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Original Research

A preliminary study on the role of personal history of infectious and parasitic diseases on self-reported health across countries

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ABSTRACT

Objectives: Infectious diseases are often associated with decline in quality of life. The aim of this study is to analyze the relationship between personal history of communicable, i.e., infectious and parasitic diseases and self-rated health.
Study design: Secondary analysis of a large dataset multi-country observational study.
Methods: We used a four-pronged analysis approach to investigate whether personal history of infectious and parasitic diseases is related to self-reported health, measured with a single item.
Results: Three of the four analyses found a small positive effect on self-reported health among those reporting a history of pathogen exposure. The meta-analysis found no support but large heterogeneity that was not reduced by two classifications of countries.
Conclusion: Personal history of infectious and parasitic diseases does not reduce self-reported health across a global sample.

1. Introduction

Numerous people live with chronic diseases and conditions, as life expectancy is increasing, and the numbers of older persons also rise.[1,2] For example, between 1985 and 2005, the prevalence of chronic diseases doubled.[3] In 2017, chronic diseases represented more than 60 % of the global burden of disease.[4] Nonetheless, when focusing on low-income countries, communicable (infectious and parasitic) diseases still contribute to the high disease burden.[4]

In 2019 alone, tuberculosis was responsible for 1.18 million deaths, malaria for 643,000 deaths, typhoid fever for 110,000 deaths, dengue for 36,100 deaths, schistosomiasis for 11,500 deaths, leishmaniasis for 5,710 deaths, and trypanosomiasis for 1,360 deaths.[5] It is widely agreed that these numbers will – if at all – only slowly decrease given drug resistances,[6] global climate change[7] and the limitations of health education programs (e.g., personal hygiene) and sanitation.[8] Besides the loss of human lives, infectious diseases have other consequences, such as decline in quality of life, expenses, medication, incapacity to work, or strain on caregivers.[2]

Higher infectious disease rates and their impact on mortality and morbidity are more commonly found in individuals with lower social status.[9] The prevalence of infectious diseases has been linked to cross-cultural differences between regions,[10,11] which span from gastronomic variations[12] to distinctions of personality traits.[13] Of relevance for this secondary analysis, poor self-reported health was found in individuals not only with chronic diseases[14,15] but also among those with infectious diseases.[16]

Self-reported health is a general health indicator widely used in public health studies.[9,17] Self-reported health usually consists of a single question asking people to rate their general health. Despite its simplicity, this single self-report item is considered a relatively reliable tool for assessing general health and has been used worldwide in an array of research settings and conditions.[18,19] Its widespread use as an index of health may be tied to lessening the burden for the respondent, lower costs, and easier interpretation compared to multi-item measures.[17]

Across European countries, self-reported health status is positively

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associated with life satisfaction[20]. A meta-analysis of studies assessing self-reported health with a single item and all-cause mortality as outcome found that persons with poor self-reported health, although subjective, had a 2-fold higher mortality risk compared with persons reporting excellent self-rated health.[21] This aligns well with a cohort study from Sweden, finding that self-reported health correlates negatively with more objective measures, such as mortality risk (hazard ratio .89), use of social insurance facilities (disability pension, hazard ratio .77), and utilization of health care services (hazard ratio .96).[22]

Some authors have stated that even though communicable diseases have an important public health weight, they are known as neglected tropical diseases because they are not frequently researched[23,24] and vaccine development has been slow.[25–29] For instances, there is a lack of studies that consider both distinct adult age groups and individuals from different countries with infectious diseases and multiple parasitic infections.[30] The aim of this study, therefore, is to analyze the relationship between personal history of communicable, i.e., infectious and parasitic, diseases and self-rated health, through a secondary analysis of a large, cross-cultural, and cross-cohort database.[31]

