Longitudinal Research: A Methods Study

Ashlee Noblin Tolliver, Doctoral Student
Shonda Sears, Doctoral Student
The University of Texas at Tyler, Department of Human Resource Development

Abstract

Longitudinal research is conducted with the purpose of studying a group over time to understand the change phenomena that occurs within a given context. While these types of studies are common in health and medical fields, a brief review of literature has shown that they are less common in the field of Human Resource Development (HRD).

Purpose

The goal of this research project is to inform scholars and practitioners in HRD on the concepts of longitudinal research and the benefits of using these methods in their own studies. Todd Little (2013) states that most of the design and measurement problems that plague longitudinal studies are due to a lack of proper planning. Through this methods analysis we hope to aid researchers in their preparation for longitudinal studies by providing key background information, discussing benefits and challenges found within literature, and providing examples utilizing statistical analyses to interpret results which will offer a practical application to research.

Introduction

Longitudinal Studies have many benefits for scholars and practitioners. These include:

- Ability to identify changes and identify patterns over time
- Provide estimates on relative construct stability
- Produce more precise estimates on an interventions impact on the individual and not between –individual variability

If the benefits are clear, why are these studies lacking in fields such as Human Resource Development?

While there are many benefits of doing a longitudinal study, there are also challenges which deter scholars from pursing this method for their research. These can include:

- Additional costs associated
- Longitudinal students are more time consuming
- Issues with retention of study participants
- Dealing with missing data in the analysis

Not much can be done to limit the costs and time for a longitudinal study, but many of issues with retention and missing data can be proactively planned for within the methodology, making it easier to deal with in the analysis.

Methodology

For this methods paper, we conducted a literature review for vital background information. The search strategy included queries using electronic peer reviewed journals through different databases. The databases that were used included those accessed through The University of Texas at Tyler and the Tarleton State University library systems. The databases used include: Business Source Complete, EBSCO, ProQuest, Sage Journals, and Emerald. In addition to the use of these databases, Google Scholar was also used to add to the comprehensive search. There was a focus on HRD specific journals for relevance to the field. Keywords that were used to search these resources included longitudinal study / longitudinal data analysis along with a mixture of the following words or phrases benefits and challenges, missing data, retention strategies, structural equation modelling, configural factor analysis, measurement invariance, and model types. For this project while research in the past 15 years was emphasized for relevance, some articles written prior to these years were included to understand the development of longitudinal studies.

Published data was used to demonstrate a factorial invariance of a longitudinal study in R. This example provides an opportunity for scholars and practitioners to reference in order to replicate this procedure with their own studies.

Results

Tips for Designing a Longitudinal Study:

- Your measurement points should be based on theory and prior research; too short and the effect may be missed and too long between measurements and the effect may be lost
- Match your statistical model with your theoretical question, as some models may be better suited to your research purpose
- Consider issues of retention prior to starting your study to determine appropriate sample size
- Address missing data within your study by considering statistical techniques such as: multiple imputation (MI), direct maximum likelihood (ML), or full information maximum likelihood (FIML)
- Evaluate and achieve factorial invariance before conducting further analyses

“Factorial invariance is probably the most important empirical question to address in any analysis that involves more than one group and/or more than one time point...[it] is also one of the most misunderstood concepts,” (Little, 2013, p. 137).

What is factorial invariance?

A modelling technique that helps determine if the same unobserved variable (latent variable) is being measured the same across multiple time points within a confirmatory factor analysis (CFA) framework. There are four nested levels of factorial invariance which compare patterns and model fit prior to moving to the next level.

Level of Invariance	Item Factor Loading	Item Threshold (Intercept)	Item Residuals
Configural	Free	Free	Free
Weak	Equal	Free	Free
Strong	Equal	Equal	Free
Strict	Equal	Equal	Equal

Figure 1: Constraints imposed at each nested level of factorial invariance

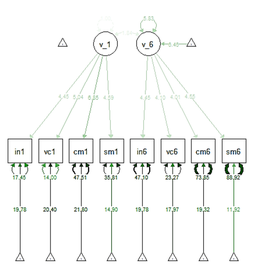

Figure 2: Configural Model. Model fit X^2 = 25.968, RMSEA = .042, CFI = .991

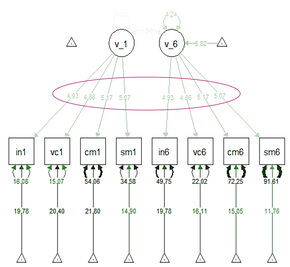

Figure 3: Weak Model. Model fit X^2 = 41.897, RMSEA = .067, CFI = .976 Constraints circled.

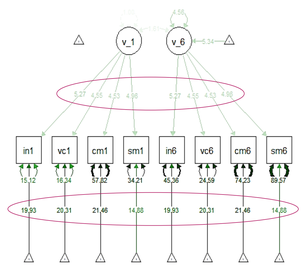

Figure 4: Strong Model. Model fit X^2 = 41.897, RMSEA = .067, CFI = .976 Constraints circled. *Best Model Fit

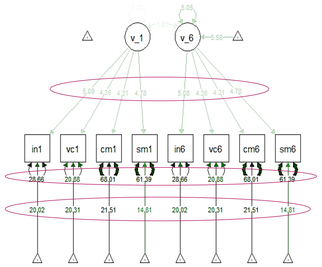

Figure 5: Strict Model. Model fit X^2 = 134.559, RMSEA = .134, CFI = .871 Constraints circled.

Conclusion

The results of this methods analysis showed that longitudinal research can offer advantages over other research methods based on its potential to enhance the effectiveness of determining patterns over time, to study developmental trends, and in some cases can provide flexibility dependent on the context and content of the study (Lerner et al., 2009; Avey et al., 2008). While there are many challenges to the method, with proper planning, there are statistical and theoretical tools that can aid researchers in conducting these studies. Through our research we have found that being an informed scholar and understanding the methods available is vital to the design of a valid and reliable study.

Primary References

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Contact Information

For additional references, r syntax, or questions:
Ashlee Noblin Tolliver – anoblin@patriots.uttyler.edu
Shonda Sears – ssears2@patriots.uttyler.edu