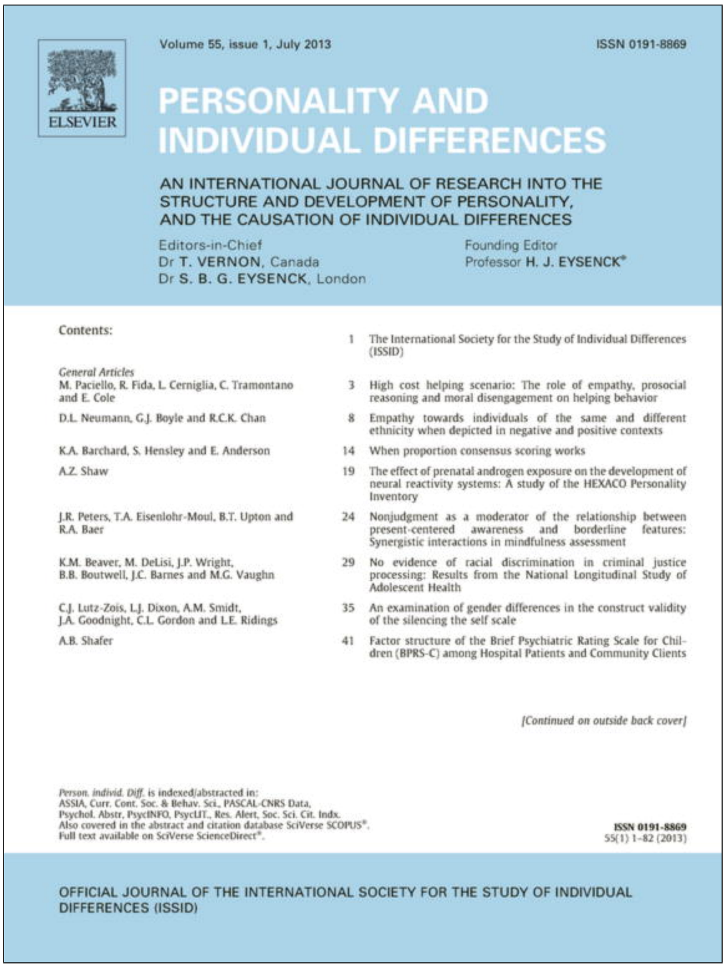

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A preliminary investigation of sex differences in associations between emotion regulation difficulties and higher-order cognitive abilities ☆

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ABSTRACT

The present study sought to clarify the cognitive correlates of emotion regulation difficulties (ERD). Further, because prior evidence suggests sex differences in emotion regulation, sex was examined as a moderator of associations between cognitive abilities and ERD. Participants ($N = 154$) completed self-report measures of ERD, and were administered neuropsychological tests assessing crystallized and fluid intelligence, as well as various components of executive functioning. Bivariate correlations and results from regression analyses suggested sex-dependent associations among cognitive processes and ERD. For men, inhibition of dominant response tendencies was associated with lower ERD, whereas for women, a host of executive abilities (e.g., greater inhibition, cognitive flexibility, semantic processing, abstract reasoning) were associated with greater ERD. Implications for the neurocognitive conceptualization of emotion dysregulation will be discussed.

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1. Introduction

Executive functions – a wide range of top-down cognitive processes (e.g., response inhibition, cognitive flexibility, strategy formulation) – are associated with the modulation of bottom-up responses to emotion-laden information. For example, executive processes have been linked to the regulation of trauma-related distress (Bardeen & Read, 2010) and startle reflexes to rejection stimuli (Gyurak & Ayduk, 2007). Moreover, some cognitive emotion regulation strategies have been shown to be associated with components of executive functioning. For example, Gyurak et al. (2009) found that among a variety of executive processes, greater cognitive flexibility, measured via verbal fluency, was associated with less physical responding to startle cues (loud noises) when participants were instructed to suppress their somatic reactions. Further, McRae, Jacobs, Ray, John, and Gross (2012) found that the use of cognitive reappraisal as an emotion regulation strategy was associated with relatively higher working memory capacity, shifting abilities, and abstract reasoning, but not with response inhibition or verbal fluency. These findings suggest that the ability to effectively regulate emotion may be related to specific cognitive abilities.

