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Dynamic clustering

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DOI:
[10.33612/diss.196176258](https://doi.org/10.33612/diss.196176258)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2022

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Ernst, A. F. (2022). *Dynamic clustering: classifying people through ecological momentary assessment*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen.
<https://doi.org/10.33612/diss.196176258>

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References

- Adolf, J., Schuurman, N. K., Borkenau, P., Borsboom, D., & Dolan, C. V. (2014). Measurement invariance within and between individuals: A distinct problem in testing the equivalence of intra- and inter-individual model structures. *Frontiers in Psychology*, 5, 883. <https://doi.org/10.3389/fpsyg.2014.00883>
- Adolf, J. K., & Fried, E. I. (2019). Ergodicity is sufficient but not necessary for group-to-individual generalizability. *Proceedings of the National Academy of Sciences of the United States of America*, 116(14), 6540–6541. <https://doi.org/10.1073/pnas.1818675116>
- Ahn, S. C., & Schmidt, P. (1995). Efficient estimation of models for dynamic panel data. *Journal of Econometrics*, 68(1), 5–27. [https://doi.org/10.1016/0304-4076\(94\)01641-C](https://doi.org/10.1016/0304-4076(94)01641-C)
- Allison, P. D., Williams, R., & Moral-Benito, E. (2017). Maximum likelihood for cross-lagged panel models with fixed effects. *Socius*, 3, 1–17. <https://doi.org/10.1177/2378023117710578>
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (5th ed.). American Psychiatric Publishing, Inc.
- Anderlucci, L., & Viroli, C. (2015). Covariance pattern mixture models for the analysis of multivariate heterogeneous longitudinal data. *The Annals of Applied Statistics*, 9(2), 777–800. <https://doi.org/10.1214/15-AOAS816>
- Anderson, T. W., & Hsiao, C. (1982). Formulation and estimation of dynamic models using panel data. *Journal of Econometrics*, 18(1), 47–82. [https://doi.org/10.1016/0304-4076\(82\)90095-1](https://doi.org/10.1016/0304-4076(82)90095-1)
- Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2), 277–297. <https://doi.org/10.2307/2297968>
- Asparouhov, T., Hamaker, E. L., & Muthén, B. (2017). Dynamic latent class analysis. *Structural Equation Modeling*, 24(2), 257–269. <https://doi.org/10.1080/10705511.2016.1253479>
- Asparouhov, T., Hamaker, E. L., & Muthén, B. (2018). Dynamic structural equation models. *Structural Equation Modeling*, 25(3), 359–388. <https://doi.org/10.1080/10705511.2017.1406803>
- Asparouhov, T., & Muthén, B. (2008). *Multilevel mixture models*. Information Age Publishing.
- Asparouhov, T., & Muthén, B. (2019). Latent variable centering of predictors and mediators in multilevel and time-series models. *Structural Equation Modeling*, 26(1), 119–142. <https://doi.org/10.1080/10705511.2018.1511375>
- Augustine, A. A., & Larsen, R. J. (2012). Is a trait really the mean of states? Similarities and differences between traditional and aggregate assessments of personality. *Journal of Individual Differences*, 33(3), 131–137. <https://doi.org/10.1027/1614-0001/a000083>
- Banfield, J. D., & Raftery, A. E. (1993). Model-based Gaussian and non-Gaussian clustering. *Biometrics. Journal of the Biometric Society*, 49(3), 803. <https://doi.org/10.2307/2532201>

- Barrett, L. (2018). *How emotions are made: The secret life of the brain*. Houghton Mifflin Harcourt.
- Barrett, L. (1998). Discrete emotions or dimensions? the role of valence focus and arousal focus. *Cognition & Emotion*, *12*(4), 579–599. <https://doi.org/10.1080/026999398379574>
- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, *67*(1), 1–48. <https://doi.org/10.18637/jss.v067.i01>
- Bauer, D. J. (2007). Observations on the use of growth mixture models in psychological research. *Multivariate Behavioral Research*, *42*(4), 757–786. <https://doi.org/10.1080/00273170701710338>
- Bellman, R. E. (1957). *Dynamic programming*. Princeton University Press.
- Beltz, A. M., Wright, A. G. C., Sprague, B. N., & Molenaar, P. C. M. (2016). Bridging the nomothetic and idiographic approaches to the analysis of clinical data. *Assessment*, *23*(4), 447–458. <https://doi.org/10.1177/1073191116648209>
- Bhargava, A., & Sargan, J. D. (1983). Estimating dynamic random effects models from panel data covering short time periods. *Econometrica*, 1635–1659.
- Bishop, C. M. (2006). *Pattern Recognition and Machine Learning (Information Science and Statistics)*. Springer.
- Biss, R. K., & Hasher, L. (2012). Happy as a lark: Morning-type younger and older adults are higher in positive affect. *Emotion*, *12*(3), 437–441. <https://doi.org/10.1037/a0027071>
- Blaauw, F. J., van der Gaag, M. A. E., Snell, N. R., Emerencia, A. C., Kunnen, E. S., & de Jonge, P. (2019). The u-can-act platform: A tool to study intra-individual processes of early school leaving and its prevention using multiple informants. *Frontiers in Psychology*, *10*, 1808. <https://doi.org/10.3389/fpsyg.2019.01808>
- Bos, F. M., Schoevers, R. A., & aan het Rot, M. (2015). Experience sampling and ecological momentary assessment studies in psychopharmacology: A systematic review. *European Neuropsychopharmacology*, *25*, 1853–1864. <https://doi.org/10.1016/j.euroneuro.2015.08.008>
- Bouveyron, C., & Brunet-Saumard, C. (2014). Model-based clustering of high-dimensional data: A review. *Computational Statistics and Data Analysis*, *71*(1), 52–78. <https://doi.org/10.1016/j.csda.2012.12.008>
- Bringmann, L. F., Hamaker, E. L., Vigo, D. E., Aubert, A., Borsboom, D., & Tuerlinckx, F. (2017). Changing dynamics: Time-varying autoregressive models using generalized additive modeling. *Psychological Methods*, *22*(3), 409–425. <https://doi.org/10.1037/met0000085>
- Bringmann, L. F., Vissers, N., Wichers, M., Geschwind, N., Kuppens, P., Peeters, F., Borsboom, D., & Tuerlinckx, F. (2013). A Network Approach to Psychopathology: New Insights into Clinical Longitudinal Data. *PLOS ONE*, *8*(4), 1–13. <https://doi.org/10.1371/journal.pone.0060188>
- Brose, A., Schmiedek, F., Koval, P., & Kuppens, P. (2015a). Emotional inertia contributes to depressive symptoms beyond perseverative thinking. *Cognition and Emotion*, *29*(3), 527–538. <https://doi.org/10.1080/02699931.2014.916252>
- Brose, A., Voelkle, M. C., Lövdén, M., Lindenberger, U., & Schmiedek, F. (2015b). Differences in the Between-Person and Within-Person Structures of Affect Are a Matter of Degree. *European Journal of Personality*, *29*(1), 55–71. <https://doi.org/10.1002/per.1961>
- Bulteel, K., Mestdagh, M., Tuerlinckx, F., & Ceulemans, E. (2018). VAR(1) based models do not always outpredict AR(1) models in typical psychological applications. *Psychological Methods*, *23*(4), 740–756. <https://doi.org/10.1037/met0000178>