2. Methods

The present study is a cross-sectional secondary analysis of a dataset from 187 countries. Data were collected through an online questionnaire administered between April and August 2021 in 45 different languages, with two countries (Algeria and Morocco) employing written questionnaires. Participants were recruited from diverse sample pools, considering factors such as sex, age, residence (including both small and large cities), and education. The survey link was shared on various social media platforms, while approximately 6 % of the data were collected through outsourcing platforms. Detailed information on data collection methodology can be found elsewhere.[31,32] The original collection of data was approved by the Institutional Review Board (IRB) at the Institute of Psychology, University of Wrocław. All team members adhered to the principles of the Declaration of Helsinki[33] and the ethical guidelines of their respective IRBs, either based on the ethical approval of the Principal Investigator's IRB or their local IRB. Prior to participating in the survey, all participants provided informed consent, and the anonymity of their data was ensured. 117,289 participants (women: 71, 325, men: 34,862) aged 18–90 years ($M = 30.35$, $SD = 12.55$) took part.

For the present study, participants that did not answer the self-perceived health item were excluded (N = 26,486). Participants not indicating their sex (n = 9,527, 8.1 %) or age (n = 9,754, 8.1 %) were removed. Also, given the low prevalence of non-binary participants (n = 1,089, .9 %) in the dataset (this option was not available in all countries during data collection), respondents indicating non-binary as gender were excluded from analysis. Participants not responding to any of the nine pathogen items were also removed (n = 19,232). This reduced the original number of observations from 117,289 to 87,673 (multiple causes possible). See the supplementary material for a comparison among responders and non-responders.

Note, the final number of participants included in the analysis varies for specific analysis (e.g., removing those raised in a different country than currently living, N = 6,001).

Self-perceived health was assessed by an 11-point Likert scale to the question: How healthy are you? (1 = Extremely unhealthy; 11 = Extremely healthy). This question has been used earlier in health, social, and psychology surveys.[34–37]

Demographic variables were sex (female, male), age, country-raised, and country lived.

Personal history of infectious and parasitic diseases was assessed by the nine-item Pathogen Prevalence Index[10] through the question "Have you ever contracted (been sick with) any of the following diseases?" (response alternatives were: Never (0), Once (1), More than once (2)) concerning each of nine infectious and parasitic diseases (see supplementary material). Multiple answers were possible, 269 participants indicated to have been exposed to all pathogens at least once, and 30 participants indicated that they had all nine diseases multiple times. Overall, 10.06 % of the participants reported an exposure to any of the nine pathogens at least once (pathogen(s) once: n = 6,345, one pathogen multiple times: n = 2,480, more than one pathogen/disease: n = 2103. N = 269 indicated to have contracted all diseases at least once, whereof n = 166 live in the USA, see supplementary material, table 1). The nine pathogens significantly differ with respect to self-rated health ($F(9, 87671) = 153.33$, $p < .0001$, Pillai's trace = .015, with dengue, filariae and typhus not yielding any difference to those not exposed to any pathogen whereas participants who have been exposed to any of the other six pathogens once report higher health, see supplementary material, Fig. S1).

We had no prediction about differences by type of pathogen/disease, especially since their occurrence naturally varies by country. We therefore coded having had any of the pathogens at least once as a prevalence. It is worth noting that for participants who selected 'More than once', we do not know whether this "multiple times" refers to twice, thrice, or any other multiple exposure. We therefore used three groups, never exposed, exposed to one pathogen only once, exposed to either the same pathogen multiple times or exposed more than one pathogen. Thus, multiple exposure refers to either the same pathogen more than once or having contracted an infection with two or more pathogens during one's lifetime.

Regarding data analysis, we performed a four-pronged approach.[38] We firstly investigated the relationship between pathogen prevalence and self-rated health with linear regression, including age and sex as additional predictors. We secondly used linear mixed modelling nesting participants within countries (random effect) and pathogen prevalence, age and gender as fixed effects. For this analysis we excluded participants that reported living in a different country than born (n = 6,001) reducing the sample size to N = 81,672. Thirdly, we performed propensity scoring to limit the selection bias in our retrospective observational study.[39] Propensity scoring will pseudo-randomize participants who reported a prevalence with a participant who reported no prevalence. Since propensity scores analyze effects at the sample level, not the individual level as regression analysis does, we excluded countries with less than 30 responses;[39] this exclusion left 90 countries (from 187 countries). Propensity scoring by age, sex and country (using exact matching for country and sex, allowing nearest for age to increase the number of matches) yielded 5,212 participants per group (N = 10,424).

