FLORIDA CENTER *for*
READING RESEARCH

Examining the Hypothesized Linkage Between Exceptional Abilities and Dyslexia: Considering Population and Distributional Issues

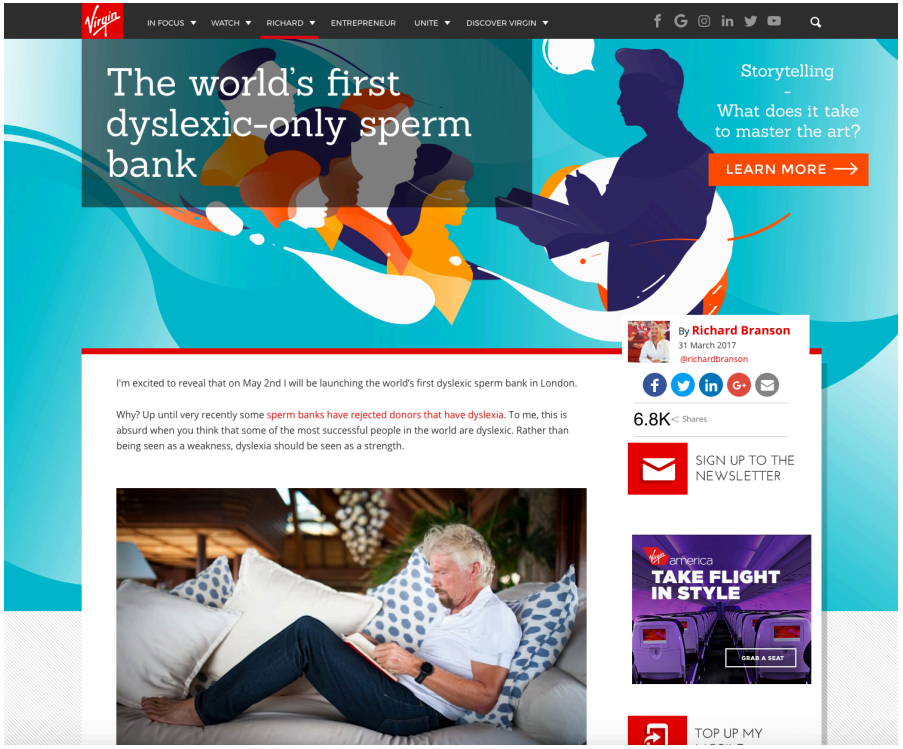
Donald L. Compton, Ph.D.
Director, Florida Center for Reading Research
Florida State University

March 31, 2017

March 31, 2017

Sir Richard Branson announces his intent to open the Worlds first “Dyslexic-only Sperm Bank”!

March 31, 2017

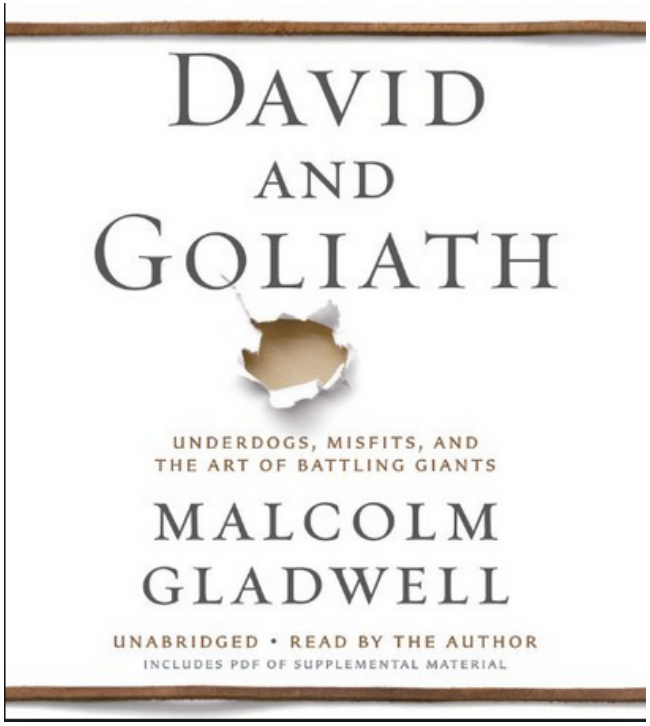


March 31, 2017

- According to Branson, “Up until very recently some sperm banks have rejected donors that have dyslexia. To me, this is absurd when you think that some of the most successful people in the world are dyslexic. Rather than being seen as a weakness, dyslexia should be seen as a strength.”

Turns out March 31 is very close to April 1!

Malcom Gladwell



Malcom Gladwell

- In David and Goliath Gladwell asks, “You wouldn’t wish dyslexia on your child. Or would you?”
- Gladwell develops the idea that dyslexia might be a “desirable difficulty”, a condition that is usually a liability but can also be the engine for astonishing personal success.
- Gladwell is impressed by fact that “an extraordinarily high percentage of entrepreneurs are dyslexic.”
- Gladwell’s argument is that having dyslexia, and dealing with its consequences, played a causal role in their success.

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the examiner

VOL. 6, ISSUE 3
SEPTEMBER 2017
International DYSLEXIA Association®

Education Policy Update: Out with the Old and In with the New

Meghan Whittaker, the policy and advocacy manager at the National Center for Learning Disabilities (NCLD), provides an update on what's happening with government policies that support the success of individuals with learning and attention issues in school, at work, and in life. We are nearly through the first year of the new administration, but we've seen a great deal of change when it comes to education policy.

