Understanding, Evaluating, and Treating Disruptive Mood Dysregulation Disorder in Childhood A Brief History of Executive Functioning Educational Settings

Sam Goldstein, PhD

Neurology, Learning, and Behavior Center

www.samgoldstein.com

www.samgoldstein.com
info@samgoldstein.com
@drsamgoldstein
@doctorsamgoldstein
@CommonSenseScience
TRUTH. @CommonSenseScience

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Sam obtained his Ph.D. in School Psychology from the University of Utah and is licensed as a Psychologist and Certified School Psychologist in the State of Utah. He is also board certified as a Pediatric Neuropsychologist and listed in the Council for the National Register of Health Service Providers in Psychology. He is a Fellow of the American Psychological Association and the National Academy of Neuropsychology. Sam is an Adjunct Assistant Professor in the Department of Psychiatry at the University of Utah School of Medicine. He has authored, co-edited, or co-authored over 50 clinical and trade publications, three dozen chapters, nearly three dozen peer-reviewed scientific articles, and eight psychological and neuropsychological tests. He is in development for a behavioral assessment tool to evaluate DMDD. His clinical volume about DMDD was just published by Springer. Sam is the former Editor in Chief of the *Journal of Attention Disorders*. Since 1980, he has served as the Clinical Director of the Neurology, Learning, and Behavior Center in Salt Lake City, Utah.

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Relevant Disclosure

- Author of the Disruptive Mood Questionnaire
- Co-author: Tenacity in Children
- Editor of Handbook of DMDD
- Coauthor: CEFI, ASRS, RSI, CAS 2 and RISE
- Coauthor: Handbook of DSM 5 in Children
- Coauthor: Handbook of Executive Functioning
- Compensated Speaker

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Objectives

- **Define Executive Functioning**: Explain the concept of executive functioning and its core components, such as working memory, cognitive flexibility, and inhibitory control.
- **Explore Historical Origins**: Discuss the early research and theories that laid the foundation for understanding executive functioning, including contributions from psychology and neuroscience.
- **Examine Key Developments**: Highlight significant milestones in the study of executive functioning, such as advancements in brain imaging and cognitive assessment.
- **Link to Everyday Behavior**: Illustrate how executive functioning impacts daily tasks, decision-making, and self-regulation across different life stages.
- **Address Modern Implications**: Touch on current trends and challenges in executive functioning research, including its relevance in education, mental health, and productivity.

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What do we mean by the term Executive Function(s)?

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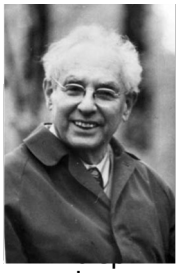
Executive Function (s)

- In 1966 Alexander Luria first wrote and defined the concept of Executive Function (EF)
- He credited Bianchi (1895) and Bekhterev (1905) with the initial definition of the process



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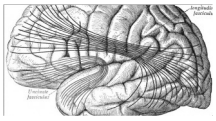
What is Executive Function(s)

There is no formal excepted definition of EF

- We typically find a vague general statement of EF (e.g., goal-directed action, cognitive control, top-down inhibition, effortful processing, etc.).
- Or a listing of the constructs such as
  - Inhibition,
  - Working Memory,
  - Planning,
  - Problem-Solving,
  - Goal-Directed Activity,
  - Strategy Development and Execution,
  - Emotional Self-Regulation,
  - Self-Motivation



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Does Experience Shape EF?

- The Family Life Project has demonstrated that poverty is associated with elevated cortisol in infancy and early childhood.
- This association is mediated through characteristics of the household.
- Parenting sensitivity mediates the relationship between poverty and stress physiology.
- In combination parenting sensitivity and elevated cortisol mediate the association between poverty and poor EF in children.

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What Neural Activities Require EF?

- Those that involve planning or decision making.
- Those that involve error correction or troubleshooting.
- Situations when responses are not well-rehearsed or contain novel sequences of actions.
- Dangerous or technically difficult situations.
- Situations that require the overcoming of a strong habitual response or resisting temptation.

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Goldstein, Naglieri, Principotta, & Otero (2013)

- We found more than 30 definitions of EF(s).
- Executive function(s) has come to be an umbrella term used for many different abilities, including planning, working memory, attention, inhibition, self-monitoring, self-regulation and initiation carried out by pre-frontal areas of the frontal lobes.

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What is Executive Function(s)

1. Barkley (2011): "EF is thus a **self-directed set of actions**)" (p. 11).
2. Dawson & Guare (2010): "Executive skills allow us **to organize our behavior over time**" (p. 1).
3. Delis (2012): "Executive functions reflect the **ability to manage and regulate one's behavior** (p. 14).