Fourthly, we performed a random effect meta-analysis. For this analysis we removed all countries with less than 30 respondents, and the countries also needed to have at least ten respondents reporting a prevalence. This ensured that the statistics per country were reliable (mean similarity difference[40]). The meta-analysis is based on n = 79, 563.

We followed this up with two subgroup analyses, one by the UN economic categorization of countries into developed, developing, in transition and least developed countries, and another one by categorizing countries into temperate and tropical.

3. Results

Self-reported health on a scale from 1 to 11, with higher values representing better health, was $M = 7.43$ ($SD = 2.08$).

Among participants without pathogen prevalence self-perceived health rating was generally good, $M = 7.39$, $SD = 2.05$, 95 % CI [7.38, 7.40], participants with one pathogen prevalence reported a slightly higher health, $M = 7.65$, $SD = 2.14$, 95 % CI [7.59; 7.71] and participants with multiple exposures to either the same or different pathogens reported the highest health score, $M = 8.35$, $SD = 2.26$, 95 % CI [8.29; 8.42]. This difference was statistically significant, $F(2, 87670) = 414.7$, $p < .001$, $R^2_{adj} = .009$. Post-hoc tests yielded a significant difference between the "never being exposed" group and the "once exposed" group ($t = -8.19$, $p < .001$, $\beta = -.261$) and the "never being exposed" group and the "multiple times" group ($t = -27.98$, $p < .001$, $\beta = -.963$), and between the "once exposed" and "multiple times" group ($t = -15.35$, $p = .262$, $\beta = -.702$). Note, both the "once exposed" and the "multiple times" group reported higher health. Given the low proportion of participants with exposure we decided to pool the two groups and contrast them with the never exposed group in all subsequent analyses. Applying this dichotomy we find that self-perceived health was statistically lower among those reporting no history of infectious and parasitic diseases ($M = 7.39$, $SD = 2.05$, 95 % CI [7.38; 7.4]) than among those reporting pathogen exposure at least once ($M = 7.97$, $SD = 2.26$, 95 % CI [7.93; 8.02]), Welch's $t(9663.4) = -22.71$, $p < .001$, Cohen's $d = .28$.

Supplementary Table 2 provides the self-rated health per country and separately for participants reporting an exposure or reporting no exposure to any of the nine diseases.

3.1. Regression analyses

A simple linear regression for the complete dataset (N = 87,672) with self-rated health as outcome and sex, age, and personal history of infectious and parasitic diseases as predictors, explained 1.1 % of the variance in self-perceived health ($F(3, 87{,}669) = 333.5$, $R^2_{adj} = .011$, $p < .001$). Regarding the predictors; a) for every decade reported self-rated health reduced with .11 points on the scale, $t(87{,}669) = -20.125$, $\beta = -.11$, $p < .001$; b) for reporting exposure at least once to any pathogen listed increased self-rated health by over half a point, $t(87{,}669) = 23.4$, $\beta = .56$, $p < .001$, and c) being a woman statistically significantly reduced self-rated health (for men: $M = 7.47$, $SD = 2.14$, for women: $M = 7.43$, $SD = 2.04$), $t(87{,}669) = 2.35$, $\beta = .035$, $p = .019$). Pathogen prevalence was not detrimental to self-perceived health. We next conducted a sensitivity analysis using being female as a benchmark covariate, and pathogen prevalence (binary) as treatment. In explaining pathogen prevalence and self-rated health we investigate the maximum strength of a confounder once, twice, or three times as strong as female. We used the sensemakr package.[41] The robustness value for testing the null hypothesis was 6.98 %, i.e., unobserved confounders not explaining at least 6.98 % of the residual variance are not sufficiently strong to change the association between pathogen prevalence and self-rated health (see supplementary Material). Unobserved confounders would need to explain at least .6 % of the residual variance of the treatment to fully explain away the observed effect. One possible confounder is country; hence we next tested a linear mixed model.

