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The link between dissociative tendencies and hyperassociativity

R.J.C. Huntjens [a,*], G.P.J. Janssen [a], H. Merckelbach [b], S.J. Lynn [c]

[a] Department of Experimental Psychotherapy and Psychopathology, University of Groningen, Grote Kruisstraat 2/1, 9712, TS, Groningen, the Netherlands
[b] Forensic Psychology Section, Maastricht University, PO Box 616, 6200, MD, Maastricht, the Netherlands
[c] Department of Psychology, Binghamton University, 4400 Vestal Pkwy. West, Binghamton, NY, 13902, USA

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ABSTRACT

Background and objectives: Anecdotal and research evidence suggests that individuals with dissociative symptoms exhibit hyperassociativity, which might explain several key features of their condition. The aim of our study was to investigate the link between dissociative tendencies and hyperassociativity among college students.
Methods: The study (n = 118) entailed various measures of hyperassociativity, measures of dissociative tendencies, depressive experiences, unusual sleep experiences, cognitive failures, and alexithymia.
Results: We found a positive association between dissociative experiences (i.e., depersonalization) and hyperassociativity specific for associative fluency and associative flexibility tasks (including neutral and valenced material), but not for a remote association task. We also found tentative evidence for cognitive failures and alexithymia explaining the link between hyperassociativity and daytime dissociation and nighttime unusual sleep experiences.
Limitations: Limitations include the use of hyperassociation tasks limited to verbal associations vs. imagistic associations, the lack of a measure of trauma history, and a sample limited to college students.
Conclusion: Our study reports a link between depersonalization and hyperassociativity on tasks that allow for free associations across different semantic domains, potentially explained by alexithymia and cognitive failures. This finding may, with replication, open the pathway to applied intervention studies.

1. Introduction

Dissociative experiences pertain to feeling disconnected from yourself and the world around you. Dissociative experiences range from mild and prevalent experiences in the general population Aderibigbe, Bloch, & Walker, 2001; Ross, Joshi, & Currie, 1991) to more debilitating and chronic symptoms occurring transdiagnostically across a wide range of clinical disorders (Ellickson-Larew, Stasik-O'Brien, Stanton, & Watson, 2020; Soffer-Dudek, 2014), most noticeably the dissociative disorders (DSM-5; American Psychiatric Association, 2013). Our study focuses on the dissociative experiences of absorption (i.e., narrowing of consciousness), depersonalization (i.e., detachment from the self and the body or being a detached observer of oneself), and amnesia (i.e., gaps in memory) among college students. This analogue approach conforms with the dimensional model of dissociation as falling on a continuum and with an emerging diathesis-stress model that links the propensity to nonpathological dissociation in nonclinical contexts to the cognitive impairments in pathological dissociation (e.g., Chiu, 2018; Dewe, Watson, Kessler, & Braithwaite, 2018).

Recent theoretical formulations acknowledge transtheoretical and transdiagnostic variables in the genesis of dissociation (see Lynn et al., 2016, 2019). These variables include emotion dysregulation; problems in meta-consciousness, including alexithymia, which refers to a lack of the ability to distinguish, label, and describe emotions (for a review of the link with dissociation see Merckelbach, Boskovic, Pesy, Dalsklev, & Lynn, 2017); unusual sleep experiences (e.g., nightmares, hypnopompic hallucinations); avoidance of potentially anxiety-producing internal or external stimuli; and, most recently, hyperassociativity.

The latter concept refers to increased activation of (weakly) semantically and emotionally related mental representations in response to emotions, memories, or actions (Horton & Malinowski, 2015). Hyperassociativity can be considered on a continuum ranging from adaptive to maladaptive associativity, the latter generally being *less* normative, controlled, coherent, and contextually constrained. That is, with hyperassociativity, activated associations in memory are *more* emotion-driven and less semantically related to the index topic compared with adaptive associativity.

Our research represents the first empirical investigation of

* Corresponding author.
E-mail addresses: r.j.c.huntjens@rug.nl (R.J.C. Huntjens), h.merckelbach@maastrichtuniversity.nl (H. Merckelbach), stevenlynn100@gmail.com (S.J. Lynn).

