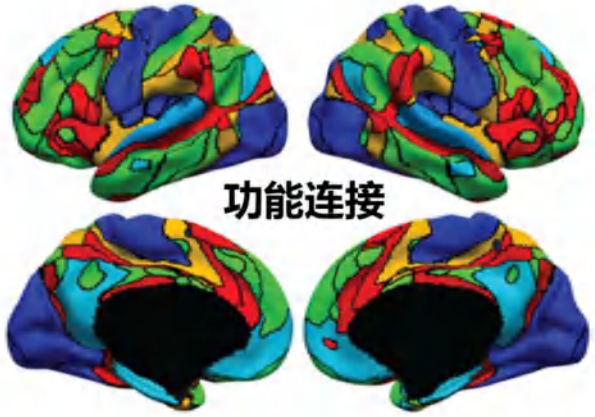
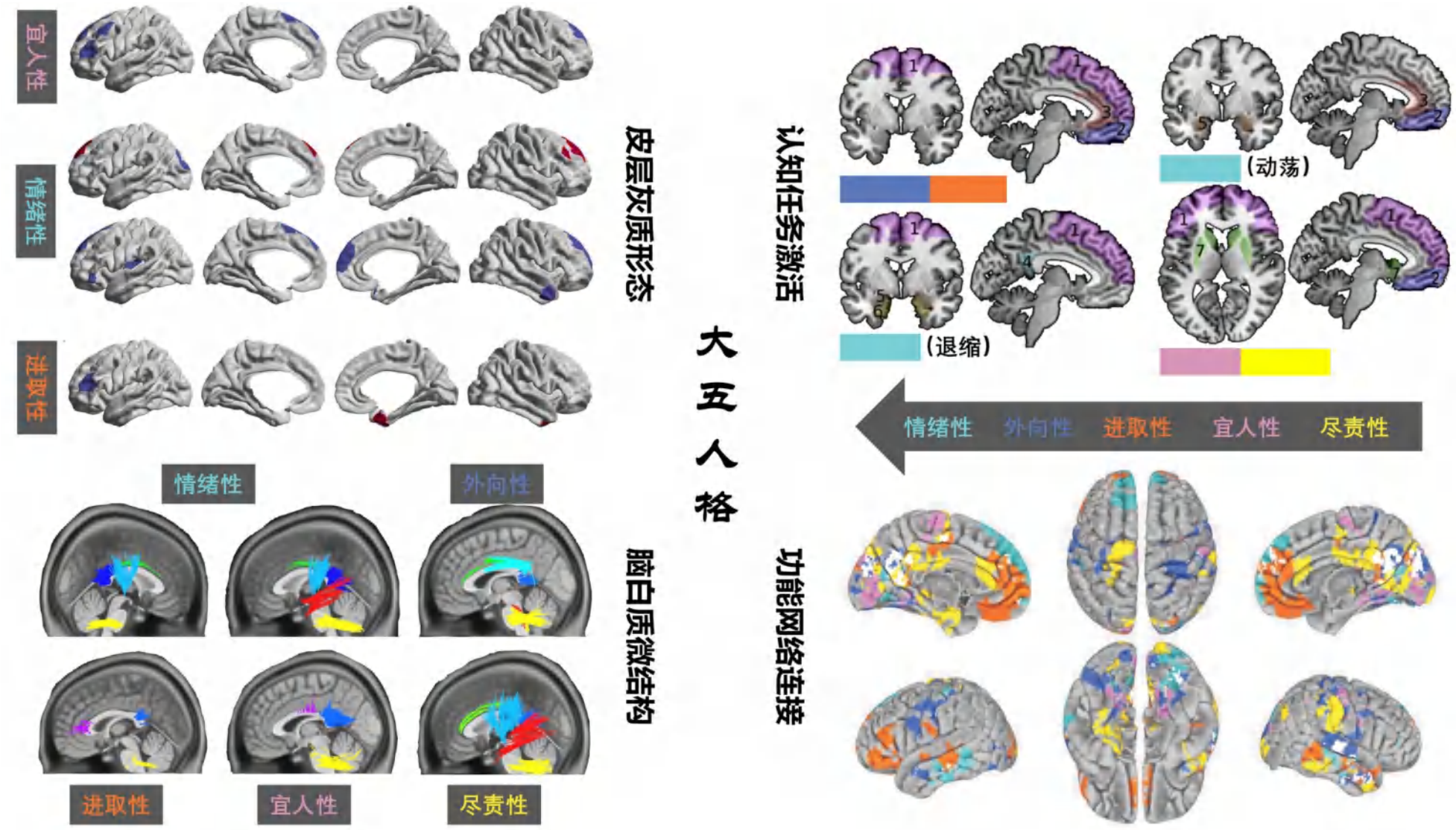


功能连接

Brain-Personality Association Studies (BPAS)



Brain-Personality Association Studies (BPAS)

Personality Neuroscience

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“Nothing to see here”: No structural brain differences as a function of the *Big Five* personality traits from a systematic review and meta-analysis

Review Paper

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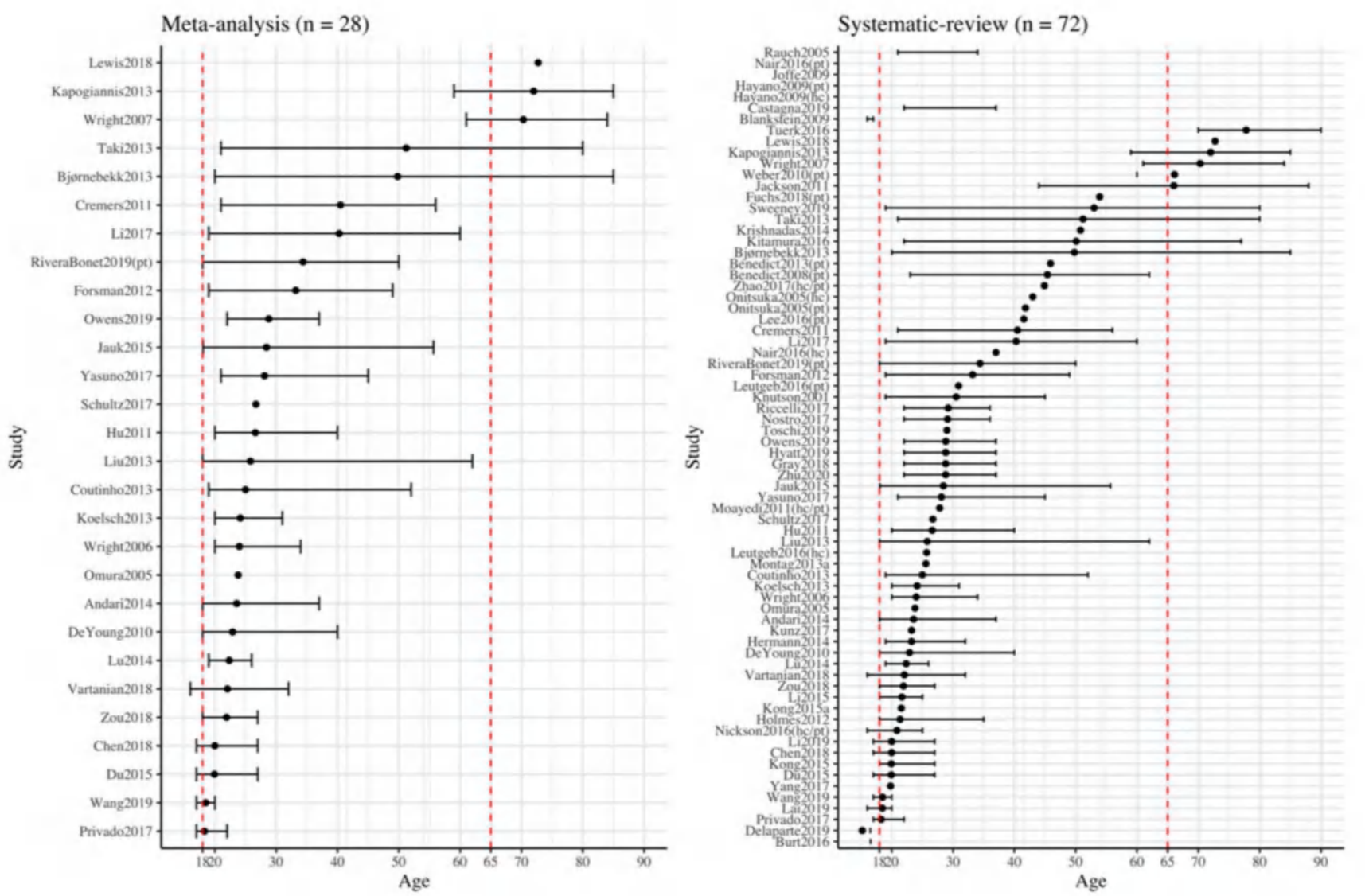
Abstract

Personality reflects social, affective, and cognitive predispositions that emerge from genetic and environmental influences. Contemporary personality theories conceptualize a Big Five Model of personality based on the traits of neuroticism, extraversion, agreeableness, conscientiousness, and openness to experience. Starting around the turn of the millennium, neuroimaging studies began to investigate functional and structural brain features associated with these traits. Here, we present the first study to systematically evaluate the entire published literature of the association between the Big Five traits and three different measures of brain structure. Qualitative results were highly heterogeneous, and a quantitative meta-analysis did not produce any replicable results. The present study provides a comprehensive evaluation of the literature and its limitations, including sample heterogeneity, Big Five personality instruments, structural image data acquisition, processing, and analytic strategies, and the heterogeneous nature of personality and brain structures. We propose to rethink the biological basis of personality traits and identify ways in which the field of personality neuroscience can be strengthened in its methodological rigor and replicability.

Brain-Personality Association Studies (BPAS)



Connectome-Personality Association Studies (CPAS)

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PLoS one

Personality Is Reflected in the Brain's Intrinsic Functional Architecture

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Abstract

Personality describes persistent human behavioral responses to broad classes of environmental stimuli. Investigating how personality traits are reflected in the brain's functional architecture is challenging, in part due to the difficulty of designing appropriate task probes. Resting-state functional connectivity (RSFC) can detect intrinsic activation patterns without relying on any specific task. Here we use RSFC to investigate the neural correlates of the five-factor personality domains. Based on seed regions placed within two cognitive and affective 'hubs' in the brain—the anterior cingulate and precuneus—each domain of personality predicted RSFC with a unique pattern of brain regions. These patterns corresponded with functional subdivisions responsible for cognitive and affective processing such as motivation, empathy and future-oriented thinking. Neuroticism and Extraversion, the two most widely studied of the five constructs, predicted connectivity between seed regions and the dorsomedial prefrontal cortex and lateral paralimbic regions, respectively. These areas are associated with emotional regulation, self-evaluation and reward, consistent with the trait qualities. Personality traits were mostly associated with functional connections that were inconsistently present across participants. This suggests that although a fundamental, core functional architecture is preserved across individuals, variable connections outside of that core encompass the inter-individual differences in personality that motivate diverse responses.