- Bulteel, K., Tuerlinckx, F., Brose, A., & Ceulemans, E. (2016). Clustering vector autoregressive models: Capturing qualitative differences in within-person dynamics. *Frontiers In Psychology, 7*, 1540. <https://doi.org/10.3389/fpsyg.2016.01540>
- Bulteel, K., Wilderjans, T. F., Tuerlinckx, F., & Ceulemans, E. (2013). CHull as an alternative to AIC and BIC in the context of mixtures of factor analyzers. *Behavior Research Methods, 45*(3), 782–791. <https://doi.org/10.3758/s13428-012-0238-5>
- Bun, M. J., & Carree, M. A. (2005). Bias-corrected estimation in dynamic panel data models. *Journal of Business & Economic Statistics, 23*(2), 200–210. <https://doi.org/10.1198/073500104000000532>
- Burke, L. E., Shiffman, S., Music, E., Styn, M. A., Kriska, A., Smailagic, A., Siewiorek, D., Ewing, L. J., Chasens, E., French, B., Mancino, J., Mendez, D., Stollo, P., & Rathbun, S. L. (2017). Ecological momentary assessment in behavioral research: Addressing technological and human participant challenges. *Journal of Medical Internet Research, 19*(3), e77. <https://doi.org/10.2196/jmir.7138>
- Butler, E. A. (2011). Temporal interpersonal emotion systems: The “ties” that form relationships. *Personality and Social Psychology Review, 15*(4), 367–393. <https://doi.org/10.1177/1088868311411164>
- Carstensen, L. L., & DeLiema, M. (2018). The positivity effect: A negativity bias in youth fades with age. *Current Opinion in Behavioral Sciences, 19*, 7–12. <https://doi.org/https://doi.org/10.1016/j.cobeha.2017.07.009>
- Carstensen, L. L., Pasupathi, M., Mayr, U., & Nesselroade, J. R. (2000). Emotional experience in everyday life across the adult life span. *Journal of Personality and Social Psychology, 79*(4), 644–655. <https://doi.org/10.1037/0022-3514.79.4.644>
- Carstensen, L. L., Turan, B., Scheibe, S., Ram, N., Ersner-Hershfield, H., Samanez-Larkin, G. R., Brooks, K. P., & Nesselroade, J. R. (2011). Emotional experience improves with age: Evidence based on over 10 years of experience sampling. *Psychology and Aging, 26*(1), 21–33. <https://doi.org/10.1037/a0021285>
- Charles, S. T., Reynolds, C. A., & Gatz, M. (2001). Age-related differences and change in positive and negative affect over 23 years. *Journal of Personality and Social Psychology, 80*(1), 136–151. <https://doi.org/10.1037/0022-3514.80.1.136>
- Cho, S.-J., Brown-Schmidt, S., & Lee, W.-Y. (2018). Autoregressive generalized linear mixed effect models with crossed random effects: An application to intensive binary time series eye-tracking data. *Psychometrika, 83*(3), 751–771. <https://doi.org/10.1007/s11336-018-9604-2>
- Collins, L. M. (2006). Analysis of longitudinal data: The integration of theoretical model, temporal design, and statistical model. *Annual Review of Psychology, 57*, 505–528. <https://doi.org/10.1146/annurev.psych.57.102904.190146>
- Corduas, M., & Piccolo, D. (2008). Time Series Clustering and Classification by the Autoregressive Metric. *Computational Statistics & Data Analysis, 52*(4), 1860–1872. <https://doi.org/10.1016/j.csda.2007.06.001>
- Crayen, C., Eid, M., Lischetzke, T., & Vermunt, J. K. (2017). A continuous-time mixture latent-state-trait markov model for experience sampling data: Application and evaluation. *European Journal of Psychological Assessment, 33*(4), 296–311. <https://doi.org/10.1027/1015-5759/a000418>
- Curran, P. J., Obeidat, K., & Losardo, D. (2010). Twelve Frequently Asked Questions About Growth Curve Modeling. *Journal of Cognition and Development, 11*(2), 121–136. <https://doi.org/10.1080/15248371003699969>
- Dejonckheere, E., Mestdagh, M., Kuppens, P., & Tuerlinckx, F. (2020). Reply to: Context matters for affective chronometry. *Nature Human Behaviour, 4*(7), 690–693. <https://doi.org/10.1038/s41562-020-0861-6>

