

Longitudinal physiological and proteomic profiling under psychological assessments: a pilot study

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Motivation and Aim: Human behaviour is an integral function of the whole organism. Differences in the human proteome may reflect differences between human states [1–4]. We have attempted to identify patterns of dynamic changes in the human proteome over several days of observation, in connection with general physiological indicators of human adaptive changes and individual psychological characteristics. Previous attempts have been made to identify intergroup and individual differences in proteomic profiles of people due to their habits, age, sex, and various pathologies. Our study seeks to identify individual differences in the patterns of temporal changes in the human proteome. At the same time, the levels of part of the proteins remain unchanged due to homeostatic reasons, and part reflects current changes in the human body.

Methods and Algorithms: A longitudinal study was conducted, during which 20 patients were examined with respect to their proteomic states using 228 proteins and physiological conditions (drawn on FCI (Functional Change Index, R.M. Baevskij, 1997 [5, 6]) and Kerdo scores) over three days at four time points during the day (with two-hour time lag). Additionally, participants were classified into groups using Pavlovian Temperament Survey (PTS) and The Big Five Inventory (BFI). We used GEE and LMM to assess proteomic values and FCI scores as well as their respective within-subject correlation; repeated measures ANOVA to evaluate FCI dynamics over time; correlation analysis to estimate the relationship between viability score and proteins as well as viability score with one's level of arousal using nonparametric tests with permutation.

Results: It was concluded that dynamics of FCI scores over time is significantly different for two contrasting psychological groups. Two proteins were found to have significant within-subject correlation coefficients with respect to FCI scores and were significant using GEE and LMM after adjustment for psychological groupings; seven proteins were obtained as crucial when evaluating relationship between viability scores and proteomic profiles.

Conclusion: We hypothesize that dynamics of a proteomic profile reflects physiological and psychological conditions of an individual, we intend to continue our research for further evaluation of the given proposition.

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References

- 1 Carrasco-Zanini J. et al. Proteomic signatures for identification of impaired glucose tolerance. *Nat Med.* 2022;28(11):2293-2300. doi 10.1038/s41591-022-02055-z
- 2 Nimer R.M., Alfaqih M.A., Shehabat E.R., Mujammami M., Abdel Rahman A.M. Label-free quantitative proteomics analysis for type 2 diabetes mellitus early diagnostic marker discovery using

- data-independent acquisition mass spectrometry (DIA-MS). *Sci Rep.* 2023;13(1):20880. doi 10.1038/s41598-023-48185-3
- 3 Oh H. S.-H. et al. Organ aging signatures in the Plasma Proteome Track Health and disease. *Nature.* 2023;624(7990):164-172
 - 4 Williams S.A. et al. Plasma protein patterns as comprehensive indicators of health. *Nat Med.* 2019;25(12):1851-1857
 - 5 Baevskij R.M. Predicting conditions on the verge of normality and pathology. Moscow: Medicina, 1979 (in Russian)
 - 6 Baevskij R.M., Berseneva A.P. Assessment of the adaptive capabilities of the body and the risk of developing diseases. Moscow: Medicina, 1997 (in Russian)