



Executive Function Index (EFI) performance and risk factors for disordered eating



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ABSTRACT

We examined Executive Function Index (EFI) performance in individuals at risk ($n = 22$) for an eating disorder, based on the SCANS criteria. In comparison to those not at risk ($n = 104$; also based on the SCANS criteria), those at risk on SCANS were more likely to be depressed, anxious, and showed deficits in many components of EFI performance, including EFI impulse control and EFI total score. These results support previous work on executive function in those at risk for an eating disorder and highlight the use of the EFI as a tool for such investigation in this population.

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1. Introduction

In 2010, Scherr, Ferraro, and Weatherly showed that women at-risk for an eating disorder (based on the SCANS; Setting Conditions for Anorexia Nervosa Scale; Slade & Dewey, 1986) were more depressed, had lower motivation, displayed more empathy, were more anxious and had greater impulse behavior of urgency, as compared to women not at risk (Scherr, Ferraro & Weatherly, 2010). At-risk was defined as obtaining, on the SCANS, a dissatisfaction score greater than 42 and a perfectionism score greater than 22. Not at risk was defined as scoring at or below 42 and 22 on dissatisfaction and perfectionism (Slade & Dewey, 1986). While our at-risk subjects displayed higher urgency, which is consistent with greater impulse behavior, they did not show lower EFI impulse control or lower overall EFI total score performance.

Impulsivity is associated with eating disorders (Wade & Wildon, 2005). Specifically, deficits in executive functioning have been found to be related to impulsivity or mental flexibility (Cooper & Fairburn, 1992; Fassino et al., 2002; Green, Elliman, Wakeling, & Rogers, 1996; Tchanturia, Anderluh, et al., 2004 and Tchanturia, Morris, et al., 2004). People with anorexia nervosa are often less flexible when it comes to change. This lack of flexibility and resistance to change has been found to often effect the treatment and the recovery process of the patient (Tchanturia, Anderluh, et al., 2004). Thus, we should see differences

between at-risk and non-at-risk subjects on the impulse control subtest of the EFI (Spinella, 2005).

The EFI is a 27-item self-report measure of executive functioning with good internal consistency ($\alpha = .82$) and good convergent validity. It contains 5 subscales that were used to assess specific aspects of participants' executive functioning: Motivational Drive (MD), Impulse Control (IC), Empathy (EM), Organization (ORG) and Strategic Planning (SP), plus a total score. The EFI has demonstrated good internal consistency ($\alpha = .82$) and the subscales evidenced adequate reliability ($\alpha = .55$ to $.74$; Spinella, 2005).

We again employed the SCANS as a way to identify individuals at risk for an eating disorder. It shows good validity and reliability (Butler, Newton, & Slade, 1988) and has been used recently to examine the relationship between family functioning and risk for an eating disorder (Felker & Stivers, 1994; Lyke & Matsen, 2013). In the present study we wanted to revisit what impact being at-risk (or not) for an eating disorder has on executive function, as measured using the EFI. As in Scherr et al. (2010), we defined being at-risk as scoring greater than 42 on the Dissatisfaction (D) subscale of the SCANS and greater than 22 on the Perfectionism (P) subscale, as outlined in the original Slade and Dewey (1986) article. We defined not being at-risk with a more relaxed SCANS scoring method in which subjects could score greater than 42 on D and less than 22 on P (High D/Low P), lower than 42 on D and higher than 22 on P (Low D/High P), or lower than 42 on D and lower than 22 on P (Low D/Low P). This classification method increases our number of non-at-risk individuals, as compared to Scherr et al. (2010) from 21 to 104. Although our at-risk sample in the present study is 22 (was 41 in Scherr et al.), the addition of non-at-risk subjects increases our power of finding group differences. We expect to replicate Scherr

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et al. (2010) with the added prediction that at-risk subjects will also show deficits on EFI impulse control and EFI total score.

2. Methods

2.1. Participants

A total of 126 female college students (M age = 20.75, SD = 4.46) participated for extra credit in their psychology classes. Of this total, 22 scored higher than 42 on the Dissatisfaction subscale of the SCANS and higher than 22 on the Perfectionism subscale of the SCANS, thus identifying them as at-risk for an eating disorder (Slade & Dewey, 1986). The remaining 104 subjects scored in one of the three categories discussed previously (High D/Low P; Low D/High P; Low D/Low P) and were, thus, identified as not at-risk for an eating disorder.

2.2. Measures

Following reading and signing a consent form, subjects individually received the following instruments in a procedure that lasted approximately 1 h. These were preceded by a Background Information Questionnaire that asked date of birth, education level, self-rated health, medications currently taken, height and weight.

