

Are retrospective reports of adverse childhood experiences stable or state- dependent? Evidence from a nationwide longitudinal study in a general adult population

Yoshiaki Kanamori

The University of Tokyo

Yuki Kimura

The University of Tokyo

Takahiro Tabuchi

Tohoku University

Daisuke Nishi

d-nishi@m.u-tokyo.ac.jp

The University of Tokyo

Article

Keywords: adverse childhood experiences, psychological distress, random-intercept cross-lagged panel model

Posted Date: August 5th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10400801/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Additional Declarations: Competing interest reported. TT received financial support for research, (consulting fees and lecture fees) from Daiichi Sankyo Healthcare Co., Ltd., Johnson & Johnson K.K., Data Seed Inc. and Workout-Plus LLC (in the last 36 months). DN received personal fees outside the submitted work from MD.net, and an honorarium from Takeda Pharmaceutical Co. and Otsuka Medical Devices Co., Ltd. The other authors have no conflicts of interest.

Abstract

Background

Although retrospective self-report is the dominant method for assessing adverse childhood experiences (ACEs), it may be biased by changes in psychological distress. This study investigated the bidirectional within-person associations between adult psychological distress and retrospective ACE reports in general adult populations.

Methods

We analyzed four annual waves (2021–2024) of the Japan COVID-19 and Society Internet Survey (JACSIS; $N = 31,000$), a nationally representative web-based panel. ACEs and psychological distress were measured with the 15-item ACE-J and the Kessler Psychological Distress Scale (K6), respectively. A random-intercept cross-lagged panel model (RI-CLPM) was employed to estimate within-person cross-lagged associations. Sensitivity analyses incorporated sociodemographic covariates and stratified the sample by age group.

Results

A within-person cross-lagged effect from psychological distress to subsequent ACE self-reports was observed. Despite achieving statistical significance, the magnitude of the effect was small and unlikely to be practically meaningful at the individual level ($B = 0.007$, $\beta = 0.023$, $p = 0.015$). This pattern persisted among adults aged 30 years and older. The cross-lagged effect lost significance after adjustment for sociodemographic covariates.

Conclusions

These findings suggest that retrospective ACE self-reports are unlikely to be biased to a clinically meaningful degree by changes in psychological distress and remain largely stable over time, supporting their reliability as a measurement tool. At the same time, the possible temporal precedence of psychological distress over ACE recall may warrant consideration when interpreting retrospective ACE assessments.

Introduction

Adverse childhood experiences (ACEs) are a key transdiagnostic risk factor for poor health outcomes in adulthood and represent a major public health concern. ACEs originally referred to abuse, neglect, and household dysfunction occurring before the age of 18 years¹. Cumulative ACE exposure is associated with increased risk of diabetes, obesity, depression, anxiety, and premature death^{2–4}. In retrospective self-reports, more than 60% of adults report at least one ACE⁵, and higher ACE burden is associated with elevated psychological distress in adulthood⁶.

Careful consideration is warranted when interpreting ACE findings, given that prospective and retrospective approaches identify overlapping but non-identical groups of individuals with ACE exposure⁷. Retrospective self-report, the dominant approach in large-scale epidemiological research, has several recognized limitations. For example, its psychometric properties have not been fully established, and it does not constitute a biologically standardized measure of cumulative stress exposure^{8–10}. Nevertheless, retrospective self-report remains an indispensable tool in ACE research, where it is valued for its practical utility and accumulated evidence base⁹. Notably, retrospective reports are more strongly

associated with subsequent psychopathology than are prospective records¹¹. Identifying factors that can systematically bias retrospective reports is therefore of considerable scientific and clinical importance.

Changes in psychological distress may be one such factor of bias. Defined as a non-specific state of emotional suffering characterized by symptoms of depression and anxiety¹², the experience of psychological distress can change over time and may shape how individuals recall and report their childhood experiences. There are theoretical grounds to expect bidirectional associations between adult psychological distress and retrospective ACE self-reports. In one direction, negative mood states are known to bias autobiographical memory, leading individuals to recall more adverse experiences and to interpret ambiguous memories more negatively^{13–15}. Therefore, psychological distress in adulthood can lead to an overestimation of retrospective ACE reports through affect-driven memory bias. In the other direction, ACE exposure may itself predict the persistence or worsening of distress via biological pathways (e.g., HPA axis dysregulation)¹⁶ as well as psychological mechanisms such as insecure attachment and reduced resilience^{17,18}. Clarifying these bidirectional associations requires longitudinal data with appropriate analytical methods that separate stable between-person differences from within-person changes over time.

To our knowledge, only one longitudinal study has directly examined the bidirectional association between psychological distress and retrospective ACE self-reports¹⁹. Using three waves of data from Chinese university students, the study demonstrated that depressive symptoms predicted subsequent ACE reporting, although the reverse pathway was non-significant. This finding is important but it has two notable limitations. First, the sample was restricted predominantly to university students (mean = 18.40, SD = 0.77), leaving open whether similar dynamics operate across the full adult lifespan or in a general population. Second, although statistically significant, the reported effect sizes were small, and their practical and clinical significance was not fully discussed, which is a question relevant to how the reliability of retrospective ACE measurement should be interpreted.