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hyperassociativity in the context of dissociation. Lynn et al. (2019) recently summarized the evidence for associative processes in dissociative clinical presentations, beginning with Lynn's observations of patients with dissociation who exhibited highly fluid associations that were often not tightly bound to situational constraints but, rather, were activated in response to deeply personal or idiosyncratic negative thoughts and emotions (Lynn et al., 2016, p. 311). As an example of hyperassociation, one of Lynn's patients, when discussing how her father harshly disciplined and berated her for not completing her homework, abruptly shifted the topic to share a joyful interaction with a beloved pet. Such tendencies appeared to be linked with forgetting/amnesia (e.g., difficulty recalling the conversation), depersonalization/derealization (e.g., feeling an outside observer of the self, feeling disconnected from the surroundings), and deep absorption (e.g., the patient getting "lost" in a train of thought, "staring into space," seemingly detached from the therapist and surroundings).

Research relevant to dysfunctional associative processes in dissociation is indicative of pronounced and often rapid changes in associative networks, i.e., "set switching" (Chiu et al., 2016; Chiu, Yeh, Huang, Wu, & Chiu, 2009, p. 214), or the tendency to shift rapidly from one task to another (Chiu et al., 2009; see also; Chiu et al., 2010; Chiu, Liu, Yeh, & Hwu, 2012), a potential avoidance response to negative affect (see Dorahy, 2006). Second, patients with dissociation have been shown to exhibit automatic and uncontrolled associations (Scroppo, Drob, Weinberger, & Eagle, 1998), potentially mediated by imaginative involvement (Bregman-Hai et al., 2018). Third, dissociation may be characterized by a tendency to see patterns where none exist (i.e., apophenia; DeYoung, Grazioplene, & Peterson, 2012) and form remote associations.

Lynn et al. (2019) hypothesized that dysregulated associational processes and set shifts could be produced or exacerbated by transtheoretical variables. For example, unusual sleep/dream-like experiences, which infiltrate daytime consciousness, can loosen the semantic link among associations, dysregulate emotions, impair reality monitoring and labeling of emotions (i.e., alexithymia), and thereby produce dissociative symptoms (Van der Kloet, Merckelbach, Giesbrecht, & Lynn, 2012).

Our research aimed to investigate the link between dissociative tendencies and hyperassociativity using a variety of measures that tap different facets of hyperassociativity. In a pilot study (for details on method and results, see the supplemental file), we compared high versus low dissociators on four measures of association and hypothesized that (a) high dissociators would score higher on hyperassociativity, especially on tasks allowing for free associations and (b) that valenced material would augment this tendency. The latter hypothesis was based on the cognitive avoidance hypothesis that high dissociators selectively avoid internally-generated or externally-presented emotionally negative information (Cloitre, 1992; Elzinga, de Beurs, Sergeant, Van Dyck, & Phaf, 2000). We expected hyperassociativity to be a salient mechanism in cognitive avoidance, as dissociation appears specific to cognitive processing of emotionally negative material (e.g., Dorahy & Huntjens, 2007). The results of the pilot study were promising, as high dissociators seemed to show differential performance compared to low dissociators on two tasks indexing associative flexibility (i.e., generating a chain of associations). This included performance on a task that relied on neutral material as well as a task that involved negatively valenced material. High and low dissociators did not differ with regard to other association tasks. Although high and low dissociators did not differ with regard to other association tasks, the statistical power of the pilot study was limited (i.e., post-hoc power to detect large differences between high and low dissociators was 0.88, and power to detect medium differences was 0.50). Moreover, whereas extreme groups may be used in exploratory research to maximize time and cost efficiency (i.e., in this case ensure the inclusion of a group scoring high on dissociation), this approach is not advisable in later stages of research (Preacher, Rucker, MacCallum, & Nicewander, 2005).

For this reason, the current study entailed a correlational approach. Specifically, we (a) examined whether subscales of the Curious Experiences Survey (CES; Goldberg, 1999; depersonalization, absorption, and amnesia) would be linked to the four association tasks that were explored in the pilot study, and (b) included multiple potential correlates of dissociation; that is, depression, unusual sleep experiences, positive and negative emotion, cognitive failures, and alexithymia. We examined each of the subscales independently and made no differential predictions among these scales. We assessed depression to examine the specificity of the link between dissociative experiences and hyperassociativity and measures of unusual sleep experiences (e.g., sleep paralyses, hallucinations, nightmares; see Koffel, 2011); cognitive failures, referring to lapses in attention and memory (Merckelbach, Horselenberg, & Schmidt, 2002); and alexithymia (Grabe, Rainermann, Spitzer, Gänsicke, & Freyberger, 2000).