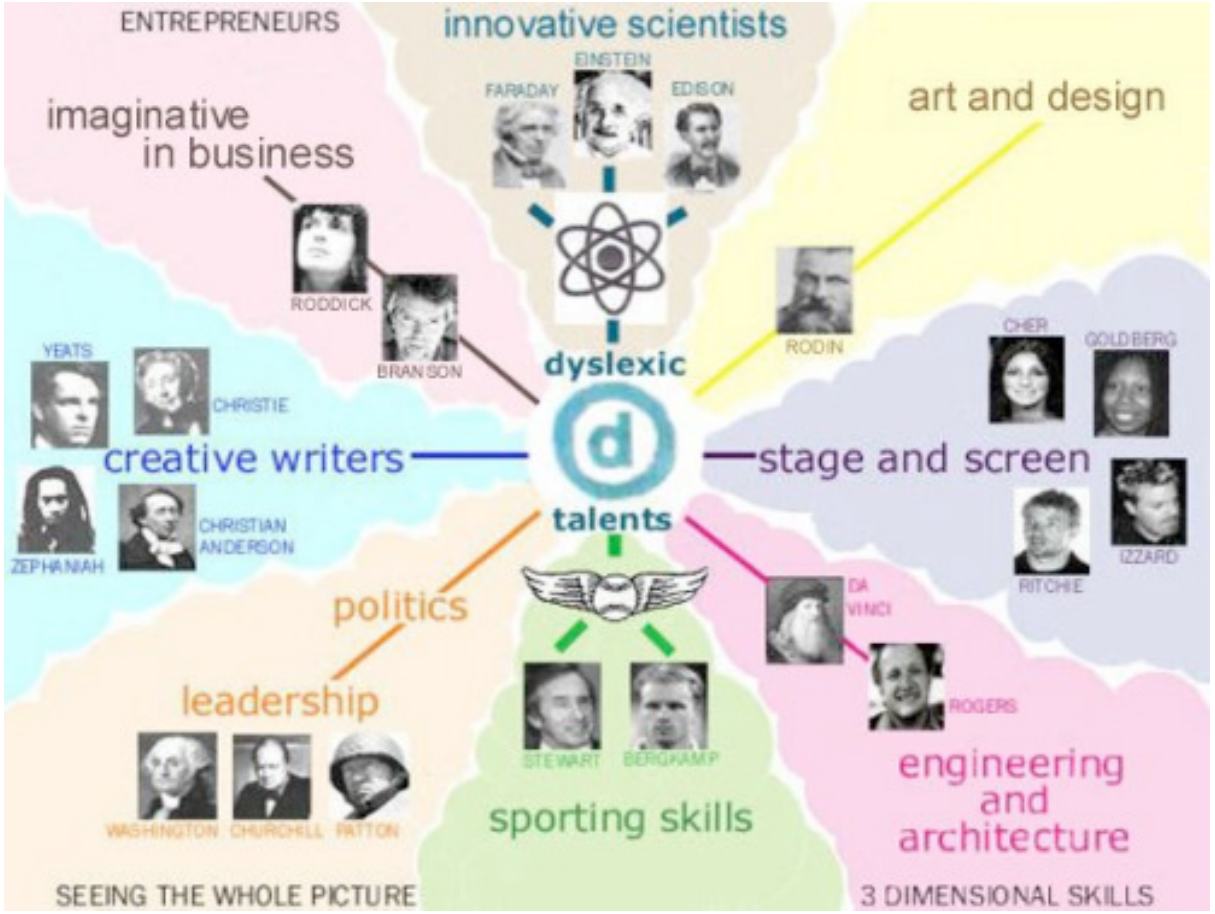
Read More

Is dyslexia a gift?

PRO The notion that dyslexia imparts cognitive strengths is a pillar for a movement celebrating dyslexia's advantages and asserting that the brains of people with dyslexia are *different, not defective.*

This premise can be a lifeline of hope for parents and students drowning in the academic challenges that often overwhelm learners with dyslexia. Hope—the promise of reaching a distant shore—can make a world of difference.

The parade of "celebrity dyslexics" marching through most stories about dyslexia in the popular press helps impart that hope and highlight dyslexia's hypothesized upsides.


ENTREPRENEURS
innovative scientists
EINSTEIN
FARADAY
EDISON
art and design
imaginative in business
RODDICK
BRANSON
RODIN
dyslexic
YEATS
CHRISTIE
CHER
GOLDBERG
creative writers
stage and screen
talents
ZEPHANIAH
CHRISTIAN ANDERSON
IZZARD
RITCHIE
politics
DA VINCI
ROGERS
leadership
STEWART
BERGKAMP
WASHINGTON
CHURCHILL
PATTON
sporting skills
engineering and architecture
SEEING THE WHOLE PICTURE
3 DIMENSIONAL SKILLS

Dyslexia as a gift, neuromyth?

What is a Neuromyth?

Dispelling the Myth: Training in Education or Neuroscience Decreases but Does Not Eliminate Beliefs in Neuromyths

Kelly Macdonald[1], Laura Germine[2], Alida Anderson[3], Joanna Christodoulou[4] and Lauren M. McGrath[5*]

[1]Department of Psychology, University of Houston, Houston, TX, United States
[2]Department of Psychiatry, McLean Hospital, Harvard Medical School, Belmont, MA, United States
[3]School of Education, American University, Washington, DC, United States
[4]Communication Sciences and Disorders, MGH Institute of Health Professions, Charlestown, MA, United States
[5]Department of Psychology, University of Denver, Denver, CO, United States

Neuromyths

- Neuromyths are misconceptions about brain research and its application to education and learning. Previous research has shown that these myths may be quite pervasive among educators, but less is known about how these rates compare to the general public or to individuals who have more exposure to neuroscience.
- Neuromyth survey responses and demographics were gathered via an online survey hosted at TestMyBrain.org.

#	Item	Answer
1	We use our brains 24 h a day	True.
2	It is best for children to learn their native language before a second language is learned	False.
3	Boys have bigger brains than girls, on average	True.
4	If students do not drink sufficient amounts of water, their brains shrink	False.
5	When a brain region is damaged, other parts of the brain can take up its function	True.
6	We only use 10% of our brain.	False.
7	The left and right hemispheres of the brain work together	True.
8	Some of us are "left-brained" and some are "right-brained" and this helps explains differences in how we learn	False.
9	The brains of boys and girls develop at different rates	True.
10	Brain development has finished by the time children reach puberty	False.
11	There are specific periods in childhood after which certain things can no longer be learned	False.
12	Information is stored in the brain in networks of cells distributed throughout the brain	True.
13	Learning is due to the addition of new cells to the brain	False.
14	Individuals learn better when they receive information in their preferred learning style (e.g., auditory, visual, kinesthetic)	False.
15	Learning occurs through changes to the connections between brain cells	True.
16	Academic achievement can be negatively impacted by skipping breakfast	True.
17	A common sign of dyslexia is seeing letters backwards	False.
18	Normal development of the human brain involves the birth and death of brain cells	True.
19	Mental capacity is genetic and cannot be changed by the environment or experience	False.
20	Vigorous exercise can improve mental function	True.
21	Children must be exposed to an enriched environment from birth to three years or they will lose learning capacities permanently	False.
22	Children are less attentive after consuming sugary drinks and/or snacks	False.
23	Circadian rhythms ("body-clock") shift during adolescence causing students to be tired during the first lessons of the school day	True.
24	Exercises that rehearse coordination of motor-perception skills can improve literacy skills	False.
25	Extended rehearsal of some mental processes can change the structure and function of some parts of the brain	True.
26	Children have learning styles that are dominated by particular senses (i.e., seeing, hearing, touch)	False.
27	Learning problems associated with developmental differences in brain function cannot be improved by education	False.
28	Production of new connections in the brain can continue into old age	True.
29	Short bouts of motor coordination exercises can improve integration of left and right hemisphere brain function	False.
30	There are specific periods in childhood when it's easier to learn certain things	True.
31	When we sleep, the brain shuts down	False.
32	Listening to classical music increases children's reasoning ability	False.

Adapted from Dekker et al. (2012).

