

Automatic Generation of Rule-Based Raven-Like Matrices in R: The matRiks Package

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Andrea Brancaccio¹ , Ottavia M. Epifania^{2,3} , Pasquale Anselmi⁴ ,
and Debora de Chiusole⁴

Keywords

Raven-like stimuli, fluid intelligence, automatic generation, R, open source

Description

Fluid intelligence (FI) denotes the capacity for novel problem-solving and abstract reasoning, relatively uninfluenced by culturally acquired knowledge or educational experience (Cattell, 1963). Raven's Progressive Matrices (RPMs; Raven, 1938) are visually structured puzzles that assess individuals' ability to identify patterns and relationships among abstract elements, and they are among the most widely used tools to measure FI. Each matrix is accompanied by set of response options from which the respondent must select the correct answer. To preserve the novelty of the task, RPMs should be administered only once or after a substantial delay.

Automatic generation tools for Raven-like matrices enable their use across various contexts without reusing the same items. These matrices can be generated using transformational rules that define the relationship between the elements. According to spatial rules, transformations involve the graphical and spatial features of the elements (e.g., orientation). According to logical rules, transformations involve the logical relationships between the elements (e.g., set intersection). Although some resources exist for the automatic generation of Raven-like matrices, they present different shortcomings, such as the small variety of implemented transformational rules or the need for advanced programming skills.

matRiks (Brancaccio et al., 2024) is an R package (R Core Team, 2024) for generating Raven-like matrices, which implements both spatial and logical rules. The package generates coherent sets of response options for each generated matrix, which include the correct answer and incorrect options based on the typical error response styles identified in the literature on RPMs. The final

¹Institute for Applied Mathematics and Information Technologies 'E. Magenes', National Research Council, Milan, Italy

²Department of Psychology and Cognitive Science, University of Trento (IT), Italy

³Psicostat Research Group, University of Padova (IT), Italy

⁴Department of Philosophy, Sociology, Education and Applied Psychology, University of Padova (IT), Italy

Corresponding Author:

Ottavia M. Epifania, Department of Psychology and Cognitive Science, University of Trento (IT), Corso Bettini 84, Rovereto (TN) 38068, Italy.

Email: ottavia.epifania@unitn.it

stimuli (i.e., the matrices and their response options) align with the literature on both transformational rules and error responses.

Stimuli from the matRiks package support FI test development in both general and clinical populations (e.g., de Chiusole et al., 2024).

Availability

The matRiks package, its associated manual, and the vignettes illustrating its functioning are available on the Comprehensive R Archive Network (CRAN) repository (<https://cran.rproject.org/web/packages/matRiks/index.html>). The development version of the package can be installed from GitHub (<https://github.com/OttaviaE/matRiks>).

ORCID iDs

Andrea Brancaccio  <https://orcid.org/0000-0001-5919-6990>

Ottavia M. Epifania  <https://orcid.org/0000-0001-8552-568X>

Pasquale Anselmi  <https://orcid.org/0000-0003-2982-7178>

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Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Supplemental Material

Supplemental material for this article is available online

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