The present study investigated the bidirectional, within-person longitudinal associations between retrospective self-reported ACEs and adult psychological distress in a nationally representative sample, using a random-intercept cross-lagged panel model (RI-CLPM) across four annual waves (2021–2024). We focused on effect size interpretation and examined whether associations were robust by performing sensitivity analyses incorporating sociodemographic covariates and age-stratified analyses.

Methods

Study sample and procedure

Data were drawn from four annual waves of the Japan COVID-19 and Society Internet Survey (JACSIS), a large-scale web-based panel survey²⁰. Wave 1 was conducted in 2021, and 31,000 participants were recruited from a panel maintained by Rakuten Insight, Inc., using stratified sampling based on gender, age group, and prefecture of residence to approximate the national adult population. From Wave 2 onwards, participants from the previous wave were re-invited, and additional individuals were recruited using the same stratification protocol in order to maintain the target sample size. Quality control procedures included algorithmic fraud prevention at registration and the post-hoc exclusion of “sacrificers” identified by multiple indicators including response time, contradictory answers, and implausible response pattern.

The analytic sample for the main analysis consisted of all 31,000 Wave 1 participants. Attrition over waves resulted in N = 23,348 for Wave 2, N = 18,937 for Wave 3, and N = 16,307 for Wave 4, with some participants rejoining after one or more missed waves (Supplement Fig. 1). Participants newly recruited after Wave 1 were not included in the RI-CLPM because the analysis required baseline participation in 2021.

Measurements

Adverse childhood experiences

ACEs were assessed using the 15-item Japanese version of the ACE scale (ACE-J) ²¹, which extends the original ACE instrument by incorporating community-level adversities relevant to the Japanese context. Respondents indicated, for each item, whether they had experienced the given adversity before the age of 18 years. Items covered parental death, parental divorce or separation, parental mental illness, parental substance dependence, domestic violence, physical abuse, neglect, emotional abuse, lack of perceived parental love, childhood poverty, parental overcontrol, school bullying, childhood sexual abuse, prolonged hospitalization during childhood, and near-death experience from a natural disaster. The ACE score was computed as the sum of all reported items, with higher scores indicating greater cumulative adversity.

Psychological distress

Psychological distress was measured using the Japanese version of the Kessler Psychological Distress Scale (K6)²². Items assessed were nervousness, hopelessness, restlessness, sadness, effortfulness, and feelings of worthlessness over the past 30 days, with total scores ranging from 0 to 24; higher scores indicate greater distress. The K6 has demonstrated screening performance equivalent to the original ^{22,23}.

Data analyses

Preliminary analyses

Longitudinal measurement invariance of the K6 was assessed using confirmatory factor analysis across the four waves. A series of nested models were tested sequentially: a configural model, with factor structure constrained to be equal across time points; a metric model, with factor loadings additionally constrained to be equal; and a scalar model, with item intercepts additionally constrained to be equal. Model fit was evaluated using the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR), with a change in CFI of < 0.010 , a change in RMSEA of < 0.015 , and change in SRMR of < 0.030 between nested models used as the criteria for invariance ²⁴. Intraclass correlation coefficients (ICCs) of the K6 and ACE scores were estimated to quantify the proportion of total variance attributable to stable between-person differences.

Main analyses

We employed an RI-CLPM to estimate the bidirectional associations between ACE scores and K6 scores across the four waves. Compared with the traditional CLPM, the RI-CLPM enables the observed scores for each wave to be decomposed into a person-specific random intercept (capturing stable trait-level differences) and within-person deviations (capturing time-varying fluctuations) ²⁵. Therefore, cross-lagged paths in the RI-CLPM reflect whether an individual scoring above their own expected value on one variable subsequently scores above their expected value on the other variable.

For model selection, we compared four nested models: Model 1 (unconstrained), Model 2 (autoregressive paths constrained to equality across wave pairs), Model 3 (additionally constraining cross-lagged paths), and Model 4 (additionally constraining residual variances and covariances). Model selection was guided by absolute fit indices (CFI

≥ 0.95 , SRMR < 0.08, RMSEA < 0.06)²⁶ and reduction of Akaike information criterion (AIC) and Bayesian information criterion (BIC)²⁷.

All analyses were performed using R ver. 4.3.3. RI-CLPMs were estimated using the lavaan package²⁸. Missing data due to wave non-response were handled using full-information maximum likelihood estimation, which allowed all 31,000 Wave 1 participants to be included in the analysis regardless of participation in subsequent waves.

Sensitivity analyses

We estimated the model parameters separately by age group (younger adults aged 16–29 years and older adults aged 30 years and older) to assess whether the primary findings were consistent across different life stages, thereby enabling comparison with previous findings derived from a university student sample¹⁹.

We also incorporated time-invariant predictors of the random intercepts into the best-fitting model in two sequential steps: Adjusted Model 1 included gender and age, and Adjusted Model 2 additionally included educational attainment, lifetime psychiatric diagnosis, and household income. Adjusted Model 2 was estimated on participants with observed income data (n = 24,355).