Previous studies have confirmed the link between unusual sleep experiences and dissociative experiences, finding moderate-strong correlations between the constructs (r = .30-.55; Van der Kloet et al., 2012). We predicted links between hyperassociativity and unusual sleep experiences and between hyperassociativity and awake dissociative experiences to be carried by high levels of cognitive failures (i.e., although results of previous studies have not been completely consistent in this regard, e.g., see Chiu, 2018). In the case of negatively valenced stimulus material, we expected alexithymia to play an important role. That is, hyperassociativity may be accompanied by affect shifts, although the person may not recognize, monitor, and/or experience these shifts in emotions, producing an experience of numbness and psychological distance from the self (Lynn et al., 2019).

2. Method

2.1. Participants

Participants were 122 first-year psychology students. As this study was conducted online, we included the 13-item true-false Chapman Infrequency Scale (Chapman & Chapman, 1986; cited in Roivainen, Veijola, & Miettunen, 2016) to control for careless responding. A sample question is: "I cannot remember a single time I went with the bus." Roivainen et al. (2016) found the validity of this scale to be adequate. Based on a cutoff-score of three, four participants were excluded, rendering a final sample of 118 participants. Of this sample, ninety-six (81.4%) of the participants were female. The age ranged from 18 to 44 years; the mean was 19.79 (SD = 2.86).

2.2. Materials

To index dissociation, we used the 31-item *Curious Experiences Survey* (CES; Goldberg, 1999). This is a revised version of the Dissociative Experiences Scale (DES), selected because its item format and response scale are arguably more user-friendly and tailored to student populations compared with other widely used dissociation measures. Items pertain to typical dissociative experiences, and are answered on a five-point Likert scale (1 = this never happens to me; 5 = happens almost always to me; range = 31 to 155 for the total scale, 8 to 40 for the subscales depersonalization and absorption, and 5 to 25 for the subscale amnesia), with higher scores indicating stronger dissociative tendencies. A sample question is: "Drove without remembering." Goldberg (1999) reported the validity to be good, and Cann and Harris (2003) concluded that reliability of the CES is high. Cronbach's alpha in the current sample was .92 for the CES total scale, 0.86 for the CES subscale depersonalization (8 items), 0.81 for the CES subscale absorption (8 items), and 0.68 for the CES subscale amnesia (5 items).

As this study was the first to examine the link between hyperassociativity and dissociation, we employed multiple measures of association to evaluate this potential link. On all the association tasks, a higher score reflects hyperassociativity. In the 30-item Dutch version of the *Remote Associates Task* (RAT; Chermahini, Hickendorff, & Hommel, 2012), participants make word pairs. Three words (triads like palm/-family/hut) are presented for 60 s. The participant is instructed to respond with one word that makes three valid word pairs (i.e., in the case of "tree" to create palm tree, family tree, and tree hut). The total score reflects the number of correct words (range 0–30). Chermahini et al. (2012) reported the validity and reliability of this task to be good.

In the *Associative Fluency Task* (AFT; Benedek, Neubauer, Kaernbach, & Köhnken, 2009), we presented one of six neutral words in a fixed order for 60 s during which participants were instructed to make as many associations as possible: street, mountain, lion, fruit, lamp, and bread. Benedek et al. (2009) found the validity and reliability of this measure to be adequate.

The *Associative Flexibility Task Neutral* (AFTN; Benedek et al., 2009) consisted of six cue words. Participants were instructed to create as many associations as possible in 60 s. Participants had to come up with a word associated with the first given word and then with an associated word to the response word, generating a chain of associations to moon, hand, music, sleep, chair, and city. Benedek et al. (2009) reported validity and reliability to be adequate.

The *Associative Flexibility Task Valenced* (AFTV; Benedek et al., 2009) is identical to the AFTN with the exception that the cue words pain, murder, tumor, nuclear bomb, vomiting, and funeral are emotionally negative. Benedek et al. (2009) reported adequate validity and reliability.

