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Raven's Progressive Matrices test sheet adaptations: Challenges and Projections

Carolina Lemus[1] [0009-0000-6503-0719]
Paulette Morales[2] [0009-0009-1850-1894].
[12]*Universidad de Chile, Santiago*
carolina.lemus@ug.uchile.cl

Abstract

This research focuses on promoting accessibility by developing adaptations of the Raven's Progressive Matrices test sheets. The study acknowledges the importance of aligning with inclusive education, understanding the background of adaptations, and considering multisensory and multimodal techniques. The objective is to design and create tactile adaptations based on the principles of educational inclusion, while also considering multimodal and multisensory techniques. This exploratory research includes the design, development, and revisions of the instruments. Two adaptation proposals are developed: one using microencapsulated paper sheets and another with 3D printing. Both adaptations highlight various relevant aspects, such as the benefits in terms of production and durability, as well as challenges related to design complexities, time, and access to materials. Projections for the application of these adaptations in educational and/or training settings are identified, and future research is proposed to optimize and expand these innovations in the field of psychological assessment.

Keywords: Tactile adaptations; Raven's Progressive Matrices test; Inclusive education

Introduction

This research aims to promote and disseminate accessibility by designing and adapting psychological assessment instruments with a multisensory design, which seeks to diversify the approach to psychological tests. The objective is to design and create tactile adaptations of the Raven's Progressive Matrices test sheets.

Theoretical Framework

Inclusive education

Regarding the concept of inclusion, there are various ways to understand and address it in education (Amor et al., 2018). According to UNESCO (2020), inclusion involves measures that consider diversity in terms of processes, practices, or outcomes. In education, it encompasses not only disabilities, educational needs, and contexts of poverty, but also diversity in the classroom and society (Blanco, 2014). The application of inclusive education implies transforming the educational culture to create a shared culture, with responsibility falling on the actors involved (Andújar & Rosoli, 2014).

Multisensory-Multimodal

Multisensory techniques in education involve utilizing a student's vision, hearing, and touch to enhance memory and learning (Volpe & Gori, 2019). Multimodality, on the other hand, includes different modes of communication and is used in pedagogy to create meanings and allow students to represent learning in varied ways, fostering the co-construction of knowledge (Li, 2020).

Psychological test adaptations

Psychological assessments are primarily designed for people without disabilities, making them inaccessible to those with visual or auditory impairments (Minks et al., 2020). In the case of the Raven's Progressive Matrices test, although there are adaptations like the Tactual Progressive Matrices, these have faced criticism regarding their validity and complexity (Anderson, 1961). Moreover, the lack of research and support limits the development and distribution of these adaptations (Cassar & Lucchese, 2016).

Method

Design of the investigation

Exploratory research, consisting of stages of design, development, and revisions.

Participants

The design and development of these instruments involved the participation of teachers and printing technicians.

Data production

Based on a literature review, data collection, and consultations with teachers and technicians, the design and development of the instruments were carried out: an adaptation using microencapsulated paper and an adaptation using 3D material.

Microencapsulated Sheets Adaptation of sheets with textured relief, consisting of a rectangle bordered by raised edges (matrix) that contains the exercise, with 6 or 8 alternatives at the bottom of the sheet, also bordered by raised edges. Following the design created by teachers from a state university, 7 sheets from different series of the test (A4, B9, C7, D1, D8, E1, and E4) were adjusted and printed on microencapsulated paper.

3D Printed Sheets A prototype for a 3D adaptation of two sheets from the test (A4 and B9) was designed and developed using Autodesk Fusion 360. A total of 4 prints were produced using polylactic acid (PLA), where various textures were integrated into the design to replace the colors in the matrices. This adaptation consists of the sheet separated into each of its elements, with the matrix and the alternatives being independent of each other.

Results

Adaptation of Microencapsulated Sheets

This instrument featured a design that allowed for rapid and effective adaptation by using the original test design. Although the printing process was quick, precise, and error-free, the economic cost of the material and printing is high. Additionally, the material has a limited lifespan due to rapid wear from handling. While the type of material allows for the printing of sheets with more complex designs, the size used may hinder tactile exploration due to the large amount of information presented.

Adaptation of 3D Printed Sheets

This adaptation involves a complex design in accordance with the translation of the test sheets into textures and three-dimensional reliefs. Although the printing of the material is low-cost, it has a high margin of error due to irregularities in the printing process. The resulting material was durable and resistant, though adjustments and corrections were needed during the process. As a limitation, sheets of lower complexity were chosen to facilitate adaptation and production.

Discussion and conclusions

Focused on inclusive education, various aspects of the design and development process of these instruments are evident. Benefits are identified regarding the cost of 3D printing production, the material's lifespan, and the time required for production when working with microencapsulated paper. Difficulties are recognized in translating the design into textures in 3D prints, as well as the printing time and access to print with this material. In terms of research, a limitation is the lack of a validation process for both instruments. Looking ahead, there is a plan to carry out application and validation processes to assess the various uses of the material in educational and/or training settings, as well as its potential in the field of psychological evaluation. Thus, these adaptations could provide significant support for learning, considering the benefits of multisensory and multimodal materials. The challenge of optimizing the design and execution of the instruments, as well as delving into other aspects not considered in the process, is recognized.

References

Amor, A., Hagiwara, M., Shogren, K., Thompson, J., Verdugo, M. A., Burke, K. & Aguayo, V. (2018). International perspectives and trends in research on inclusive education: a systematic review. International Journal of Inclusive Education, 23(12), 1277-1295.

Anderson, R. (1961). Modification of the Raven Progressive Matrices for the Blind. Unpublished progress report and request for continuation.

Andújar, C. y Rosoli, A. (2014). Enseñar y aprender en la diversidad: el desarrollo de centros y aulas inclusivas. En A. Marchesi, R. Blanco, y L. Hernández, (Coords.). Avances y desafíos en la educación inclusiva en Iberoamérica, (pp. 47-59). Madrid: Organización de Estados Iberoamericanos (OEI).

Blanco, R. (2014). Inclusión educativa en América Latina: caminos recorridos y por recorrer. En A. Marchesi, R. Blanco, y L. Hernández, (Coords.). Avances y desafíos en la educación inclusiva en Iberoamérica, (pp. 11-35). Madrid: Organización de Estados Iberoamericanos (OEI).

Cassar, C., & Lucchese, F. (2016). Psychometric test for blind adults and children, critical issues and perspectives. International Journal of Developmental and Educational Psychology, 2(1), 109-116.

Li, M. (2020). Multimodal pedagogy in TESOL teacher education: Students' perspectives. System, 94.

Minks, A., Williams, H., & Basille, K. (2020). A critique of the use of psychometric assessments with visually impaired children and young people. Educational Psychology in Practice, 36(2), 170-192.

UNESCO (2020). Global Education Monitoring report 2020: Inclusion and education: All means all. UNESCO.

Volpe, G. & Gori, M. (2019). Multisensory Interactive Technologies for Primary Education: From Science to Technology. Frontiers in Psychology, 10.