A linear mixed model, nesting participants within a country, age and sex as covariates, yielded results similar to the results of the simple linear regression, that is, self-rated health decreased with age ($t(81{,}390) = -7.19$, $p < .001$, $\beta = -.005$), women reported a lower self-rated health ($t(81{,}660) = 3.86$, $p = .0001$, $\beta = .059$), and exposure at least once to any pathogen increased self-rated health ($t(76{,}080) = 3.53$, $p = .0004$, $\beta = .011$). Note, the regression models explained very little of the variance for self-rated health. We next assessed robustness by running a model after excluding participants from countries with fewer than 30 respondents. This analysis replicated the above findings, i.e., self-rated health decreased with age ($t(81{,}110) = -7.25$, $p < .001$, $\beta = -.005$), women reported a lower self-rated health ($t(81{,}420) = 3.95$, $p < .001$, $\beta = .06$), and exposure at least once to any pathogen increased self-rated health ($t(75{,}930) = 3.66$, $p = .0003$, $\beta = .011$). An analysis of deviance yielded that in both models all three predictors were significant and similar in size (see supplementary material).

3.2. Propensity scoring

We performed propensity scoring with the match-it package in R.[42] Country and sex were set as exact, age was set to nearest. The distance was calculated using generalized linear models with a logit link function, and a 1:1 approach used. There were 10,424 matched cases. Self-rated health was slightly higher in the pathogen group ($M = 7.52$, $SD = 2.19$) than the non-pathogen group ($M = 7.4$, $SD = 2.14$). Welch's t-test yielded a significant difference, $t(10{,}361) = -2.79$, $p = .005$, Cohen's $d = .055$. Overall, participants with pathogen prevalence reported on average a slightly better perceived health (Supplementary Fig. S2), but note the negligible effect size.

3.3. Random-effect meta-analysis

For each country with more than 30 participants and at least 10 participants (55 countries, n = 71,397) that reported a personal history of infectious and parasitic diseases, we calculated the weighted effect size for the relation between self-rated health and personal history of infectious and parasitic diseases. We used a random effect model in the meta package. Across the 55 countries, we found no evidence of a significant difference in self-rated health between participants with or without a personal history of infectious and parasitic diseases (estimated difference = −.006, 95 % CI[-.008; .067], $p = .876$). There was considerable heterogeneity ($I^2 = 82.9$ %, 95 % CI [78.4 %; 86.5 %]). Fig. 1 presents the forest plot. To address the heterogeneity of our sample, we categorized countries either by their economy—as countries with better economy tend to have a better health system, easily offering adequate treatment for their citizen—and by their climate—as this might capture the disease load with tropical countries having a higher load than temperate countries.

A subgroup analysis by UN categorization by economy reduced heterogeneity in the least developed group (38.3 %) but not in the developing and developed group (81.1 % and 85.6 %, respectively). A subgroup analysis classifying countries into temperate and tropical reduced heterogeneity for tropical (49.2 %) but not for temperate regions (88.1 %). In both subgroup analyses there were no significant differences in the weighted effect size (see Supplementary Figs. 3 and 4).

4. Discussion

The present study was designed to investigate the impact of personal history of infectious and parasitic diseases on self-rated health, and its variation across age, sex, and countries. Using four different statistical approaches, we found no detrimental reduction on self-rated health among those exposed at least once to one of the nine pathogens we studied. Three analyses showed a lower rating of health among those never exposed to any pathogen, but with negligible effect sizes. The random-effects meta-analysis found no difference in self-reported health across 55 countries. However, there was large heterogeneity, particularly among developed and developing countries in temperate regions. The heterogeneity analyses (common effects model) suggest a beneficial relationship between pathogen prevalence and self-rated health in developed countries, and in temperate but not tropical regions, likely due to lower prevalence and better health and education systems.

The four-pronged approach started from treating the sample as being a random draw from the world population (linear regression), to acknowledging differences by country (linear mixed model, propensity scoring, meta-analysis). The analyses complement each other, and importantly, do not find a systematic reduction in self-perceived health among those having been exposed to pathogens.

