

# Strengths and weaknesses in the intellectual profile of children with dyslexia: consistency and not discrepancy

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A decorative graphic consisting of several horizontal lines of varying lengths and colors (teal, white, and light blue) extending from the right side of the slide towards the center.

# Overview

- **1) Discrepancy**
- **2) Models of intelligence**
- **3) Hierarchical models and learning**
- **4) Hierarchical models and LDs**
- **5) Assessment of intelligence: the use of WISC-IV**
- **6) WISC-IV and LDs**
- **7) Cognitive Psychology and the study of intelligence**
- **8) The role of Working Memory**
- **9) the case of ADHD**

# Discrepancy

- High intelligence and poor achievement?
- The case of famous examples: Einstein, leonardo, edison, disney, cruise?

# Distribution of FSIQ

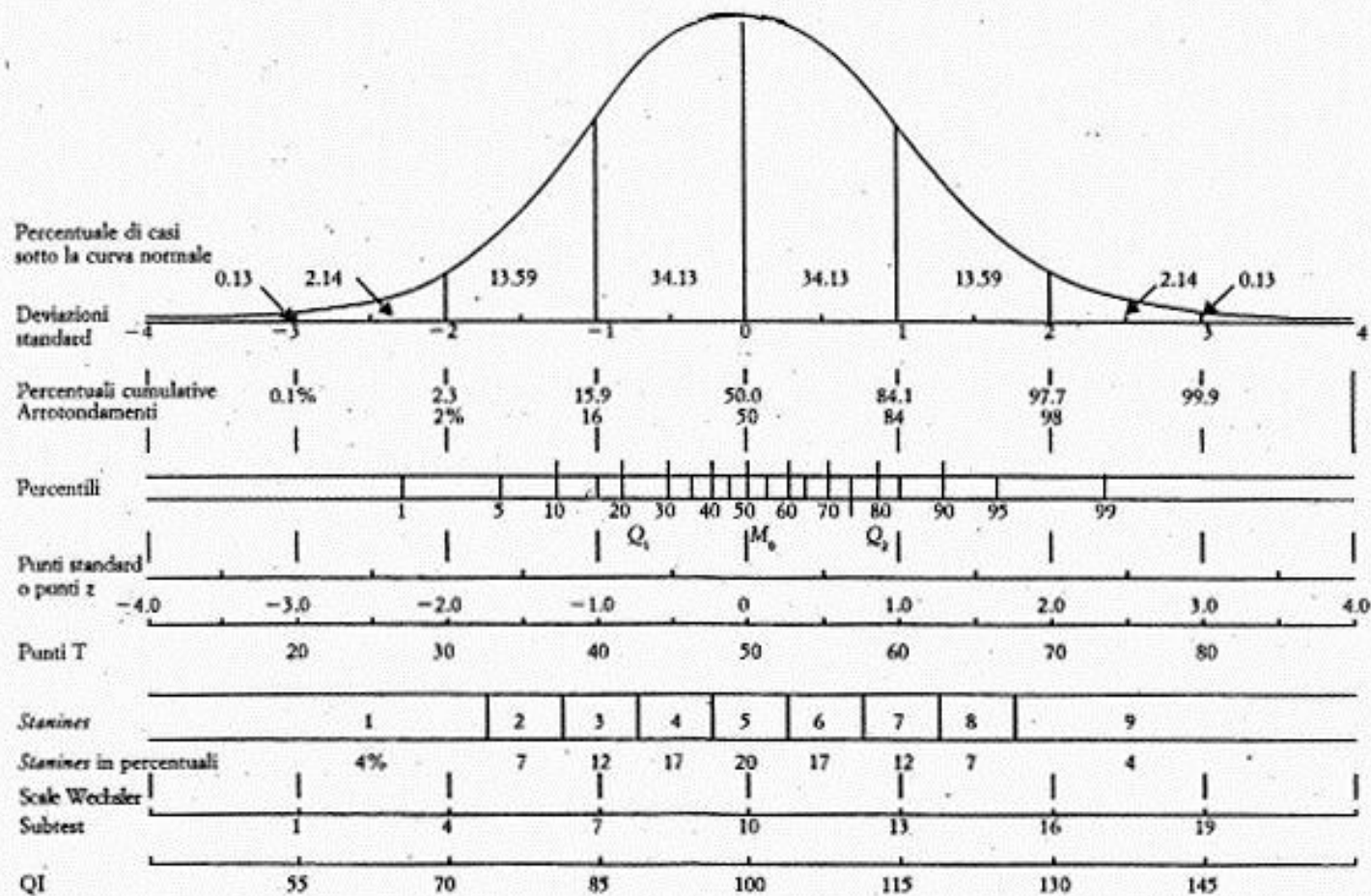


FIG. 6.11. Corrispondenza fra i vari tipi di punteggi in una distribuzione normale.