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What is Executive Function(s)

4. Denckla (1996): "EF (is) a set of **domain-general control processes**…" (p. 263).
5. Gioia, Isquith, Guy, & Kenworthy (2000): "a **collection of processes that are responsible for guiding, directing, and managing cognitive, emotional, and behavioral functions**" (p. 1).

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What is Executive Function(s)

6. Pribram (1973): "**executive programmes …to maintain brain organization** " (p. 301).
7. Roberts & Pennington (1996): EF "**a collection of related but somewhat distinct abilities such as planning, set maintenance, impulse control, working memory, and attentional contro**l" (p. 105).

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What is Executive Function(s)

8. Stuss & Benson (1986): "**a variety of different capacities that enable purposeful, goal-directed behavior, including behavioral regulation, working memory, planning and organizational skills, and self-monitoring**" (p. 272).
9. Welsh and Pennington (1988): "the **ability to maintain an appropriate problem-solving set for attainment of a future goal**" (p. 201).

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What is Executive Function(s)

10. McCloskey (2006): "a **diverse group of highly specific cognitive processes collected together to direct cognition, emotion, and motor activity,** including …the **ability to engage in purposeful, organized, strategic, self-regulated, goal directed behavior**" (p. 1)

"think of executive functions as a set of independent but coordinated processes rather than a single trait" (p. 2).

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What is Executive Function(s)

11. . Lezak (1995): "**a collection of interrelated cognitive and behavioral skills that are responsible for purposeful, goal-directed activity**," …"**how and whether a person goes about doing something**" (p. 42).

12. Luria (1966): "… **ability to correctly evaluate their own behavior and the adequacy of their actions**" (p. 227).

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Executive Function(s)

Given all these definitions of EF(s) we wanted to address the question…

Executive Function***s …*** or
Executive Function?

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Executive Function(s)

- One way to examine this issue is to research the factor structure of behaviors related to EF(s)
- To do so, we examined the factor structure of a nationally representative sample of children.
- We conducted a series of research studies to answer the following question:
  - What is the underlying structure of EF behaviors?
  - Is there is just one underlying factor called Executive Function), or do the behaviors group together into different constructs suggesting a multidimensional structure?

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Exploratory Factor Analyses

- Both item-level and scale-level exploratory factor analyses (EFA) were conducted.
- The normative samples for parents, teacher, and self ratings were randomly split into two samples and EFA conducted using
  - the item raw scores
  - nine scales' raw scores
- We used a standardization sample from our instrument the Comprehensive Executive Functioning Inventory (CEFI).

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CEFI Standardization

- Sample was stratified by
  - Sex, age, race/ethnicity, parental education level (PEL; for cases rated by parents), geographic region
  - Race/ethnicity of the child (Asian/Pacific Islander, Black/African American/African Canadian, Hispanic, White/Caucasian, Multi-racial by the rater
  - Parents provided PEL of both parents
    - The higher of the two levels was used to classify the parental education level of the child.
  - All raters completed the questionnaire via paper-and-pencil or online methods.

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Exploratory Factor Analyses

- For the *first half* of the normative sample using item scores: EFA of the 90 items was conducted
- The scree plot test and the very simple solution criterion both indicated that only **one factor** should be retained.
- The ratio of the first and second eigenvalues was greater than four for all three forms, which is a common rule to support a **one factor solution.**

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CEFI Standardization Samples

- Sample was stratified by
  - Sex, age, race/ethnicity, parental education level (PEL; for cases rated by parents), geographic region
  - Race/ethnicity of the child (Asian/Pacific Islander, Black/African American/African Canadian, Hispanic, White/Caucasian, Multi-racial by the rater
  - Parent (N=1,400), Teacher (N=1,400) and Self (N=700) ratings were obtained

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Item Factor Analyses – Part 1

- For the *first half* of the normative sample for Parent, Teacher and Self ratings' **item scores** (90 items) was analyzed using exploratory factor analysis
- The *scree plots* and the *very simple solution* criterion both indicated that only **one factor**.
- The *ratio of the first and second eigenvalues* was greater than four for all three forms, which indicated a **one factor solution.**

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Item Factor Analyses – Part 1

- Item level factor analysis clearly indicted that one factor was the best solution

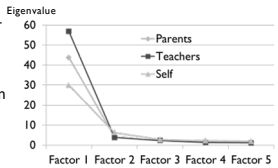

Table 8.2. Eigenvalues from the Inter-Item Correlations

	Factor						
Form	1	2	3	4	5	6	7
Parent	43.7	4.1	2.3	1.5	1.3	1.3	1.0
Teacher	56.8	3.8	2.3	1.3	1.1	1.1	0.8
Self-Report	29.9	6.3	2.7	2.1	1.9	1.8	1.5

Note. Extraction = Principal Axis Factoring. Only the first 10 eigenvalues are presented.