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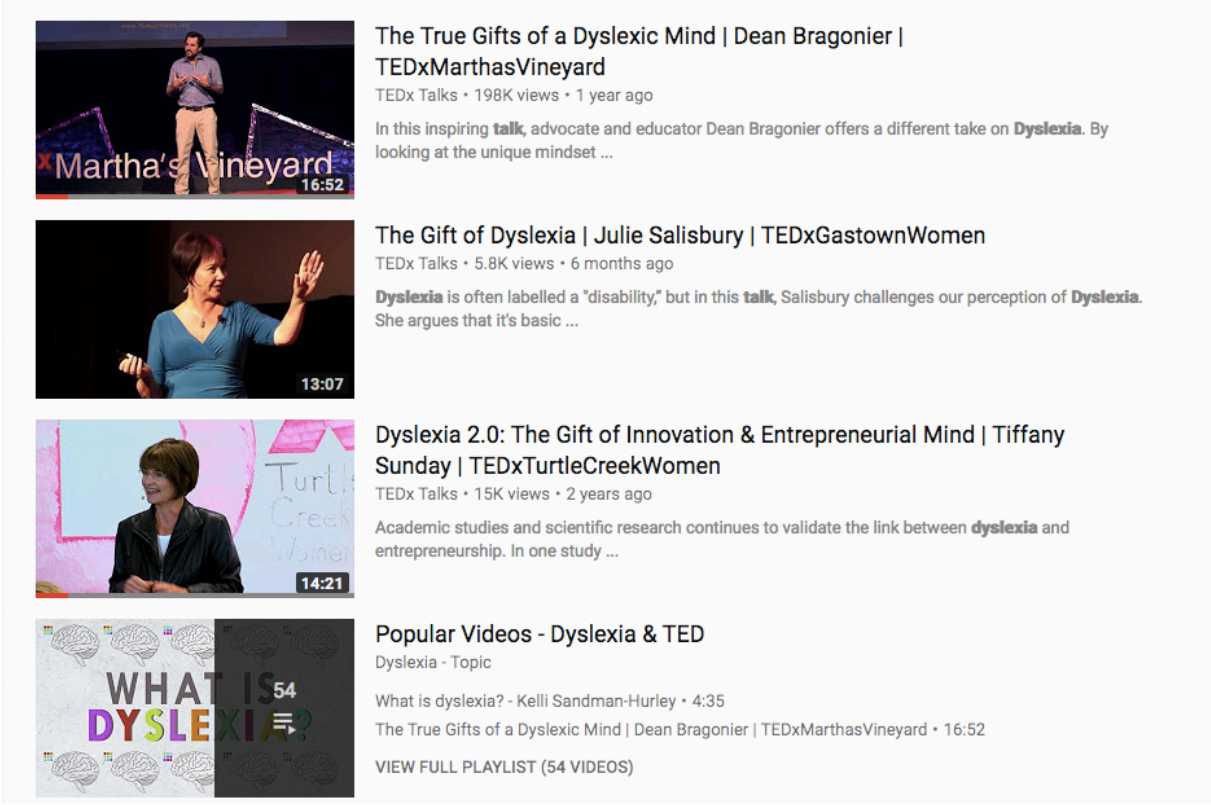
Adapted from Dekker et al. (2012).

Neuromyth Survey Results

- Results indicated that a core group of 7 “classic” neuromyths factored together (items related to learning styles, dyslexia, the Mozart effect, the impact of sugar on attention, right-brain/ left-brain learners, and using 10% of the brain).
- The general public endorsed the greatest number of neuromyths (*M* = 68%), with significantly fewer endorsed by educators (*M* = 56%), and still fewer endorsed by the high neuroscience exposure group (*M* = 46%).
- The two most commonly endorsed neuromyths across all groups were related to learning styles and dyslexia.
- The dyslexia neuromyth (a common sign of dyslexia is seeing letters backwards) was indorsed 76% by the general public, 59% by educators, and 50% by high neuroscience individuals.

Dyslexia as a gift, neuromyth?

“Ted Talks” Supporting Dyslexia as a Gift



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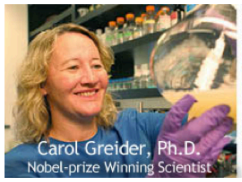
The Yale Center for Dyslexia & Creativity

ABOUT | HAVE DYSLEXIA? | FOR PARENTS | FOR EDUCATORS | POLICY & ADVOCACY | SUCCESSFUL DYSLEXICS

An Index of Successful Dyslexics



Actors, Performers & Producers

- Nelsan Ellis
- Whoopi Goldberg
- Brian Grazer
- Jay Leno
- Fred Newman
- Roger Ross Williams
- Henry Winkler

Artists, Architects & Designers

- Samuel Botero
- Jerry Pinkney
- Richard Rogers
- Willard Wigan

Entrepreneurs & Executives

- Carol Moseley Braun
- Nancy Brinker
- Tom Cavanaugh
- Ari Emanuel
- Daymond John
- Steve Mariotti
- Douglas Merrill
- Charles Schwab
- Patrick Whaley

Explorers

- Ann Bancroft
- Jack Horner

Scientists

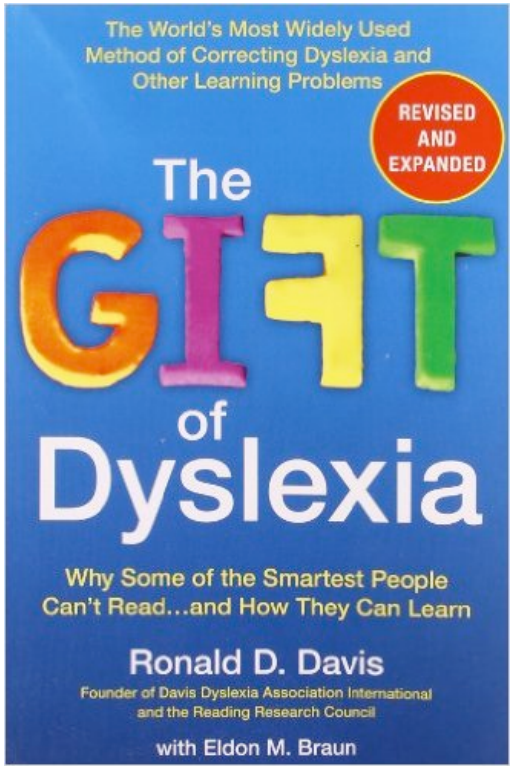
- Maggie Aderin-Pocock, Ph.D.
- Carol Greider, Ph.D.
- Jack Horner