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RESEARCH ARTICLE

Personality reflection in the brain's intrinsic functional architecture remains elusive

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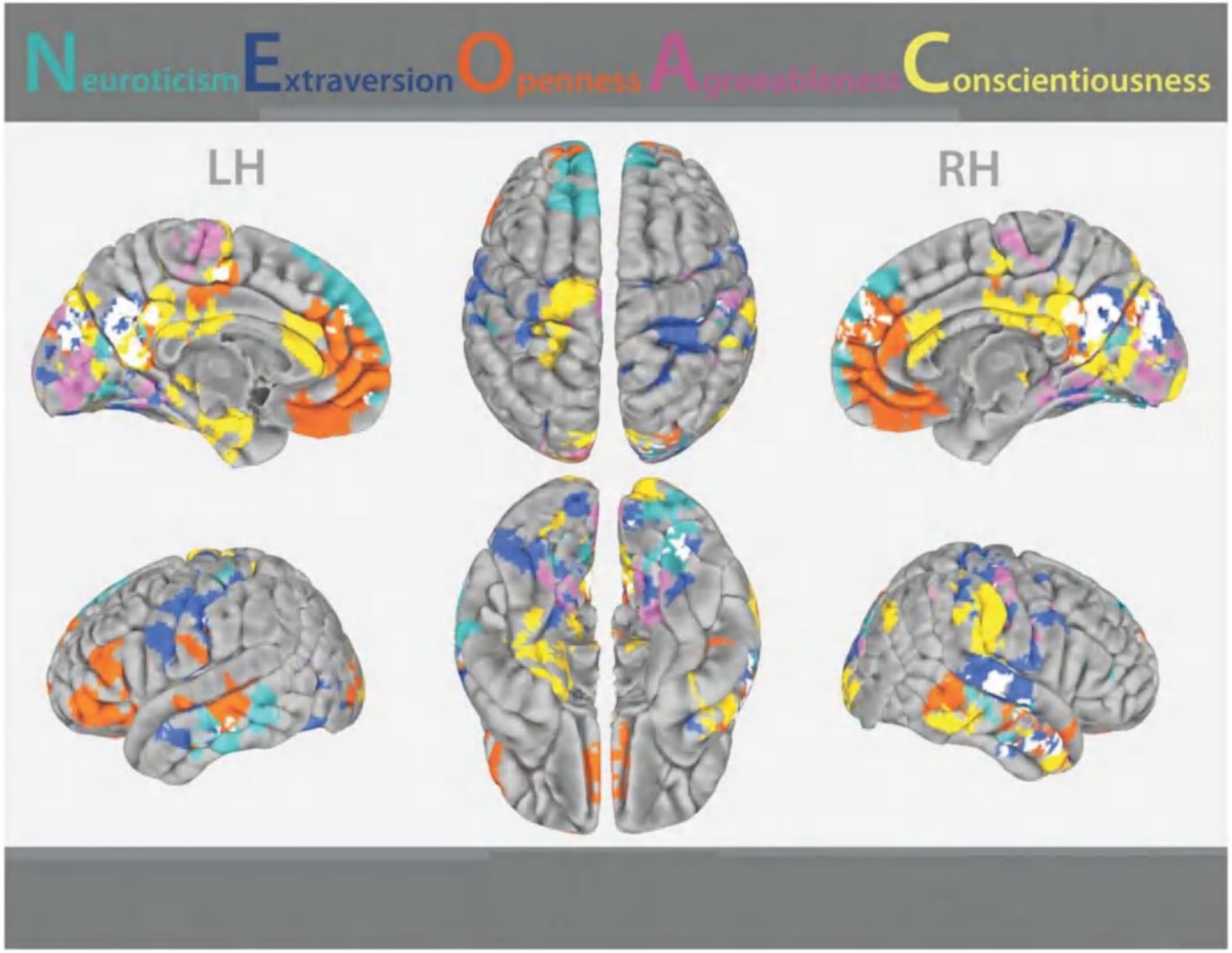
Abstract

In the last years, there has been a considerable increase of research into the neuroimaging correlates of inter-individual temperament and character variability—an endeavour for which the term 'personality neuroscience' was coined. Among other neuroimaging modalities and approaches, substantial work focuses on functional connectivity in resting state (rs-FC) functional magnetic resonance imaging data. In the current paper, we set out to independently query the questions asked in a highly cited study that reported a range of functional connectivity correlates of personality dimensions assessed by the widely used 'Big Five' Personality Inventory. Using a larger sample (84 subjects) and an equivalent data analysis pipeline, we obtained widely disagreeing results compared to the original study. Overall, the results were in line with the hypotheses of no relation between functional connectivity and personality, when more precise permutation-based multiple testing procedures were applied. The results demonstrate that as with other neuroimaging studies, great caution should be applied when interpreting the findings, among other reasons due to multiple testing problem involved at several levels in many neuroimaging studies. Of course, the current study results can not ultimately disprove the existence of some link between personality and brain's intrinsic functional architecture, but clearly shows that its form is very likely different and much more subtle and elusive than was previously reported.

Connectome-Personality Association Studies (CPAS)



可重复性验证

For a summary visualization of obtained results, see Fig 1. In general, we have observed widespread cortical and subcortical areas of significant relation of FC and personality. Visual comparison with Fig 2 of the original study by Adelstein, Shehzad, Mennes, DeYoung, Zuo, Kelly, et al. [22] suggest a rather weak overlap of the observed results. To obtain some quantitative evidence on the agreement between the results, we have computed the number of analyses in which both datasets provided at least one significant cluster (even if spatially distinct), as the

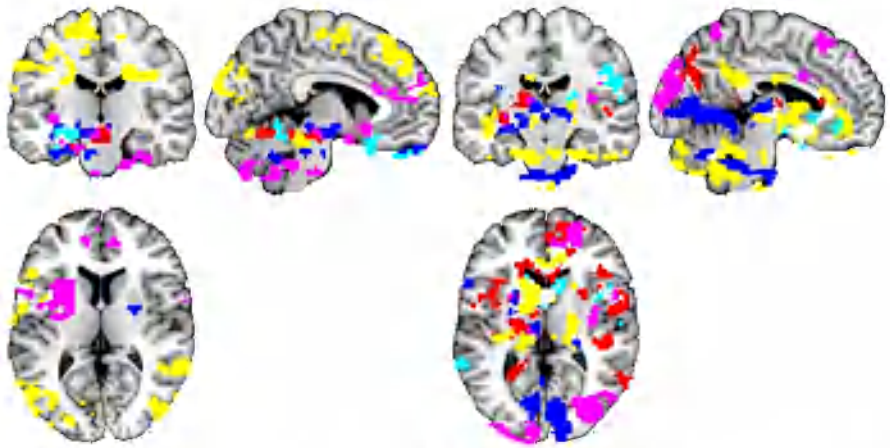


Fig 1. Personality trait measures 'predicted' by rs-FC using the original denoising and the GRF approach. Thresholded at $t>2.3$ and $p<0.05$ (corrected), positive—left, negative—right. Connections inferred as having a relationship with personality, grouped by color based on the personality domain: neuroticism = lightblue, extraversion = blue, openness = red, agreeableness = violet, conscientiousness = yellow. The significant functional connectivity maps of all 18 seeds are overlaid in a single image for compactness of presentation. Position of slices corresponds to MNI coordinates of -5,0,0.

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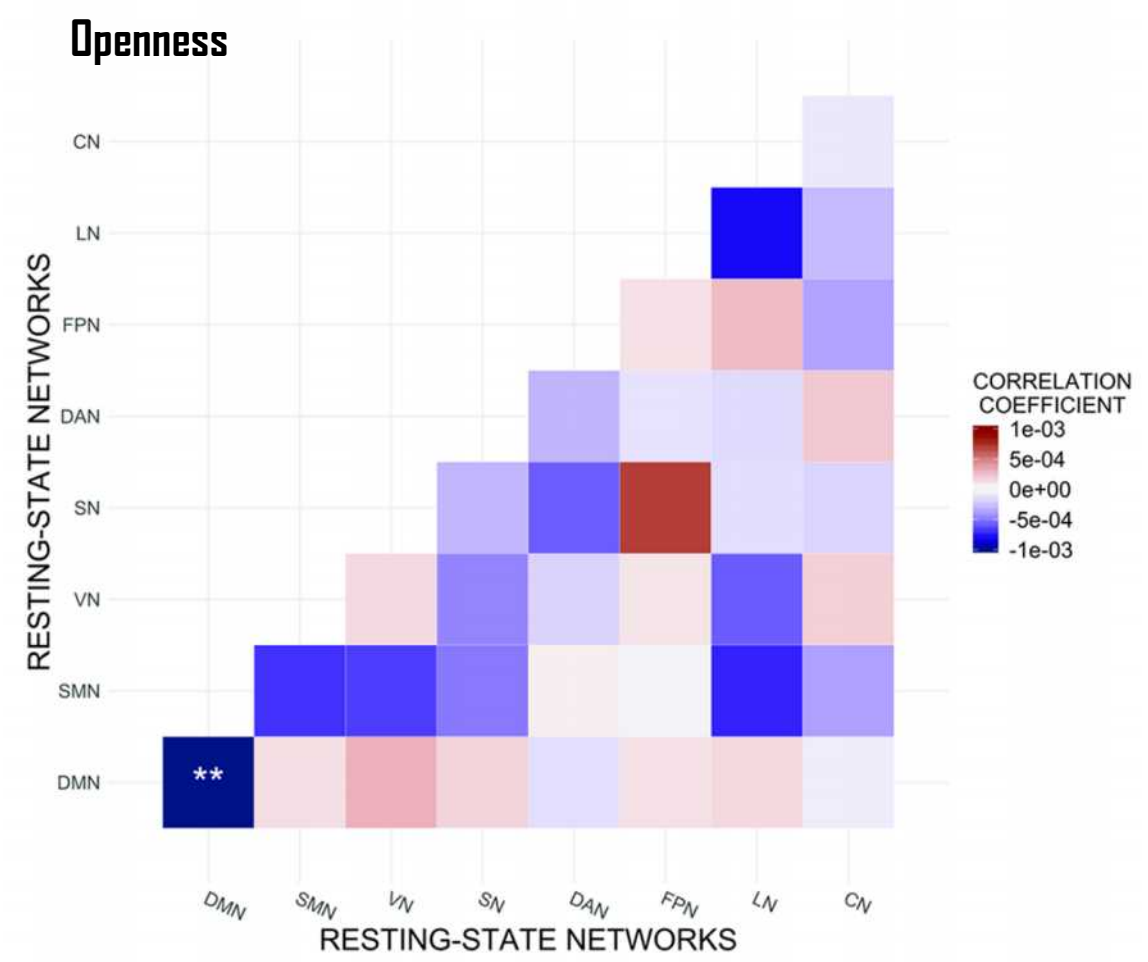