Interestingly, although it seems to make intuitive sense that higher-order cognitive abilities would be positively related to the capacity to flexibly regulate emotion, and some research is consistent with this proposition (e.g., Welborn et al., 2009), there is evidence to the contrary. Shamosh and Gray (2007) examined associations among fluid intelligence, emotion suppression, and self-regulatory depletion in a sample ($N = 58$) of undergraduate students. Among participants who were instructed to suppress emotional reactions to the viewing of a sad video, individuals with relatively higher fluid intelligence showed greater depletion of cognitive resources following the task, and no differences in actual suppression ability were observed. Shamosh and Gray (2007) suggested the possibility that higher-order cognitive abilities may not predict one's ability to regulate emotion, rather, such abilities predict the degree to which cognitive resources are employed, with those with relatively higher fluid intelligence expending more resources, thus resulting in greater resource depletion following attempts to regulate emotion.

In a similar vein, Beilock and Carr (2005) found that participants ($N = 93$) with higher working memory capacity performed less well on arithmetic problems, in comparison to those with lower working memory capacity, but only in a high pressure condition (i.e., peer pressure and social evaluation). Results suggest that cognitive resources were taxed to a greater extent by self-regulatory attempts among those with higher working memory capacity when

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under pressure, thus leaving relatively fewer available resources for task success. Similarly, DeCaro, Thomas, and Beilock (2008) suggested that individuals with higher levels of executive resources may have impaired performance and learning during certain tasks because they expend a larger amount of cognitive resources than is necessary, perhaps by using advanced strategies when simpler, less taxing strategies, would suffice.

The role of sex in cognitive ability-emotion regulation associations has yet to be examined. This is especially important because a variety of sex differences have been found in emotion regulation (e.g., Nolen-Hoeksema, 2012; Zlomke & Hahn, 2010). Furthermore, although women are more likely than men to report engaging in emotion regulation strategies, differential strategy use has been observed. The most pronounced difference in strategy use between men and women is that women tend to use rumination far more than men (for a review see Tamres, Janicki, & Helgeson, 2002), whereas men are more likely to use emotion suppression (Gross & John, 2003). Moreover, women are more likely than men to attend to, analyze, and engage in conscious attempts to regulate emotion (Nolen-Hoeksema, 2012).

Neural evidence of sex differences in emotion regulation is consistent with these findings. Specifically, when asked to down-regulate emotional responses through the use of cognitive reappraisal, women demonstrated greater activation in the prefrontal cortex (PFC), but failed to surpass men in the down-regulation of amygdala activity (McRae, Ochsner, Mauss, Gabrieli, & Gross, 2008). McRae et al. (2008) suggested that men may be more efficient in the down-regulation of negative emotion because they require relatively less cognitive resources to do so. Thus, the regulatory depletion effect described above may be particularly applicable to women. That is, evidence suggests that women use higher-order cognitive abilities to a greater degree than men when attempting to regulate negative emotions, and therefore, women may have fewer resources available when faced with tasks that require prolonged use of higher-order cognitive processes (e.g., repeated or prolonged stressors). Given the above, it is important to account for sex when examining relations among emotion regulation and higher-order cognitive abilities.

Although there is a lack of consensus regarding the definition of emotion regulation, it seems clear that the construct of emotion regulation, in its entirety, must account not only for strategies, but also for other processes which impact emotional responding. For example, before one can employ an emotion regulation strategy, one must first be able to identify the experience of emotion. As described by Gratz and Roemer (2004), emotion regulation is the ability to monitor, evaluate, and modify emotional experience in accordance with one's desired goals.

This conceptualization suggests multiple distinct, albeit related, domains of emotion regulation including awareness and clarity of emotional responses, acceptance of emotional reactions, access to effective emotion regulation strategies, and control of impulses and engagement in goal-directed behaviors when experiencing negative emotions (Gratz & Roemer, 2004). From this definition, Gratz and Roemer (2004) developed a comprehensive measure of emotion regulation; the Difficulties in Emotion Regulation Scale (DERS) accounts for six dimensions of emotion regulation.

