

Analysing Matched Continuous longitudinal Data

Supplementary Materials

A Literature review

A.1 Data sources and searches

Computerized bibliographic databases Web of science, Pubmed, and Scopus were used to identify studies. These databases were searched on October 18, 2023 and without limitations regarding to the year of publication. The search criteria were restricted to containing ‘*longitudinal*’ in the title (or abstract in Web of Science) and ‘*matched*’ and/or ‘*paired*’ in the abstract.

A.2 Study selection

Publications were included in this systematic review if the following inclusion criteria were met: 1) the study is longitudinal and subjects have measurements on more than two time points. 2) the data is paired, which means that there is an obvious and meaningful one-to-one correspondence between subjects. This can also be the case when there is one-to-one (propensity score) matching. 3) the response is continuous. The yield of the database search were first screened based on title and abstract and next the full text of the selected articles was screened for relevance.

A.3 Data extraction

The studies included were grouped based on the various statistical methodologies employed. These categories were:

1. Difference scores
2. Comparison of subject-specific slopes

Table 3: Number of studies per category of statistical method.

Method	N
Paired t-tests at specific timepoints	8
Difference scores	3
Subject-specific slopes	1
Unpaired t-tests or non-parametric alternative	4
MANOVA	1
Linear mixed models	37
<i>Without consideration for the paired nature of the data</i>	(24)
<i>With consideration for the paired nature of the data</i>	(12)
New methodology	2

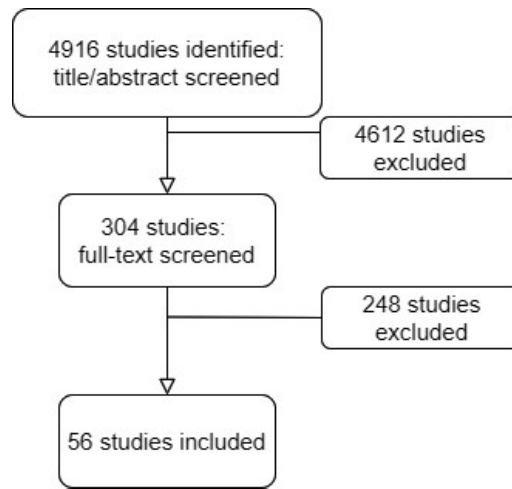


Figure 2: Flowchart of the literature search.

3. Paired t-tests or non-parametric alternative
4. Unpaired t-tests or non-parametric alternative
5. Linear mixed models
 - (a) Without consideration for the paired nature of the data
 - (b) With consideration for the paired nature of the data
6. New methodology

A.4 Results

The search strategy in the database identified 4916 potentially relevant studies (953 in Web of Science, 5 in Pubmed, and 4143 in Scopus). Based on the title and abstract, 304 articles appeared to meet the selection criteria, but after reading the full text of these studies, only 56 fulfilled the inclusion criteria (see flowchart in Fig. 2). The studies are grouped in different categories based on the used methods in Table 3. An article-by-article overview can be found in Table 4.

