

Correlation with statistical significance and its explanation rate: comment on Minelli et al., “BDNF serum levels, but not BDNF Val66Met genotype, are correlated with personality traits in healthy subjects.” (Eur Arch Psychiatry Clin Neurosci doi:10.1007/s00406-011-0189-3)

Tomoyuki Kawada

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Dear Sirs,

Minelli et al. reported the existence of a relationship between the serum levels of brain-derived neurotrophic factor (BDNF) ($n = 107$) or BDNF Val66Met polymorphism ($n = 217$) and personality traits as measured by the scores of the temperament and character inventory (TCI) in healthy volunteers [1]. A significant correlation was observed between the scores for some scales of the TCI and the serum BDNF concentrations [1]. Although there are seven main scales and 24 subscales in the TCI, statistically significant correlation was found only for one main scale and three subscales. The Pearson's correlation coefficients between the serum BDNF and four scales, namely, harm avoidance, anticipatory worry, fatigability/asthenia, and resourcefulness were -0.253 ($P = 0.009$), -0.222 ($P = 0.023$), -0.221 ($P = 0.023$), and 0.256 ($P = 0.008$), respectively. By using a regression analysis to control for confounders, they concluded that decreased serum BDNF concentration was associated with anxiety personality traits in the general population. In addition, Minelli et al. reported that there was no significant association between BDNF Val66Met polymorphism and TCI personality traits. In contrast, Suzuki et al. reported the opposite result, that BDNF Val66Met polymorphism modulates the effects of parental rearing, especially maternal care, on harm avoidance and self-directedness in healthy subjects [2].

Related research results have been reported on the relationships between biological and psychological indicators. Okuno et al. showed statistically significant correlations between some of the following three sets of scale scores

(social adaptation, personality traits, and psychological job stress) as evaluated by a questionnaire survey and the plasma BDNF or 3-methoxy-4-hydroxyphenylglycol (MHPG) levels. The three sets of questionnaires used were the Social Adaptation Self-evaluation Scale (SASS), NEO-Five-factor inventory and Stress and Arousal Check Lists (s-SACL and a-SACL), and the target subjects were 269 employees of a publishing industry in Japan [3]. When indicators related to BDNF and personality traits were extracted, only the Pearson's correlation coefficient between the serum BDNF and NEO-extroversion was found to be significant ($r = 0.166$, $P = 0.01$). Although it was statistically significant, the explanation rate presented by Okuno et al. was 2.8%, and those presented by Minelli et al. ranged from 4.9 to 6.6%. These values highlight the limitations of biological monitoring as a substitute for psychometric indicators, although statistically significant bio-psycho-relationships have been demonstrated. Biological monitoring indicators and subjectively evaluated indicators emerge from different origins and these indicators can be used in several situations, but with an understanding of their limitations.

I want to put into question these papers analyzing the putative relationships between biological and psychological domains. There are researchers who consider it fruitful to perform research to investigate relationships between biological and psychological domains, even if the results might only explain a tiny part of a very complex reality. I suppose that a number of other biological factors may interact with those that are measurable, and many of these factors may not be known today. Human biological research will almost always simplify realities because of a lack of sufficient knowledge of the functioning of the human body. It is also usually not possible to perform experimental research for analyzing complex behaviors in

T. Kawada (✉)
Department of Hygiene and Public Health, Nippon Medical
School, 1-1-5 Sendagi, Bunkyo-Ku, Tokyo 113-8602, Japan
e-mail: kawada@nms.ac.jp

everyday life of humans to more precisely disentangle the causes and relationships.

But the levels of associations between biochemical indicators and psychometric scales emphasize the limitation that biological monitoring cannot become a substitute for psychometric indicators. Pass analysis using a large data set with BDNF and behavioral variables will not resolve the relationships among variables. I believe that subjectively evaluated indicators cannot be substituted by biological indicators, and I recommend that biological and psychometric scales are used simultaneously to understand the health status of employees.

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