- Dempster, A. P., Laird, N. M., & Rubin, D. B. (1977). Maximum Likelihood for Incomplete Data via the EM Algorithm (with discussion). *Journal of the Royal Statistical Society: Series B (Methodological)*, (39), 1–38. <https://doi.org/10.1111/j.2517-6161.1977.tb01600.x>
- DeSarbo, W. S., & Cron, W. L. (1988). A maximum likelihood methodology for clusterwise linear regression. *Journal of Classification*, 5(2), 249. <https://doi.org/10.1007/BF01897167>
- de Fruyt, F., & Hoekstra, H. (2008). *NEO-PI-3 persoonlijkheidsvragenlijst*. Hogrefe.
- de Graaf, R., ten Have, M., van Gool, C., & van Dorsselaer, S. (2012). Prevalence of mental disorders and trends from 1996 to 2009. Results from the Netherlands Mental Health Survey and Incidence Study-2. *Social Psychiatry and Psychiatric Epidemiology*, 47(2), 203–213. <https://doi.org/10.1007/s00127-010-0334-8>
- de Leeuw, J., & Meijer, E. (2008). *Handbook of Multilevel Analysis*. Springer Science + Business Media. <https://doi.org/10.1007/978-0-387-73186-5>
- Diener, E., Scollon, C. N., & Lucas, R. E. (2009). The evolving concept of subjective well-being: The multifaceted nature of happiness. *Assessing well-being: The collected works of Ed Diener* (pp. 67–100). Springer Science + Business Media. https://doi.org/10.1007/978-90-481-2354-4_4
- Driver, C. C., & Voelkle, M. C. (2018). Hierarchical Bayesian continuous time dynamic modeling. *Psychological Methods*. <https://doi.org/10.1037/met0000168>
- D'Urso, P., De Giovanni, L., & Massari, R. (2015). Time series clustering by a robust autoregressive metric with application to air pollution. *Chemometrics and Intelligent Laboratory Systems*, 141, 107–124. <https://doi.org/http://dx.doi.org/10.1016/j.chemolab.2014.11.003>
- D'Urso, P., De Giovanni, L., Massari, R., & Di Lallo, D. (2013). Noise fuzzy clustering of time series by autoregressive metric. *Metron*, 71(3), 217. <https://doi.org/10.1007/s40300-013-0024-x>
- Ernst, A. F., Albers, C. J., & Timmerman, M. E. (Submitted-a). A comprehensive model framework for between-individual differences in longitudinal data.
- Ernst, A. F., Timmerman, M. E., Ji, F., Jeronimus, B. F., & Albers, C. J. (Submitted-b). Mixture multilevel vector-autoregressive modelling.
- Ernst, A. F., Albers, C. J., Jeronimus, B. F., & Timmerman, M. E. (2020). Inter-individual differences in multivariate time-series: Latent class vector-autoregressive modeling. *European Journal of Psychological Assessment*, 36(3), 482–491. <https://doi.org/10.1027/1015-5759/a000578>
- Ernst, A. F., Timmerman, M. E., Jeronimus, B. F., & Albers, C. J. (2021). Insight into individual differences in emotion dynamics with clustering. *Assessment*, 28(4), 1186–1206. <https://doi.org/10.1177/1073191119873714>
- Fisher, A. J., & Boswell, J. F. (2016). Enhancing the personalization of psychotherapy with dynamic assessment and modeling. *Assessment*, 23(4), 496–506. <https://doi.org/10.1177/1073191116638735>
- Fisher, A. J., Medaglia, J. D., & Jeronimus, B. F. (2018). Lack of group-to-individual generalizability is a threat to human subjects research. *Proceedings Of The National Academy Of Sciences Of The United States Of America*, 115(27), 6105–6115. <https://doi.org/10.1073/pnas.1711978115>
- Fleeson, W., & Jayawickreme, E. (2015). Whole trait theory [Integrative Theories of Personality]. *Journal of Research in Personality*, 56, 82–92. <https://doi.org/https://doi.org/10.1016/j.jrp.2014.10.009>
- Fraley, C., & Raftery, A. E. (2002). Model-based Clustering, Discriminant Analysis and Density Estimation. *Journal of the American Statistical Association*, (97), 611–631. <https://doi.org/10.1198/016214502760047131>