We employed The *Self-Assessment Manikin (*SAM) to assess whether negatively valenced AFTV words were experienced as negative (Bradley & Lang, 1994). The SAM consisted of two rows of five pictures of a manikin who expressed different facial expressions and bodily sensations. In the upper row (SAM-valenced), five manikin pictures ranging from *pleasant/positive* (1) to *unpleasant/negative* (9) were shown; in the bottom row, five pictures ranging from *aroused* (1) to *calm* (9) (SAM-Arousal) were shown. The six words were identical to the cue words in the AFTV. Participants rated the stimulus words as negative ($M = 7.62$, $SD = 0.98$) and as medium on the arousal dimension ($M = 4.48$, $SD = 1.75$).

To index mood changes related to the AFTV, we administered The *Positive and Negative Affect Schedule* (PANAS) (Watson, Clark, & Tellegen, 1988) before and after the task. The PANAS contains twenty separate words (mood terms), and participants indicate to what extent they are currently feeling what the word denotes (e.g., enthusiastic, proud, jittery). Words are evenly divided among a positive and negative affect scale, measuring positive and negative mood, respectively. Answers are provided on a 5-point scale ranging from *slightly or not at all* (1) to *very much* (5). Both external and internal validity are high (Watson et al., 1988) as is reliability (Crawford & Henry, 2004). The Cronbach's alpha for the PANAS in the current sample was .86 and .87 for the positive scale (first and second administration, respectively) and 0.88 and 0.91 for the negative scale.

We employed the 21-item *Beck Depression Inventory II* (BDI-II) to measure to what extent participants experienced depressive symptoms over the last two weeks. Symptoms were rated on a 4-point scale ranging from *not at all* (0) to *very much* (3) (Beck, Steer, Ball, & Ranieri, 1996). Scores range from 0 to 63 with measures above 20 indicating moderate symptoms and scores above 29 indicating severe symptoms. Validity and reliability are both high (Wang & Gorenstein, 2013). Cronbach's alpha in the current sample was .93.

We used part of the *Iowa Sleep Disturbances Inventory Extended* (ISDI-E) scale to measure unusual sleep experiences (Koffel, 2011), employing the following scales: "Nightmares," "Movement at Night," "Sensations at Night," "Sleep Paralysis," and "Sleep Hallucinations" that together contain 33 items scored *true* or *false*. Koffel (2011) summarized evidence to show adequate validity and reliability (Koffel, 2011). Cronbach's alpha in the current sample was .89.

The 25-item *Cognitive Failures Questionnaire* measures self-reported failures of perception, memory, and motor function in the last six months (Broadbent, Cooper, Fitzgerald, & Parkes, 1982). Items contain five answer possibilities ranging from *never* (1) to *very often* (5), range 25–125). Both reliability and validity have found to be good in previous research (Bridger, Johnsen, & Brasher, 2013; Merckelbach, Muris, Nijman, & de Jong, 1996). Cronbach's alpha in the current sample was .88.

The 20-statement *Toronto Alexithymia Scale 20 (TAS-20)* assesses alexithymia (Bagby, Parker, & Taylor, 1993). Response options range from *strongly disagree* (1) to *strongly agree* (5) with a range from 20 to 100. Scores between 51 and 61 indicate possible alexithymia, and scores above 61 indicate alexithymia. Reliability and validity are adequate (Bagby et al., 1993). Cronbach's alpha in the current sample was .71.

2.3. Procedure

The study was approved by the local ethics committee. Individuals participated online for course credit and provided written informed consent. They were informed that the study evaluated individual differences in creativity. Questionnaires were administered in Dutch, except the ISDI-E (administered in English as no validated Dutch translation was available). Participants started with the AFT and continued with the RAT, AFTN, PANAS-pre, AFTV, the PANAS-post, and finally the SAM. These tasks were presented in a fixed order with the tasks employing negatively valenced stimulus material at the end to prevent any carry-over effects from these tasks to the tasks employing neutral material. After a 5-min break, they continued with four questionnaires presented in random order: the CES, BDI-II, CFQ, and TAS-20. Finally, participants completed the Chapman Infrequency Scale.

3. Results

3.1. Scoring of the associative flexibility tasks

Two independent raters scored chains of associations on the Associative Flexibility Task Neutral (AFTN) and the Associative Flexibility Task Valenced (AFTV). The scoring was based on semantic similarity (Benedek et al., 2009). That is, two independent raters scored the number of "topic changes" within each of the six chains and their sum served as an estimate of associative flexibility. For practical reasons, different pairs of raters were utilized for each task. With an Intraclass Correlation Coefficient of 0.97 for the AFTN and 0.96 for the AFTV, interrater agreement for both tasks were excellent (Cicchetti, 1994). Table 1 displays the mean scores for the participants on the measures employed.