Ethics approval

The study protocol was approved by the Research Ethics Committee of the Osaka International Cancer Institute on June 19, 2020 (approval number 20084). Approval was also obtained from the Research Ethics Committee of the Graduate School of Medicine/Faculty of Medicine at The University of Tokyo (approval number 2020336NI). Before participating in the online survey, each respondent provided informed consent electronically. Participants were compensated with “E-points,” which are credits that can be exchanged for cash or online shopping.

Results

Sample characteristics and preliminary analyses

The demographic characteristics of the analytic sample (N = 31,000) are presented in Table 1. Consistent with the study’s stratified sampling strategy, the sample was broadly distributed across sex, age, and educational attainment. Approximately 50.4% of the respondents were women, 49.0% held a university degree, and 83.5% reported no lifetime psychiatric diagnosis. The mean K6 score for Wave 1 was 4.27 (SD = 5.43) and the mean ACE score was 1.50 (SD = 1.77).

Longitudinal measurement invariance was supported for the K6 at the level of residual variance, indicating scalar invariance across waves (Supplement Table 1). ICCs were 0.723 for ACE scores and 0.737 for K6 scores, indicating that approximately 72%–74% of the total variance in each variable was attributable to stable between-person differences.

Main analysis

Among the models tested, Model 4 (equality constraints on autoregressive paths, cross-lagged paths, and residual covariances across waves) maintained acceptable absolute fit (CFI = 0.98, SRMR = 0.06, RMSEA = 0.06). Although Model 1 showed the lowest AIC and BIC, Model 4 retained acceptable fit and was selected as the more parsimonious constrained model (Supplement Table 2). The final model (Model 4) and its results are presented in Fig. 1 and Table 2. Regarding between-person effects, the random intercepts for the K6 and ACE scores were substantially and positively correlated ($B = 2.721$, $\beta = 0.411$, $p < 0.001$), indicating that individuals with chronically higher psychological distress

tended to report higher ACE levels on average across the study period. For within-person effects, autoregressive paths for K6 scores were modest but significant ($\beta = 0.117\text{--}0.128$, $p < 0.001$), while those for ACE scores were small and non-significant ($\beta = 0.026$, $p = 0.074$). The cross-lagged effects revealed a directional pattern—within-person K6 scores significantly predicted subsequent ACE scores ($B = 0.007$, $SE = 0.003$, $\beta = 0.023$, $p = 0.015$), whereas the reverse path was non-significant ($B = 0.033$, $SE = 0.025$, $\beta = 0.011$, $p = 0.188$), indicating that a within-person increase of one point on the K6 above an individual's own average was associated with a 0.007-point increase in ACE score for the subsequent wave. Residual correlations between K6 and ACE scores were significant and positive for all waves (T1: $\beta = 0.112$, $p < 0.001$; T2–4: $\beta = 0.098$, $p < 0.001$).

Sensitivity analysis

Table 3 shows the results of the two adjusted models. In Adjusted Model 1 (adjusted for sex and age; $n = 31,000$), the overall pattern was largely preserved, with the K6→ACE cross-lagged path remaining significant and the ACE→K6 path remaining non-significant. In Adjusted Model 2, which additionally included educational attainment, lifetime psychiatric diagnosis, and household income ($n = 24,236$), the K6→ACE path was no longer significant ($B = 0.005$, $SE = 0.003$, $\beta = 0.016$, $p = 0.108$). Stratification by age group revealed that the K6→ACE cross-lagged effect remained significant among adults aged 30 years and older ($B = 0.009$, $p = 0.005$), consistent with the overall finding, but it was not significant among people aged 16–29 years (Supplement Table 2).

Discussion

This study examined bidirectional, within-person longitudinal associations between retrospective self-reported ACEs and adult psychological distress in a large Japanese general population sample, using RI-CLPM across four annual waves. The principal finding was that, although cross-lagged effects of changes in psychological distress over subsequent self-reported ACEs was statistically significant, the magnitude was small and the robustness was not consistently supported across adjusted models.

The finding that the K6 → ACE path was of small magnitude is central to interpreting these results. The raw cross-lagged coefficient for K6 → ACE was $B = 0.007$, indicating that a one-unit increase in K6 score predicted only a 0.007-point increase in ACE score at the subsequent wave. Considering that ACE scales typically comprise 10 to 15 items^{1,21}, such a magnitude is unlikely to carry clinically meaningful implications at the individual level, even if statistically detectable at the population level because of the large sample size. The standardized coefficient ($\beta = 0.023$) falls below the conventional benchmark for a small cross-lagged effect ($\beta = 0.03$)⁽²⁹⁾. Both the direction and magnitude of this cross-lagged effect are consistent with the previous study, which reported a similarly small effect from depressive symptoms to subsequent ACE reporting ($B = 0.016$, $SE = 0.004$, $\beta = 0.052$) in a sample that consisted mainly of university students¹⁹. The study population in that study may differ from the general adult population in terms of developmental stage, memory consolidation, and stability of distress levels^{30,31}. In our stratified analyses by age group, cross-lagged effects of comparable magnitude were observed among adults aged 30 years and older, suggesting that this small effect pattern is not confined to younger populations. Extending their work to a broader community-based sample spanning a wider age range, the present findings confirmed the same directional tendency and a comparable magnitude.