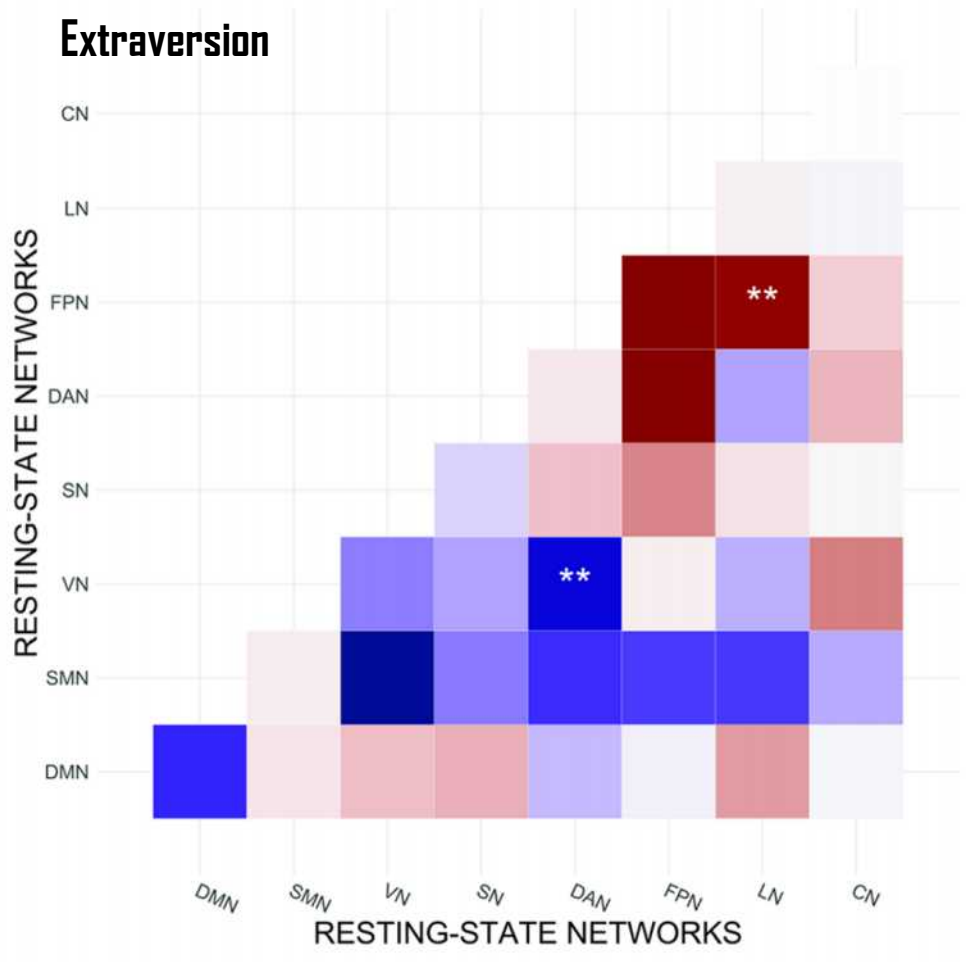

Social Cognitive and Affective Neuroscience (2021) **16**:950-961

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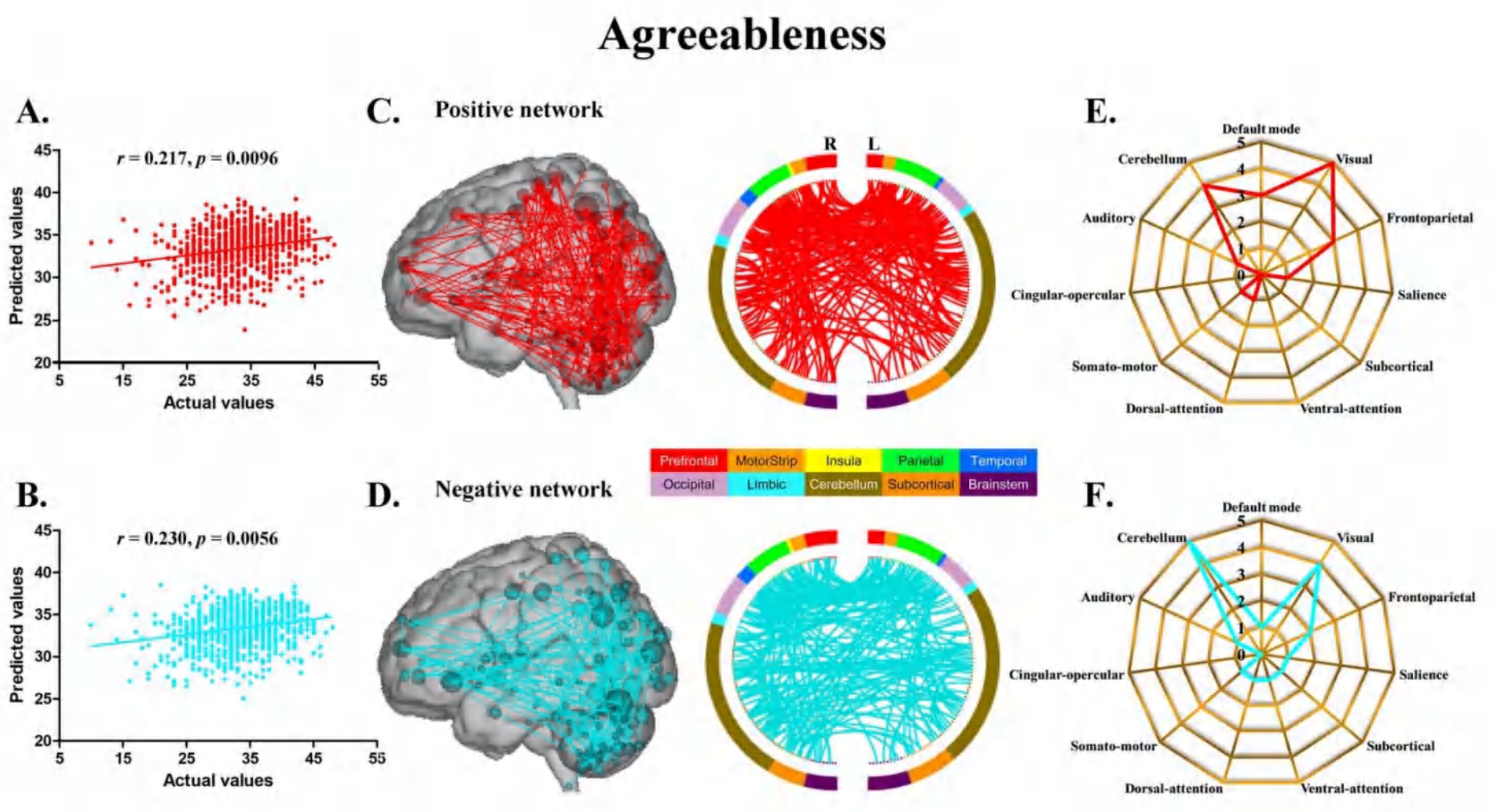

Social Cognitive and Affective Neuroscience (2020) **15**:359-369

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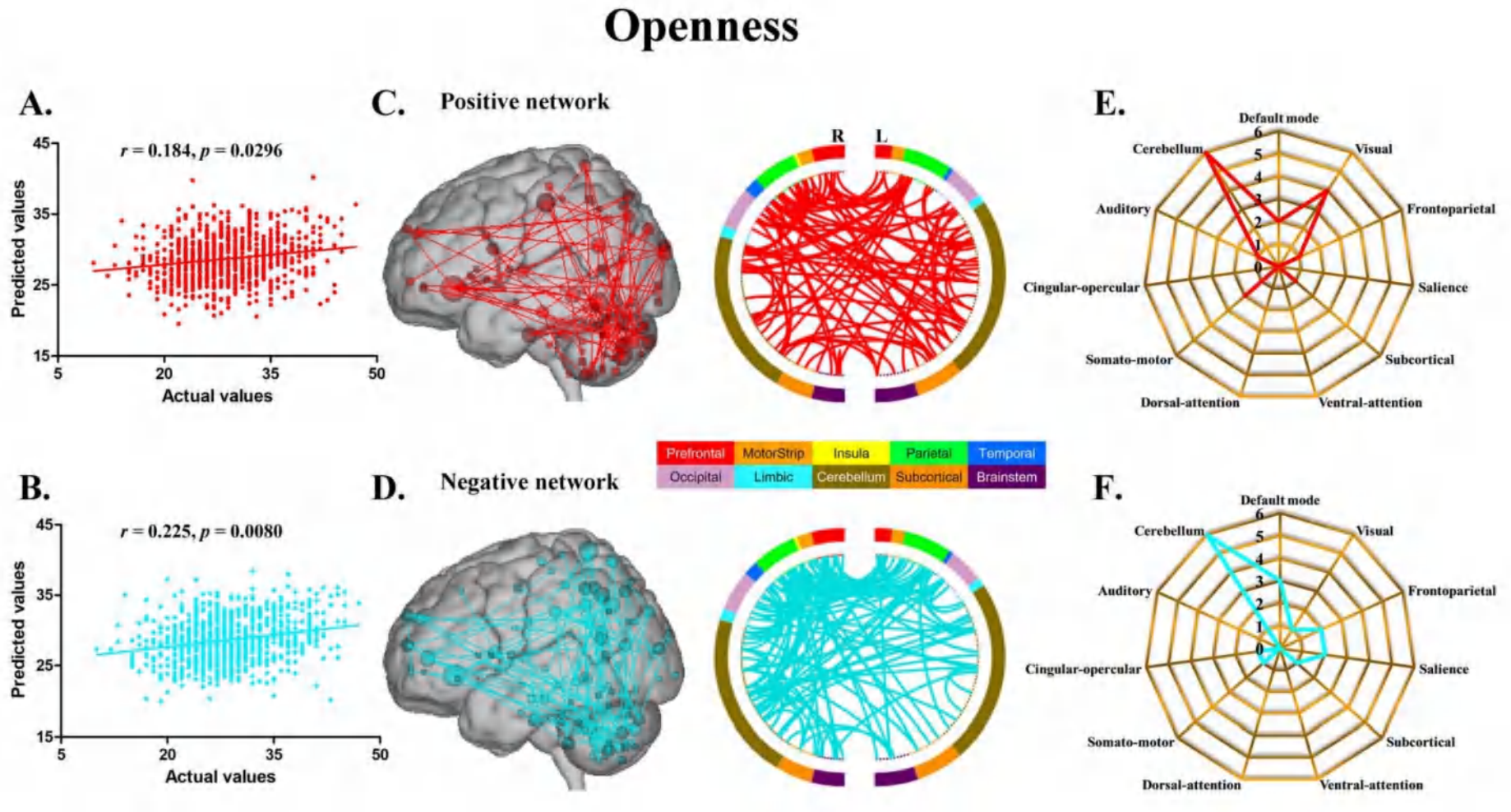

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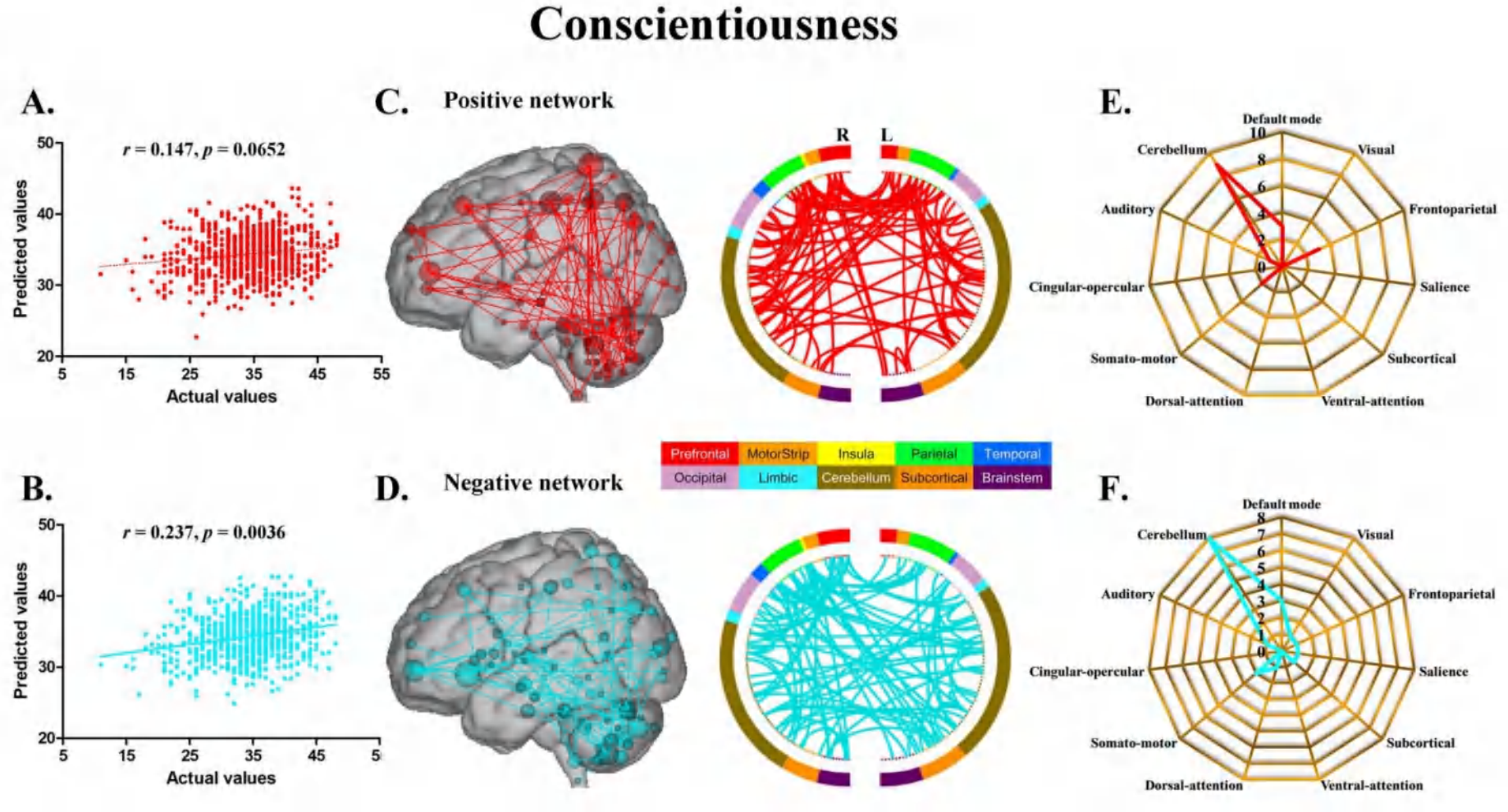