2.3. Setting Conditions for Anorexia Nervosa Scale (SCANS) (Slade & Dewey, 1986)

The SCANS is composed of 40 questions to measure the risk of that individual developing an eating disorder. The individual chooses, for each of the 40 questions, which answers best applied to him/her. The SCANS has two measures of perfectionism and dissatisfaction to determine if an individual is at risk for developing an eating disorder. Both total dissatisfaction scores greater than 42 and perfectionism scores greater than 22, indicate that an individual is at risk for developing an eating disorder. Scores lower than both 43 on dissatisfaction and 23 on perfectionism indicate a non-risk individual for developing an eating disorder. An individual may partially be at-risk for developing an eating disorder if he/she scores high on one measure and not the other.

2.4. Executive Function Index (EFI) (Spinella, 2005)

The EFI consists of 27 questions that assess an individual's executive functions in daily life. The individual answers each of the 27 questions on a 4 point scale, with "NOT AT ALL" and "VERY MUCH" as the two extremes. The EFI measures five areas associated with frontal lobe function (motivational drive, strategic planning, organization, impulse control, empathy, plus a total score). Higher scores indicate better frontal lobe functioning.

2.5. Wechsler Adult Intelligence Scale-Revised (Wechsler, 1981)

The WAIS-R is a brief measure of intelligence and measures participants' knowledge and comprehension of 35 vocabulary items (e.g., "What is a guitar?") and scored on a range from 0 (i.e., incorrect), 1 (i.e., demonstrated partial knowledge of the item), and 2 (i.e., correct) (Wechsler, 1981). Higher scores on this subtest reflect a component of overall verbal intelligence.

2.6. State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, & Lushene, 1971)

The STAI measures two types of anxiety: state anxiety and trait anxiety. Both of these measures of the State-Trait Anxiety Inventory ask 20 questions. The 20 questions will be answered on a 4 point scale, with "NOT AT ALL" and "VERY MUCH" as the two extremes. Scores on the STAI have a direct relation to their scales, with high scores meaning

more trait or state anxiety and low scores meaning less trait or state anxiety.

2.7. Mood Scale (short form) (Ferraro & Chelminski, 1996)

The Mood Scale consists of 15 questions that assess the individual's mood over the past week. The individuals will circle either a "YES" or a "NO" to answer each of the questions. Individuals who score higher on this scale report a more depressed mood than individuals who score lower.

2.8. Body mass index (BMI)

The participants self-reported their weight in pounds and height in inches. The BMI was calculated using a mathematical formula using the individual's weight and height. A person is considered underweight if his/her BMI is less than 18.5, normal weight if his/her BMI is 18.5–24.9, overweight if his/her BMI is 25.0–29.9, and obese if his/her BMI is 30.0 and above. A low BMI is a good indicator for those at risk for anorexia, but not all eating disorders.

2.9. Procedure

Participants signed up using the SONA system, an electronic subject recruitment system. Subjects were tested individually in a research room in the Northern Plains Center for Behavioral Research. The experiment took approximately 1 h and subjects were debriefed when they finished.

2.10. Results & discussion

An initial examination of the demographic data using a one-way ANOVA revealed that the two groups did not differ on age, education, self-rated health, number of medications currently taking, BMI, or WAIS-R vocabulary (all F 's (1, 124) < 3.21, all p 's > .08). Using a one-way MANOVA, the groups differed on mood, state and trait anxiety, and several subscales of the EFI and on the EFI total score. Table 1 lists these results.

There are some limitations to the present study. We only tested college women and only used the SCANS and the EFI as measures of possible eating disorders and executive function, respectively. A larger study with different measures would be useful. We did increase our overall

Table 1
Descriptive statistics between at-risk (1)/non-at-risk (2) groups.

Measure	Group	Mean	SD	F(1, 124)
Mood	1	5.90	3.10	80.69**
	2	1.61	1.74	
State anxiety	1	43.18	9.91	9.78**
	2	35.93	10.02	
Trait anxiety	1	52.23	7.40	37.64**
	2	39.66	8.97	
EFI 1 (MD)	1	13.45	2.61	20.74**
	2	16.15	2.51	
EFI 2 (IC)	1	15.77	3.46	5.16*
	2	17.55	3.30	
EFI 3 (EM)	1	25.41	4.50	1.86, ns
	2	26.45	2.94	
EFI 4 (ORG)	1	20.72	4.44	1.95, ns
	2	21.89	3.35	
EFI 5 (SP)	1	19.64	3.39	8.84**
	2	21.59	2.66	
EFI total	1	96.36	10.22	11.72**
	2	103.63	8.79	

Note: EFI indicates Executive Function Index; EFI1 indicates Motivational Drive (MD); EFI2 indicates Impulse Control (IC); EFI3 indicates Empathy (EM); EFI4 indicates Organization (ORG); and EFI5 indicates Strategic Planning (SP).

* Indicates $p < .05$.

** Indicates $p < .01$.

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