# DSM-5, D Criterion (Exclusion factors)

- **D. The learning difficulties are not better accounted for by intellectual disabilities, uncorrected visual or auditory acuity, other mental or neurological disorders, psychosocial adversity, lack of proficiency in the language of academic instruction, or inadequate educational instruction.**

# Critiques to the concept of discrepancy

- 1) intelligence and learning are not two independent concepts
- 2) discrepancy has been typically substituted by deviation in achievement in presence of average intelligence
- 3) there are not shared criteria concerning the limits of 'average intelligence' and the degree of specificity required
- 4) in any case intelligence does not predict Response To Intervention
- 5) discrepancy should be defined on the basis of a model of intelligence
- 6) many important models of intelligence are multicomponent and it is not clear with respect to which component discrepancy-average intelligence should be considered
- 7) average intelligence must be defined considering components substantially independent from achievement

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# Models of intelligence

- There are many different models, but for the discussion of the relationship with learning we can focus on three different models:
- Unitary
- Multiple
- Hierarchical



# Difficulties of unitary theories

- Correlations between measures of different abilities are not high even when corrected for reliability
- There are specific weaknesses, like in the case of the LDs, and specific strengths
- The unitary factor is typically defined statistically and ‘a posteriori’

# Difficulties of multiple theories

- Abilities are correlated
- Abilities have not the same importance
- The number of Abilities can be increased
- Abilities can be further articulated
- Only the deficits in some abilities impair the adaptive functioning

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# Hierarchical theories

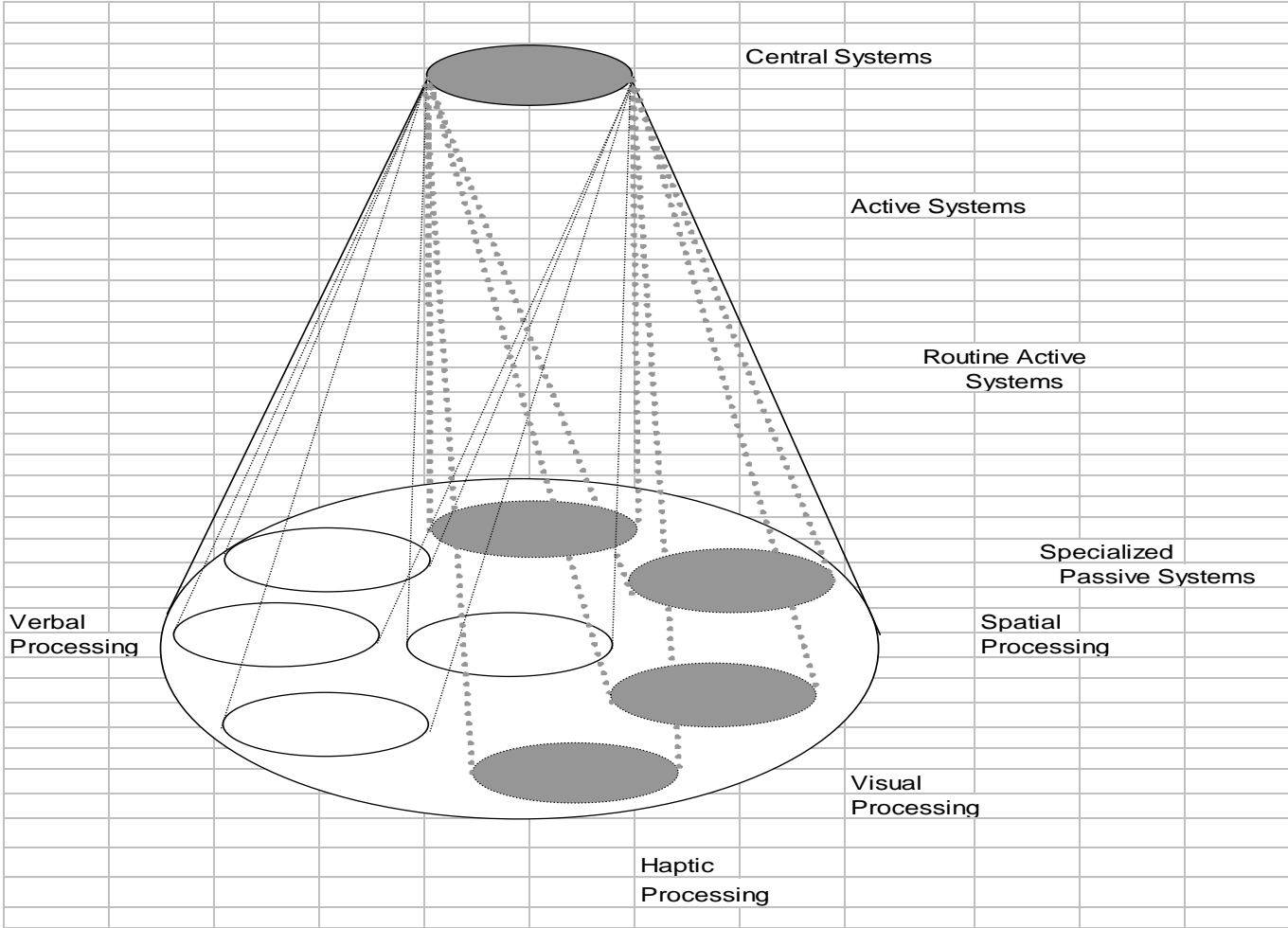
- Hierarchical theories recognise the articulation of intelligence and take into account the fact that some components are more central