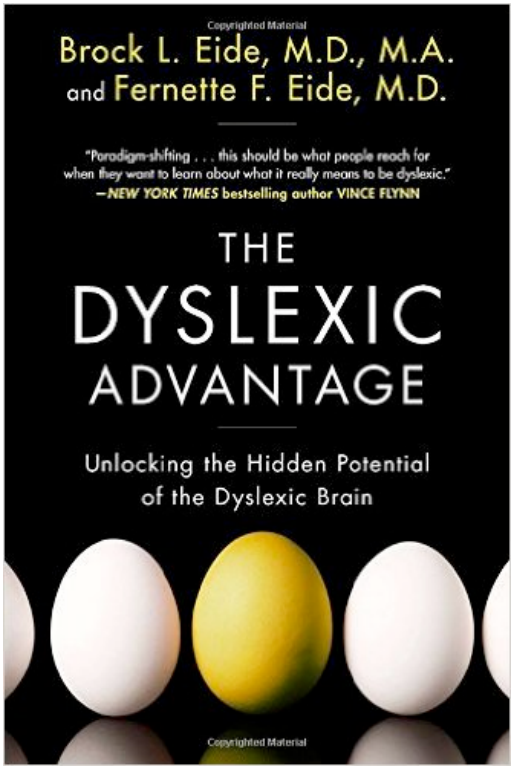
Teachers

- Liz Ball
- Steve Mariotti
- David Schenck

Sports Personalities

- Meryl Davis
- Brent Sopel
- Sir Jackie Stewart
- Joe Whitt, Jr.


The World's Most Widely Used Method of Correcting Dyslexia and Other Learning Problems
REVISED AND EXPANDED
The GIFT of Dyslexia
Why Some of the Smartest People Can't Read...and How They Can Learn
Ronald D. Davis
Founder of Davis Dyslexia Association International and the Reading Research Council
with Eldon M. Braun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Brock L. Eide, M.D., M.A.
and Fernette F. Eide, M.D.
"Paradigm-shifting . . . this should be what people reach for when they want to learn about what it really means to be dyslexic."
—NEW YORK TIMES bestselling author VINCE FLYNN
THE DYSLEXIC ADVANTAGE
Unlocking the Hidden Potential of the Dyslexic Brain
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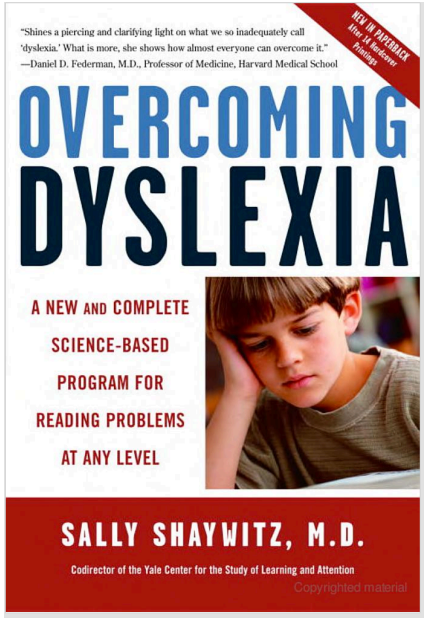
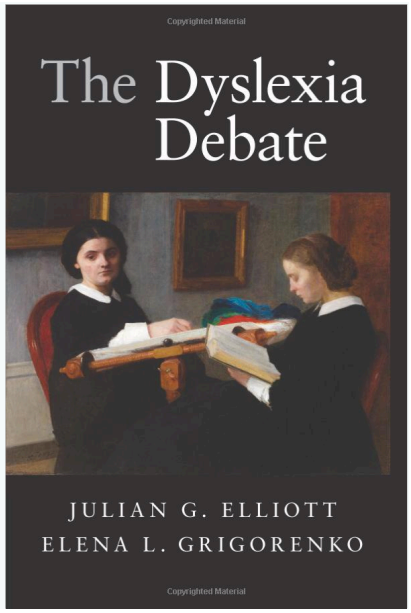
"Dyslexics think differently. They are intuitive and excel at problem solving, seeing the big picture, and simplifying. They feast on visualizing, abstract thinking, and thinking out of the box. They are poor rote reciters but inspired visionaries" (Shaywitz, 2003).

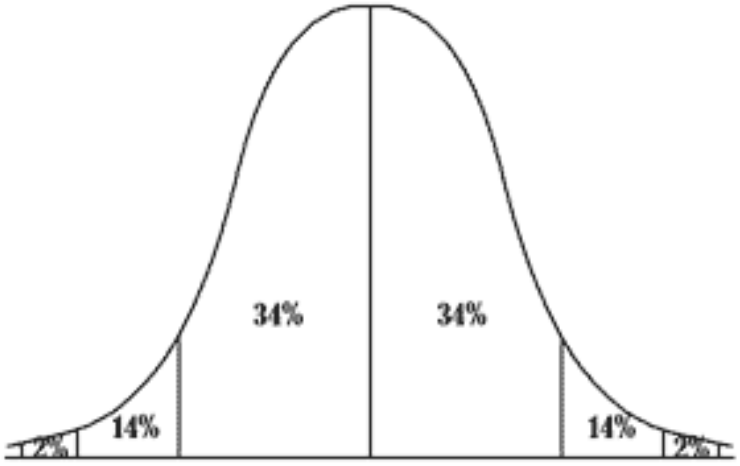


"The great attraction of a diagnostic label that not only decoupled intelligence and reading ability but is also suggestive of high-level intellectual functioning is understandable. The frequent references in the media to gifted dyslexics (e.g., Albert Einstein, Thomas Edison, and Winston Churchill) merely feed this perception" (Elliott & Grigorenko, 2014).



How should we think about this Scientifically?

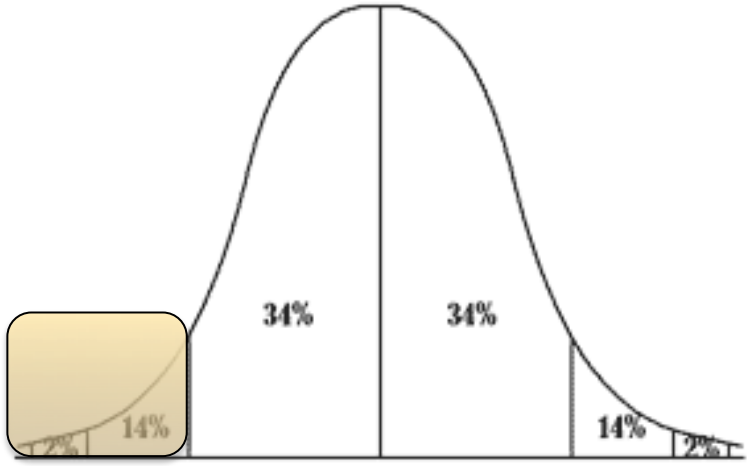
Dyslexia: A Profile of Strengths and Weaknesses within the **Population** or **Individual**?