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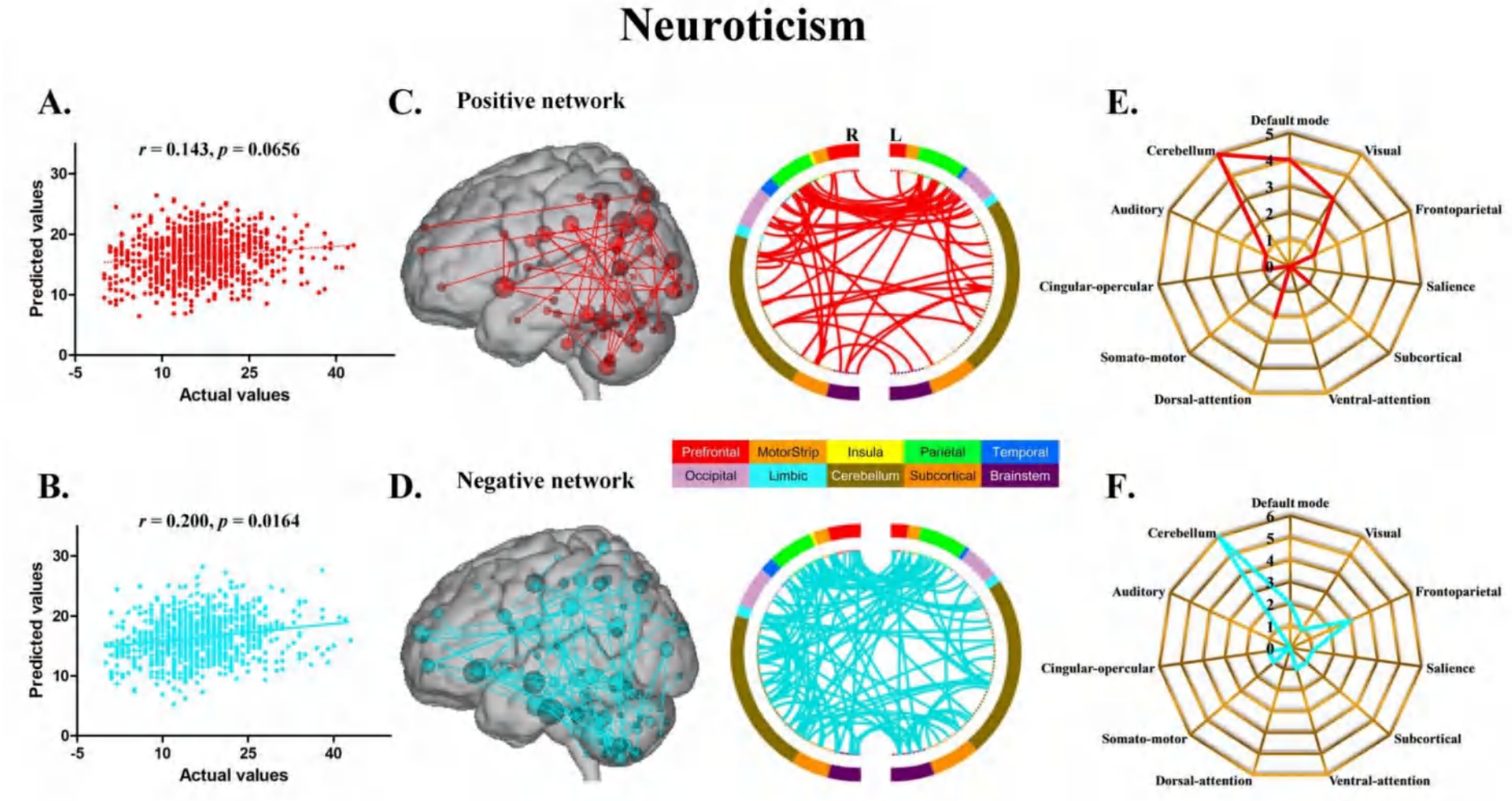

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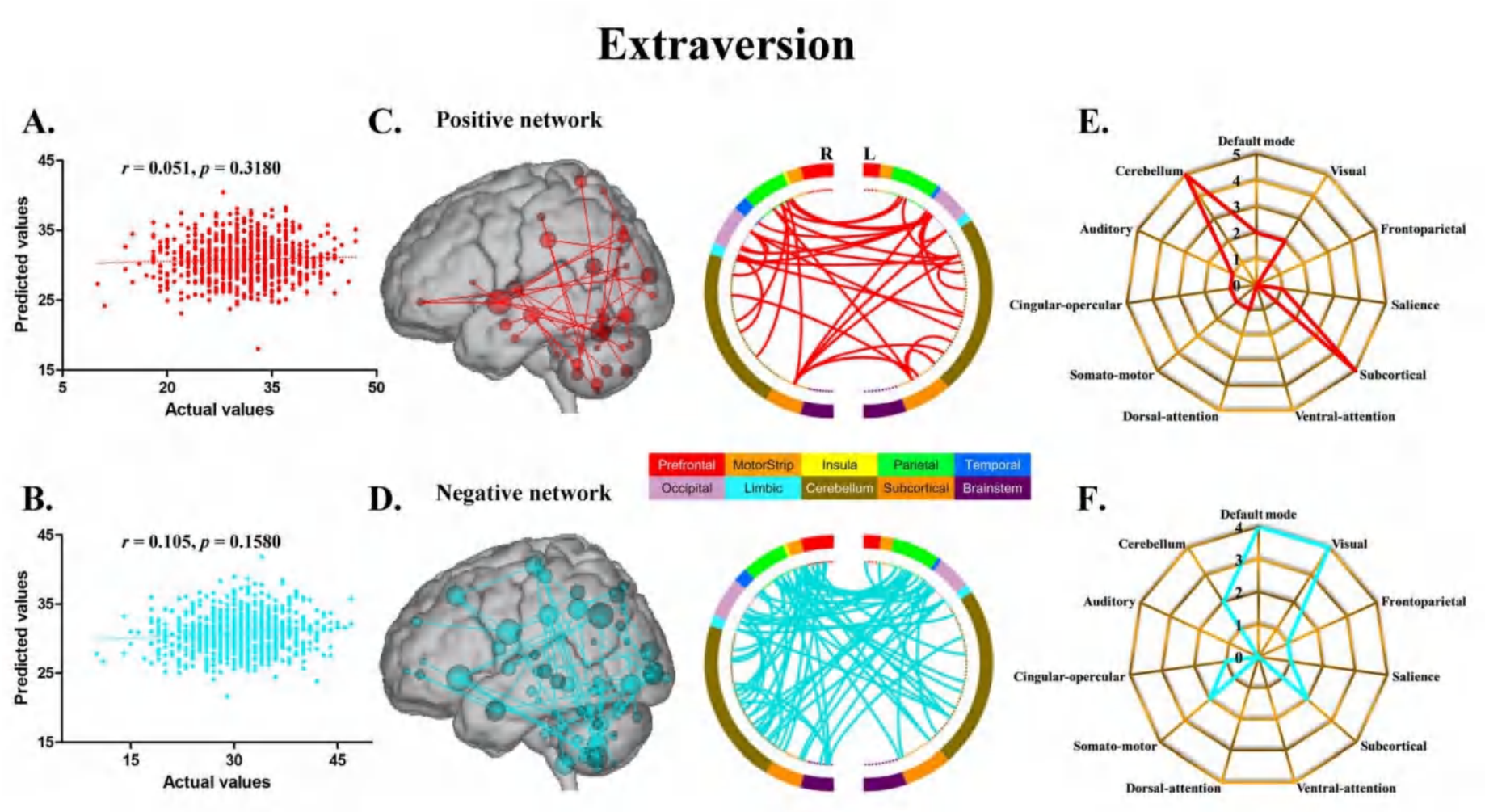