A possible explanation for this might be that in the face of recurring acute health challenges, individuals develop better coping mechanisms, including palliative coping strategies,[43] that may lead to an improved perception of their health over time, and embracing the challenges that life provides.[44] Experiencing infectious and parasitic diseases may also led to increased appreciation of health and therefore higher satisfaction with one's health.[45] On the other hand, lower self-perceived health is typically associated with the presence of chronic health conditions in individuals,[46] suggesting that participants in this study did not suffer from long-term consequences of the acute infection. A conceptual model[47] considers a comparison to other people's health as a factor for how one rates one's own health. As a mechanism of resilience,

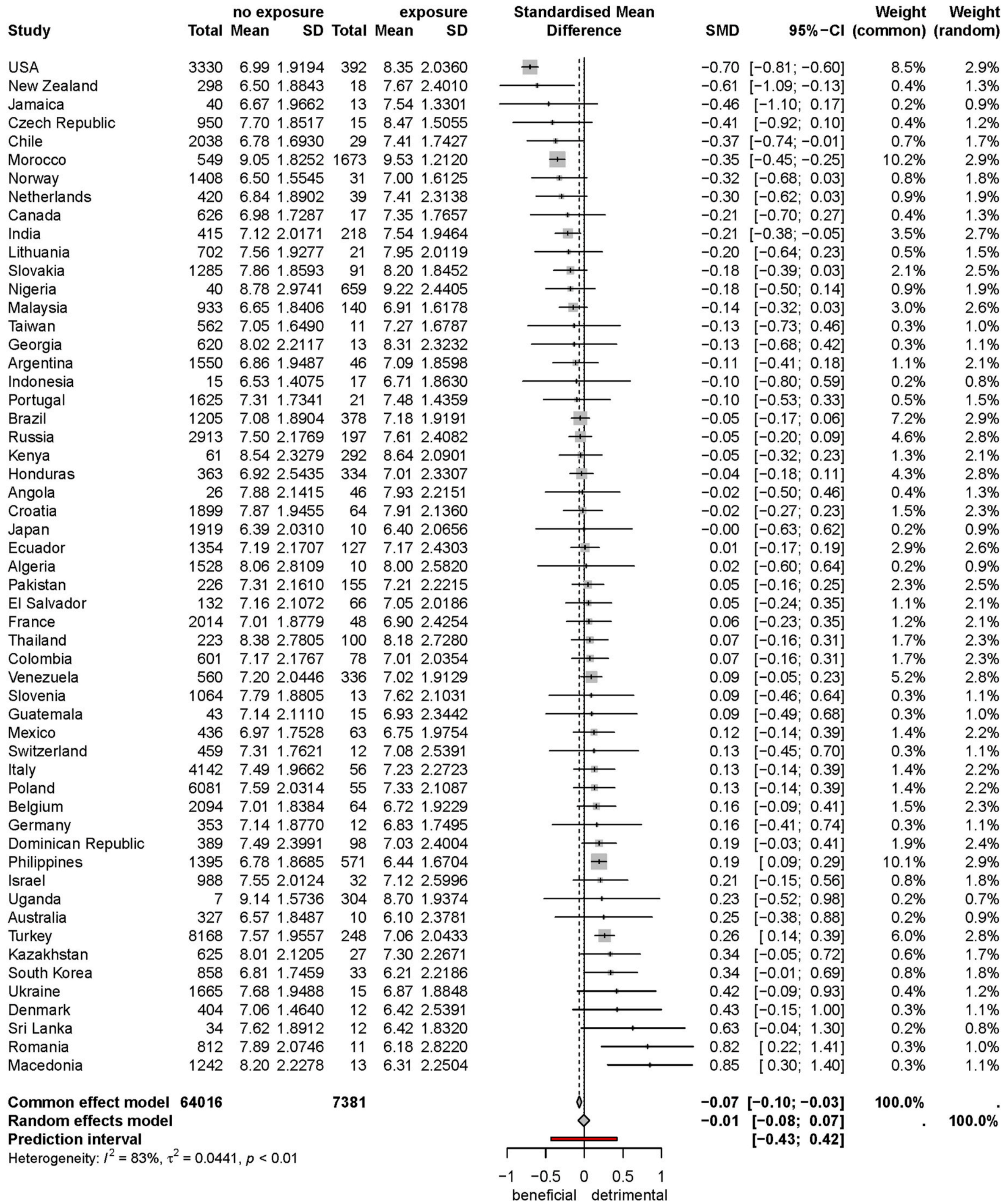

Fig. 1. Forest plot random-effect model.

downward comparison but not upward comparison increases subjective well-being.[48] Future studies could examine if, indeed, those with exposure to pathogen(s) engaged more in downward comparison whereas those without exposure engaged more in upward comparison.

Older age[49,50] and being a woman[50] are known predictors of poor self-perceived health and this aligns with the findings of the present research, supporting its trustworthiness.

Interpreting the findings regarding the association between personal history of infectious and parasitic diseases and self-reported health is challenging due to unaccounted interactions and confounding variables in the analysis. These factors, such as mental health problems, cultural beliefs, values, life satisfaction,[20] demographic, geographical and ecological factors, differences in the distribution of the considered diseases in the participant countries, norms within the sampled countries, and disparities in access to healthcare services, may all contribute to the self-reported health levels, but we are not able to make any further conclusion on this complex set of interactions in this secondary analysis study. We note though, that subgroup analyses did not remove heterogeneity for all subgroups.

This study has some important limitations. Because it is a secondary analysis, the study is limited to the variables and data already collected, which may restrict the exploration of the self-reported health in individuals with personal history of infectious and parasitic diseases more thoroughly. The results of the present study therefore need to be interpreted with caution. Future studies could contrast the types of infectious diseases, their severity and chronicity, and how these factors affect perceived health.[51,52]

Further, our primary outcome measure, self-rated health, is a subjective rating. Still, health is a multi-faceted concept. The absence of somatic diseases or mental disorder, as assessed by clinicians, does not necessarily indicate excellent health. Note also that perceived health, as assessed here, is a strong predictor of morbidity and mortality.[53]