Table 1
Means (SD) and Range on Association Tasks, Dissociation Scales, and Individual Difference Variables (n = 118).

	Mean (SD)	Min	Max
RAT	11.89 (3.32)	5	20
Ass. Fluency Task	75.57 (23.05)	13	144
Ass. Flex. Task Neutral	51.19 (16.57)	19	107
Ass. Flex. Task Valenced	47.17 (15.62)	21	92
CES	53.63 (14.05)	33	94
CES-Absorption	18.08 (5.64)	8	35
CES-Amnesia	6.45 (2.02)	5	17
CES-Depersonalization	11.41 (4.28)	8	26
BDI-II	34.60 (11.35)	21	74
ISDI-E	8.19 (6.45)	0	27
CFQ	66.73 (12.54)	39	110
TAS-20	53.70 (8.54)	34	75

Note. RAT = Remote Associates Task; CES = Curious Experiences Survey; BDI-II = Beck Depression Inventory-II; ISDI-E = Iowa Sleep Disturbances Inventory Extended, subscale Unusual Experiences; CFQ = Cognitive Failures Questionnaire; TAS-20 = Toronto Alexithymia Scale 20.

3.2. Correlational analyses

Table 2 displays Pearson correlations among the Curious Experiences Survey (CES), its subscales, and the association tasks. Three out of four hyperassociativity measures (the associative fluency task and the two associative flexibility tasks, (i.e., neutral stimuli and negatively valenced stimuli) showed significant correlations (low to medium effect sizes) with scores on the depersonalization subscale. The difference between these two correlations was not significant $t(115) = 0.88$, ns). No significant correlations were found between the association tasks and the dissociation subscales of amnesia and absorption.

When comparing scores of the positive and Negative Affect Scale (PANAS) scales for baseline administration ($M = 26.89$, $SD = 6.52$) and post-experimental administration ($M = 24.92$, $SD = 7.01$), a significant decline was evident, $t\ (117) = 5.07$, $p < .001$. The effect size measured with Cohen's d was 0.47 (medium effect). Scores on negative PANAS scales significantly increased from baseline ($M = 15.03$, $SD = 5.46$) to post-experimental administration ($M = 33.25$, $SD = 5.22$), $t\ (117) = 66.44$, $p < .001$. The corresponding Cohen's d effect size was 6.11 (large).

Table 3 displays correlations between association tasks, additional measures, and the CES. Dissociative experiences (total scale and subscales) correlated significantly with the individual difference variables (i.e., depression, unusual sleep experiences, cognitive failures, and alexithymia). With regard to the association tasks, depression correlated positively with hyperassociativity, but only for the neutral version of the associative flexibility task. Furthermore, nighttime cognitive functioning (i.e., unusual sleep experiences) was significantly correlated with the valenced associative flexibility task. Cognitive failures and alexithymia correlated with the fluency task, neutral flexibility task, and there was a nonsignificant trend for these variables to correlate with the valenced associative flexibility task.

We conducted separate hierarchical regressions to predict nighttime (i.e., unusual sleep experiences) and awake (i.e., depersonalization) functioning. For nighttime functioning, we predicted unusual sleep experiences by associative flexibility-valenced performance (block one) and additionally cognitive failures and alexithymia (block two). We found a significant effect for valenced flexibility for block one ($R^2 = 0.04$, $F(1, 116) = 4.79$, $p = .03$) and a significant effect for block two ($R^2_{change} = 0.15$, $F(2, 114) = 10.12$, $p < .001$). However, the contribution of valenced flexibility for block two was no longer significant (*Beta* $= 0.12$; $t = 1.43$, $p = .16$), indicating that the relation between hyperassociativity (indicated by the valenced flexibility task) and unusual sleep experiences was carried by alexithymia (*Beta* $= 0.29$; $t = 3.09$, $p = .003$) and to a lesser extent by cognitive failures (*Beta* $= 0.17$; $t = 1.89$, $p = .06$).