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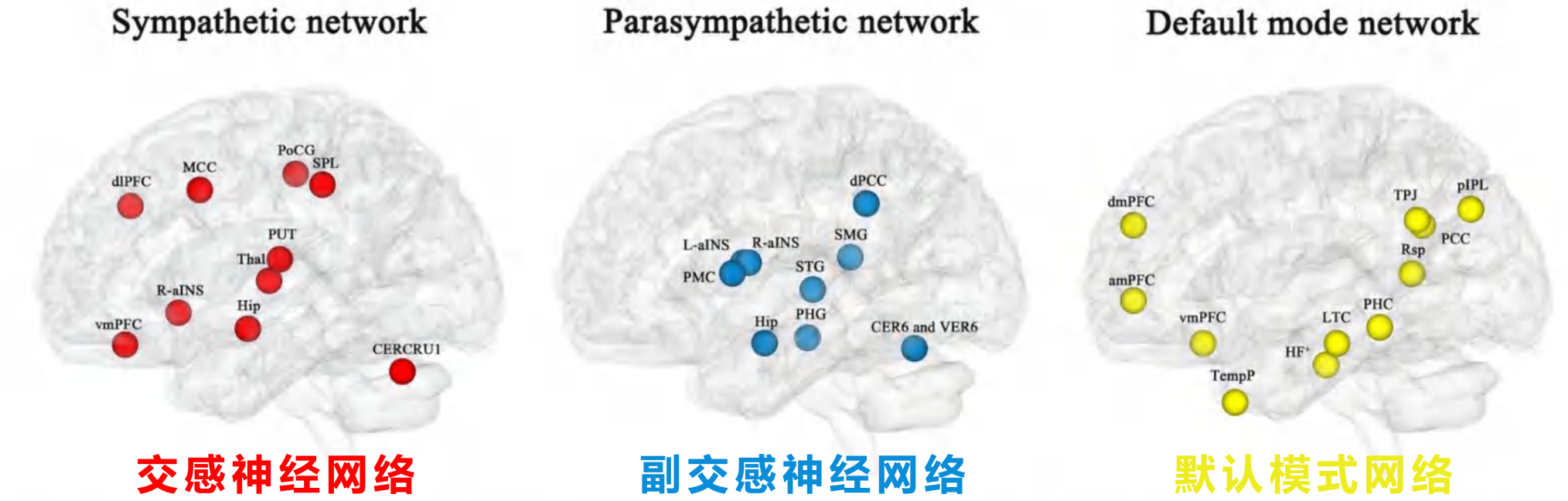
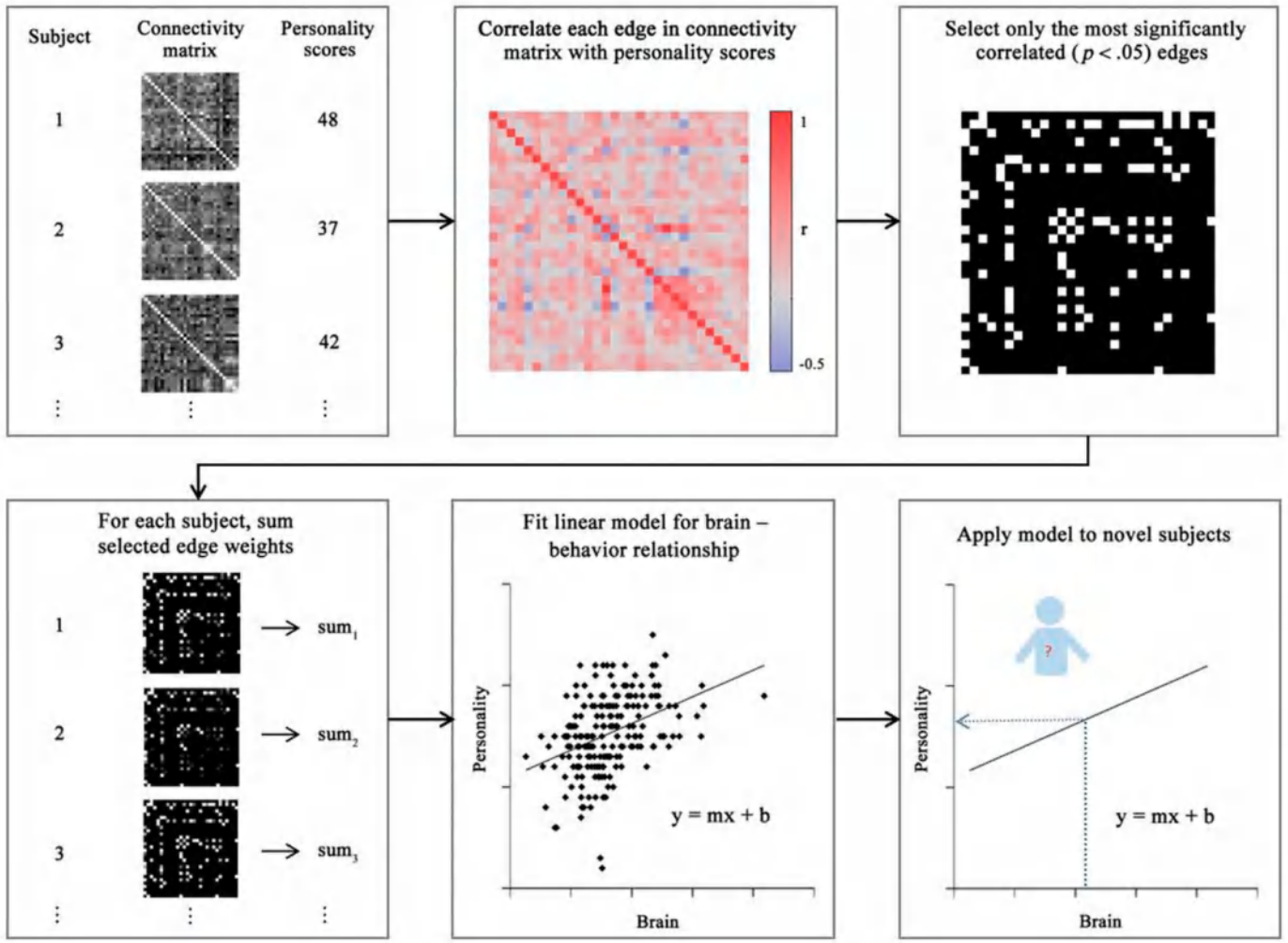


FIGURE 1 Nodes of the sympathetic, parasympathetic, and default mode networks. amPFC, anterior medial prefrontal cortex; CER6 and VER6, cerebellum (lobuli VI and vermis VI); CERCRU1, cerebellum (lobulus crus I); dlPFC, dorsolateral prefrontal cortex; dmPFC, dorsal medial prefrontal cortex; dPCC, dorsal posterior cingulate cortex; HF^{+}, hippocampal formation; Hip, hippocampus; L-aINS, left anterior insula; LTC, lateral temporal cortex; MCC, middle cingulate cortex; PCC, posterior cingulate cortex; PHC, parahippocampal cortex; PHG, parahippocampal gyrus; pIPL, posterior inferior parietal lobule; PMC, primary motor cortex; PoCG, postcentral gyrus; PUT, putamen; R-aINS, right anterior insula; Rsp, retrosplenial cortex; SMG, supramarginal gyrus; SPL, superior parietal lobule; STG, superior temporal gyrus; TempP, temporal pole; Thal, thalamus; TPJ, temporal parietal junction; vmPFC, ventral medial prefrontal cortex.

Journal of Neuroscience Research (2022) **100**:2187-2200

Connectome-Personality Association Studies (CPAS)



PROTOCOL

Using connectome-based predictive modeling to predict individual behavior from brain connectivity

Xilin Shen[1], Emily S Finn[2], Dustin Scheinost[1], Monica D Rosenberg[3], Marvin M Chun[2–4], Xenophon Papademetris[1,5] & R Todd Constable[1,5,6]

Neuroimaging is a fast-developing research area in which anatomical and functional images of human brains are collected using techniques such as functional magnetic resonance imaging (fMRI), diffusion tensor imaging (DTI), and electroencephalography (EEG). Technical advances and large-scale data sets have allowed for the development of models capable of predicting individual differences in traits and behavior using brain connectivity measures derived from neuroimaging data. Here, we present connectome-based predictive modeling (CPM), a data-driven protocol for developing predictive models of brain–behavior relationships from connectivity data using cross-validation. This protocol includes the following steps: (i) feature selection, (ii) feature summarization, (iii) model building, and (iv) assessment of prediction significance. We also include suggestions for visualizing the most predictive features (i.e., brain connections). The final result should be a generalizable model that takes brain connectivity data as input and generates predictions of behavioral measures in novel subjects, accounting for a considerable amount of the variance in these measures. It has been demonstrated that the CPM protocol performs as well as or better than many of the existing approaches in brain–behavior prediction. As CPM focuses on linear modeling and a purely data-driven approach, neuroscientists with limited or no experience in machine learning or optimization will find it easy to implement these protocols. Depending on the volume of data to be processed, the protocol can take 10–100 min for model building, 1–48 h for permutation testing, and 10–20 min for visualization of results.

INTRODUCTION

Journal of Neuroscience Research (2022) **100**:2187-2200; *Nature Protocols* (2017) **12**:506-518

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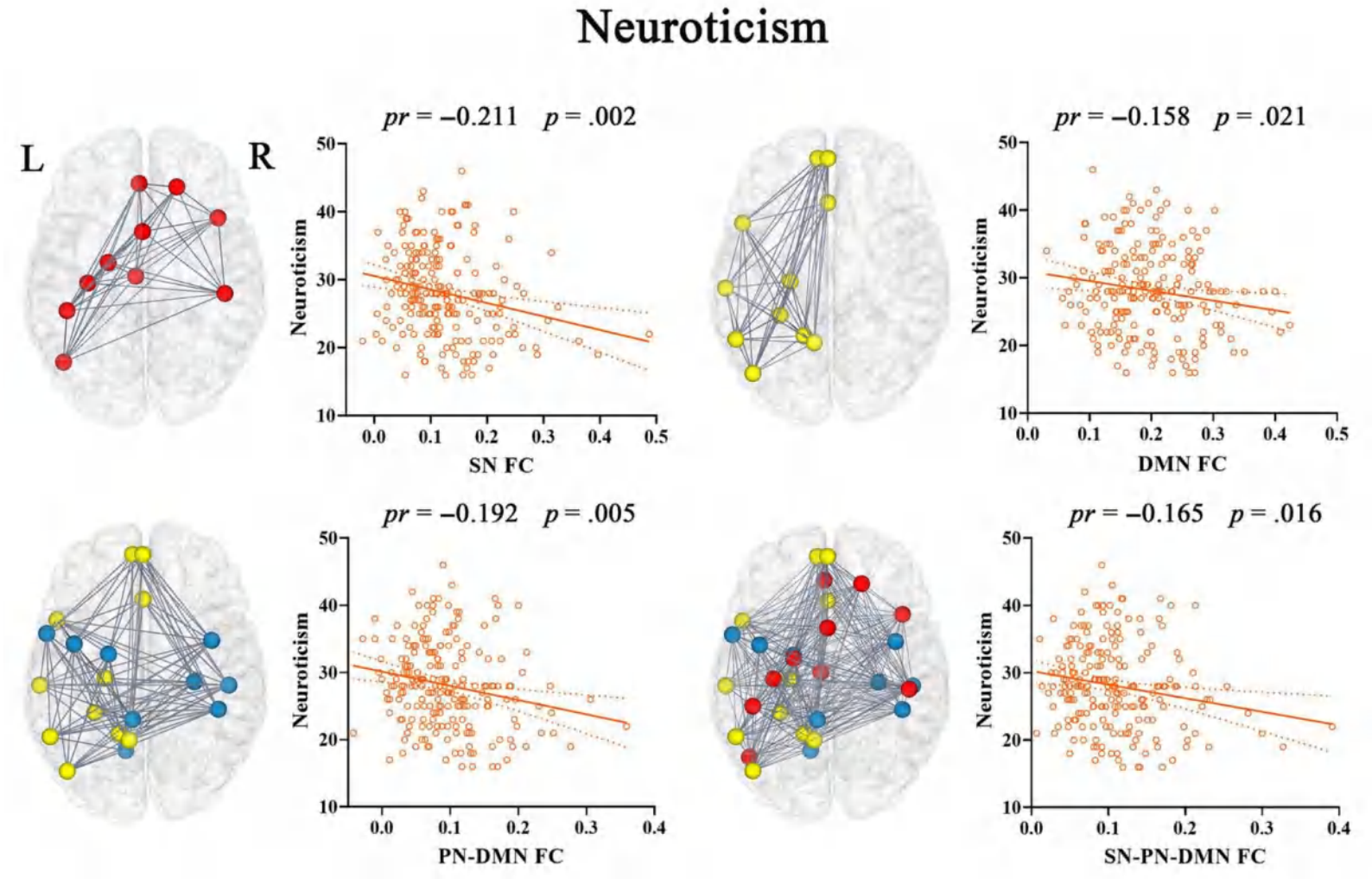

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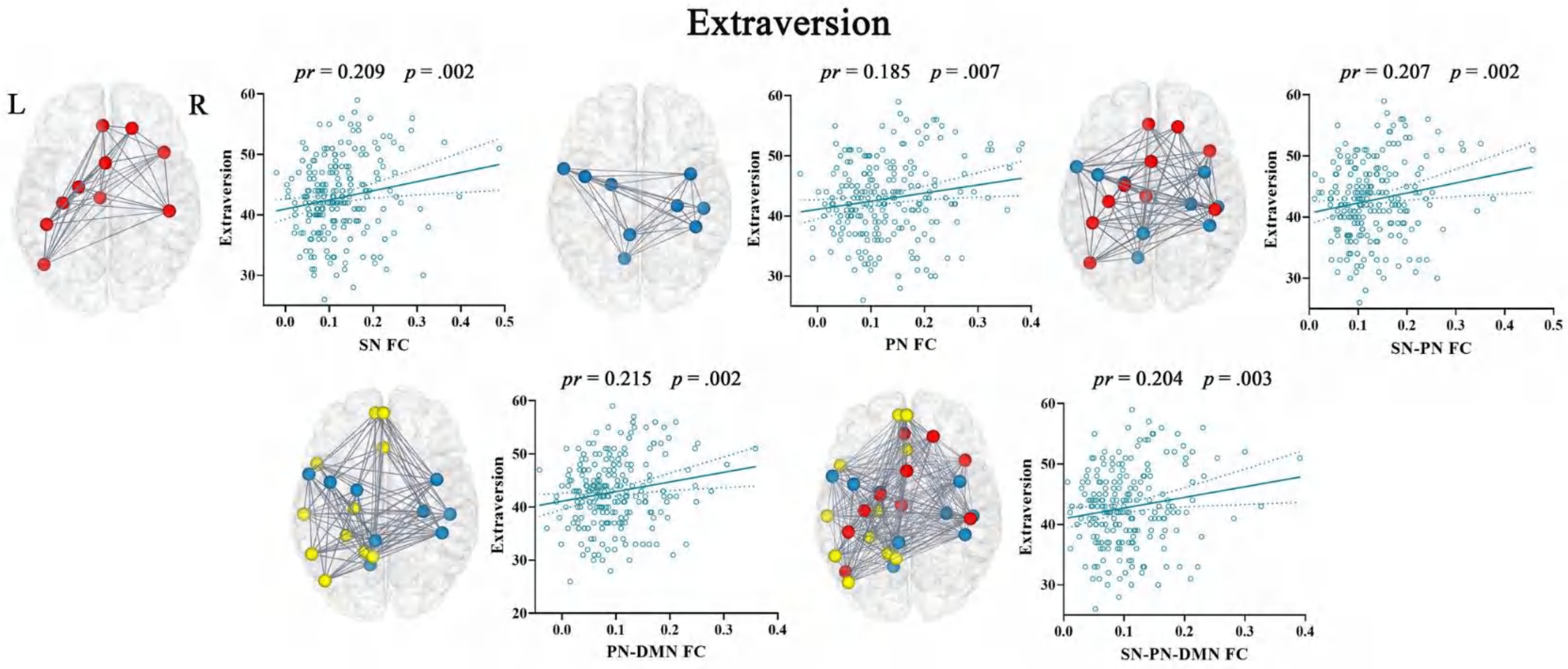