Additionally, due to its cross-sectional nature, it cannot establish causality, but only associations. Therefore, it is essential to conduct further research, including qualitative studies, to gain a better understanding of the factors influencing self-perceived health in populations that have experienced multiple infections.

Nonetheless, this study offers valuable insights, particularly through its use of data from a large sample spanning numerous countries.

Our results can contribute to more targeted health support. Health education, including explanations of the non-detrimental findings, may reduce fear and stigma,[54,55] thereby increasing the well-being and encouraging more people with a parasitic disease to seek health services. Further, given that the relationship between illnesses and self-perceived health varies across countries, one practical implication is the need to tailor public health policies to local contexts. Public health strategies should not only consider general health patterns but also the specific social, cultural, and economic factors of each population. A higher prevalence of poor or very poor self-perceived health is observed among participants living in sparsely populated areas or older populations.[50]

This suggests that public policies should address local challenges, such as improving healthcare access, addressing cultural perceptions of illness, and reducing economic disparities. Tailoring interventions to these specific needs can improve their effectiveness and help reduce health inequalities. Public policies could focus on enhancing healthcare infrastructure, promoting education on managing health conditions, and ensuring that health services are culturally appropriate for each community.

Finally, to improve public health and manage the infectious diseases worldwide, vaccine development is crucial.[56] As a conclusion, individuals who have experienced infectious and parasitic diseases rate their health as similar good or somewhat higher than those never been exposed to a pathogen.

Author statements

Ethical approval

The original collection of data was approved by the Institutional Review Board (IRB) at the Institute of Psychology, University of Wrocław. All team members adhered to the principles of the Declaration of Helsinki[33] and the ethical guidelines of their respective IRBs, either based on the ethical approval of the Principal Investigator's IRB or their local IRB. All participants provided informed consent.

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Competing interests

All authors declare no competing interests.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2025.02.030.

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