Analogical Reasoning Assessments In Intellectual Developmental Disabilities: A Systematic-Review

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INTRODUCTION

Analogical reasoning (AR) is the ability to establish links on structural similarities between a known system (i.e., source) and a new system (i.e., the target) (Gentner, 1983; Holyoak, 2012). AR is considered to be impaired in IDD. However, there is a lack of consensus regarding its development and the availability of adapted tools to assess this ability in this population. The main purpose of this systematic-review is to provide a centralized analysis of AR abilities, and its means of assessment, in IDD. Our work focused on 3 types of information: (1) the studies' theoretical area and objectives. (2) the methods and tools used to assess AR abilities in IDD, (3) the results of these studies.

METHOD

This systematic review was conducted in accordance with the PRISMA methodology. The eligibility assessment was made in accordance with the JBI criteria. The included articles had to met over 70% of the criteria.

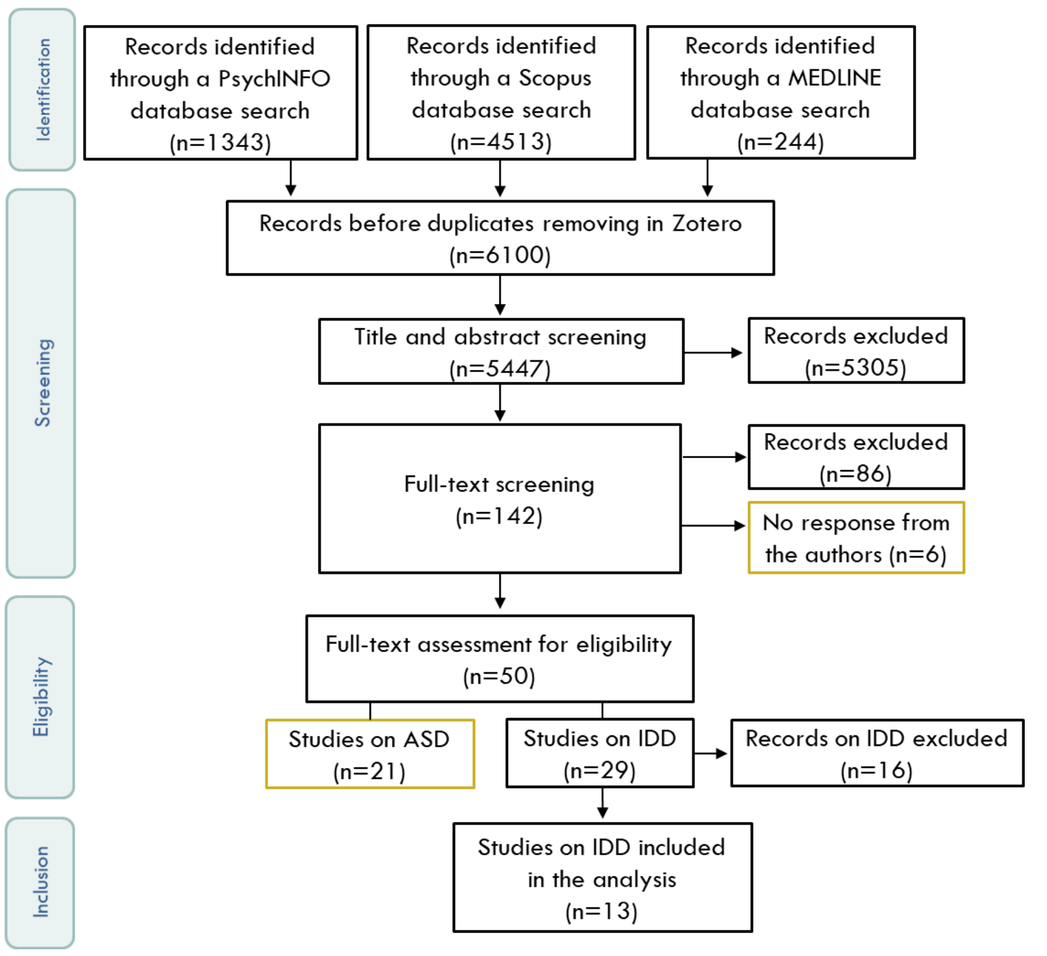

Figure 1. *Flow diagram*

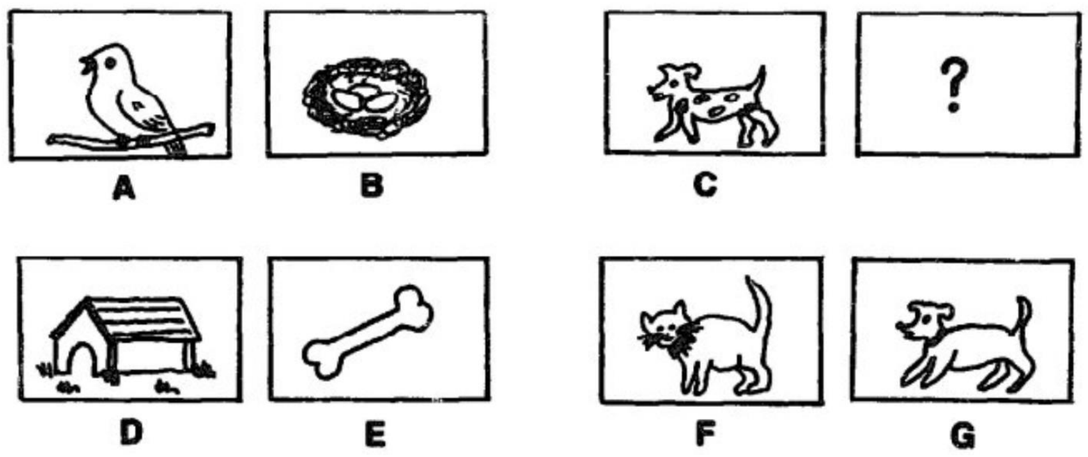

Figure 2. *A:B::C:D analogy for « bird:nest::dog:doghouse » (Goswami, 1990).*

RESULTS

Study (n=13)	IDD groups	Theoretical area	Material
Curie et al. (2016)	DS, FragX, ARX	Analogical Reasoning	Geometrical A:B::C:D + eye-tracking
Denaes-Bruttin (2011)	UND	Analogical Reasoning	Figurative A:B::C:D
Hetzroni et al. (2019)	UND	Analogical Reasoning	Word-extension task
Tzuriel & Klein (1985)	UND	Analogical Reasoning	Geometrical A:B::C:D
Vakil et al. (2011)	UND	Analogical Reasoning	Figurative and geometrical A:B::C:D + eye-tracking
Vakil & Lifshitz-Zehavi (2012)	DS, UND	Analogical Reasoning	RSPM + eye-tracking
Witt et al. (2020)	UND	Categorization	Word-extension task
Facon & Nuchadee (2010)	DS, UND	Nonverbal intelligence	RCPM
Goharpey et al. (2013)	UND	Nonverbal intelligence	RCPM
Kemper et al. (1988)	FragX	Nonverbal intelligence	Matrix Analogies Subtest (K-ABC)
Mungkhetklang et al. (2016)	UND	Nonverbal intelligence	RCPM + WNV + TONI-4