Reading and Spelling Skill

Dyslexia: A Profile of Strengths and Weaknesses within the **Population** or **Individual**?

Dyslexia – A phonologically-based reading and spelling disorder



Reading and Spelling Skill

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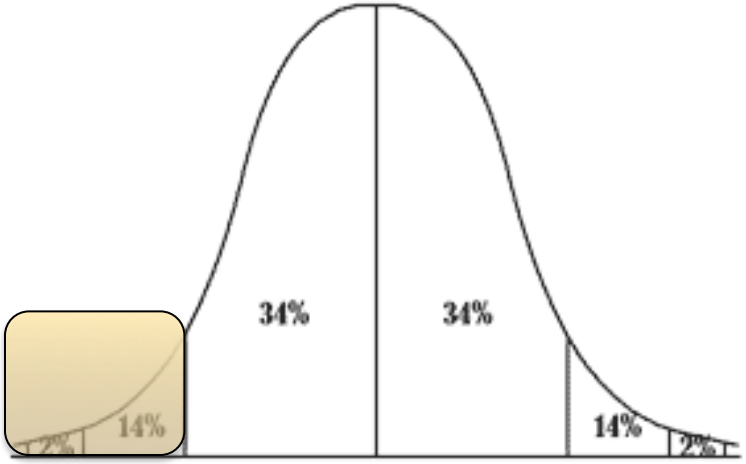
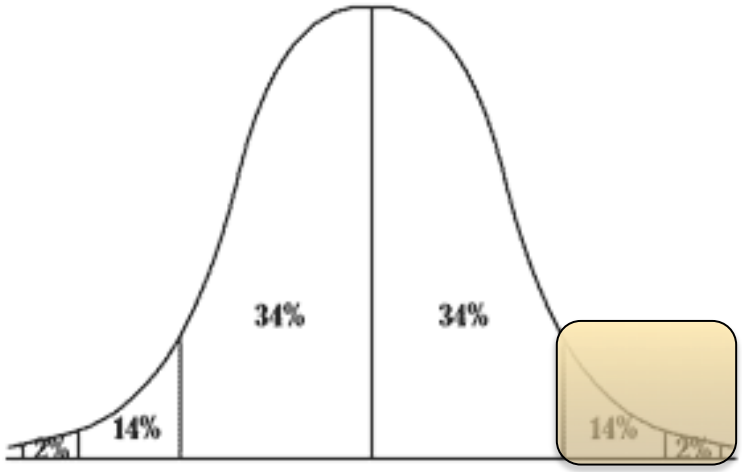


Reading and Spelling Skill

Creativity – the use of imagination or original ideas



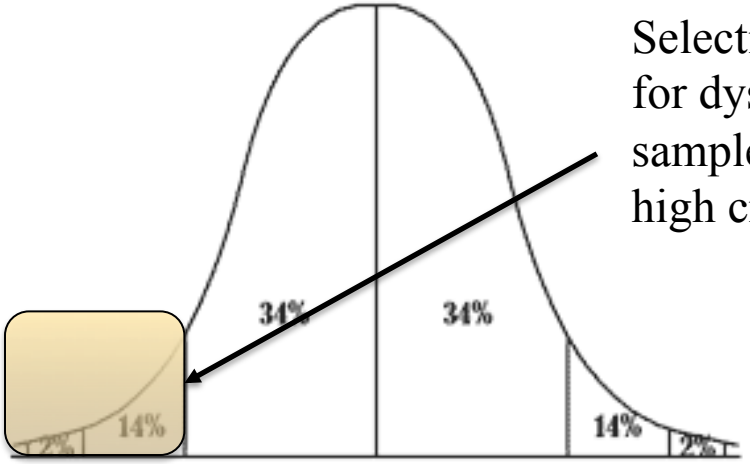
Creativity Skills

Dyslexia: A Profile of Strengths and Weaknesses within the **Population**?

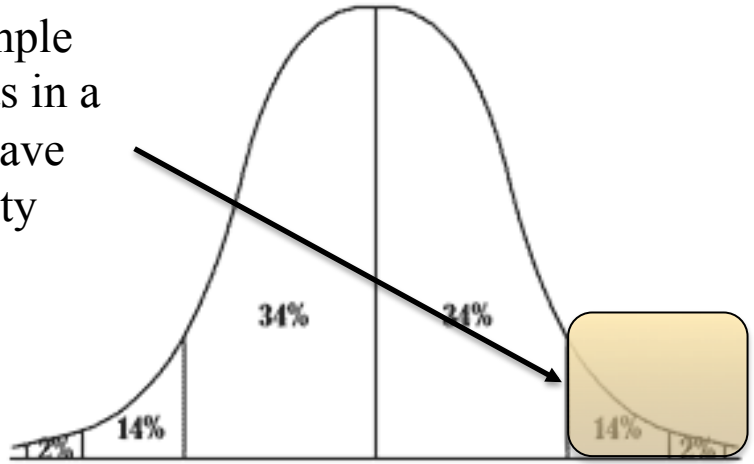
Dyslexia – A phonologically-based reading and spelling disorder

Creativity – the use of imagination or original ideas

Selecting on a sample for dyslexia results in a sample that also have high creative ability



Reading and Spelling Skill



Creativity Skills

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Dyslexia – A phonologically-based reading and spelling disorder

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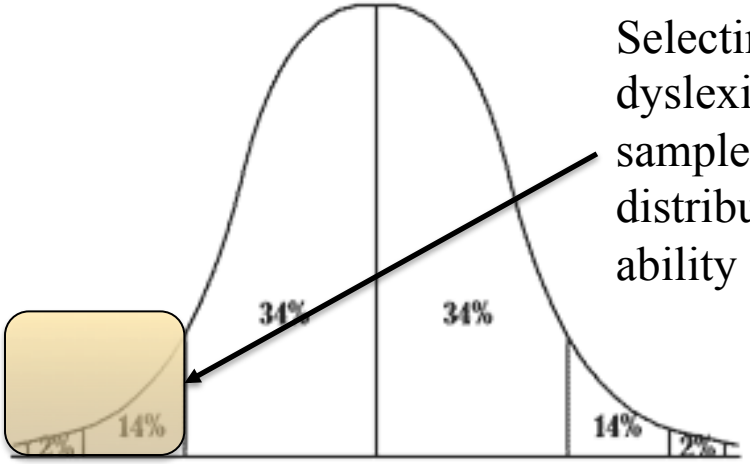
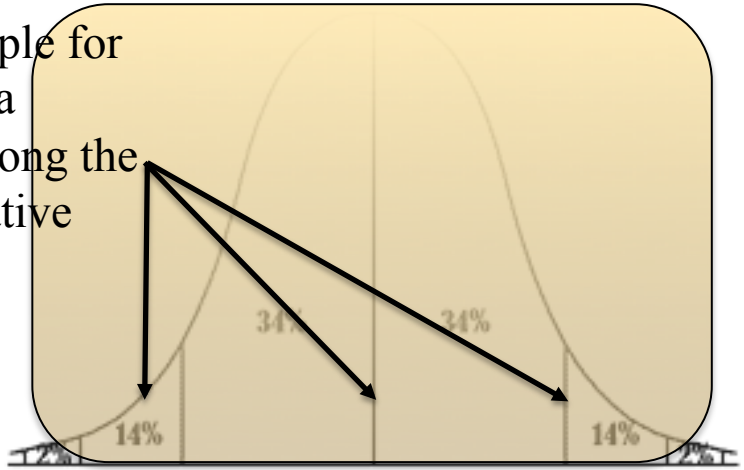