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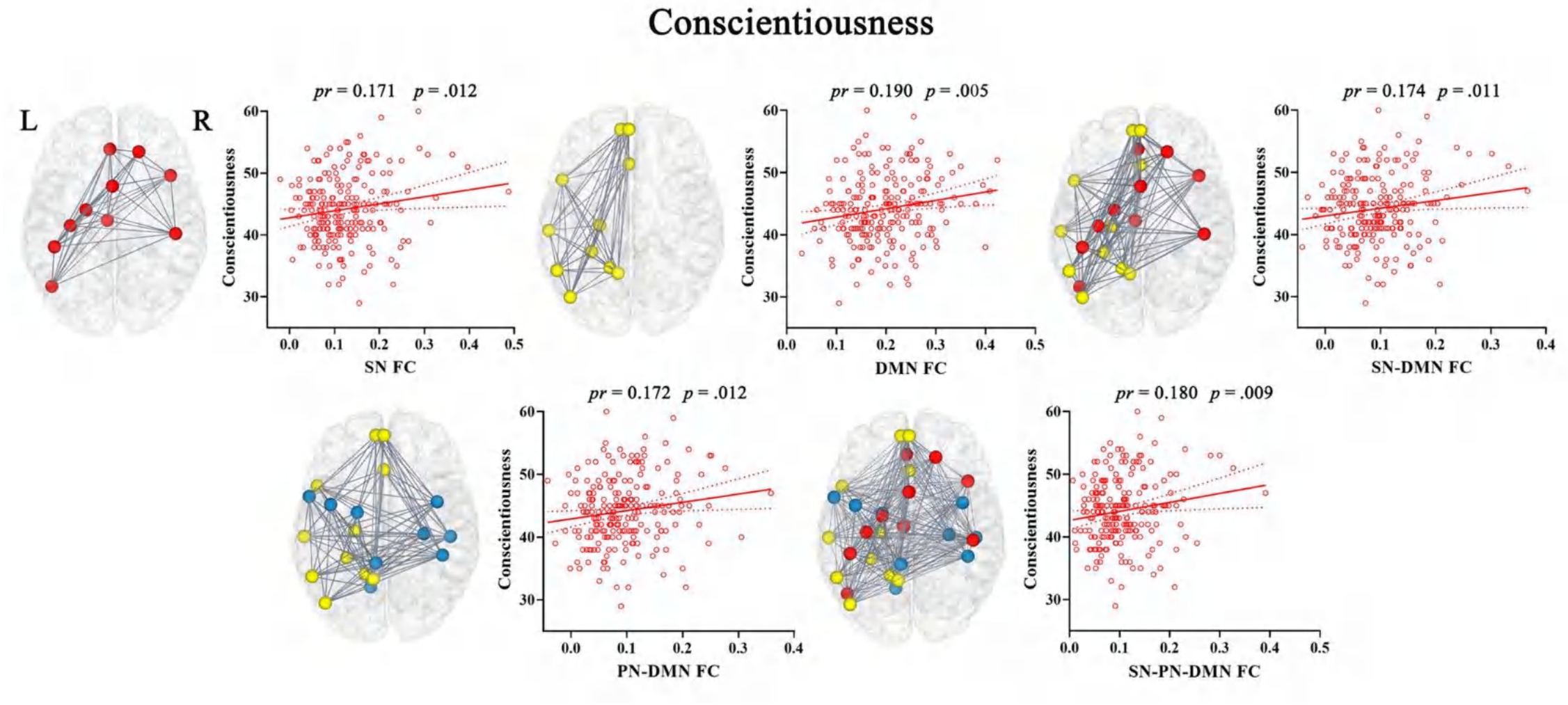

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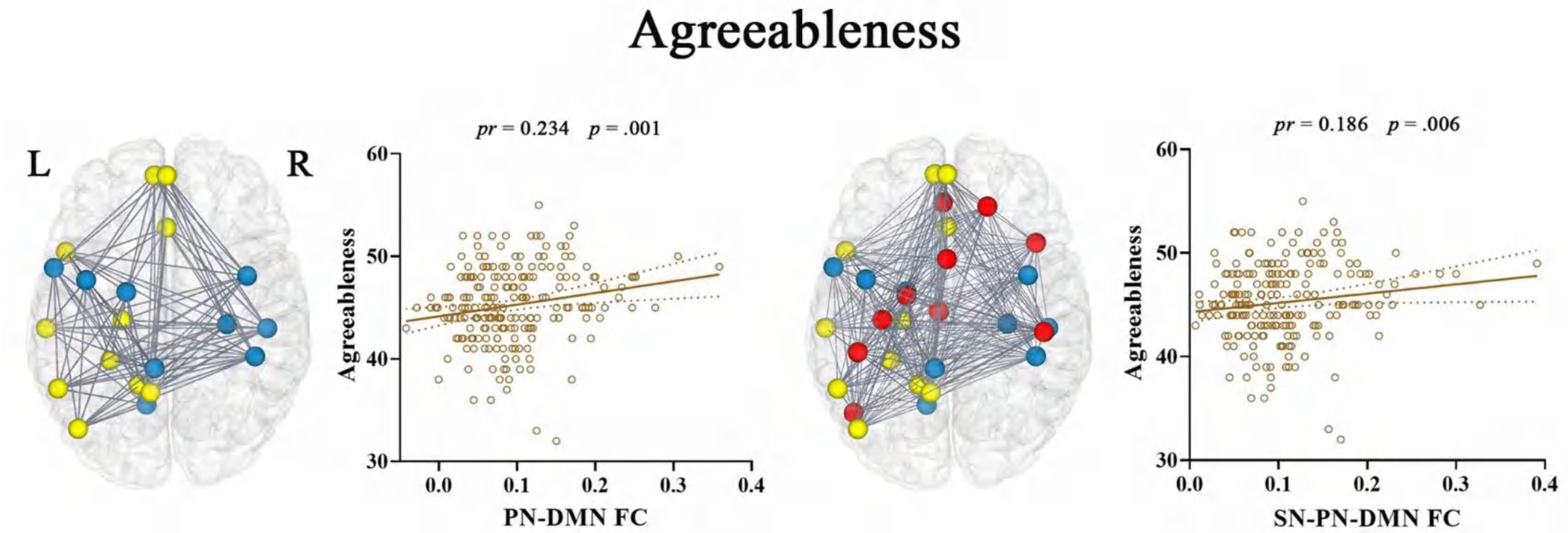

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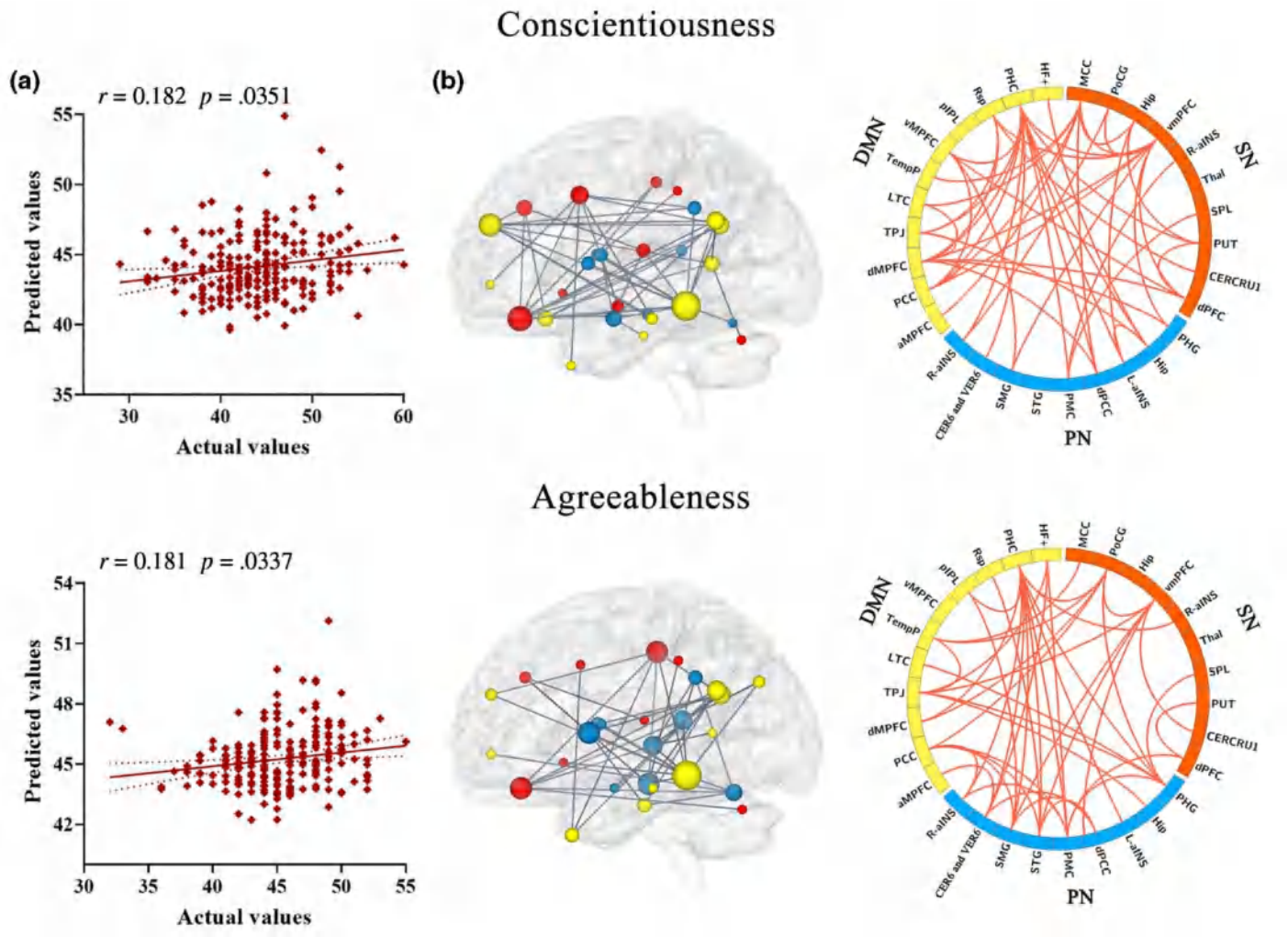