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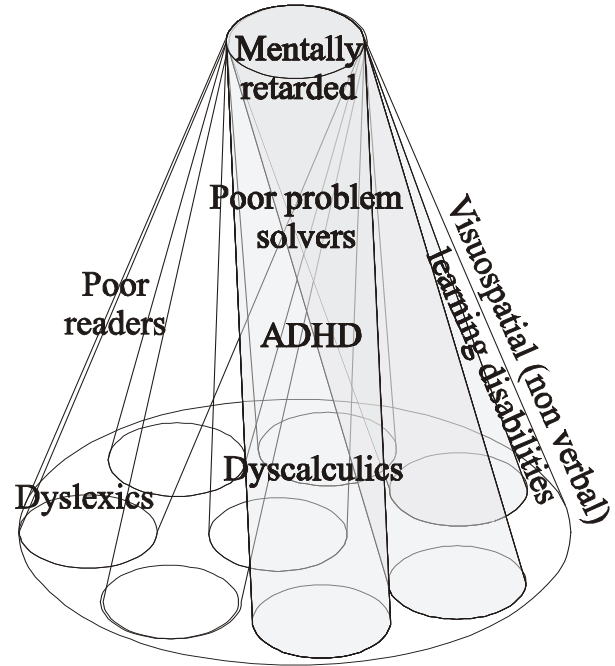
- Componential theories of intelligence appear more adequate for describing weaknesses and strengths of children with LD
- In particular componential hierarchical theories may explain why central aspects of intelligence are preserved but specific aspects are impaired