Facon et al. (2016)	DS, UND	Receptive vocabulary	RCPM + BOEHM
Rinaldi et al. (2002)	UND	Working memory	Figurative A:B::C:D

DS: Down Syndrom; FragX : Fragile X Syndrom; ARX: ARX mutation; UND: undifferentiated etiology

Table 1. *Theorical area and material used in the included studies.*

Study (n=13)	Results
Curie et al. (2016)	Scores for IDD group < TD group, visual strategy IDD ≠ TD
Denaes-Bruttin (2011)	IDD can be trained in analogical reasoning
Hetzroni et al. (2019)	IDD without ASD ≠ ASD without IDD
Tzuriel & Klein (1985)	Error type in IDD ≠ TD and IDD can be trained in analogical reasoning
Vakil et al. (2011)	Visual strategy IDD ≠ TD
Vakil & Lifshitz-Zehavi (2012)	Visual strategy IDD ≠ TD
Witt et al. (2020)	Difficulties in relations generalizations in IDD
Facon & Nuchadee (2010)	UND = DS = TD
Goharpey et al. (2013)	IDD < CA, IDD = MA
Kemper et al. (1988)	Matrix Analogies = the most consistant strenght of Mental Processing scale (K-ABC) in FragX
Mungkhetklang et al. (2016)	WM contribution in IDD's nonverbal intelligence scores
Facon et al. (2016)	Correlation between RCPM and relational vocabulary
Rinaldi et al. (2002)	IDD do not suceed to apply new WM strategy to analogical reasoning task

CA: chronological-age matched control group; MA: mental-age matched control group; RCPM: Raven Coloured Progressive Matrices; WM: working memory

Table 2. *Results of the included studies.*

DISCUSSION & CONCLUSION

Our study highlights several key observations: (1) limited research on analogical reasoning in IDD, (2) heterogeneity among ID groups based on etiology, (3) diverse methods for measuring analogical reasoning, including original tasks (e.g., A:B::C:D, word-extension tasks), specific batteries (e.g., ARLT, CAM-R, CPAM), and standardized tasks (e.g., Raven's Progressive Matrices), (4) findings suggest impaired analogical reasoning in ID compared to typically developing individuals. We suggest future studies on analogical reasoning centralize it, standardize populations by removing etiological distinctions (Karmiloff-Smith, 2009), and unify tasks.

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