In addition to its small magnitude, the robustness of the K6 → ACE effect was not consistently demonstrated. The cross-lagged effects were non-significant with time-invariant covariates. By design, the RI-CLPM separates between-person and within-person variance³². It should also be noted that the shift in sample composition due to potentially non-random missingness in income data cannot be entirely excluded³³. Even so, the finding that the cross-lagged effect lost significance upon inclusion of standard sociodemographic covariates suggests that the primary result

should be interpreted with caution and cannot be considered robust. Taken together, these findings suggest that within-person changes in psychological distress are unlikely to bias ACE recall to a clinically meaningful degree in broader adult populations. Rather, retrospective ACE reports appear to show substantial temporal stability, consistent with prior studies ^{34–36}, suggesting that they can be regarded as predominantly stable over time. Although prospective and retrospective assessments may still identify partially non-identical groups of individuals with ACE exposure ⁷, this does not necessarily call into question the reliability of retrospective ACE reports, offering some assurance regarding their use as a research instrument for ACE-based epidemiological research.

Beyond the implications for ACE research, the present findings also have practical relevance for interventions targeting psychological distress and for considerations in conducting ACE assessments. However the small effect size, the finding that changes in psychological distress precede subsequent ACE recall at the individual level suggests a clinically meaningful possibility; that is, reducing depressive or anxiety symptoms may help to prevent the worsening of trauma-related recalls, thereby potentially interrupting a cycle of increasing distress ³⁷. In addition, the TIC literature emphasizes that the process of assessing ACEs can itself be distressing and may be modulated by psychological state ^{38,39}. These findings are consistent with the need for caution when interpreting ACE scores in the context of changes in psychological distress and may be relevant to trauma-informed approaches to ACE assessment ⁴⁰. Further research is needed to clarify the conditions under which the influence of changes in psychological distress on ACE recall becomes relevant, and to confirm these findings in other populations and settings.

This study has several limitations that should be noted. First, the study relied on an online panel survey, and despite stratified sampling, the findings may not generalize to individuals who are not internet users or who are underrepresented in commercial panels, including individuals with the most severe psychiatric conditions. Second, the K6 was developed as a screening instrument for depression and anxiety, and may not fully capture the range of distress-related cognitive processes that could influence ACE recall. Instruments targeting specific symptoms implicated in autobiographical memory bias might yield more nuanced estimates. Third, all ACE assessments were retrospective self-reports; the absence of prospective ACE data prevents direct comparison of reporting consistency across measurement modalities. Fourth, the RI-CLPM, despite offering advantages over conventional CLPM, operates within a specific causal structure that cannot be validated by fit statistics alone, and residual confounding by unmeasured time-varying covariates cannot be excluded. Fifth, the annual wave interval may not be optimal for capturing the dynamics of mood-congruent memory, and shorter intervals might reveal more pronounced or shorter-lived effects.

Conclusion

This study revealed that the within-person association from psychological distress to subsequent retrospective ACE self-reports, although statistically significant, was small in magnitude and not robust to covariate adjustment. This finding suggests that retrospective ACE self-reports are unlikely to be biased to a clinically meaningful degree by changes in psychological distress and will remain largely stable over time, supporting their reliability as a measurement tool. At the same time, given the possible temporal precedence of psychological distress over ACE recall, this may warrant consideration when interpreting retrospective ACE assessments and further research is needed to clarify the conditions under which this influence may become relevant.

Declarations

Competing Interests

TT received financial support for research, (consulting fees and lecture fees) from Daiichi Sankyo Healthcare Co., Ltd., Johnson & Johnson K.K., Data Seed Inc. and Workout-Plus LLC (in the last 36 months). DN received personal fees outside the submitted work from MD.net, and an honorarium from Takeda Pharmaceutical Co. and Otsuka Medical Devices Co., Ltd. The other authors have no conflicts of interest.

Author Contribution

TT was responsible for the overall organization and coordination of the JACSIS study. YKa (Yoshiaki Kanamori) conceptualized and designed the study under the supervision of DN. YKa and YKb (Yuki Kimura) were responsible for the data analysis. All authors contributed to the writing of the final manuscript.

Acknowledgement

The authors would like to thank the JACSIS study partners and all participants for their important contributions. This manuscript was written by the authors and finalized using generative AI(Opus 4.8) to improve the precision of English expressions.

Data Availability

Data are available upon reasonable request. Individual data can be obtained from the JACSIS study website (<https://jacsis-study.jp/dug/index.html>).

Code Availability

The underlying code for this study is not publicly available but may be made available to qualified researchers on reasonable request from the corresponding author.