- Fraley, C., Raftery, A. E., Murphy, T. B., & Scrucca, L. (2012). mclust Version 4 for R: Normal Mixture Modeling for Model-Based Clustering, Classification, and Density Estimation.
- Frey, B. (2018). *The SAGE encyclopedia of educational research, measurement, and evaluation (Vols. 1-4)*. SAGE Publications, Inc. <https://doi.org/10.4135/9781506326139>
- Funatogawa, I., & Funatogawa, T. (2012). An autoregressive linear mixed effects model for the analysis of unequally spaced longitudinal data with dose-modification. *Statistics in Medicine*, *31*(6), 589–599. <https://doi.org/10.1002/sim.4456>
- Gamerman, D., & Migon, H. S. (1993). Dynamic hierarchical models. *Journal of the Royal Statistical Society: Series B (Methodological)*, *55*(3), 629–642. <https://doi.org/10.1111/j.2517-6161.1993.tb01928.x>
- Gates, K. M., Lane, S. T., Varangis, E., Giovanello, K., & Guskiewicz, K. (2017). Unsupervised classification during time-series model building. *Multivariate Behavioral Research*, *52*(2), 129–148. <https://doi.org/10.1080/00273171.2016.1256187>
- Gorrostieta, C., Ombao, H., Bédard, P., & Sanes, J. N. (2012). Investigating brain connectivity using mixed effects vector autoregressive models. *NeuroImage*, *59*(4), 3347–3355. <https://doi.org/10.1016/j.neuroimage.2011.08.115>
- Haan-Rietdijk, S., Gottman, J. M., Bergeman, C. S., & Hamaker, E. L. (2016). Get over it! a multilevel threshold autoregressive model for state-dependent affect regulation. *Psychometrika*, *81*(1), 217–241. <https://doi.org/10.1007/s11336-014-9417-x>
- Hamaker, E. L., Asparouhov, T., Brose, A., Schmiedek, F., & Muthén, B. (2018). At the frontiers of modeling intensive longitudinal data: Dynamic structural equation models for the affective measurements from the cogito study. *Multivariate Behavioral Research*, *53*(6), 820–841. <https://doi.org/10.1080/00273171.2018.1446819>
- Hamaker, E. L., Ceulemans, E., Grasman, R. P. P. P., & Tuerlinckx, F. (2015a). Modeling affect dynamics: State of the art and future challenges. *Emotion Review*, *7*(4), 316–322. <https://doi.org/10.1177/1073191116632339>
- Hamaker, E. L., & Grasman, R. P. P. P. (2015). To center or not to center? Investigating inertia with a multilevel autoregressive model. *Frontiers in Psychology*, *5*, 1492. <https://doi.org/10.3389/fpsyg.2014.01492>
- Hamaker, E. L., Grasman, R. P. P. P., & Kamphuis, J. H. (2016). Modeling BAS Dysregulation in Bipolar Disorder: Illustrating the Potential of Time Series Analysis. *Assessment*, *23*(4), 436–446. <https://doi.org/10.1177/1073191116632339>
- Hamaker, E. L., Kuiper, R. M., & Grasman, R. P. P. P. (2015b). A critique of the cross-lagged panel model. *Psychological Methods*, *20*(1), 102–116. <https://doi.org/10.1037/a0038889>
- Hamaker, E. L., & Muthén, B. (2020). The fixed versus random effects debate and how it relates to centering in multilevel modeling. *Psychological Methods*, *25*(3), 365–379. <https://doi.org/10.1037/met0000239>
- Hamaker, E. L., & Wichers, M. (2017). No time like the present: Discovering the hidden dynamics in intensive longitudinal data. *Current Directions in Psychological Science*, *26*(1), 10–15. <https://doi.org/10.1177/0963721416666518>
- Hamilton, J. D. (1994). State-space models. In R. F. Engle & D. McFadden (Eds.), *Handbook of Econometrics* (1st ed., pp. 3039–3080). Elsevier. [https://doi.org/10.1016/S1573-4412\(05\)80019-4](https://doi.org/10.1016/S1573-4412(05)80019-4)
- Hay, E. L., & Diehl, M. (2011). Emotion complexity and emotion regulation across adulthood. *European Journal Of Ageing*, *8*(3), 157–168. <https://doi.org/10.1007/s10433-011-0191-7>
- Henry, K. L., & Muthén, B. (2010). Multilevel latent class analysis: An application of adolescent smoking typologies with individual and contextual predictors. *Structural Equation Modeling*, *17*(2), 193–215. <https://doi.org/10.1080/10705511003659342>

- Honaker, J., King, G., & Blackwell, M. (2011). Amelia II: A program for missing data. *Journal of Statistical Software*, *45*(7), 1–47. <https://doi.org/10.18637/jss.v045.i07>
- Hopwood, C. J., Bleidorn, W., & Wright, A. G. (2021). Connecting theory to methods in longitudinal research. <https://doi.org/10.31234/osf.io/w5huz>
- Houben, M., Van Den Noortgate, W., & Kuppens, P. (2015). The relation between short-term emotion dynamics and psychological well-being: A meta-analysis. *Psychological Bulletin*, *141*(4), 901–930. <https://doi.org/10.1037/a0038822>
- Hubert, L. J., & Arabie, P. (1985). Comparing partitions. *Journal of Classification*, *2*(2-3), 193–218. <https://doi.org/10.1007/BF01908075>
- Hyndman, R., & Athanasopoulos, G. (2018). *Forecasting: Principles and Practice* (2nd). OTexts. <https://otexts.org/fpp2/>
- Jacques, J., & Preda, C. (2014). Functional data clustering: A survey. *Advances in Data Analysis and Classification*, *8*(3), 231–255. <https://doi.org/10.1007/978-3-7908-2062-1>
- Jain, A. K., & Dubes, R. C. (1988). *Algorithms for clustering data*. Prentice-Hall, Inc.
- Jebb, A. T., Tay, L., Wang, W., & Huang, Q. (2015). Time series analysis for psychological research: Examining and forecasting change. *Frontiers in Psychology*, *6*, 727. <https://doi.org/https://doi.org/10.3389/fpsyg.2015.00727>
- Jeronimus, B. F. (2019). Dynamic system perspectives on anxiety and depression. *Dynamic system perspectives on Anxiety and Depression*. Routledge Psychology.
- John, O. P., Robins, R. W., & Pervin, L. A. (2008). *Handbook of personality: Theory and research., 3rd ed.* Guilford Press. <https://doi.org/10.4135/9781849200479>
- Jongerling, J., Laurenceau, J.-P., & Hamaker, E. L. (2015). A Multilevel AR(1) Model: Allowing for Inter-Individual Differences in Trait-Scores, Inertia, and Innovation Variance. *Multivariate Behavioral Research*, *50*(3), 334–349. <https://doi.org/10.1080/00273171.2014.1003772>
- Kim, S.-Y., Mun, E.-Y., & Smith, S. (2014). Using mixture models with known class membership to address incomplete covariance structures in multiple-group growth models. *British Journal of Mathematical and Statistical Psychology*, *67*(1), 94–116. <https://doi.org/10.1111/bmsp.12008>
- Koehler, E., Brown, E., & Haneuse, S. J.-P. (2009). On the assessment of Monte Carlo error in simulation-based statistical analyses. *The American Statistician*, *63*(2), 155–162.
- Koval, P., & Kuppens, P. (2012). Changing emotion dynamics: Individual differences in the effect of anticipatory social stress on emotional inertia. *Emotion*, *12*(2), 256–267. <https://doi.org/10.1037/a0024756>
- Koval, P., Kuppens, P., Allen, N. B., & Sheeber, L. (2012). Getting stuck in depression: The roles of rumination and emotional inertia. *Cognition and Emotion*, *26*(8), 1412–1427. <https://doi.org/10.1080/02699931.2012.667392>
- Krone, T., Albers, C. J., Kuppens, P., & Timmerman, M. E. (2018). A multivariate statistical model for emotion dynamics. *Emotion*, *18*(5), 739–754. <https://doi.org/10.1037/emo0000384>
- Kuppens, P., Allen, N. B., & Sheeber, L. B. (2010). Emotional inertia and psychological maladjustment. *Psychological Science*, *21*(7), 984–991. <https://doi.org/10.1177/0956797610372634>
- Kuppens, P., & Verduyn, P. (2017). Emotion dynamics. *Current Opinion In Psychology*, *17*, 22–26. <https://doi.org/10.1016/j.copsyc.2017.06.004>
- Lane, S. T., Gates, K. M., Pike, H. K., Beltz, A. M., & Wright, A. G. C. (2019). Uncovering general, shared, and unique temporal patterns in ambulatory assessment data. *Psychological Methods*, *24*(1), 54–69. <https://doi.org/10.1037/met0000192>
- Lapate, R. C., & Heller, A. S. (2020). Context matters for affective chronometry. *Nature Human Behaviour*, *4*(7), 688–689. <https://doi.org/10.1038/s41562-020-0860-7>