Emotion regulation difficulties (ERD) may result in a wide variety of consequences, some being relatively benign (e.g., social awkwardness resulting from an inability to inhibit socially inappropriate emotional responding), and others which are associated with severe impairment (e.g., borderline personality disorder, generalized anxiety disorder, depression, alcohol dependence; Fox, Hong, & Sinha, 2008; Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006; Salters-Pedneault, Roemer, Tull, Rucker, & Mennin, 2006; Tull, Stipleman, Salters-Pedneault, & Gratz, 2009). Given the potential transdiagnostic applicability of ERD, the importance of pursuing research to better understand the cognitive correlates of ERD cannot be overstated. Moreover, an examination of the higher-order cognitive processes associated with the broad construct of ERD has yet to be conducted, and thus, the purpose of the present study was to identify differential associations among cognitive abilities and ERD.

As suggested by Shamosh and Gray (2007), in their attempts to regulate emotion, individuals with relatively higher cognitive abilities may expend more resources, thus resulting in greater resource depletion and leaving one with fewer resources available when faced with tasks that require prolonged use of higher-order cognitive processes (e.g., repeated or prolonged stressors). Evidence suggests that women attempt to regulate their emotions more than men (Nolen-Hoeksema, 2012) and use higher-order cognitive abilities to a greater degree than men when regulating negative emotions (McRae et al., 2008). Thus, women may be particularly prone to resource depletion following attempts to regulate emotion. On the other hand, men may be more efficient in down-regulating negative emotion because they require relatively less cognitive resources to do so (McRae et al., 2008).

Consistent with this rationale, we broadly predicted that higher levels of higher-order cognitive abilities would be associated with greater ERD among women, but not men. Moreover, men are significantly more likely to use expressive suppression to regulate emotion than women (Gross & John, 2003). Thus, we predicted that higher inhibition abilities would be associated with lower ERD among men. Because women are more likely than men to attend to and analyze their emotions (Barrett & Bliss-Moreau, 2009; Nolen-Hoeksema, 2012), and use rumination as a regulatory strategy when distressed (Tamres et al., 2002), we predicted that women with greater cognitive flexibility, semantic processing, and abstract reasoning abilities would have greater ERD, which, as described above, may be a consequence of resource depletion

2. Method

2.1. Participants and procedure

Participants for this institutional review board approved study were introductory psychology students, over the age of 18, recruited from a mass testing pool at a mid-sized University in the Midwest. Data was collected over two assessment sessions conducted between 2 and 10 days apart. At session one, participants ($N = 225$) provided informed consent and then completed a battery of self-report questionnaires administered via a desktop computer in a private room. At session two, participants were administered a variety of measures of cognitive and executive functioning. From those who attended both sessions ($n = 169$), the data from participants who were not fluent in English ($n = 5$), or for whom data collection was incomplete ($n = 10$), was removed from reported analyses. The final sample ($N = 154$; 82 women) had an average age of 19.7 years ($SD = 2.1$), and 69% self-identified as White, 21% as Black, 5% as Asian, 3% as Multi-racial, and 1% endorsed "other". Regarding ethnicity, 10% of participants identified as Hispanic or Latino. For their participation, students received partial course credit toward their undergraduate psychology course.

2.2. Measures

2.2.1. Emotion Regulation Difficulties

The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36-item self-report measure used to assess six dimensions of emotion regulation: Nonacceptance of Emotional Responses (Nonacceptance; e.g., *When I'm upset, I feel guilty for feeling that way*), Difficulty Engaging in Goal-Directed Behavior (Goals;

e.g., *When I'm upset, I have difficulty getting work done*), Impulse Control Difficulties (Impulse; e.g., *When I'm upset, I feel out of control*), Lack of Awareness of Emotions (Awareness; e.g., *When I'm upset, I acknowledge my emotions*), Limited Access to Strategies for Regulation (Strategies; e.g., *When I'm upset, it takes me a long time to feel better*), and Lack of Emotional Clarity (Clarity; e.g., *I am clear about my feelings*). Items are rated on a 5-point scale based on how often participants believe each item pertains to them (1 = *almost never* to 5 = *almost always*). As per Gratz and Roemer (2004), the 36 DERS items were summed to create a total scale score with higher scores indicating more emotion regulation difficulties. Internal consistency for the DERS total scale was excellent ($\alpha = .93$). All DERS subscales evidenced adequate internal consistency (α values ranging from .75 to .91).