References

1. Felitti, V. J. *et al.* Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *Am. J. Prev. Med.* 14, 245–258 (1998).
2. Bellis, M. A. *et al.* Measuring mortality and the burden of adult disease associated with adverse childhood experiences in England: a national survey. *J. Public Health* 37, 445–454 (2015).
3. Hughes, K. *et al.* The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. *Lancet Public Health* 2, e356–e366 (2017).
4. Petruccelli, K., Davis, J. & Berman, T. Adverse childhood experiences and associated health outcomes: A systematic review and meta-analysis. *Child Abuse Negl.* 97, 104127 (2019).
5. Madigan, S. *et al.* Adverse childhood experiences: a meta-analysis of prevalence and moderators among half a million adults in 206 studies. *World Psychiatry* 22, 463–471 (2023).
6. Sasaki, N. *et al.* Effects of expanded adverse childhood experiences including school bullying, childhood poverty, and natural disasters on mental health in adulthood. *Sci. Rep.* 14, 12015 (2024).
7. Baldwin, J. R., Reuben, A., Newbury, J. B. & Danese, A. Agreement between prospective and retrospective measures of childhood maltreatment: A systematic review and meta-analysis: A systematic review and meta-analysis. *JAMA Psychiatry* 76, 584–593 (2019).

8. Mosler, F. *et al.* Assessing exposure to childhood adversity in adults: A systematic review of validated self-report childhood adversity questionnaires. *Psychother. Psychosom.* 94, 1–24 (2025).
9. Anda, R. F., Porter, L. E. & Brown, D. W. Inside the adverse childhood experience score: Strengths, limitations, and misapplications. *Am. J. Prev. Med.* 59, 293–295 (2020).
10. McLennan, J. D., MacMillan, H. L. & Afifi, T. O. Questioning the use of adverse childhood experiences (ACEs) questionnaires. *Child Abuse Negl.* 101, 104331 (2020).
11. Baldwin, J. R., Coleman, O., Francis, E. R. & Danese, A. Prospective and retrospective measures of child maltreatment and their association with psychopathology: A systematic review and meta-analysis: A systematic review and meta-analysis. *JAMA Psychiatry* 81, 769–781 (2024).
12. APA Dictionary of Psychology. <https://dictionary.apa.org/>.
13. LeMoult, J. & Gotlib, I. H. Depression: A cognitive perspective. *Clin. Psychol. Rev.* 69, 51–66 (2019).
14. Dalgleish, T. & Werner-Seidler, A. Disruptions in autobiographical memory processing in depression and the emergence of memory therapeutics. *Trends Cogn. Sci.* 18, 596–604 (2014).
15. Ashbaugh, A. R., Marinos, J. & Bujaki, B. The impact of depression and PTSD symptom severity on trauma memory. *Memory* 26, 106–116 (2018).
16. Yang, J. Z. *et al.* Effect of adverse childhood experiences on hypothalamic-pituitary-adrenal (HPA) axis function and antidepressant efficacy in untreated first episode patients with major depressive disorder. *Psychoneuroendocrinology* 134, 105432 (2021).
17. Nanni, V., Uher, R. & Danese, A. Childhood maltreatment predicts unfavorable course of illness and treatment outcome in depression: a meta-analysis. *Am. J. Psychiatry* 169, 141–151 (2012).
18. Zhao, Y. *et al.* The psychological factors mediating/moderating the association between childhood adversity and depression: A systematic review. *Neurosci. Biobehav. Rev.* 137, 104663 (2022).
19. Zhang, Z. *et al.* Depression shapes the recall of adverse childhood experiences: evidence from a three-wave longitudinal study of 6,260 Chinese adolescents. *Nat. Ment. Health* 1–12 (2026) doi:10.1038/s44220-025-00580-7.
20. Someko, H. *et al.* Data resource profile: The japan COVID-19 and society internet survey (JACSIS). *Int. J. Epidemiol.* 55, dyag025 (2026).
21. Fujiwara, T. Impact of adverse childhood experience on physical and mental health: A life-course epidemiology perspective. *Psychiatry Clin. Neurosci.* 76, 544–551 (2022).
22. Furukawa, T. A. *et al.* The performance of the Japanese version of the K6 and K10 in the World Mental Health Survey Japan. *Int. J. Methods Psychiatr. Res.* 17, 152–158 (2008).
23. Sakurai, K., Nishi, A., Kondo, K., Yanagida, K. & Kawakami, N. Screening performance of K6/K10 and other screening instruments for mood and anxiety disorders in Japan: Screening performance of K6/K10. *Psychiatry Clin. Neurosci.* 65, 434–441 (2011).
24. Chen, F. F. Sensitivity of goodness of fit indexes to lack of measurement invariance. *Struct. Equ. Modeling* 14, 464–504 (2007).
25. Hamaker, E. L., Kuiper, R. M. & Grasman, R. P. P. A critique of the cross-lagged panel model. *Psychol. Methods* 20, 102–116 (2015).
26. Hu, L.-T. & Bentler, P. M. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct. Equ. Modeling* 6, 1–55 (1999).
27. Burnham, K. P. & Anderson, D. R. Multimodel inference: Understanding AIC and BIC in model selection. *Sociol. Methods Res.* 33, 261–304 (2004).
28. Rosseel, Y. lavaan: AnRPackage for Structural Equation Modeling. *J. Stat. Softw.* 48, 1–36 (2012).