- Larson, R. W., & Almeida, D. M. (1999). Emotional transmission in the daily lives of families: A new paradigm for studying family process. *Journal of Marriage & Family*, *61*(1), 5–20. <https://doi.org/10.2307/353879>
- Lenk, P. J., & DeSarbo, W. S. (1999). Bayesian inference for finite mixtures of generalized linear models with random effects. *Psychometrika*, *65*, 93–119. <https://doi.org/10.1007/BF02294188>
- Liao, W. T. (2005). Clustering of time series data — a survey. *Pattern Recognition*, *38*(11), 1857–1874. <https://doi.org/10.1016/j.patcog.2005.01.025>
- Lloyd, S. (1982). Least squares quantization in PCM. *IEEE Transactions on Information Theory*, *28*(2), 129–137. <https://doi.org/10.1109/TIT.1982.1056489>
- Lubke, G. H., & Muthén, B. (2005). Investigating population heterogeneity with factor mixture models. *Psychological Methods*, *10*(1), 21–39. <https://doi.org/10.1037/1082-989X.10.1.21>
- Lütkepohl, H. (2005). *New Introduction to Multiple Time Series Analysis*. Springer.
- Maddala, G. S. (1971). The use of variance components models in pooling cross section and time series data. *Econometrica*, 341–358. <https://doi.org/10.2307/1913349>
- Maitra, R., & Melnykov, V. (2010). Simulating data to study performance of finite mixture modeling and clustering algorithms. *Journal of Computational and Graphical Statistics*, *19*(2), 354. <https://doi.org/10.1198/jcgs.2009.08054>
- Malmberg, L.-E., & Martin, A. J. (2019). Processes of students' effort exertion, competence beliefs and motivation: Cyclic and dynamic effects of learning experiences within school days and school subjects. *Contemporary Educational Psychology*, *58*, 299–309. <https://doi.org/https://doi.org/10.1016/j.cedpsych.2019.03.013>
- Mansueto, A. C., Wiers, R., van Weert, J., Schouten, B. C., & Epskamp, S. (2020). Investigating the feasibility of idiographic network models. <https://doi.org/10.31234/osf.io/hgcz6>
- McAdams, D. P., Shiner, R. L., & Tackett, J. L. (2019). *Handbook of personality development*. The Guilford Press.
- McArdle, J. J. (1988). Dynamic but structural equation modeling of repeated measures data. *Handbook of multivariate experimental psychology*, 2nd ed (pp. 561–614). Plenum Press. https://doi.org/10.1007/978-1-4613-0893-5_17
- McLachlan, G. J., & Basford, K. E. (1988). *Mixture Models*. Marcel Dekker Inc.
- McLachlan, G. J., & Peel, D. (2004). *Finite Mixture Models*. Wiley-Interscience.
- McLachlan, G. J. (2011). Commentary on Steinley and Brusco (2011): Recommendations and cautions. *Psychological Methods*, *16*(1), 80–81. <https://doi.org/10.1037/a0021141>
- McNeish, D., & Hamaker, E. L. (2020). A primer on two-level dynamic structural equation models for intensive longitudinal data in Mplus. *Psychological Methods*, *25*(5), 610–635. <https://doi.org/10.1037/met0000250>
- McNicholas, P. D. (2016). Model-based clustering. *Journal of Classification*, *33*(3), 331. <https://doi.org/10.1007/s00357-016-9211-9>
- McNicholas, P. D., & Murphy, T. B. (2010). Model-based clustering of longitudinal data. *The Canadian Journal of Statistics*, *38*(1), 153. <https://doi.org/10.1002/cjs.10047>
- Melnykov, V. (2012). Efficient estimation in model-based clustering of Gaussian regression time series. *Statistical Analysis & Data Mining*, *5*(2), 95–99. <https://doi.org/10.1007/s00357-016-9216-4>
- Melnykov, V., Chen, W.-C., & Maitra, R. (2012). MixSim: An R package for simulating data to study performance of clustering algorithms. *Journal of Statistical Software*, *51*(12), 1–25. <http://www.jstatsoft.org/v51/i12/>