2.2.2. Crystallized and Fluid Intelligence

Selected cognitive domains of intelligence (i.e., Similarities and Matrix Reasoning subtests) were assessed using the Wechsler Adult Intelligence Scale, fourth edition (WAIS-IV; Wechsler, 2008). Similarities is a subtest within the verbal comprehension domain that measures verbal concept formation and verbal reasoning, and involves crystallized intelligence, abstract reasoning, and categorical thinking. Matrix Reasoning is a subtest within the perceptual reasoning domain that measures nonverbal reasoning, and involves fluid intelligence, visual perception, and perceptual organization (Wechsler, 2008). The WAIS-IV subtests were administered and scored according to standard protocol (Wechsler, 2008).

2.2.3. Executive Functioning

Three subtests of the Delis–Kaplan Executive Functioning System (D–KEFS; Delis, Kaplan, & Kramer, 2001) were administered and scored according to standard protocol. Administered subtests included Verbal Fluency, Color-Word Interference, and Twenty Questions.

For the Verbal Fluency subtest conditions, participants are asked to rapidly name words beginning with a specific letter, words belonging to a specific category, or words belonging to two categories while switching between the categories. For the Color-Word subtest, participants are first asked to quickly and correctly name colors and read color words in order to establish baseline responding. Next, participants are instructed to identify the color in which words are printed while paying no attention to word meaning (each word is the name of a color); this condition corresponds to the traditional Stroop task. Finally, participants are instructed to switch back and forth between naming the color in which words are printed and reading the words. For the Twenty Questions subtest, participants were presented with 30 colored objects on a single page and were asked to identify the target object by asking the fewest number of yes/no questions possible.

From the D–KEFS subtests that were administered, four scores were calculated for use in analyses. These specific scores were selected in order to provide a comprehensive assessment of various executive functions that includes category fluency, cognitive flexibility, inhibition, and categorical processing. Consistent with Delis et al. (2001), scores were scaled based on participant age. For a detailed description of these scores, see Delis et al. (2001).

1. Verbal Fluency total correct: higher scores reflect greater semantic category fluency, and to a lesser degree, cognitive flexibility.
2. Verbal Fluency switching accuracy: higher scores reflect greater cognitive flexibility, as well as greater semantic category fluency.
3. Color-Word Interference: higher scores reflect better inhibition after accounting for basic naming ability.
4. Twenty Questions: higher scores reflect better initial abstract thinking and categorical processing.

3. Results

3.1. Preliminary analysis

As noted above, associations among emotion regulation and higher-order cognitive abilities may differ as a function of sex. Thus, means, standard deviations, and bivariate correlations were calculated independently for men and women in order to examine associations among variables of interest (i.e., executive functions, crystallized and fluid intelligence, ERD).

As seen in Table 1, among women, the DERS total scale was positively associated with Verbal Fluency total correct, Verbal Fluency switching accuracy, Color-Word Interference, and Twenty Questions ($ps < .05$). That is, greater ERD were associated with relatively better verbal fluency, cognitive flexibility, inhibition of automatic responding, abstract thinking, and categorical processing. Interestingly, among women, the DERS-Clarity subscale was the only subscale that was significantly associated with every one of the cognitive ability scores that the DERS total scale was associated with.

In men, there was only one cognitive process variable that was associated with ERD. Specifically, the DERS total scale was negatively associated with Color-Word Interference ($p < .05$). That is, among men, lower ERD were associated with relatively better inhibition of automatic responding (i.e., verbal inhibition). For men, DERS-Goals, DERS-Awareness, and DERS-Strategies were negatively associated with Color-Word Interference ($ps < .05$). In addition, a marginally significant negative association was observed between Color-Word Interference and DERS-Impulse ($p = .07$).