29. Orth, U. et al. Effect size guidelines for cross-lagged effects. *Psychol. Methods* 29, 421–433 (2024).
30. Arnett, J. J. Emerging adulthood: A theory of development from the late teens through the twenties. *Am. Psychol.* 55, 469–480 (2000).
31. Habermas, T. & Bluck, S. Getting a life: The emergence of the life story in adolescence. *Psychol. Bull.* 126, 748–769 (2000).
32. Mund, M., Johnson, M. D. & Nestler, S. Changes in size and interpretation of parameter estimates in within-person models in the presence of time-invariant and time-varying covariates. *Front. Psychol.* 12, 666928 (2021).
33. Jabkowski, P. & Piekut, A. Not random and not ignorable. An examination of nonresponse to income question in the European Social Survey, 2008–2018. *Field Methods* 36, 213–228 (2024).
34. Yancura, L. A. & Aldwin, C. M. Stability and change in retrospective reports of childhood experiences over a 5-year period: findings from the Davis Longitudinal Study. *Psychol. Aging* 24, 715–721 (2009).
35. Dube, S. R., Williamson, D. F., Thompson, T., Felitti, V. J. & Anda, R. F. Assessing the reliability of retrospective reports of adverse childhood experiences among adult HMO members attending a primary care clinic. *Child Abuse Negl.* 28, 729–737 (2004).
36. Goltermann, J. et al. Temporal stability and state-dependence of retrospective self-reports of childhood maltreatment in healthy and depressed adults. *Psychol. Assess.* 35, 12–22 (2023).
37. McNally, R. J., Bryant, R. A. & Ehlers, A. Does early psychological intervention promote recovery from posttraumatic stress? *Psychol. Sci. Public Interest* 4, 45–79 (2003).
38. Mersky, J. P., Lee, C.-T. P. & Gilbert, R. M. Client and provider discomfort with an adverse childhood experiences survey. *Am. J. Prev. Med.* 57, e51–e58 (2019).
39. Finkelhor, D. Screening for adverse childhood experiences (ACEs): Cautions and suggestions. *Child Abuse Negl.* 85, 174–179 (2018).
40. Mendel, W. E., Sperlich, M. & Fava, N. M. “Is there anything else you would like me to know?”: Applying a trauma-informed approach to the administration of the adverse childhood experiences questionnaire. *J. Community Psychol.* 49, 1079–1099 (2021).

Tables

Table 1
Demographic characteristics for all participants included
in the analysis (N = 31,000)

Continuous Variables	Mean	± SD
K6_{T1}	4.27	5.43
ACEs Score_{T1}	1.50	1.77
Age_{T1}	49.73	16.96
Categorical Variables	N	%
Gender		
Woman	15,614	50.4
Man	15,386	49.6
Educational attainment		
High school	8,786	28.5
Vocational / college	6,910	22.4
Undergraduate / postgraduate	15,085	49.0
Others	219	0.7
Psychiatric History		
Never	25,887	83.5
Any	5,113	16.5
Income		
< 2 million JPY	2,700	8.7
2–4 million JPY	6,277	20.2
4–6 million JPY	5,869	18.9
6–8 million JPY	3,943	12.7
8–10 million JPY	2,685	8.7
10–12 million JPY	1,256	4.1
12–14 million JPY	599	1.9
14–16 million JPY	416	1.3
16–18 million JPY	155	0.5
18–20 million JPY	133	0.4
≥ 20 million JPY	322	1.0
NA	6,645	21.4

Note

K6 = Kessler Psychological Distress Scale; ACEs = adverse childhood experiences. T1–T4 correspond to survey waves from 2021 to 2024. Solid lines represent significant paths, and dashed lines represent non-significant paths. * $P < 0.05$. *** $P < 0.001$. All P values are two-tailed. Subscript i represents the random intercept. The coefficients presented in the figure are standardized.

Table 2
Parameter estimates from the random-intercept cross-lagged panel model (RI-CLPM) of psychological distress (K6) and adverse childhood experiences (ACEs).

Path	<i>B</i>	SE	<i>Z</i>	<i>P</i>	β
Between-person effects					
K6 _{<i>i</i>} with ACE _{<i>i</i>}	2.721	0.068	40.060	< 0.001	0.411
Within-person effects					
Autoregressive paths					
K6 _{T1} → K6 _{T2}	0.117	0.012	9.699	< 0.001	0.128
K6 _{T2} → K6 _{T3}	0.117	0.012	9.699	< 0.001	0.117
K6 _{T3} → K6 _{T4}	0.117	0.012	9.699	< 0.001	0.117
ACEs _{T1} → ACEs _{T2}	0.026	0.015	1.786	0.074	0.026
ACEs _{T2} → ACEs _{T3}	0.026	0.015	1.786	0.074	0.026
ACEs _{T3} → ACEs _{T4}	0.026	0.015	1.786	0.074	0.026
Cross-lagged paths					
K6 _{T1} → ACEs _{T2}	0.007	0.003	2.427	0.015	0.023
K6 _{T2} → ACEs _{T3}	0.007	0.003	2.427	0.015	0.021
K6 _{T3} → ACEs _{T4}	0.007	0.003	2.427	0.015	0.021
ACEs _{T1} → K6 _{T2}	0.033	0.025	1.318	0.188	0.011
ACEs _{T2} → K6 _{T3}	0.033	0.025	1.318	0.188	0.011
ACEs _{T3} → K6 _{T4}	0.033	0.025	1.318	0.188	0.011
Residuals correlations					
K6 _{T1} with ACEs _{T1}	0.355	0.039	9.126	< 0.001	0.112
K6 _{T2} with ACEs _{T2}	0.287	0.027	10.560	< 0.001	0.098
K6 _{T3} with ACEs _{T3}	0.287	0.027	10.560	< 0.001	0.098
K6 _{T4} with ACEs _{T4}	0.287	0.027	10.560	< 0.001	0.098