- Mestdagh, M., & Dejonckheere, E. (2021). Ambulatory assessment in psychopathology research: Current achievements and future ambitions. *Current Opinion in Psychology*, *41*, 1–8. <https://doi.org/https://doi.org/10.1016/j.copsyc.2021.01.004>
- Michael, S., & Melnykov, V. (2016). Finite Mixture Modeling of Gaussian Regression Time Series with Application to Dendrochronology. *Journal of Classification*, *33*(3), 412–441. <https://doi.org/10.1007/s00357-016-9216-4>
- Molenaar, P. C. M. (2004). A manifesto on psychology as idiographic science: Bringing the person back into scientific psychology, this time forever. *Measurement: Interdisciplinary Research and Perspectives*, *2*(4), 201–218. https://doi.org/10.1207/s15366359mea0204_1
- Moral-Benito, E. (2013). Likelihood-based estimation of dynamic panels with predetermined regressors. *Journal of Business & Economic Statistics*, *31*(4), 451–472. <https://doi.org/10.1080/07350015.2013.818003>
- Moral-Benito, E., Allison, P., & Williams, R. (2019). Dynamic panel data modelling using maximum likelihood: an alternative to Arellano-Bond. *Applied Economics*, *51*(20), 2221–2232. <https://doi.org/10.1080/00036846.2018.1540854>
- Muthén, B., & Asparouhov, T. (2008). Growth mixture modeling: Analysis with non-Gaussian random effects. *Longitudinal Data Analysis. G. Fitzmaurice, M. Davidian, G. Verbeke and G. Molenberghs (Eds.)* (pp. 143–165). Chapman; Hall–CRC.
- Muthén, B., & Shedden, K. (1999). Finite mixture modeling with mixture outcomes using the EM algorithm. *Biometrics*, *55*(2), 463–469. <https://doi.org/10.1111/j.0006-341X.1999.00463.x>
- Muthén, B., & Asparouhov, T. (2009). Multilevel regression mixture analysis. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *172*(3), 639–657. <https://doi.org/10.1111/j.1467-985X.2009.00589.x>
- Muthén, L. K., & Muthén, B. O. (2013). *Mplus user's guide*. (Eighth Edition). Muthén & Muthén.
- Nerlove, M. (1967). Experimental evidence on the estimation of dynamic economic relations from a time series of cross-section. *The Economic Studies Quarterly*, *18*(3), 42–74.
- Nerlove, M. (1971). Further evidence on the estimation of dynamic economic relations from a time series of cross sections. *Econometrica*, 359–382. <https://doi.org/10.2307/1913350>
- Ng, S. K., McLachlan, G. J., Wang, K., Ben-Tovim Jones, L., & Ng, S.-W. (2006). A Mixture model with random-effects components for clustering correlated gene-expression profiles. *Bioinformatics*, *22*(14), 1745–1752. <https://doi.org/10.1093/bioinformatics/btl165>
- Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica*, 1417–1426. <https://doi.org/10.2307/1911408>
- Oravecz, Z., Tuerlinckx, F., & Vandekerckhove, J. (2009). A hierarchical Ornstein-Uhlenbeck model for continuous repeated measurement data. *Psychometrika*, *74*(3), 395–418. <https://doi.org/10.1007/s11336-008-9106-8>
- Pe, M. L., & Kuppens, P. (2012). The dynamic interplay between emotions in daily life: Augmentation, blunting, and the role of appraisal overlap. *Emotion*, *12*(6), 1320–1328. <https://doi.org/10.1037/a0028262>
- Peeters, F., Ponds, R., & Vermeeren, M. (1996). Affectiviteit en zelfbeoordeling van depressie en angst. *Tijdschrift Voor De Psychiatrie*, *3*(38), 240–250. <https://www.tijdschriftvoorpsychiatrie.nl/issues/184/articles/904>
- Quinn, B. G. (1980). Order determination for a multivariate autoregression. *Journal of the Royal Statistical Society: Series B (Methodological)*, *42*(2), 182–185. <https://doi.org/10.1111/j.2517-6161.1980.tb01116.x>

- R Core Team. (2018). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Vienna, Austria. <https://www.R-project.org/>
- R Core Team. (2020). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Vienna, Austria. <https://www.R-project.org/>
- Rabe-Hesketh, S., & Skrondal, A. (2013). Avoiding biased versions of Wooldridge's simple solution to the initial conditions problem. *Economics Letters*, *120*(2), 346–349.
- Ram, N., & Grimm, K. J. (2009). Methods and measures: Growth mixture modeling: A method for identifying differences in longitudinal change among unobserved groups. *International Journal of Behavioral Development*, *33*(6), 565–576. <https://doi.org/10.1177/0165025409343765>
- Rast, P., Martin, S. R., Liu, S., & Williams, D. R. (2020). A new frontier for studying within-person variability: Bayesian multivariate generalized autoregressive conditional heteroskedasticity models. *Psychological Methods*. <https://doi.org/10.1037/met0000357>
- Rauthmann, J. F., Horstmann, K. T., & Sherman, R. A. (2019). Do self-reported traits and aggregated states capture the same thing? A nomological perspective on trait-state homomorphy. *Social Psychological and Personality Science*, *10*(5), 596–611. <https://doi.org/10.1177/1948550618774772>
- Reed, A. E., Chan, L., & Mikels, J. A. (2014). Meta-analysis of the age-related positivity effect: Age differences in preferences for positive over negative information. *Psychology and Aging*, *29*(1), 1–15. <https://doi.org/10.1037/a0035194>
- Roberts, B. W., Walton, K. E., & Viechtbauer, W. (2006). Patterns of mean-level change in personality traits across the life course: A meta-analysis of longitudinal studies. *Psychological Bulletin*, *132*(1), 1–25. <https://doi.org/10.1037/0033-2909.132.1.1>
- Rovine, M. J., & Walls, T. A. (2006). Multilevel Autoregressive Modeling of Interindividual Differences in the Stability of a Process. *Models for intensive longitudinal data* (pp. 124–147). Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780195173444.003.0006>
- Rush, A. J., Trivedi, M. H., Ibrahim, H. M., Carmody, T. J., Arnow, B., Klein, D. N., Markowitz, J. C., Ninan, P. T., Kornstein, S., Manber, R., Thase, M. E., Kocsis, J. H., & Keller, M. B. (2003). The 16-item Quick Inventory of Depressive Symptomatology (QIDS), clinician rating (QIDS-C), and self-report (QIDS-SR): A psychometric evaluation in patients with chronic major depression. *Biological Psychiatry*, *54*(5), 573–583. [https://doi.org/10.1016/S0006-3223\(02\)01866-8](https://doi.org/10.1016/S0006-3223(02)01866-8)
- Rush, J., & Hofer, S. M. (2014). Differences in within- and between-person factor structure of positive and negative affect: Analysis of two intensive measurement studies using multilevel structural equation modeling. *Psychological Assessment*, *26*(2), 462–473. <https://doi.org/10.1037/a0035666>
- Russell, J. A., & Carroll, J. M. (1999). On the bipolarity of positive and negative affect. *Psychological Bulletin*, *125*(1), 3–30. <https://doi.org/10.1037/pspp0000186>
- Russell, J. A. (1980). A Circumplex Model of Affect. *Journal of Personality & Social Psychology*, *39*(6), 1161–1178. <https://doi.org/10.1037/h0077714>
- Schenk, H. M., Bos, E. H., Slaets, J. P., de Jonge, P., & Rosmalen, J. G. (2017). Differential association between affect and somatic symptoms at the between- and within-individual level. *British Journal of Health Psychology*. <https://doi.org/10.1111/bjhp.12229>
- Schmiedek, F., Lövdén, M., & Lindenberger, U. (2010). Hundred days of cognitive training enhance broad cognitive abilities in adulthood: Findings from the COGITO study. *Frontiers in Aging Neuroscience*, *2*. <https://doi.org/10.3389/fnagi.2010.00027>