3.2. Hierarchical multiple regression

A series of six, two-step hierarchical multiple regressions were conducted in order to examine sex as moderator of potential associations between cognitive abilities and ERD (see Table 2); for each regression, the DERS total scale score served as the outcome variable. Predictor variables were mean-centered (Aiken & West, 1991). In the first step of each model, sex and one of the six higher-order cognitive variables were entered into the model as predictor variables. In the second step of the model, an interaction term comprised of sex and the higher-order cognitive variable was entered as a predictor variable.

From the six regressions that were conducted, three yielded significant interaction effects. The Sex $\times$ Verbal Fluency total correct, Sex $\times$ Color-Word Interference, and the Sex $\times$ Similarities interactions were all significant predictors of the DERS total score ($ps < .05$). In addition, the Sex $\times$ Verbal Fluency switching accuracy and the Sex $\times$ Twenty Questions interactions were marginally significant predictors of the DERS total score ($p = .08$, and $p = .09$, respectively).

Significant interaction effects were probed using simple slopes analysis (Aiken & West, 1991). Results of the first simple slopes analysis revealed no significant association between Verbal Fluency total correct and the DERS total scale for men ($\beta = -.05$, $p = .64$). For women, there was a significant positive association between Verbal Fluency total correct and the DERS total scale ($\beta = .31$, $p < .05$), with higher semantic category fluency and cognitive flexibility predicting greater ERD (see Fig. 1). The second simple slopes analysis revealed a significant negative association for men ($\beta = -.32$, $p < .05$), and positive association for women ($\beta = .22$, $p < .05$), between Color-Word Interference and the DERS total scale. Thus, better ability to inhibit dominant response tendencies was associated with lower ERD in men, and higher ERD in women

Table 1
Descriptive statistics and correlations for study variables.

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13
1. DERS-Total		–	**.75**	**.64**	**.70**	**.57**	**.78**	**.74**	**.29**	**.24**	**.23**	**.23**	.17	.06
2. DERS-Nonacceptance		**.70**	–	**.31**	**.41**	**.30**	**.48**	**.52**	**.30**	**.25**	.12	.19	.20	−.02
3. DERS-Goals		**.77**	**.42**	–	**.51**	.09	**.49**	**.30**	.12	.05	−.01	.15	.20	.07
4. DERS-Impulse		**.67**	**.25**	**.43**	–	.12	**.57**	**.46**	**.34**	**.27**	.18	.18	.10	.00
5. DERS-Awareness		**.51**	.17	**.30**	.13	–	**.25**	**.54**	.19	**.24**	**.36**	.12	.15	.15
6. DERS-Strategies		**.87**	**.69**	**.66**	**.61**	.12	–	**.40**	.08	.04	.05	.06	−.07	−.06
7. DERS-Clarity		**.74**	**.45**	**.44**	**.38**	**.52**	**.51**	–	**.24**	**.24**	**.32**	**.36**	.18	.14
8. D–KEFS VFCS		−.06	−.04	.01	−.06	−.11	−.05	.03	–	**.94**	.13	.09	.11	.10
9. D–KEFS VFCSA		−.05	−.05	.02	−.04	−.09	−.06	.06	**.95**	–	.19	.16	.17	**.22**
10. D–KEFS CW-I-C		−**.28**	−.05	−**.24**	−.22	−**.26**	−.23	−.17	−.01	−.04	–	.20	.18	.14
11. D–KEFS TQ-Abs		−.06	−.06	−.08	−.02	.00	−.11	.03	.19	**.24**	.01	–	**.36**	.06
12. WAIS-SI		−.17	−.04	−.10	−**.28**	−.15	−.12	.02	**.37**	**.40**	.03	**.27**	–	**.38**
13. WAIS-MR		.05	.01	.12	−.01	−.06	.07	.13	.02	.10	.08	.15	**.28**	–
Men	*M*	80.4	11.5	13.9	11.1	16.6	16.4	10.8	9.0	9.5	0.3	10.7	10.5	10.4
	SD	22.2	4.9	4.8	5.4	5.6	7.0	3.4	3.3	3.0	1.9	2.1	2.8	2.4
Women	*M*	79.4	12.8	14.5	10.4	15.0	15.8	11.0	10.6	10.6	0.7	9.6	10.0	9.2
	SD	20.8	6.3	5.0	4.2	5.5	5.9	3.8	3.0	3.0	2.4	2.5	2.7	2.5