# Continuum Model (Cornoldi, 2007)



Metacognition

Culture

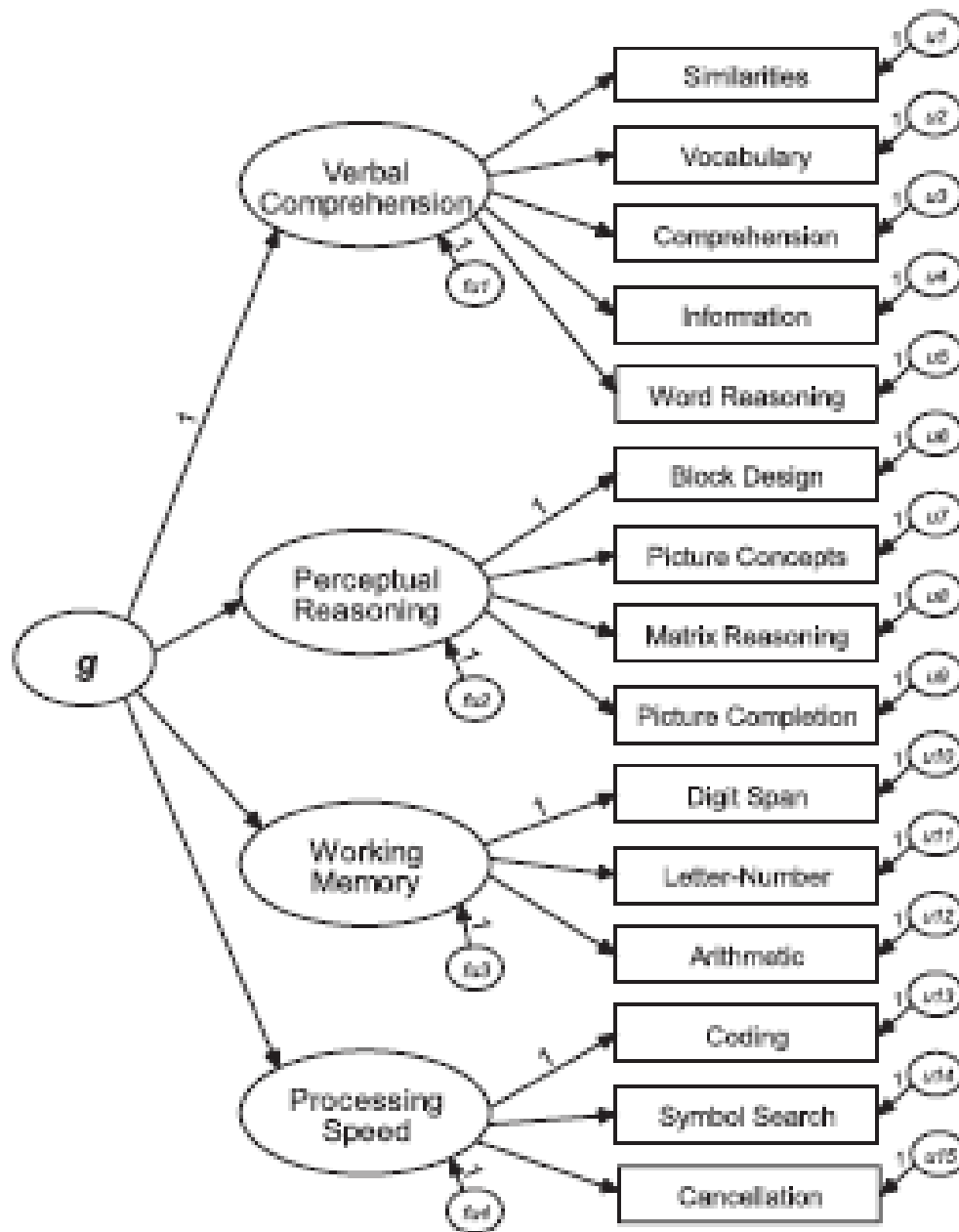


Experience



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# The creation of an Italian data bank

- With the support of the Italian Association for Learning Disorders (AIRIPA) we started to create a data bank offering information on the standardized scores at the WISC-IV 10 basic subtests of children with a diagnosis of LD
- Some of the main Italian Centres for LD collaborated including: Torino, Milano, Padova, San Donà, Ferrara, Macerata, Foggia

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## Research in Developmental Disabilities