- Schuurman, N. K., Ferrer, E., de Boer-Sonnenschein, M., & Hamaker, E. L. (2016). How to compare cross-lagged associations in a multilevel autoregressive model. *Psychological Methods, 21*(2), 206–221. <https://doi.org/10.1037/met0000062>
- Schuurman, N. K., Houtveen, J. H., & Hamaker, E. L. (2015). Incorporating measurement error in $n = 1$ psychological autoregressive modeling. *Frontiers In Psychology, 6*, 1038. <https://doi.org/10.3389/fpsyg.2015.01038>
- Schwarz, G. (1978). Estimating the Dimension of a Model. *The Annals of Statistics, (6)*, 461–464. <https://doi.org/10.1214/aos/1176344136>
- Scott, S. B., Sliwinski, M. J., & Fields, F. B. (2013). Age differences in emotional responses to daily stress: The role of timing, severity, and global perceived stress. *Psychology and Aging, 4*(28). <https://doi.org/10.1037/a0034000>
- Serang, S., Grimm, K. J., & McArdle, J. J. (2016). Estimation of time-unstructured nonlinear mixed-effects mixture models. *Structural Equation Modeling, 23*(6), 856–869. <https://doi.org/10.1080/10705511.2016.1197777>
- Shifren, K., Hooker, K., Wood, P., & Nesselrode, J. R. (1997). Structure and variation of mood in individuals with Parkinson's disease: A dynamic factor analysis. *Psychology and Aging, 12*(2), 328–339. <https://doi.org/10.1037/0882-7974.12.2.328>
- Skrondal, A., & Rabe-Hesketh, S. (2004). *Generalized Latent Variable Modeling: Multilevel, Longitudinal, and Structural Equation Models*. Chapman & Hall. <https://doi.org/10.1201/9780203489437>
- Skrondal, A., & Rabe-Hesketh, S. (2008). Multilevel and related models for longitudinal data. *Handbook of Multilevel Analysis. de Leeuw, J., Meijer, E. (Eds.)* (pp. 275–299). Springer Science + Business Media. https://doi.org/10.1007/978-0-387-73186-5_7
- Skrondal, A., & Rabe-Hesketh, S. (2014). Handling initial conditions and endogenous covariates in dynamic/transition models for binary data with unobserved heterogeneity. *Journal of the Royal Statistical Society: Series C (Applied Statistics), 211–237*. <https://doi.org/10.1111/rssc.12023>
- Smith, C. S., Folkard, S., Schmieder, R. A., Parra, L. F., Spelten, E., Almiral, H., Sen, R., Sahu, S., Perez, L. M., & Tisak, J. (2002). Investigation of morning–evening orientation in six countries using the preferences scale. *Personality and Individual Differences, 32*(6), 949–968. [https://doi.org/10.1016/S0191-8869\(01\)00098-8](https://doi.org/10.1016/S0191-8869(01)00098-8)
- Snijders, T. A. B., & Bosker, R. J. (2011a). Model specification. *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling* (2nd Edition, pp. 102–107). SAGE Publications Inc.
- Snijders, T. A. B., & Bosker, R. J. (2011b). *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling* (2nd Edition). SAGE Publications Inc.
- Spellman, P. T., Sherlock, G., Zhang, M. Q., Iyer, V. R., Anders, K., Eisen, M. B., Brown, P. O., Botstein, D., & Futcher, B. (1998). Comprehensive identification of cell cycle-regulated genes of the yeast *saccharomyces cerevisiae* by microarray hybridization. *Molecular Biology of the Cell, 9*(12), 3273–3297. <https://doi.org/10.1091/mbc.9.12.3273>
- Steinley, D. (2004). Properties of the Hubert-Arabie adjusted Rand index. *Psychological Methods, 9*(3), 386–396. <https://doi.org/10.1037/1082-989X.9.3.386>
- Steinley, D., & Brusco, M. J. (2011). Evaluating mixture modeling for clustering: Recommendations and cautions. *Psychological Methods, 16*(1), 63–79. <https://doi.org/10.1037/a0022673>
- Tyler, K. A., & Olson, K. (2018). Examining the feasibility of ecological momentary assessment using short message service surveying with homeless youth: Lessons learned. *Field Methods, 30*(2), 91–104. <https://doi.org/10.1177/1525822X18762111>
- van der Krieke, L., Jeronimus, B. F., Blaauw, F. J., Wanders, R. B. K., Emerencia, A. C., Schenk, H. M., van Vos, S., Snippe, E., Wichers, M., Wigman, J. T. W., Bos, E. H.,