Selecting on a sample for dyslexia results in a sample that falls along the distribution of creative ability



Reading and Spelling Skill

Creativity Skills

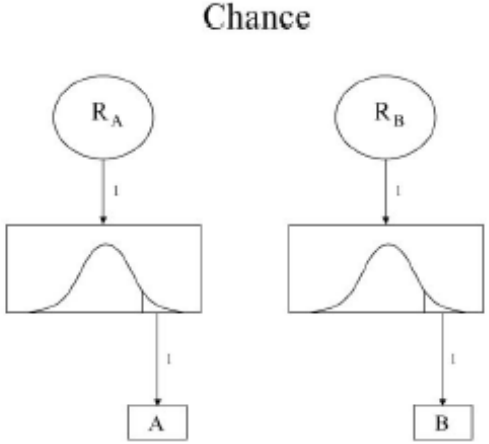
It's a Question of Co-morbidity

- **Comorbidity:** When individuals have two co-occurring disorders, we refer to them as comorbid for these disorders (Feinstein, 1970).
- A key issue pertains to the distinction between exceptionality as it occurs at the **individual** and exceptionality as applied to the **population**.
- If you believe comorbidity between dyslexia and giftedness is **individual-based** then the co-occurrence will be very low in the population (i.e., at chance rate).
- If you believe comorbidity between dyslexia and giftedness is **population-based** then the co-occurrence will be relatively high (i.e., above the rate of chance).
- In addition, if you believe in **population-based** comorbidity then it would seem reasonable that a set of cognitive skills, affective processes, and neuro circuits distinguish this group and cause the **double** exceptional skills.

Exploring 3 Models of Comorbidity

- **Chance Model**
  - Under the chance model, the liability factors are uncorrelated (i.e., $r = 0$), and comorbid cases occur purely by chance.
- **Correlated Liabilities Model**
  - Under the correlated liabilities model, the liability factors are correlated at some level (i.e., $0 < r < 1$), and comorbid cases reflect the correlation between these liabilities. As the correlation increases the chance of comorbidity increases.
- **Causal Model**
  - In directional causation models, one disorder causes the other. Causation models differ from the associated liabilities models in that comorbidity results not from the nature or expression of liability patterns, but rather from the direct influence of one disorder on another.

Chance Model

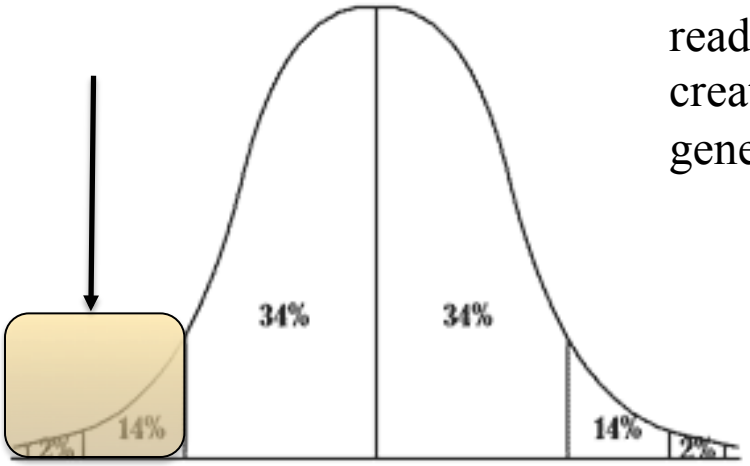


Possible Pathways for the Diagnosis of A only, B only, and AB

A only	above threshold on R_A and below threshold on R_B
B only	below threshold on R_A and above threshold on R_B
AB	above threshold on R_A and R_B

Chance Comorbidity Model Relating Dyslexia and Creativity

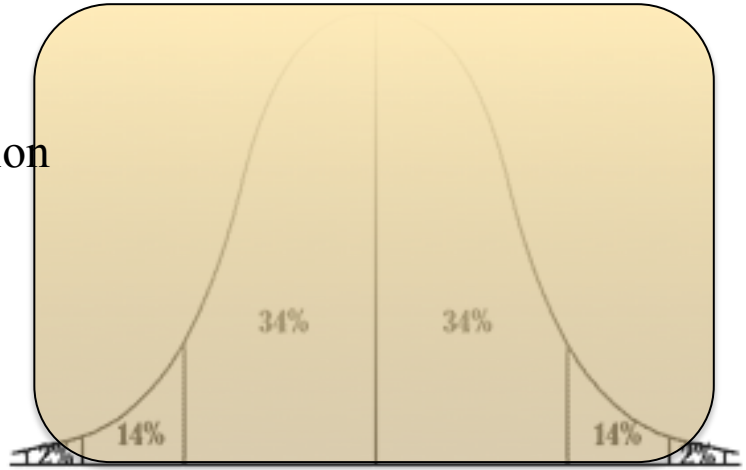
Dyslexia



Reading and Spelling Skill

Assumes no correlation between reading and creativity in the general population

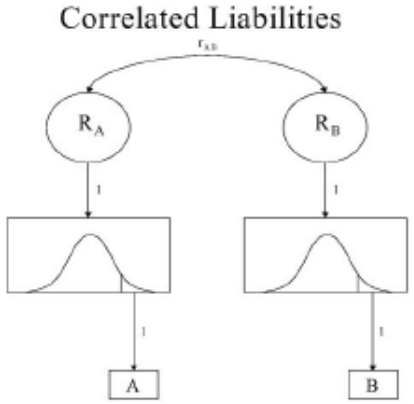
Creativity



Creativity Skills

Chance

Correlated Liabilities Model



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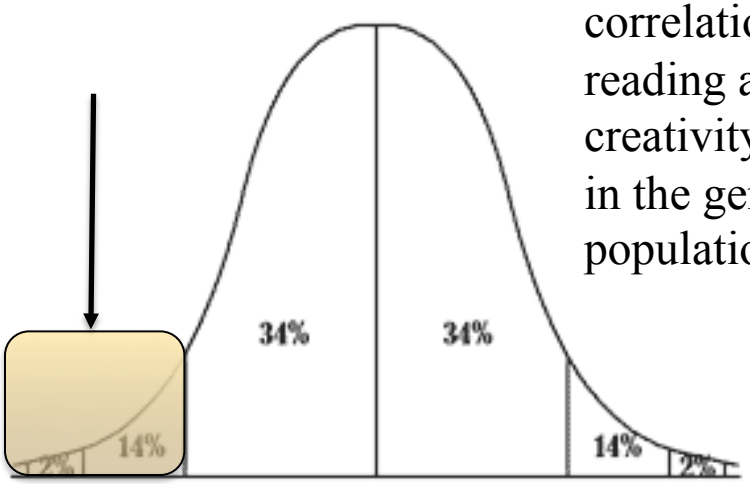
Correlated Liabilities Comorbidity Model Relating Dyslexia and Creativity