There are several limitations that should be mentioned. First, our study sample was selected from a group of educated volunteers with a limited age range of 18–30 years, which limits generalizability to the general population. Further work in participants with broader age and educational ranges may be encouraged to consolidate our preliminary findings. Second, while significant correlation and prediction were identified, it cannot unequivocally establish the causality of these effects, which is an inherent limitation of a cross-sectional design. Third, the lack of data from an independent sample prevents us from performing an external validation analysis. Fourth, our prediction results did not survive correction for multiple comparisons likely due to the modest sample size. However, because our prediction analyses are exploratory and the preliminary results may contribute to a better understanding of the nature and extent of the associations between personality and functional connectivity, the prediction results without correction for multiple comparisons were reported in this study. Fifth, the 24-channel head coil and longer TR (2000 ms) used in the current study may result in decreased signal-to-noise ratio and lower temporal resolution of the functional MRI data (McDowell & Carmichael, 2019; Weiss et al., 2018), which may affect the reliability of BOLD signals and thus may influence our interpretation. Therefore, future studies using more refined functional MRI acquisition parameters are warranted to validate our results. Finally, we measured five personality factors in the current study using the FFM, which has undergone some critics due to its limits, for example, inability to address core constructs of personality functioning beyond the level of traits (McAdams, 1992). In future inves-

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CPAS across The Human Life Span

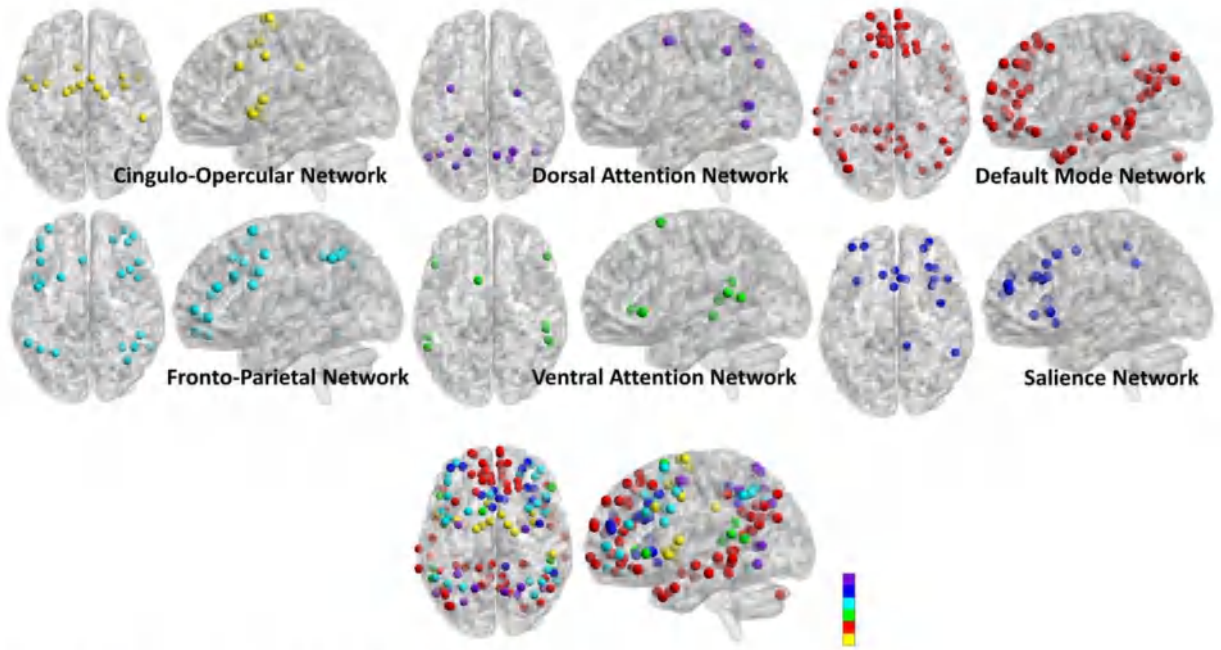


FIGURE 1 Regions of interest (ROIs) reflecting each cognitive network.
Note: Regions of interest (ROIs) making up each of the six cognitive networks were superimposed on a standard 3D brain template. Images were generated using BrainNet Viewer by creating spheres around each of the Power (2011) ROI coordinates corresponding to the networks used in the present analysis

Brain and Behavior (2020) **10**:e01515

Introduction: Personality is associated with cognitive, emotional, and social functioning, and can play a role in age-related cognitive decline and dementia risk; however, little is known about the brain dynamics underlying personality characteristics, and whether they are moderated by age.

Methods: We investigated the associations between personality and resting-state functional MRI data from 365 individuals across the adult lifespan (20–80 years). Participants completed the 50-item International Personality Item Pool and a resting-state imaging protocol on a 3T MRI scanner. Within-network connectivity values were computed based on predefined networks. Regression analyzes were conducted in order to investigate personality–connectivity associations, as well as moderation by age. All models controlled for potential confounders (such as age, sex, education, IQ, and the other personality traits).

Results: We found that openness was positively associated with connectivity in the default-mode network, neuroticism was negatively associated with both the ventral and dorsal attention networks, and agreeableness was negatively associated with the dorsal attention network. In addition, age moderated the association between conscientiousness and the frontoparietal network, indicating that this association become stronger in older age.

Conclusions: Our findings demonstrate that personality is associated with brain connectivity, which may contribute to identifying personality profiles that play a role in protection against or risk for age-related brain changes and dementia.

CPAS across The Human Occupations

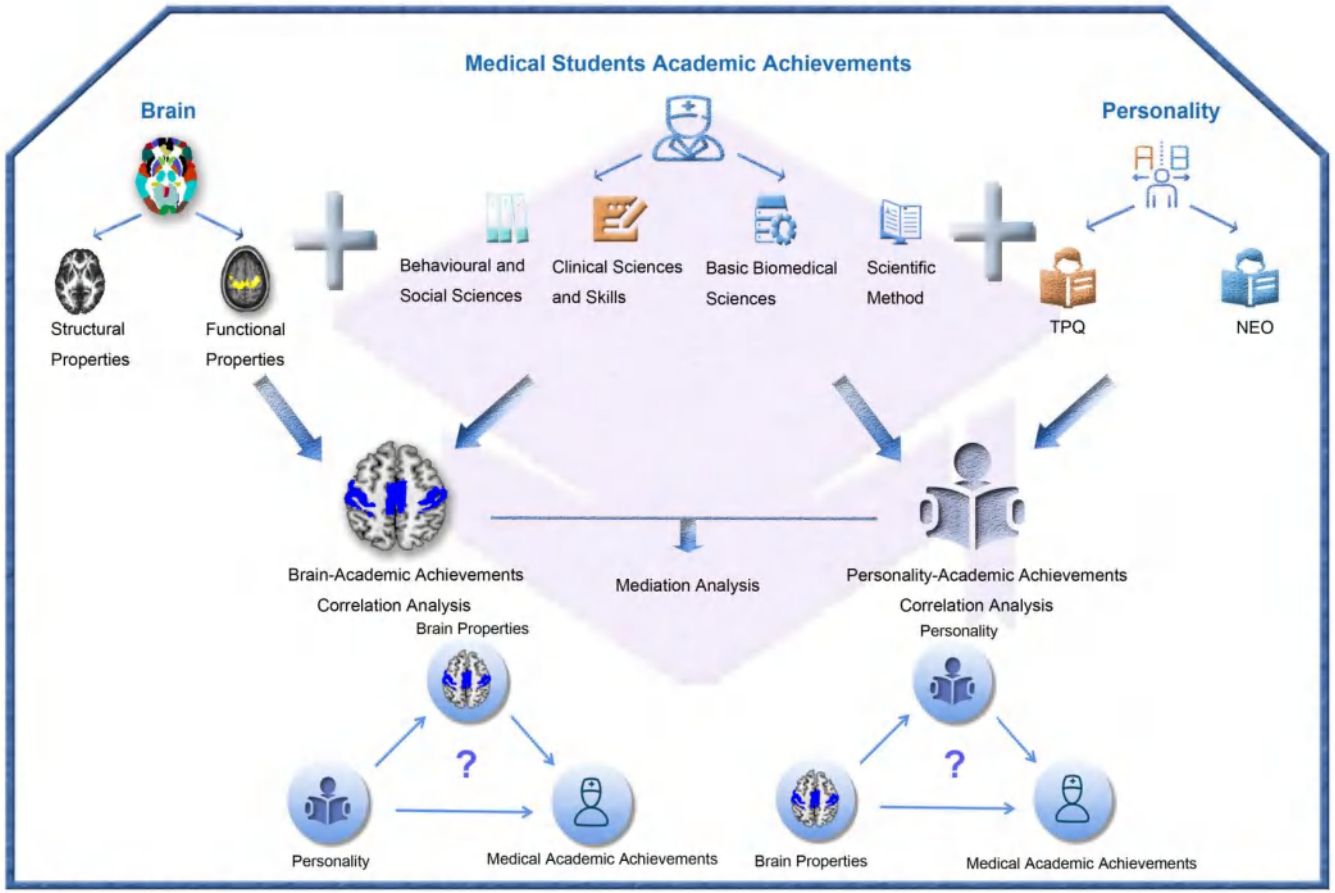
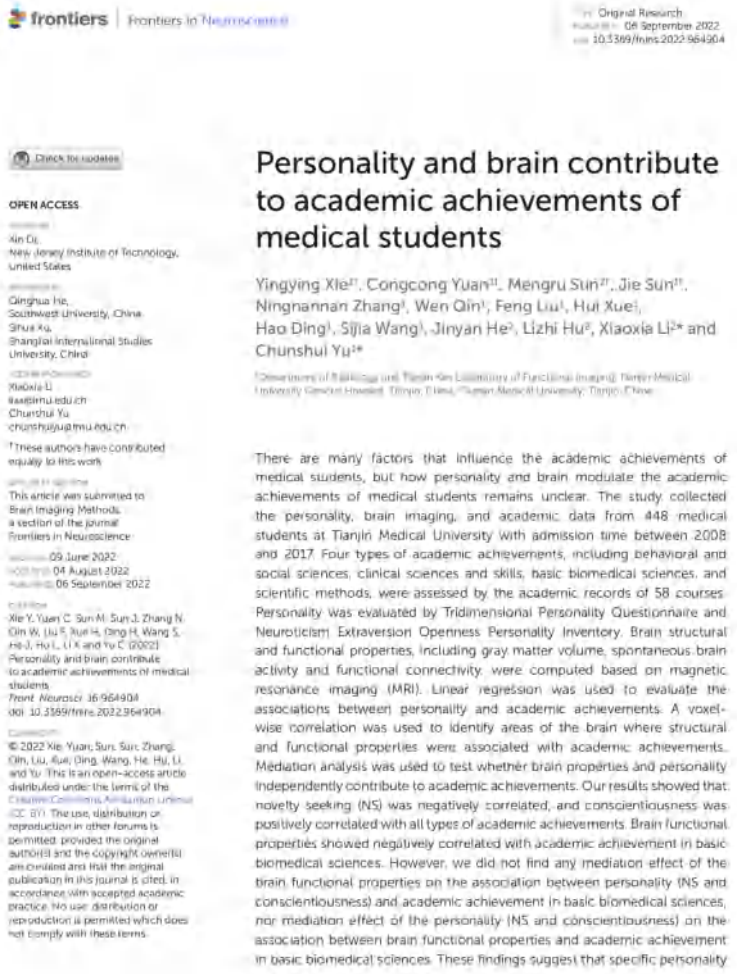


FIGURE 1
Flowchart of the study design. TPQ, tridimensional personality questionnaire; NEO, neuroticism Extraversion openness personality inventory.