### Differences in the intellectual profile of children with intellectual vs. learning disability



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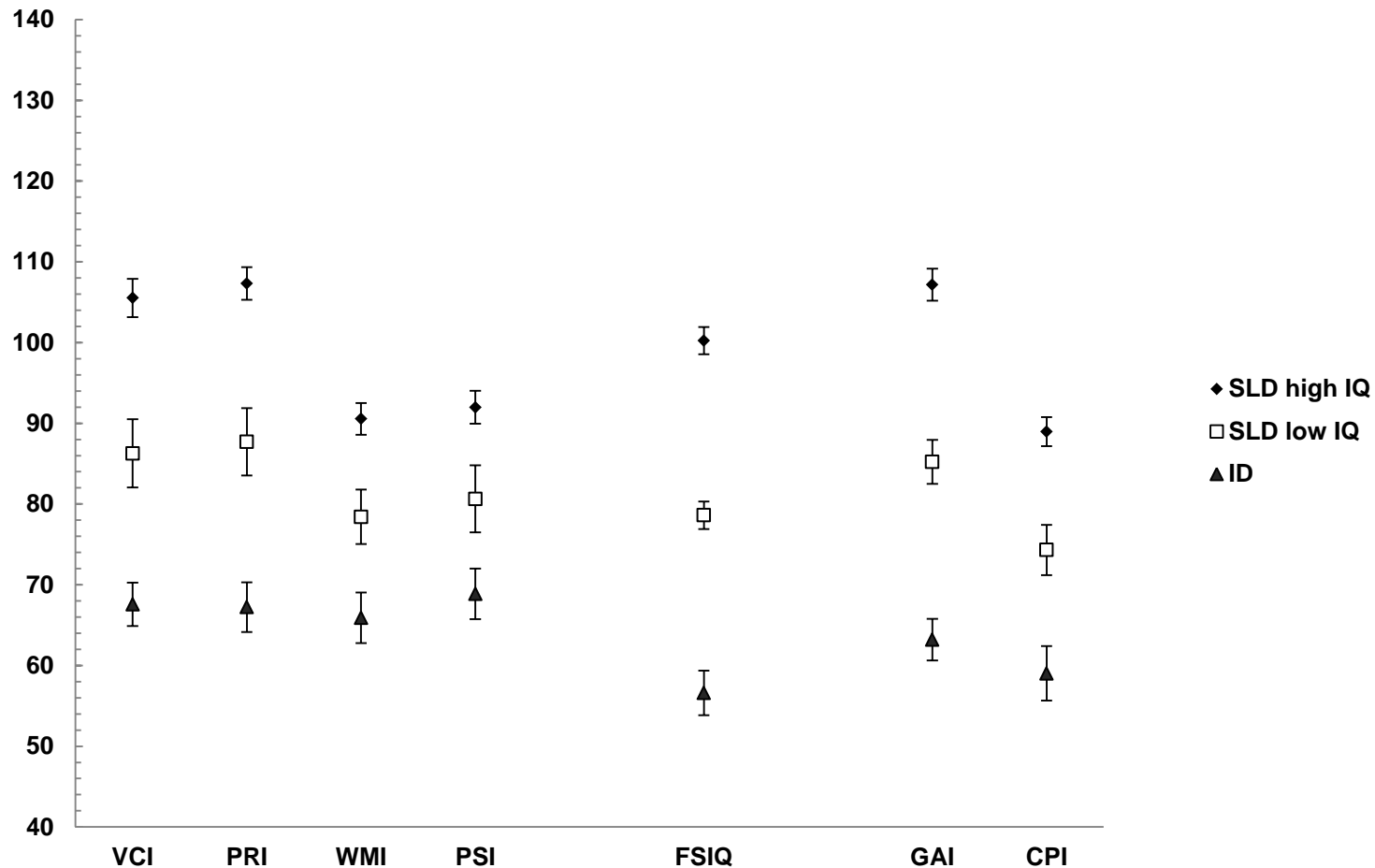
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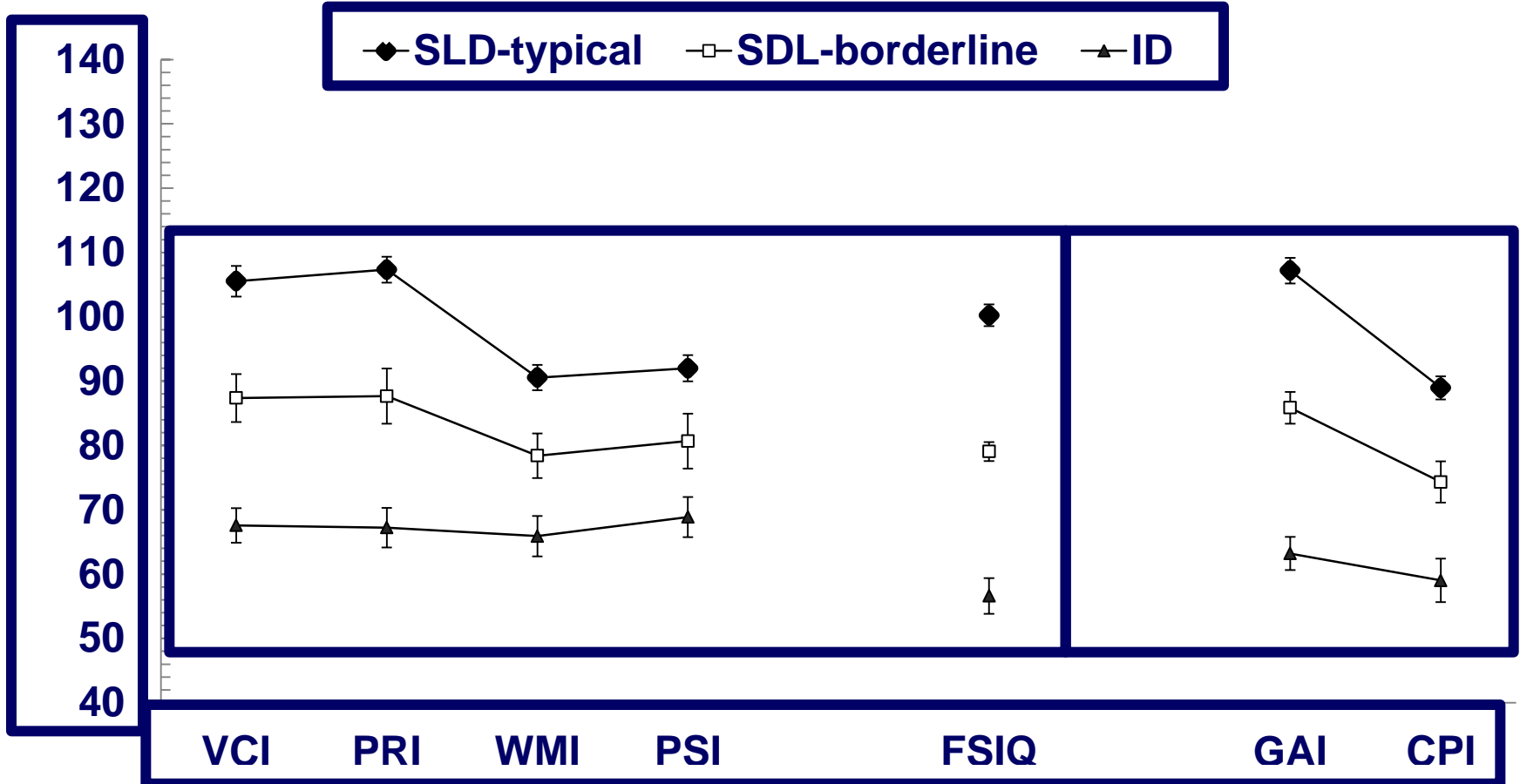
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# AIRIPA data bank: the first analyses (Cornoldi et al., 2014)