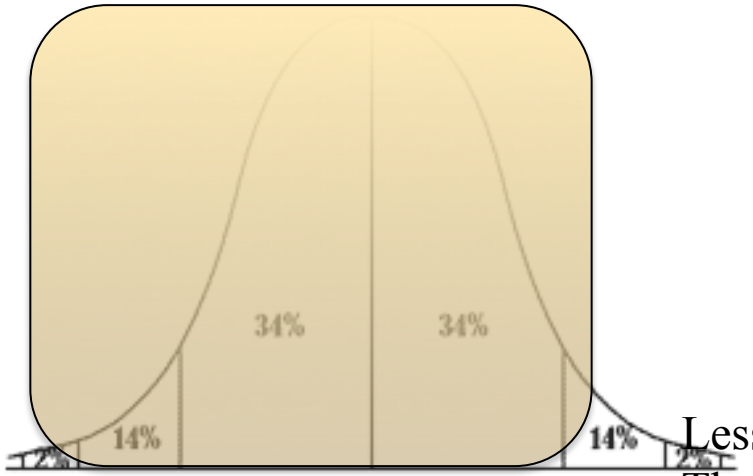
Dyslexia



Reading and Spelling Skill

Assuming the correlation between reading and creativity is positive in the general population

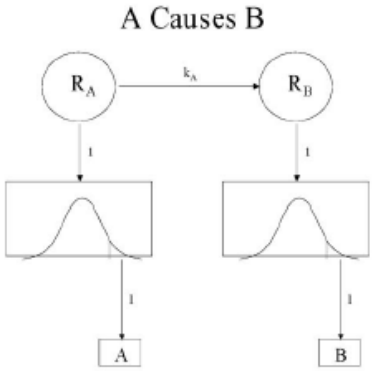
Creativity



Creativity Skills

Less Than Chance

Causal Model

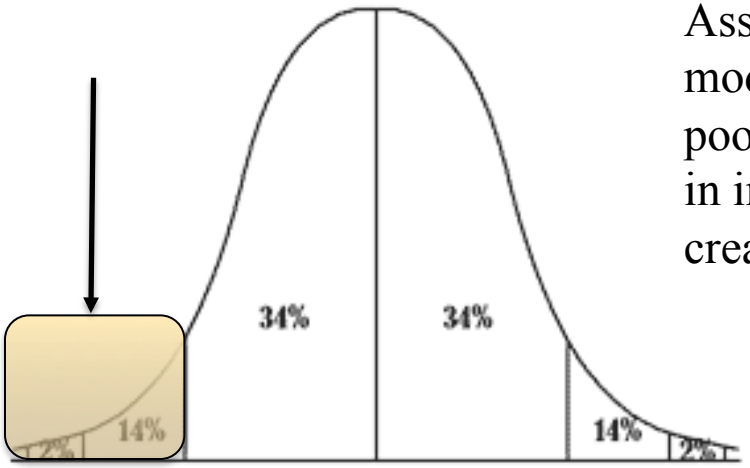


Possible Pathways for the Diagnosis of A only, B only, and AB

A only	above threshold on R_A and below threshold on R_B
B only	below threshold on R_A and above threshold on R_B
AB	1. above threshold on R_A and R_B by chance 2. above threshold score R_A leading to above-threshold score on B

Causal Comorbidity Model Relating Dyslexia and Creativity

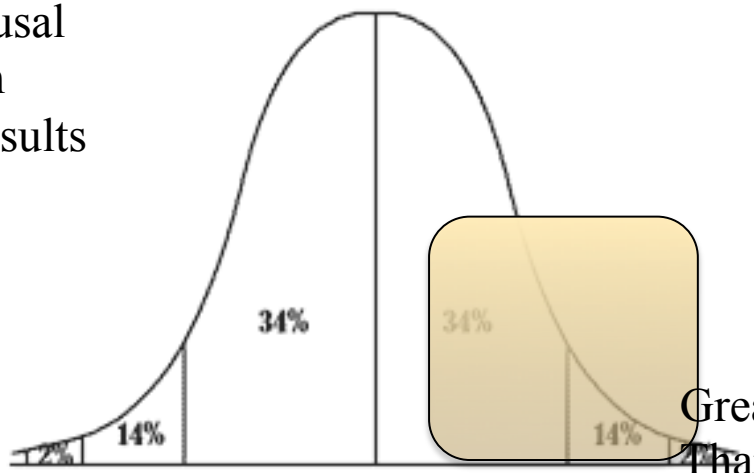
Dyslexia



Reading and Spelling Skill

Assuming a causal model in which poor reading results in increased creativity

Creativity



Creativity Skills

Greater Than Chance

Example: Comorbidity Between RD and ADHD

- Reading disorder (RD) and attention-deficit/hyperactivity disorder (ADHD) are two of the most common developmental disorders of childhood, each occurring in approximately 5% of the population (American Psychiatric Association, 1994; Shaywitz et al., 1990).
- The correlation between reading and attention in the population of elementary-age children ranges from .35-.40 (Willcutt).
- ADHD and RD also co-occur significantly more frequently than expected by chance. Specifically, the rate of RD in samples selected for ADHD typically falls between 25–40% (e.g., August and Garfinkel, 1990; Semrud-Clikeman et al., 1992), whereas 15–35% of individuals with RD also meet criteria for ADHD (Gilger et al., 1992; Shaywitz et al., 1995).
- Moreover, this comorbidity is present in both clinical and community samples, indicating that it is not a selection artifact.