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Original Research

06 September 2022

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OPEN ACCESS

Personality and brain contribute to academic achievements of medical students

Yingying Xie[†], Congcong Yuan[†], Mengru Sun[†], Jie Sun[†], Ningnannan Zhang[1], Wen Qin[1], Feng Liu[1], Hui Xue[1], Hao Ding[1], Sijia Wang[1], Jinyan He[2], Lizhi Hu[2], Xiaoxia Li[2]* and Chunshui Yu[1]*

There are many factors that influence the academic achievements of medical students, but how personality and brain modulate the academic achievements of medical students remains unclear. The study collected the personality, brain imaging, and academic data from 448 medical students at Tianjin Medical University with admission time between 2008 and 2017. Four types of academic achievements, including behavioral and social sciences, clinical sciences and skills, basic biomedical sciences, and scientific methods, were assessed by the academic records of 58 courses. Personality was evaluated by Tridimensional Personality Questionnaire and Neuroticism Extraversion Openness Personality Inventory. Brain structural and functional properties, including gray matter volume, spontaneous brain activity and functional connectivity, were computed based on magnetic resonance imaging (MRI). Linear regression was used to evaluate the associations between personality and academic achievements. A voxel-wise correlation was used to identify areas of the brain where structural and functional properties were associated with academic achievements. Mediation analysis was used to test whether brain properties and personality independently contribute to academic achievements. Our results showed that novelty seeking (NS) was negatively correlated, and conscientiousness was positively correlated with all types of academic achievements. Brain functional properties showed negatively correlated with academic achievement in basic biomedical sciences. However, we did not find any mediation effect of the brain functional properties on the association between personality (NS and conscientiousness) and academic achievement in basic biomedical sciences, nor mediation effect of the personality (NS and conscientiousness) on the association between brain functional properties and academic achievement in basic biomedical sciences. These findings suggest that specific personality

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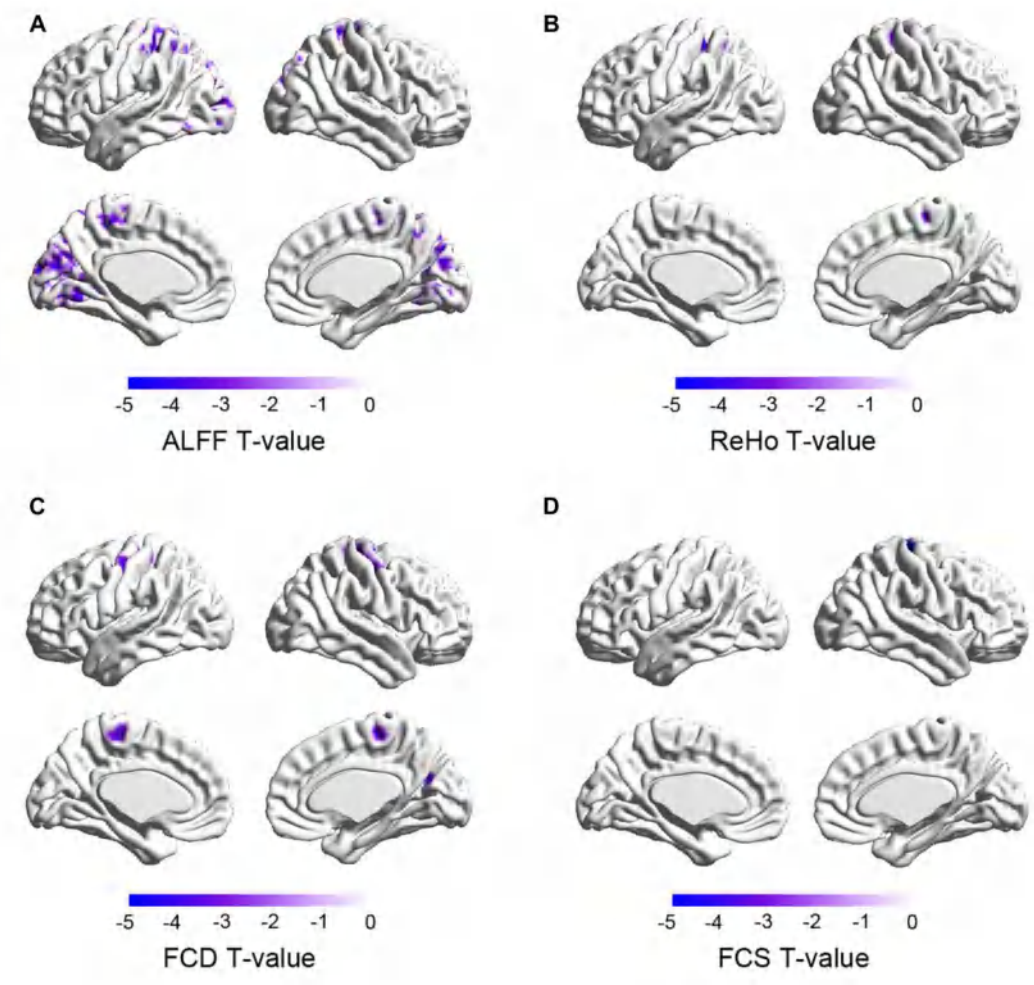
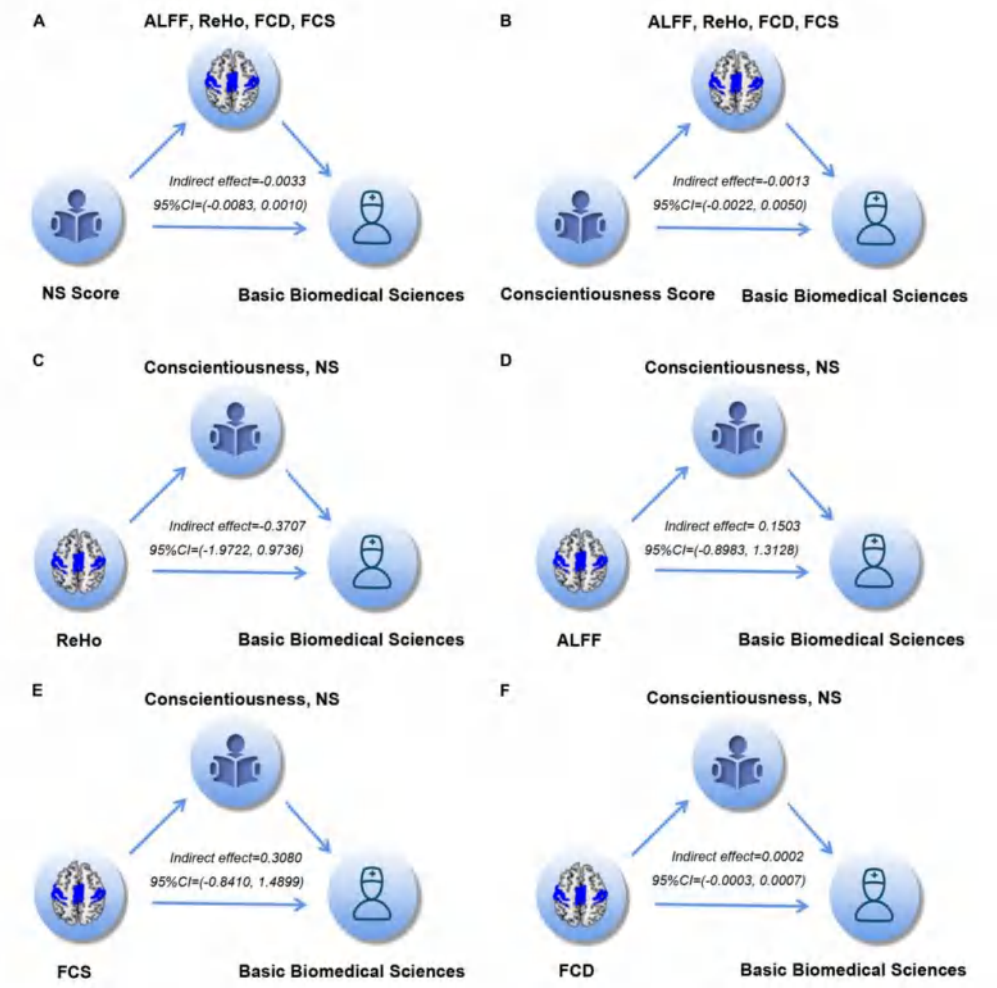
CPAS across The Human Occupation





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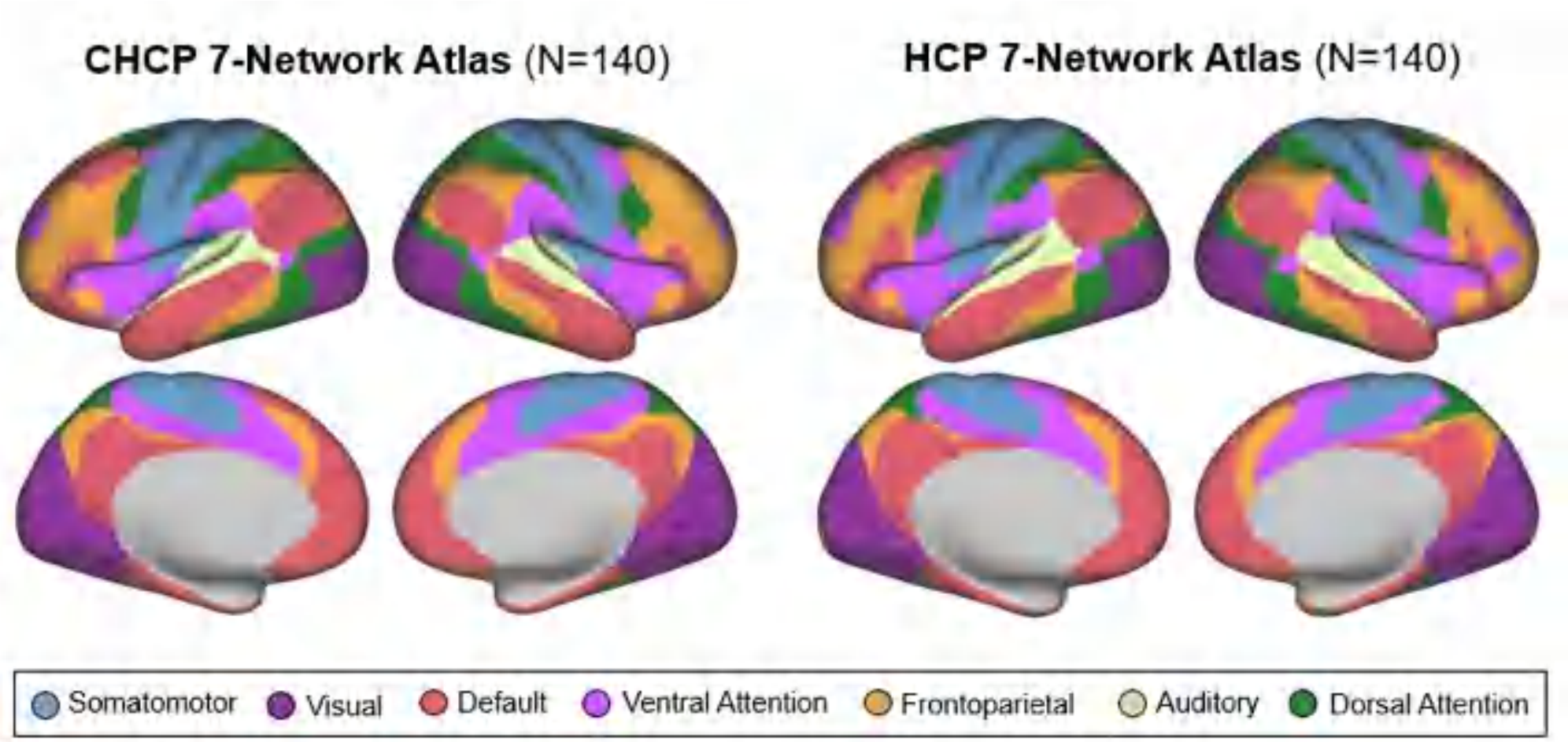
An Open Resource for CPAS across Human Culture



Chinese Human Connectome Project (CHCP): *Nature Neuroscience* (2022) **accepted**