Note: Men ($n = 72$) are presented below the diagonal and women ($n = 82$) are presented above the diagonal. Correlations greater than .23 for men, and .21 for women, are significant (in bold; $p < .05$). DERS = Difficulties in Emotion Regulation Scale; D–KEFS = Delis–Kaplan Executive Function System (VFCS = Verbal Fluency total correct, VFCSA = Verbal Fluency switching accuracy, CW-I-C = Color-Word Interference, TQ-Abs = Twenty Questions); WAIS = Wechsler Adult Intelligence Scale (SI = Similarities, MR = Matrix Reasoning).

Table 2
Hierarchical regression analyses predicting DERS total score from higher-order cognitive abilities.

Variable	Cognitive ability variable					
	VFCS β	VFCS β	CW-I-C β	TQ-Abs β	SI β	MR β
Step 1						
Sex	−.05	−.04	−.02	.00	−.02	−.01
Cognitive ability	.12	.10	.02	.10	.00	.06
R^2	.01	.01	.00	.01	.00	.00
Step 2						
Sex	−.05	−.04	−.02	−.01	−.02	−.01
Cognitive ability	.13	.10	−.05	.07	.01	.06
Sex × cognitive ability	$.18^{*}$	$.14^{\wedge}$	$.27^{***}$	$.14^{\wedge}$	$.17^{*}$	.00
ΔR^2	$.03^{*}$	$.02^{\wedge}$	$.07^{***}$	$.02^{\wedge}$	$.03^{*}$	.00

Note: $N = 154$. DERS = Difficulties in Emotion Regulation Scale; VFCS = Verbal Fluency total correct; VFCSA = Verbal Fluency switching accuracy; CW-I-C = Color-Word Interference; TQ-Abs = Twenty Questions; SI = Similarities; MR = Matrix Reasoning.
$^{\wedge}$ $p < .10$. * $p < .05$. *** $p < .001$.

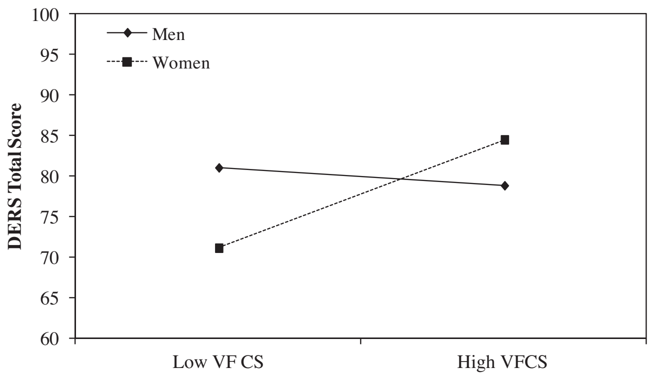

Fig. 1. Interaction between Sex and VF CS (Verbal Fluency total correct) predicting the DERS Total Score.

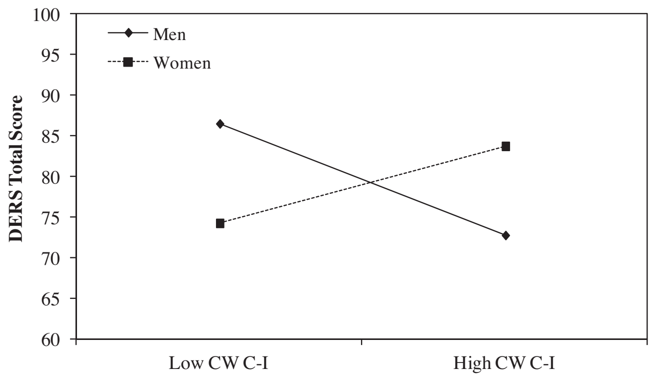

Fig. 2. Interaction between Sex and CW-I-C (Color-Word Interference) predicting the DERS Total Score.

