Do personality traits explain differences in resting state functional connectivity in older adults?

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Authors:

Lisa Haddad[1], Johanna Stumme[1,2], Svenja Caspers[1,2,3], Christiane Jockwitz[1,2]

Institutions:

[1]Institute for Anatomy I, Medical Faculty & University Hospital Düsseldorf, Düsseldorf, Germany, [2]Institute of Neuroscience and Medicine (INM-1), Research Center Jülich, Jülich, Germany, [3]JARA-BRAIN, Jülich-Aachen Research Alliance, Jülich, Germany

First Author:

Lisa Haddad
Institute for Anatomy I, Medical Faculty & University Hospital Düsseldorf
Düsseldorf, Germany

Co-Author(s):

Johanna Stumme
Institute for Anatomy I, Medical Faculty & University Hospital Düsseldorf|Institute of Neuroscience and Medicine (INM-1), Research Center Jülich
Düsseldorf, Germany|Jülich, Germany
Svenja Caspers
Institute for Anatomy I, Medical Faculty & University Hospital Düsseldorf|Institute of Neuroscience and Medicine (INM-1), Research Center Jülich|JARA-BRAIN, Jülich-Aachen Research Alliance
Düsseldorf, Germany|Jülich, Germany|Jülich, Germany
Christiane Jockwitz
Institute for Anatomy I, Medical Faculty & University Hospital Düsseldorf|Institute of Neuroscience and Medicine (INM-1), Research Center Jülich
Düsseldorf, Germany|Jülich, Germany

Introduction:

Healthy aging is accompanied by changes in the functional architecture of the brain [1] together with a decline in cognitive abilities [2]. Importantly, focusing on the older adult population, higher inter-individual variability has been shown in both, brain function and cognitive abilities [1,2], which cannot be explained by the factor age itself. Previous studies reported personality to be a promising factor that seems to have an effect on cognitive performance [3] and may contribute to the onset of neurodegenerative diseases, e.g. Alzheimer's disease [4]. Whether personality traits, however, relate to the functional architecture of the aging brain remains to be explored. Therefore, aim of the current study was to investigate the relationship between personality traits and resting state functional connectivity (RSFC) in a population-based cohort of older adults.

Methods:

We investigated 742 subjects (55-85 years, 402 males) from 1000BRAINS [5]. For each subject, 300 resting state EPI images were acquired (3T Siemens Tim-TRIO). Time series were extracted from 83 brain regions belonging to seven distinct networks: dorsal attention- (DAN), ventral attention- (VAN), sensorimotor- (SMN), default mode- (DMN), visual- (VN), limbic- (LN) and frontoparietal network (FPN) [6]. Using a graph-theoretical approach, strength values of within- and inter- network RSFC were calculated. In addition, a ratio score of inter- and within-RSFC [7] was determined to quantify network segregation versus integration. Personality traits were assessed using the Freiburg Personality Inventory (FPI) [8], containing 138 items grouped into the 12 personality traits: Life satisfaction, Social orientation, Achievement orientation, Inhibitedness, Excitability, Aggressiveness, Strain, Somatic complaints, Health concern, Frankness, Extraversion and Emotionality.
Partial correlations were carried out between the personality traits and RSFC parameters of the seven networks (corrected for age, sex and education [ISCED]). Results were considered as significant at $p < .05$.

Results:

Regarding within-network RSFC, positive correlations were found between Life satisfaction and SMN, VAN, FPN and DMN, and negative correlations between Aggressiveness and VAN and FPN, as well as between Strain and DAN and VAN. Regarding inter-network RSFC, positive correlations were found between Social Orientation and DAN, VAN, LN and DMN and negative correlations between Achievement orientation and FPN. Network integration increased with higher Social orientation (LN, DMN), higher Aggressiveness (VAN, FPN) and higher Emotionality (DMN). Network segregation increased with higher Life satisfaction (SMN).

Conclusions:

The current study revealed a complex interaction between personality traits and RSFC during older age: First, higher within-network RSFC was found to be related to higher Life Satisfaction, as well as lower Aggressiveness and Strain, traits that together hint at an even-tempered personality. Similarly, higher achievement-oriented personality was related to less inter-network RSFC of the FPN. Interestingly, higher within-network as well as lower inter-network RSFC (i.e. indicating higher segregation) have been associated with better cognitive performance in older adults [7]. Hence, as personality traits and cognitive performance might be similarly related to RSFC, future, i.e. longitudinal studies, should take-up the investigation of this triad. Regarding the inter-network RSFC, higher Social Orientation was related to a high integration of attentional networks (VAN, DAN), supporting the reported relevance of attention in social interactions [9].
Similarly, Social Orientation and Emotionality were related to high integration of the DMN, underpinning the significance of the DMN in emotion processing [10]. Thus, the results of the current study extend previous studies by showing that personality traits might be an important source of variance that relates to the functional architecture of the aging brain.

Emotion, Motivation and Social Neuroscience:

Self Processes [1]

Lifespan Development:

Aging [2]

Keywords:

Aging
FUNCTIONAL MRI
NORMAL HUMAN

Other - Personality ; Connectivity

[1|2]Indicates the priority used for review

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No

Please indicate below if your study was a "resting state" or "task-activation" study.

Resting state

Healthy subjects only or patients (note that patient studies may also involve healthy subjects):

Healthy subjects

Was any human subjects research approved by the relevant Institutional Review Board or ethics panel? NOTE: Any human subjects studies without IRB approval will be automatically rejected.

Yes

Was any animal research approved by the relevant IACUC or other animal research panel? NOTE: Any animal studies without IACUC approval will be automatically rejected.

Not applicable

Please indicate which methods were used in your research:

Functional MRI

For human MRI, what field strength scanner do you use?

3.0T

Which processing packages did you use for your study?

SPM

Provide references using author date format

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