- Wardenaar, K. J., & de Jonge, P. (2016). HowNutsAreTheDutch (HoeGekIsNL): A crowdsourcing study of mental symptoms and strengths. *International Journal Of Methods In Psychiatric Research*, 25(2), 123–144. <https://doi.org/10.1002/mpr.1495>
- van der Krieke, L., Blaauw, F. J., Emerencia, A. C., Schenk, H. M., Slaets, J. P. J., Bos, E. H., de Jonge, P., & Jeronimus, B. F. (2017). Temporal dynamics of health and well-being: A crowdsourcing approach to momentary assessments and automated generation of personalized feedback. *Psychosomatic Medicine*, 79(2), 213–223. <https://doi.org/10.1037/t03592-000>
- van Roekel, E., Verhagen, M., Engels, R. C. M. E., & Kuppens, P. (2018). Variation in the serotonin transporter polymorphism (5-httlpr) and inertia of negative and positive emotions in daily life. *Emotion*, 18(2), 229–236. <https://doi.org/10.1037/emo0000336>
- Verduyn, P., & Lavrijsen, S. (2015). Which emotions last longest and why: The role of event importance and rumination. *Motivation and Emotion*, 39(1), 119–127. <https://doi.org/10.1007/s11031-014-9445-y>
- Vermunt, J. K. (2003). Multilevel latent class models. *Sociological Methodology*, 33(1), 213–239. <https://doi.org/10.1111/j.0081-1750.2003.t01-1-00131.x>
- Vermunt, J. K. (2004). An EM algorithm for the estimation of parametric and nonparametric hierarchical nonlinear models. *Statistica Neerlandica*, 58(2), 220–233. <https://doi.org/10.1046/j.0039-0402.2003.00257.x>
- Vermunt, J. K. (2007). A hierarchical mixture model for clustering three-way data sets. *Computational Statistics and Data Analysis*, 51(11), 5368–5376. <https://doi.org/10.1016/j.csda.2006.08.005>
- Vermunt, J. K., & Magidson, J. (2003). Latent class models for classification. *Computational Statistics & Data Analysis*, 41(3-4), 531. [https://doi.org/10.1016/S0167-9473\(02\)00179-2](https://doi.org/10.1016/S0167-9473(02)00179-2)
- Vermunt, J. K., & Magidson, J. (2005). Hierarchical Mixture Models for Nested Data Structures. In C. Weihs & W. Gaul (Eds.), *Classification — the ubiquitous challenge* (pp. 240–247). Springer Berlin Heidelberg. https://doi.org/10.1007/3-540-28084-7_26
- Vidal-Ribas, P., Brotman, M. A., Valdivieso, I., Leibenluft, E., & Stringaris, A. (2016). The status of irritability in psychiatry: A conceptual and quantitative review. *Journal of the American Academy of Child & Adolescent Psychiatry*, 55(7), 556–570. <https://doi.org/10.1016/j.jaac.2016.04.014>
- Viroli, C. (2011). Finite mixtures of matrix normal distributions for classifying three-way data. *Statistics and Computing*, 21(4), 511–522. <https://doi.org/10.1007/s11222-010-9188-x>
- Voelkle, M. C., Brose, A., Schmiedek, F., & Lindenberger, U. (2014). Toward a unified framework for the study of between-person and within-person structures: Building a bridge between two research paradigms. *Multivariate Behavioral Research*, 49(3), 193–213. <https://doi.org/10.1080/00273171.2014.889593>
- Walls, T. A., & Schafer, J. L. (2006). *Models for intensive longitudinal data*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780195173444.001.0001>
- Wang, K., Ng, S. K., & McLachlan, G. J. (2012). Clustering of time-course gene expression profiles using normal mixture models with autoregressive random effects. *BMC Bioinformatics*, 13(1), 1–14. <https://doi.org/10.1186/1471-2105-13-300>
- Ward, J., Joe H. (1963). Hierarchical grouping to optimize an objective function. *Journal of the American Statistical Association*, 58, 236. <https://doi.org/10.2307/2282967>
- Watson, D., Clark, L., & Tellegen, A. (1988). Development and Validation of Brief Measures of Positive and Negative Affect: The PANAS Scales. *Emotion*, 54, 1063–1070. <https://doi.org/10.1037/0022-3514.54.6.1063>

- Wichers, M., Barge-Schaapveld, D., Nicolson, N., Peeters, F., de Vries, M., Mengelers, R., & van Os, J. (2009). Reduced Stress-Sensitivity or Increased Reward Experience: The Psychological Mechanism of Response to Antidepressant Medication. *Neuropsychopharmacology*, *34*(4), 923–931. <https://doi.org/10.1038/npp.2008.66>
- Wilderjans, T. F., Ceulemans, E., & Meers, K. (2013). Chull: A generic convex-hull-based model selection method. *Behavior Research Methods*, *45*(1), 1–15. <https://doi.org/10.3758/s13428-012-0238-5>
- Williams, R., Allison, P. D., & Moral-Benito, E. (2018). Linear dynamic panel-data estimation using maximum likelihood and structural equation modeling. *The Stata Journal*, *18*(2), 293–326. <https://doi.org/10.1177/1536867X1801800201>
- Wooldridge, J. M. (2005). Simple solutions to the initial conditions problem in dynamic, nonlinear panel data models with unobserved heterogeneity. *Journal of Applied Econometrics*, *20*(1), 39–54. <https://doi.org/10.1002/jae.770>
- Wright, A. G. C., & Zimmermann, J. (2019). Applied ambulatory assessment: Integrating idiographic and nomothetic principles of measurement. *Psychological Assessment*, *31*(12), 1467–1480. <https://doi.org/10.1037/pas0000685>
- Yik, M., Russell, J. A., & Steiger, J. H. (2011). A 12-point circumplex structure of core affect. *Emotion*, *11*(4), 705–731. <https://doi.org/10.1037/a0023980>
- Young, D. S., & Hunter, D. R. (2015). Random effects regression mixtures for analyzing infant habituation. *Journal of Applied Statistics*, *42*(7), 1421–1441. <https://doi.org/10.1080/02664763.2014.1000272>