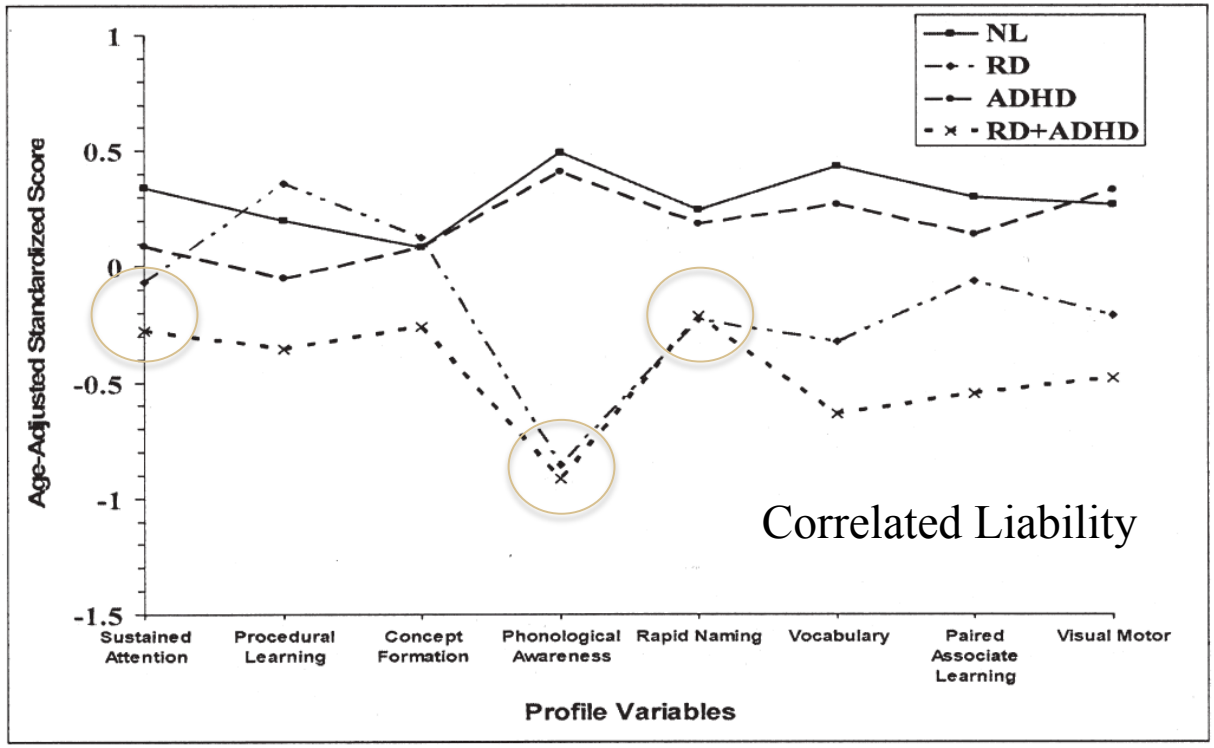


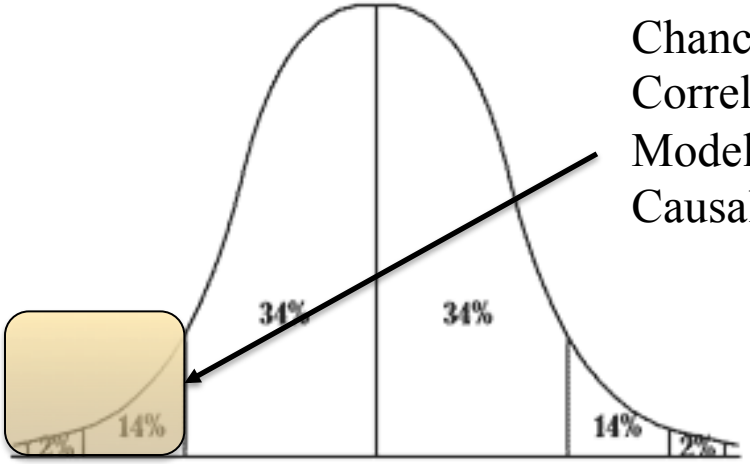
FIGURE 2. Cognitive profiles of typical achievers (NL), only reading disabilities (RD), only attention-deficit/hyperactivity disorder (ADHD), and both RD and ADHD.

Plausible Models to Describe this Pattern

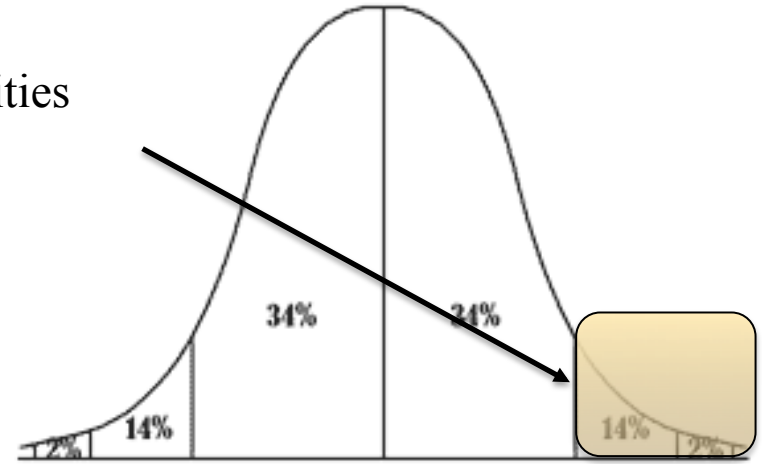
Dyslexia – A phonologically-based reading and spelling disorder

Creativity – the use of imagination or original ideas

Chance Model
Correlated Liabilities Model
Causal Model



Reading and Spelling Skill



Creativity Skills

Plausible Models to Describe this Pattern

- **Chance Model:** favors comorbidity between dyslexia and giftedness that is **individual-based,** the co-occurrence will be very low in the population (i.e., at chance rate).
  - There **will not** be a common set of underlying cognitive skills, affective processes, and neuro circuits that distinguish this group who have **double** exceptional skills.
- **Causal Model:** favors comorbidity between dyslexia and giftedness that is **population-based,** the co-occurrence will be relatively high (i.e., well above the rate of chance).
  - There **will** be a common set of underlying cognitive skills, affective processes, and neuro circuits distinguish this group and cause the **double** exceptional skills.

We Must Remember

- There are methodological threats to accurately estimating comorbidity rates.
- Comorbidity rates are based on **population** co-occurrence rates and are therefore affected by sampling procedures.
  - When subjects are ascertained through hospital/clinic records or other "enriched" sources, several types of sampling bias may adversely affect results.
  - In addition, how we define dyslexia and creativity can increase or decrease the probability of identifying comorbid individuals.
- Finally, if one chooses the 16%-tile for dyslexia and the 84%-tile for creativity then the comorbidity chance rate for the dual exceptionality would be about 3% of the population at large (.16 x .16 x 100 = 2.56%).

What Do We Need

- Population studies examining the comorbidity between dyslexia and other skills of interest (e.g., creativity).
- Included would be careful measurement of the important cognitive and affective variables thought to underlie comorbidity.
- Random sampling procedures and numbers large enough to allow accurate estimation of the number of dyslexics that potentially have “double exceptionality” and estimate the occurrence in the population.

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Thank You!