Note. *B* represents the unstandardized regression coefficient. *SE* represents the standard error. *Z* represents the Wald *z* statistic. β represents the standardized regression coefficient. Subscript i represents the random intercept. All P values

are two-tailed.

Table 3

Parameter estimates from the covariate-adjusted random-intercept cross-lagged panel models (RI-CLPMs) of psychological distress (K6) and adverse childhood experiences (ACEs)

Path	Adjusted model 1 (N = 31,000)					Adjusted model 2 (N = 24,355)				
	<i>B</i>	<i>SE</i>	<i>Z</i>	<i>P</i>	β	<i>B</i>	<i>SE</i>	<i>Z</i>	<i>P</i>	β
Between-person effects										
K6 _{<i>i</i>} with ACE _{<i>i</i>}	2.512	0.064	39.113	< 0.001	0.408	1.747	0.061	28.725	< 0.001	0.326
Covariates										
Age → K6 _{<i>i</i>}	-0.093	0.002	-61.755	< 0.001	-0.353	-0.089	0.002	-52.719	< 0.001	-0.337
Gender (man) → K6 _{<i>i</i>}	-0.340	0.053	-6.358	< 0.001	-0.038	-0.109	0.058	-1.899	0.058	-0.012
Education attainment → K6 _{<i>i</i>}	–	–	–	–	–	-0.107	0.035	-3.080	0.002	-0.021
Psychiatric History → K6 _{<i>i</i>}	–	–	–	–	–	4.158	0.096	43.426	< 0.001	0.347
Income → K6 _{<i>i</i>}	–	–	–	–	–	-0.238	0.015	-15.611	< 0.001	-0.103
Age → ACE _{<i>i</i>}	-0.007	0.001	-14.474	< 0.001	-0.084	-0.009	0.001	-14.641	< 0.001	-0.096
Gender (man) → ACE _{<i>i</i>}	-0.169	0.018	-9.276	< 0.001	-0.057	-0.068	0.020	-3.311	0.001	-0.023
Education attainment → ACE _{<i>i</i>}	–	–	–	–	–	-0.263	0.013	-20.417	< 0.001	-0.150
Psychiatric History → ACE _{<i>i</i>}	–	–	–	–	–	1.105	0.035	31.398	< 0.001	0.274
Income → ACE _{<i>i</i>}	–	–	–	–	–	-0.058	0.005	-10.749	< 0.001	-0.075
Within-person effects										
Autoregressive paths										
K6 _{<i>T1</i>} → K6 _{<i>T2</i>}	0.120	0.012	9.906	< 0.001	0.131	0.123	0.014	8.946	< 0.001	0.134
K6 _{<i>T2</i>} → K6 _{<i>T3</i>}	0.120	0.012	9.906	< 0.001	0.120	0.123	0.014	8.946	< 0.001	0.124
K6 _{<i>T3</i>} → K6 _{<i>T4</i>}	0.120	0.012	9.906	< 0.001	0.120	0.123	0.014	8.946	< 0.001	0.123

Path	Adjusted model 1 (N = 31,000)					Adjusted model 2 (N = 24,355)				
	<i>B</i>	SE	<i>Z</i>	<i>P</i>	β	<i>B</i>	SE	<i>Z</i>	<i>P</i>	β
Between-person effects										
ACEs _{T1} → ACEs _{T2}	0.026	0.015	1.747	0.081	0.025	0.021	0.016	1.335	0.182	0.021
ACEs _{T2} → ACEs _{T3}	0.026	0.015	1.747	0.081	0.026	0.021	0.016	1.335	0.182	0.021
ACEs _{T3} → ACEs _{T4}	0.026	0.015	1.747	0.081	0.026	0.021	0.016	1.335	0.182	0.021
Cross-lagged paths										
K6 _{T1} → ACEs _{T2}	0.007	0.003	2.623	0.009	0.025	0.005	0.003	1.607	0.108	0.016
K6 _{T2} → ACEs _{T3}	0.007	0.003	2.623	0.009	0.023	0.005	0.003	1.607	0.108	0.015
K6 _{T3} → ACEs _{T4}	0.007	0.003	2.623	0.009	0.023	0.005	0.003	1.607	0.108	0.015
ACEs _{T1} → K6 _{T2}	0.037	0.025	1.466	0.143	0.012	0.032	0.028	1.140	0.254	0.011
ACEs _{T2} → K6 _{T3}	0.037	0.025	1.466	0.143	0.012	0.032	0.028	1.140	0.254	0.011
ACEs _{T3} → K6 _{T4}	0.037	0.025	1.466	0.143	0.012	0.032	0.028	1.140	0.254	0.011
Residuals correlations										
K6 _{T1} with ACEs _{T1}	0.349	0.039	8.991	< 0.001	0.110	0.309	0.039	7.892	< 0.001	0.099
K6 _{T2} with ACEs _{T2}	0.294	0.027	10.789	< 0.001	0.100	0.279	0.029	9.718	< 0.001	0.098
K6 _{T3} with ACEs _{T3}	0.294	0.027	10.789	< 0.001	0.100	0.279	0.029	9.718	< 0.001	0.098
K6 _{T4} with ACEs _{T4}	0.294	0.027	10.789	< 0.001	0.100	0.279	0.029	9.718	< 0.001	0.098