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Percentages of cases with a GAI higher than CPI ( $\geq 1.5$  SDs, i.e. 23 standardised scores)).

39.4% of LDs with typical IQ

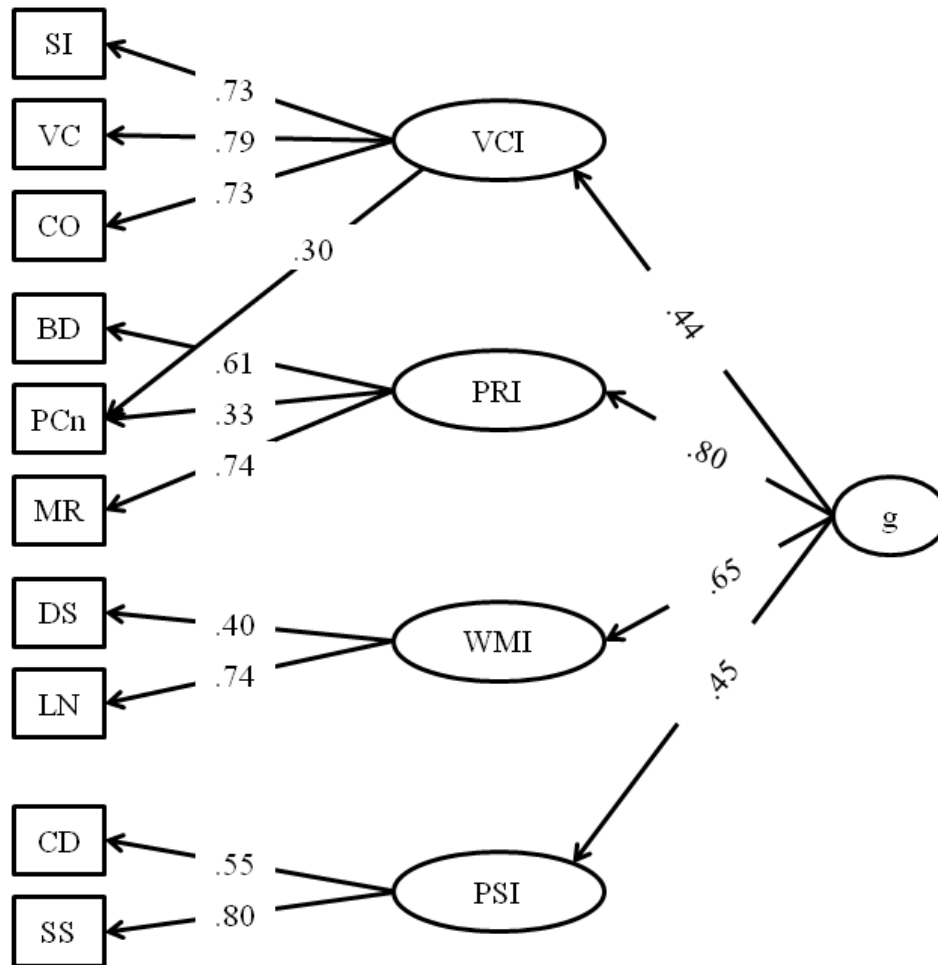
28.6% of LDs with borderline IQ

5.2% of intellectually disabled.





# 4 factors structure in LD



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# Executive Functions proposal: evidence

- The association between EFs and intelligence is supported by the observations that frontal cortex size is more developed in intellectually mature individuals and that lesions in frontal cortex may impair intellectual functioning (Duncan, 2005).
- Evidence for the relationship between EF and intelligence comes from sources beyond neuroscience. For example, it has been shown that EFs are good predictors of intelligence in children (Brydges, Reid, Fox, & Anderson, 2012) and that intellectually impaired individuals have poor EFs (Hartman, Houwen, Scherder, Visscher, 2010).