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Scale Factor Analyses – Part 2

- Using the *second half* of the normative sample EFA was conducted using raw scores for the Attention, Emotion Regulation, Flexibility, Inhibitory Control, Initiation, Organization, Planning, Self-Monitoring, and Working Memory scales
- Both the Kaiser rule (eigenvalues > 1) *and* the Eigenvalue Ratio criterion (> 4) unequivocally indicated **one factor**.

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Item Factor Analyses – Part 1

- Scale level factor analysis clearly indicted that one factor was the best solution

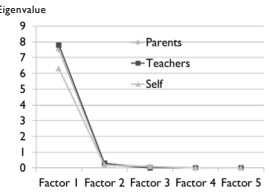

Table 8.4. Eigenvalues of the CEFI Scales Correlations

	Factor						
Form	1	2	3	4	5	6	7
Parent	7.5	0.2	0.0	0.0	0.0	0.0	0.0
Teacher	7.8	0.3	0.0	0.0	0.0	0.0	0.0
Self-Report	6.3	0.2	0.1	0.0	0.0	0.0	-0.1

Note. Extraction method: Prg.

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Our Conclusion. . .

The concept of Executive Function is best defined as a unitary construct….how you do what you do.

He got in it and he drew up the covers.

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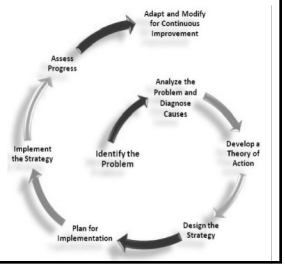
Naglieri & Goldstein, 2012

Executive Function is how efficiently you do what you decide to do.



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EF as a Mediator of Ability and Knowledge

- Ability: The skills we use to acquire and manipulate knowledge to solve problems. Also referred to as intelligence.
- Knowledge: Everything we learn in life. Also referred to as achievement.
- Executive Function: How efficiently or skillfully you do what you decide to do.

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Executive Functioning: The Foundation for Managing Stress, Achieving Goals, and Navigating Life's Challenges.

- Good executive functioning supports **mental health** by helping individuals manage stress, emotions, and impulsive behaviors effectively.
- It enhances **socialization** by enabling better control over reactions, facilitating positive interactions and relationships.
- Strong executive functioning is key to **achievement** as it improves planning, organization, and goal-setting.
- It plays a critical role in **cognitive functioning**, aiding in attention, memory, and problem-solving.
- Good executive functioning promotes **adaptive behavior**, allowing individuals to adjust to new situations and challenges smoothly.

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Conclusions

- The concept of EF is evolving.
- Data from the CEFI Standardization indicate that when measured using observable behaviors the term Executive Function is supported.
- The CEFI provides a well normed measure of EF that has demonstrated reliability & validity.
- There is emerging evidence that children can be taught to be more strategic – an important indication of good EF behavior and outcome.

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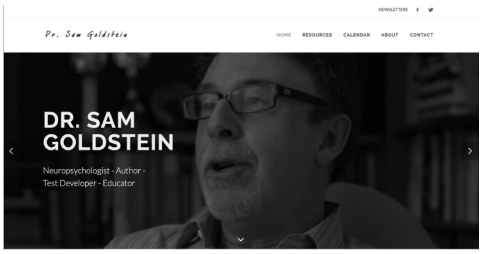

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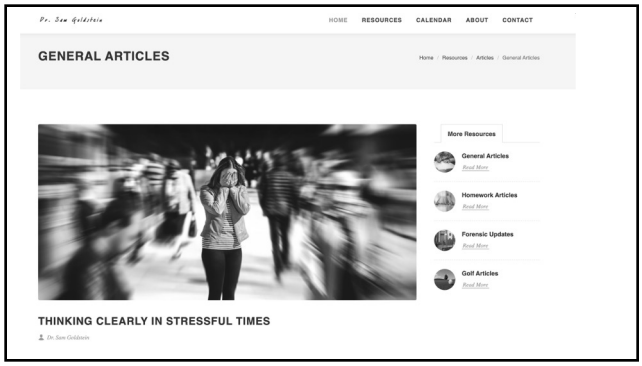

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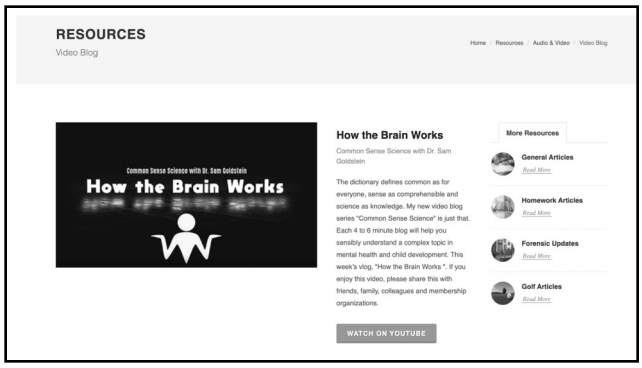
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