Table 4: Overview of the studies included in the systematic review

Authors (year)		Journal	Category
Aguilar-Mediavilla et al. (2019)	[29]	Frontiers in Psychology	LMM: Ignore pairing
Ahmed et al. (2018)	[15]	Surgery (United States)	LMM: Random effect pair
Alfieri et al. (2022)	[30]	Genes	LMM: Ignore pairing
Ancoli-Israel et al. (2014)	[31]	Supportive Care in Cancer	LMM: Ignore pairing
Andreas et al. (2006)	[32]	Journal of Consulting and Clinical Psychology	LMM: Ignore pairing
Benestad et al. (2022)	[23]	Health and Quality of Life Outcomes	LMM: Marginal
Bergstrom et al. (2016)	[33]	Language Learning	LMM: Ignore pairing
Beutel et al. (1996)	[5]	Journal of Psychosomatic Research	MANOVA
Border et al. (2020)	[17]	Jacc: Cardiooncology	LMM: Random effect pair
Bouwman et al. (2015)	[11]	Chronobiology International	LMM: Unclear structure
Büttner et al. (2021)	[34]	Physical Therapy in Sport	LMM: Ignore pairing
Ceroni et al. (2012)	[35]	BMC Musculoskeletal Disorders	Paired t-test
Dall et al. (2017)	[36]	BMC Public Health	LMM: Nested
Dayal et al. (2017)	[37]	Pediatrics Polska	Unpaired t-test
De Paul and Domenech (2000)	[38]	Child Abuse and Neglect	LMM: Ignore pairing
Gardner and Boellaard (2007)	[39]	Family Relations	LMM: Ignore pairing
Gerber et al. (2016)	[25]	Journal Of The American Medical Association	LMM: Conditional
Goodman and Must (2011)	[7]	Journal Of Adolescent Health	Difference score
Gurucharri et al. (1984)	[40]	Journal of Consulting and Clinical Psychology	LMM: Ignore pairing
Hancock et al. (1993)	[41]	Paraplegia	LMM: Ignore pairing
Hands (2008)	[42]	Journal of Science and Medicine in Sport	LMM: Ignore pairing
Hull et al. (2020)	[43]	Journal of Applied Developmental Psychology	LMM: Ignore pairing
Iaffaldano et al. (2021)	[12]	Therapeutic Advances In Neurological Disorders	LMM: Ignore pairing
Isberg et al. (1993)	[44]	Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery	Paired t-test
Keresztes et al. (2003)	[45]	Heart & Lung	LMM: Ignore pairing
Kim (2006)	[28]	Communications in Statistics-Theory and Methods	New methodology
Kleinbub et al. (2015)	[46]	Frontiers in Psychology	LMM: Ignore pairing
Kretzschmar et al. (2016)	[47]	Osteoarthritis And Cartilage	LMM: Nested
Langer et al. (2003)	[48]	Psycho-Oncology	Paired t-test
Liu et al. (2022)	[49]	Neurology	LMM: Ignore pairing
LoCascio et al. (1998)	[8]	Calcified Tissue International	Difference score
Loher et al. (2014)	[50]	Applied Neuropsychology: Child	LMM: Ignore pairing
Luo et al. (2019)	[51]	Scientific Reports	LMM: Ignore pairing
Magnusson and Naclér (1990)	[52]	Clinical Linguistics and Phonetics	Paired t-test
Metallinou et al. (2021)	[53]	Brain Sciences	Paired t-test
Mok et al. (2023)	[54]	Eye	Unpaired t-test
Moyle et al. (2007)	[55]	Journal of Speech Language and Hearing Research	LMM: Nested
Nickols-Richardson et al. (1999)	[56]	Journal of Bone and Mineral Research	LMM: Ignore pairing
Oertel et al. (2019)	[57]	Journal of Neuroinflammation	LMM: Nested
Oshima et al. (2020)	[58]	ERJ Open Research	LMM: Ignore pairing
Peetsma et al. (2001)	[59]	Educational Review	Paired t-test
Rebibo et al. (2013)	[60]	Surgical Endoscopy	Unpaired t-test
Roberts et al. (2018)	[61]	Obesity Surgery	Paired t-test
Ruhdorfer et al. (2015)	[6]	Osteoarthritis and Cartilage	Difference score
Schlee et al. (2021)	[9]	Journal of Clinical Medicine	Subject-specific slopes
Scholten-Peeters et al. (2020)	[62]	Journal of Headache and Pain	LMM: Ignore pairing
Shek and Dou (2020)	[16]	International Journal of Environmental Research and Public Health	LMM: Random effect pair
Shih et al. (2019)	[63]	Current Medical Research And Opinion	Unpaired t-test
Sibbel et al. (2016)	[18]	ASAIO Journal	LMM: Sandwich
Torgalsbøen et al. (2023)	[64]	Schizophrenia Research	LMM: Ignore pairing
Vasunilashorn et al. (2015)	[65]	Journals Of Gerontology Series A	Paired t-test
Weiler et al. (1997)	[66]	Early Human Development	LMM: Ignore pairing
Wilson (1979)	[27]	Acta Geneticae Medicae et Gemellologiae	New methodology
Yang et al. (2022)	[67]	Journal of Behavioral Medicine	LMM: Nested
Zhao et al. (2014)	[68]	Investigative Ophthalmology and Visual Science	LMM: Nested
Zorrilla-Vaca et al. (2022)	[69]	Canadian Journal Of Anesthesia	LMM: Ignore pairing