Preregistration

Psychological Needs During Intergroup Contact — An Extensive Longitudinal Study (Young Medical Professionals Sample)

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Analysis Plan

Statistical models

We will use a sequential analysis strategy in line with our proposed hypotheses. Given the nested structure of much of our data we test many of our hypotheses using a multilevel approach, where y_{ti} denotes the response at measurement occasion t ($t = 1, ..., T_i$; level 1) for individual i ($i = 1, ..., n$; level 2). It should be noted that we will follow a hierarchical modeling approach. We follow the common four-step procedure (e.g., Bliese, 2013): (1) Test whether enough variation exists within and between participants to justify a multilevel structure, (2) (sequentially) add key predictors, (3) check whether a random slope explains an adequate amount of variance, and (4) check for autocorrelations and heteroscedasticity. For brevity we will only present the full multilevel regression formulas below.

1. Contact Hypothesis (partially using between participant aggregates to meaningfully include interaction frequency)

   a. Correlation:
   $$r_{ContactFreq,Attitude} \neq 0 \tag{1}$$
   b. Regression:
   $$\begin{aligned}\text{Level 1: } & Attitude_{ti} = \beta_{0i} + \beta_{1i}OutgroupInteraction_{ti} + \\ & \qquad \beta_{2i}NonOutgroupInteraction_{ti} + e_{ti} \\ \text{Level 2: } & \beta_{0i} = \gamma_{00} + u_{0i} \\ & \beta_{1i} = \gamma_{10} + u_{1i} \\ & \beta_{2i} = \gamma_{20} + u_{2i}\end{aligned} \tag{2}$$
   c. Regression:
   $$Attitude = ContactFreq \times AverageQual \tag{3}$$

2. Allport's Conditions

   a. Regression:
   $$\begin{aligned}\text{Level 1: } & Attitude_{ti} = \beta_{0i} + \beta_{1i}AllportConditions_{ti} + e_{ti} \\ \text{Level 2: } & \beta_{0i} = \gamma_{00} + u_{0i} \\ & \beta_{1i} = \gamma_{10} + u_{1i}\end{aligned} \tag{4}$$
   b. Regression:
   $$\begin{aligned}\text{Level 1: } & InteractionQuality_{ti} = \beta_{0i} + \beta_{1i}AllportConditions_{ti} + e_{ti} \\ \text{Level 2: } & \beta_{0i} = \gamma_{00} + u_{0i} \\ & \beta_{1i} = \gamma_{10} + u_{1i}\end{aligned} \tag{5}$$
   c. Regression:
   $$\begin{aligned}\text{Level 1: } & Attitude_{ti} = \beta_{0i} + \beta_{1i}AllportConditions_{ti} + \\ & \qquad \beta_{2i}InteractionQuality_{ti} + e_{ti} \\ \text{Level 2: } & \beta_{0i} = \gamma_{00} + u_{0i} \\ & \beta_{1i} = \gamma_{10} + u_{1i} \\ & \beta_{2i} = \gamma_{20} + u_{2i}\end{aligned} \tag{6}$$

3. Key Need fulfillment

   a. Regression:
   $$\begin{aligned}\text{Level 1: } & Attitude_{ti} = \beta_{0i} + \beta_{1i}KeyNeedFulfill_{ti} + e_{ti} \\ \text{Level 2: } & \beta_{0i} = \gamma_{00} + u_{0i} \\ & \beta_{1i} = \gamma_{10} + u_{1i}\end{aligned} \tag{7}$$

b. Regression:

$$\begin{aligned}
&\text{Level 1: } InteractionQuality_{ti} = \beta_{0i} + \beta_{1i} KeyNeedFulfill_{ti} + e_{ti} \\
&\text{Level 2: } \beta_{0i} = \gamma_{00} + u_{0i} \\
&\qquad\qquad \beta_{1i} = \gamma_{10} + u_{1i}
\end{aligned} \tag{8}$$

c. Regression:

$$\begin{aligned}
&\text{Level 1: } Attitude_{ti} = \beta_{0i} + \beta_{1i} KeyNeedFulfill_{ti} + \\
&\qquad\qquad \beta_{2i} InteractionQuality_{ti} + e_{ti} \\
&\text{Level 2: } \beta_{0i} = \gamma_{00} + u_{0i} \\
&\qquad\qquad \beta_{1i} = \gamma_{10} + u_{1i} \\
&\qquad\qquad \beta_{2i} = \gamma_{20} + u_{2i}
\end{aligned} \tag{9}$$

d. Regression:

$$\begin{aligned}
&\text{Level 1: } Attitude_{ti} = \beta_{0i} + \beta_{1i} KeyNeedFulfill_{ti} + \\
&\qquad\qquad \beta_{2i} InteractionQuality_{ti} + \\
&\qquad\qquad \beta_{3i} KeyNeedFulfill * InteractionQuality_{ti} + e_{ti} \\
&\text{Level 2: } \beta_{0i} = \gamma_{00} + u_{0i} \\
&\qquad\qquad \beta_{1i} = \gamma_{10} + u_{1i} \\
&\qquad\qquad \beta_{2i} = \gamma_{20} + u_{2i} \\
&\qquad\qquad \beta_{3i} = \gamma_{30} + u_{3i}
\end{aligned} \tag{10}$$

e. Regression:

$$\begin{aligned}
&\text{Level 1: } Attitude_{ti} = \beta_{0i} + \beta_{1i} KeyNeedFulfill_{ti} + \beta_{2i} Autonomy_{ti} + \\
&\qquad\qquad \beta_{3i} Competence_{ti} + \beta_{4i} Relatedness_{ti} + e_{ti} \\
&\text{Level 2: } \beta_{0i} = \gamma_{00} + u_{0i} \\
&\qquad\qquad \beta_{1i} = \gamma_{10} + u_{1i} \\
&\qquad\qquad \beta_{2i} = \gamma_{20} + u_{2i} \\
&\qquad\qquad \beta_{3i} = \gamma_{30} + u_{3i} \\
&\qquad\qquad \beta_{4i} = \gamma_{40} + u_{4i}
\end{aligned} \tag{11}$$

4. Comparison with Allport's Conditions

a. Model Comparison:

$$AIC_{KeyNeedModel} < AIC_{AllportModel} \tag{12}$$

b. Regression:

$$
\begin{aligned}
\text{Level 1: } & Attitude_{ti} = \beta_{0i} + \beta_{1i} KeyNeedFulfill_{ti} + \\
& \qquad \beta_{2i} AllportConditions_{ti} + e_{ti} \\
\text{Level 2: } & \beta_{0i} = \gamma_{00} + u_{0i} \\
& \beta_{1i} = \gamma_{10} + u_{1i} \\
& \beta_{2i} = \gamma_{20} + u_{2i}
\end{aligned} \tag{13}
$$

All multilevel assumptions are tested as usual including (e.g., for random slopes model with j within person predictors):

$$\text{Level 1 Variance: } e_{ti} \sim \mathcal{N}(0, \sigma^2) \tag{14}$$

$$\text{Level 2 Variance: } \begin{bmatrix} u_{0i} \\ \vdots \\ u_{ji} \end{bmatrix} \sim \mathcal{N}\left(\begin{bmatrix} 0 \\ \vdots \\ 0 \end{bmatrix}, \begin{bmatrix} \tau_{00}^2 & & \\ \vdots & \ddots & \\ \tau_{j0} & \dots & \tau_{jj}^2 \end{bmatrix} \right) \tag{15}$$

References

Bliese, P. (2013). Multilevel Modeling in R (2.6). *An Introduction to R Notes on R: A Programming Environment for Data Analysis and Graphics*, page 88.