(see Fig. 2). Results of the third simple slopes analysis revealed that both simple slopes were nonsignificant; there was no significant association between Similarities and the DERS total scale for men ($\beta = -.16$, $p = .16$) or women ($\beta = .18$, $p = .13$; see Fig. 3).

Of note, the two marginally significant interaction effects described above (i.e., Sex × Verbal Fluency switching accuracy and Sex × Twenty Questions) were examined using simple slopes analysis and the interactive pattern of each of these effects was almost identical to that which is seen in Fig. 1. Specifically, for men, there was no significant association between either Verbal Fluency switching accuracy or Twenty Questions and the DERS total scale

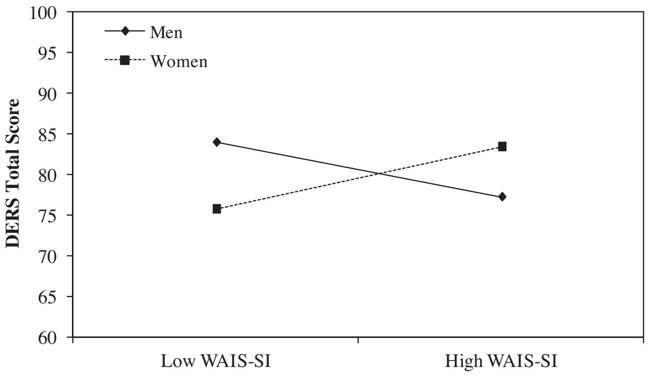

Fig. 3. Interaction between Sex and WAIS-SI (Wechsler Adult Intelligence Scale-Similarities subtest) predicting the DERS Total Score.

($\beta = -.04$, $p = .72$, and $\beta = -.07$, $p = .60$, respectively). For women, however, there was a significant positive association between both Verbal Fluency switching accuracy and Twenty Questions and the DERS total scale ($\beta = .25$, $p < .05$, and $\beta = .22$, $p < .05$, respectively).

4. Discussion

The present study sought to examine sex-dependent associations among the broader construct of ERD, specific dimensions of ERD, and higher-order cognitive abilities. As predicted, sex-dependent cognitive ability-ERD associations emerged. Specifically, among women, higher scores on Verbal Fluency total correct and Verbal Fluency switching accuracy (faster retrieval of semantic knowledge and cognitive flexibility), Color-Word Inhibition (inhibition of automatic responses), and Twenty Questions (abstract thinking, categorical processing; Delis et al., 2001) were associated with greater ERD. Among men, however, lower scores on Color-Word Inhibition were associated with greater ERD, thus suggesting that men with greater difficulty inhibiting dominant, or more automatic, responses had higher ERD.

Importantly, two primary cognitive ability-ERD associations were observed. First, better inhibition of automatic responses was associated with lower ERD in men, and higher ERD in women. This association may be related to the specific types of regulatory strategies that men and women tend to employ. That is, in comparison to women, men are significantly more likely to use expressive suppression to regulate emotion (Gross & John, 2003). As discussed by Gross and John, the use of suppression by men may be a function of cultural indoctrination through which men are taught that to express emotion is to be weak or 'unmanly' (e.g., boys do not cry). Thus, men with a relative strength in inhibiting dominant responses may perceive themselves as being better able to regulate emotion. In contrast, cultural mores dictate that women are not only the more emotional sex (Barrett & Bliss-Moreau, 2009), but in comparison to men, women are perceived as being better at identifying emotions, both their own and others', and using the information garnered from such emotional awareness to appropriately guide their actions (i.e., emotional intelligence; Petrides, Furnham, & Martin, 2004). Thus, among women who are taught that emotional well-being relies on emotional awareness and emotional expressivity, a greater ability to inhibit dominant response tendencies, when applied to emotion regulation, may result in self-perceived ERD.