# Executive Functions: limitations

- However, EFs , as an explanation for intelligence, present difficulties. In particular, the psychological definition of EFs is vague and includes various heterogeneous functions (Chan, Shum, Touloupoulou, & Chen, 2008); for example, it is difficult to consider delayed memory or task shifting as signifiers of a unique psychological mechanism. As well, some EFs seem to be preserved in the presence of severe frontal lesions (Roca et al., 2010). Moreover, some prefrontal functions are not highly related with intelligence, while other brain areas seem more critically related with specific, important intellectual functions (Todd & Marois, 2004). Furthermore, EFs correlate very weakly between themselves and, after controlling for intelligence, present modest discriminant validity (Salthouse, 2005).

# What within EF?

- If the EF hypothesis is to be maintained, then an in-depth study to ascertain which functions are most related with intelligence is needed. On the basis of the available evidence, these functions seem to be related with attentional control of WM (see Engle, 2010), and the ability to update information in WM (Friedman, Miyake, Corley, Young, Defries, & Hewitt, 2006). This evidence supports the centrality of WM in intellectual functioning.

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# Intelligence and Working Memory

- The consideration that intellectual operations are carried out based on temporarily maintained information and are guided by goals and mental sets which are also temporarily maintained provides a theoretical basis for the hypothesis that WM supports intelligence (Case, 1985). Pioneering studies in cognitive psychology (Just & Carpenter, 1992) demonstrated that the traditional means to assess intelligence may be related with WM functioning, initiating a long series of studies that have rapidly expanded in the past decade.