Note. Adjusted model 1 includes sex and age; Adjusted model 2 additionally includes educational attainment, lifetime psychiatric diagnosis, and household income.

B represents the unstandardized regression coefficient. SE represents the standard error. Z represents the Wald z statistic. β represents the standardized regression coefficient. Subscript i represents the random intercept. All P values are two-tailed.

Figures

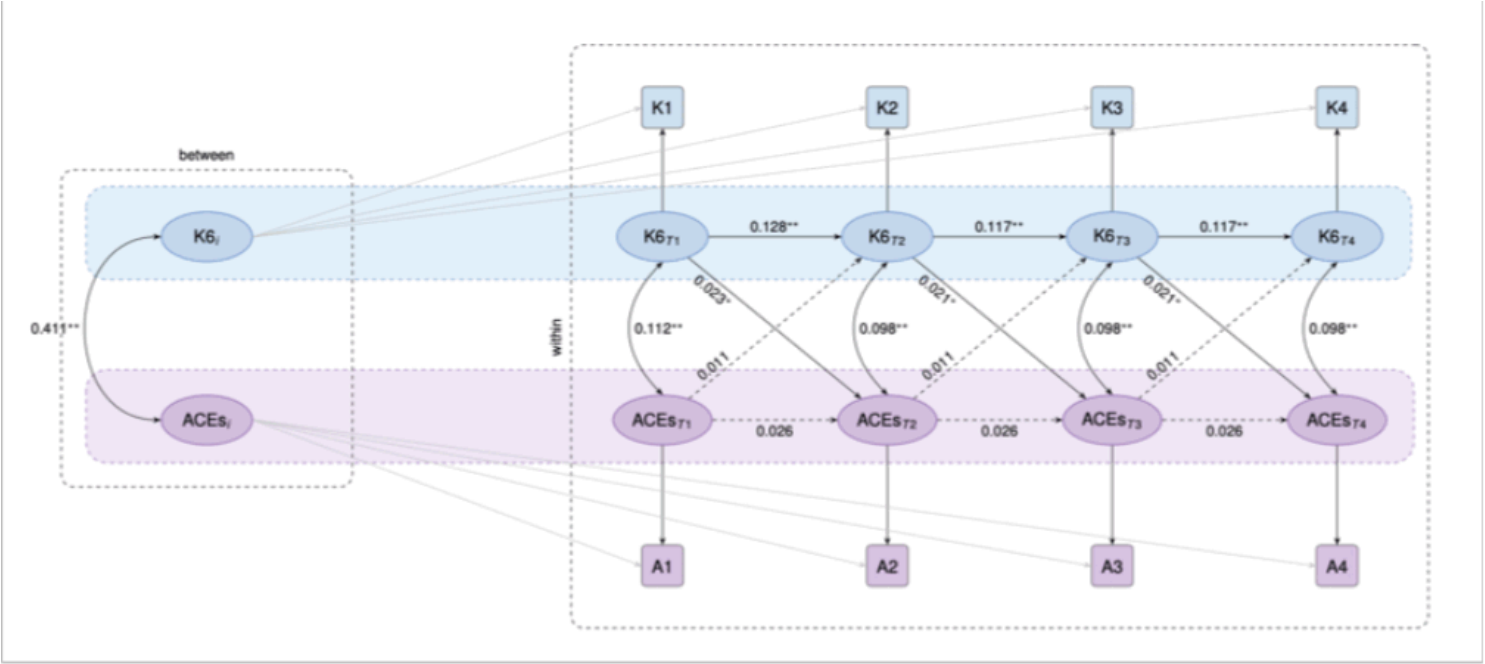


Figure 1

Random-intercept cross-lagged panel model (RI-CLPM) of psychological distress (K6) and adverse childhood experiences (ACEs) across four annual waves (2021–2024)

Note. K6 = Kessler Psychological Distress Scale; ACEs = adverse childhood experiences. T1–T4 correspond to survey waves from 2021 to 2024. Solid lines represent significant paths, and dashed lines represent non-significant paths. * $P < 0.05$. *** $P < 0.001$. All P values are two-tailed. Subscript i represents the random intercept. The coefficients presented in the figure are standardized.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [supplementsent.pdf](#)