The second primary finding in multivariate analysis suggests that both faster retrieval of semantic knowledge and better cognitive flexibility are associated with ERD in women, but not men. Among the three significant interaction effects that were observed, two had significant simple effects at the .05 level. In addition, among the two marginally significant interaction effects, both evidenced significant simple effects for women, but not men (Verbal Fluency switching accuracy and Twenty Questions). The importance of these marginally significant effects rests in their redundancy. That is, much like the associations between ERD and faster retrieval of semantic knowledge and greater cognitive flexibility in women, better abstract thinking and categorical processing have positive associations with ERD for women, but not for men. Taken together, the observed pattern of effects is consistent with an overall theme which suggests that women with higher levels of higher-order cognitive abilities may be at particular risk for ERD and associated pathology.

This may seem counterintuitive, as one might expect that individuals with better executive functioning would have more resources to effectively regulate emotion. These individuals would then be less likely to experience the depletion of such resources in the face of regulatory situations which require the prolonged use of higher-order cognitive processes (e.g., repeated or prolonged stressors). However, as described above, some evidence suggests that higher-order cognitive abilities may predict the degree to which cognitive resources are employed, with those with relatively better higher-order cognitive abilities expending more resources, which results in greater resource depletion following attempts to regulate emotion (Beilock & Carr, 2005; Shamosh & Gray, 2007). As noted, women may be particularly vulnerable to this depletion effect because they are more likely than men to attend to, analyze, and engage in conscious attempts to regulate emotion (Nolen-Hoeksema, 2012; Tamres et al., 2002).

Additionally, women are more likely than men to (a) attend to and analyze their emotions, which are viewed as important information (Barrett & Bliss-Moreau, 2009; Nolen-Hoeksema, 2012), and (b) use rumination as a regulatory strategy when distressed (Tamres et al., 2002). Thus, women with greater cognitive flexibility, semantic processing, and abstract reasoning abilities may actually expend more cognitive resources attending to and analyzing emotions, a process which may become maladaptive (i.e., rumination), thus resulting in subsequent distress and deleterious outcomes. It may be that inordinate attention to and analysis of one's emotions may actually obscure emotional understanding. Consistent with this view, among women, the DERS-Clarity subscale was the only subscale that was significantly associated with every one of the cognitive ability scores that the DERS total scale was associated with. Moreover, DERS-Clarity was the only subscale associated with the Twenty Questions abstraction score among women. Thus, higher levels of analytical thinking and cognitive flexibility are associated with deficits in emotional clarity for women, relations which may be the result of a tendency towards over-attentiveness to, or over-analysis of, emotions.

The present study is not without limitations. First, the sample consisted solely of college students, and thus, findings may not generalize to the general population. As such, findings should be considered preliminary in nature until replicated in general population samples. In addition, although neuropsychological testing should be considered a strength of the present study, because these assessments take a good deal of time to administer, study logistics (e.g., participant burden, assessor availability, etc.) precluded administration of all available tests of the D–KEFS (Delis et al., 2001) and WAIS-IV (Wechsler, 2008). In future research, it will be important to include additional tests of higher-order cognitive functioning in order to expand our understanding of the neurocognitive correlates of ERD.

To our knowledge, this is the first study to examine the higher-order cognitive processes associated with the higher-order construct of ERD. As such, the present findings are an important step in furthering our understanding of the role of the neurocognitive underpinnings of emotion dysregulation. Moreover, findings suggesting sex-dependent differential associations among cognitive abilities and ERD may help to explain equivocal findings in the extant literature. For men, inhibition of dominant response tendencies was associated with lower ERD, whereas for women, a host of executive abilities (e.g., greater cognitive flexibility, semantic processing, abstract reasoning) were associated with greater difficulty in regulating emotion. These findings may be related to the specific types of regulatory strategies that men and women employ, with men being more likely to use suppression, and women being more likely to use rumination as a regulatory strategy when distressed. Thus, men with better inhibition may be better able to strategically suppress emotions and women with greater cognitive flexibility, semantic processing, and abstract reasoning abilities may be more prone to analyzing emotions, a process which may become maladaptive (i.e., rumination), thus resulting in a perceived sense of emotion dysregulation.

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