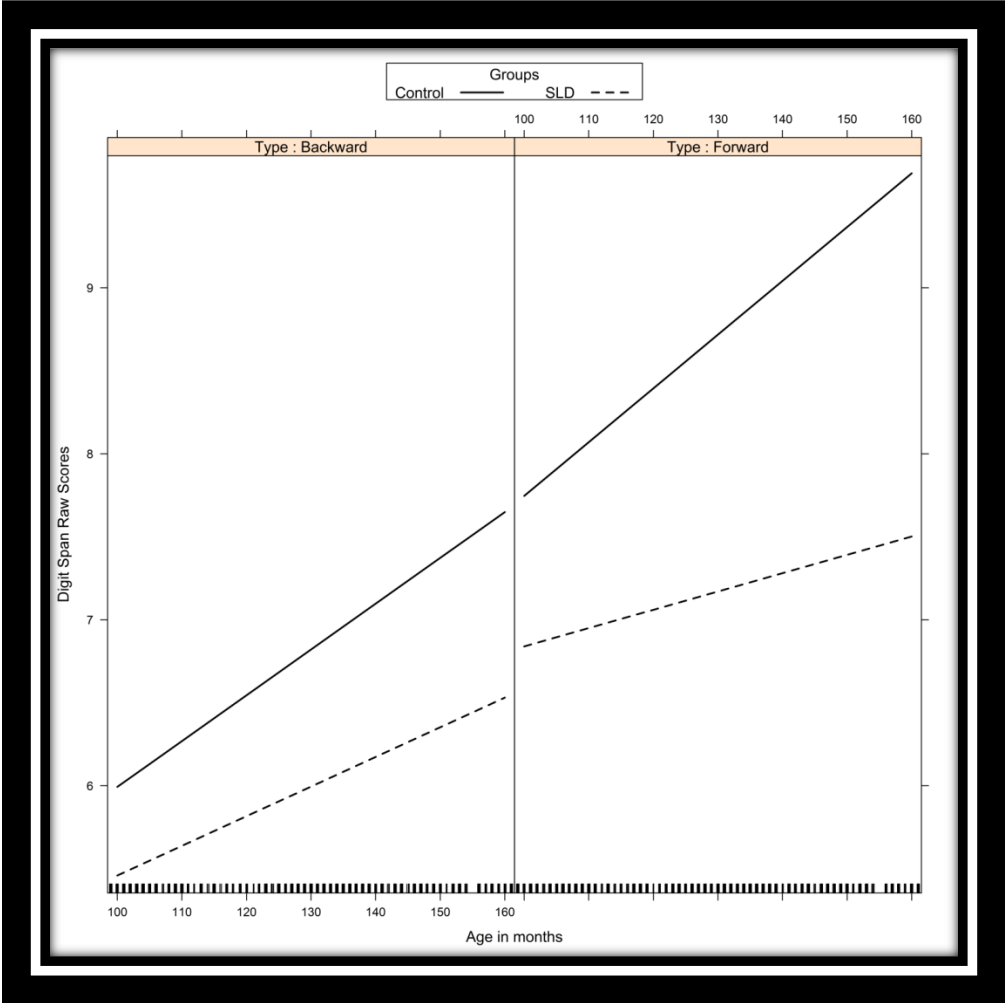
# The active control differentiation

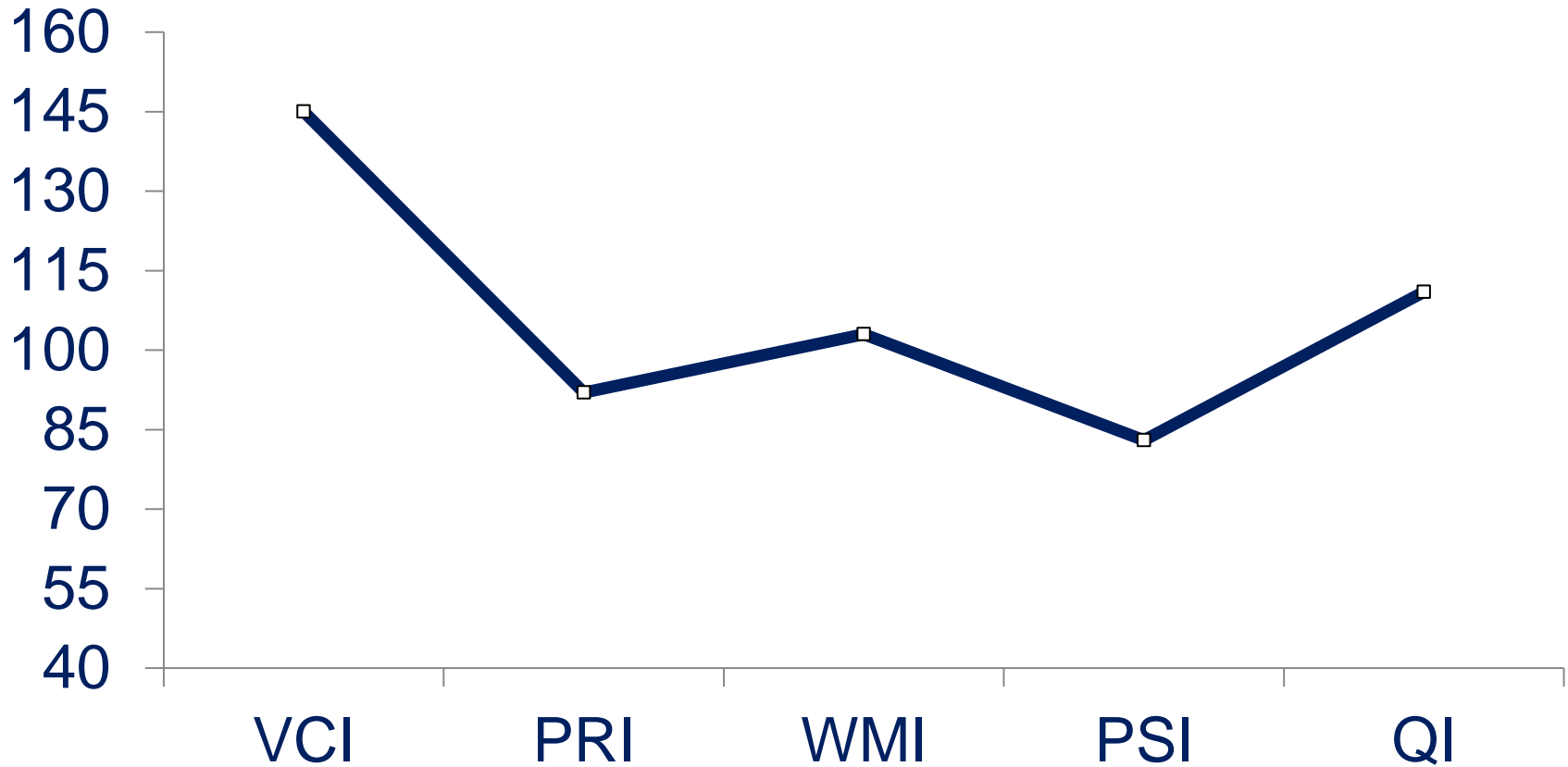
- there is a some agreement that WM tasks may be categorized as passive or active (Cornoldi & Vecchi, 2003) according to whether they require simple storage functions or the complex active manipulation of maintained material and evidence for the relationship between WM and intelligence seems to primarily concern the active rather than passive WM. For example, the variances in intelligence tests explained by complex span tasks and by STM are partially different, and STM measures account for only a small part of the variances (Conway, Getz, Macnamara, & Engel de Abreu, 2011).



# The active control continuum

- Rather than assuming a dichotomous position (Central Executive vs ancillary subsystems) we assume that, within WM, there is a continuum of functions describing to what extent active control is required and we assume that central functions of intelligence are related with WM in correspondence with the degrees of WM control





## A case