For awake functioning, we predicted depersonalization based on a compound hyperassociativity score[1] (i.e., sum of the fluency measure and the two flexibility measures) in block one and cognitive failures and alexithymia in block two. We found significant effects for block one ($R^2 = 0.05$, $F(1, 116) = 6.48$, $p = .01$), and a significant effect for block two ($R^2_{change} = 0.22$, $F(2, 114) = 17.10$, $p < .001$). The hyperassociativity effect in block two was no longer significant (*Beta* $= 0.11$; $t = 1.34$, $p = .18$), indicating the relation between depersonalization and hyperassociativity was carried by alexithymia (*Beta* $= 0.32$; $t = 3.65$, $p < .001$) and cognitive failures (*Beta* $= 0.26$; $t = 2.94$, $p = .004$).

Table 2
Pearson Correlations between the Dissociation Subscales of CES and Association Tasks.

	CES	Depersonalization	Absorption	Amnesia
RAT	-.09	-.13	-.06	-.11
Ass. Fluency Task	.12	.19*	.10	.004
Ass. Flex. Task Neutral	.14	.25**	.11	-.03
Ass. Flex. Task Valenced	.10	.20*	.04	.004

Table 3
Pearson Correlations between the Association Tasks, Dissociation Scales, and individual Difference Variables.

	BDI-II	ISDI-E	CFQ	TAS-20
RAT	-.08	-.14	.06	.02
Ass. Fluency Task	.13	.05	.22*	.19*
Ass. Flex. Task Neutral	.23*	.14	.20*	.19*
Ass. Flex. Task Valenced	.12	.20*	.16[a]	.17[a]
CES	.42***	.46***	.57***	.49***
CES-absorption	.34***	.40***	.54***	.45***
CES-Amnesia	.28**	.27**	.38***	.29***
CES-Depersonalization	.44***	.47***	.41***	.44***

Note. * = $p < .05$, ** = $p < .01$, *** = $p < .001$, [a] = 05 > $p < .10$; RAT = Remote Associates Task; CES = Curious Experiences Survey; BDI-II = Beck Depression Inventory-II; ISDI-E = Iowa Sleep Disturbances Inventory Extended, subscale Unusual Experiences; CFQ = Cognitive Failures Questionnaire; TAS-20 = Toronto Alexithymia Scale 20.

4. Discussion

We assessed whether a positive correlation exists between hyperassociativity and dissociative experiences among college students. Our hypothesis was partly confirmed: We indeed found a positive correlation between depersonalization and the scores on the neutral fluency task and both the neutral and valenced associative flexibility tasks.

Still, we did not find a significant correlation between the association tasks and the CES total scale and the subscales absorption and amnesia. The failure to find a relation with reported amnesia may result from range restriction in our nonclinical sample, so our research awaits replication in clinical samples. Restriction of range is not relevant for experiences of absorption, which were common in our sample. Perhaps the absorption component of dissociation reflects passive preoccupation with an attentional object and thus exhibits little relation with a hyperassociative train of thoughts. Alternatively, the link with hyperassociativity might be specific to the detachment component of dissociation (i.e., in contrast to the compartmentalization component; Holmes et al., 2005).

Clinically, the relation between hyperassociativity and depersonalization makes sense: Large steps in associations may result in the person not experiencing retrieved information from memory as relevant or belonging to the self and consequently feeling depersonalized. Germane to this possibility, Levin, Sirof, Simeon, and Guralnick (2004) found that relative to a non-clinical comparison group, patients with Depersonalization Disorder do not report higher absorption levels, but they do exhibit poorer attentional control, leading the authors to conclude that depersonalized patients "appear to be more easily distracted by competing internalized cognitions, which may in part explain their presenting symptomatology" (Levin et al., 2004, p. 71). Given that the relation with hyperassociativity was found to be specific to depersonalization, it might be interesting in future studies to investigate the link with another aspect of the detachment component, derealization, as large steps in associations might prove to be related to feeling not only detached from the self but also from the surroundings.

Additionally, we did we did not find stronger relations for negatively valenced material compared with neutral material. These null results were not due to an issue of power as the post-hoc power was large (0.99 to detect large differences; 0.96 to detect medium differences). Note also that our failure to observe stronger hyperassociativity with valenced material is at odds with the cognitive avoidance hypothesis, stating that high dissociators selectively avoid processing of emotionally negative

[1] Separate analyses for the three association measures were highly similar.

information. Alternatively, the valence or, as indicated by the SAM ratings, the arousal level of the stimulus material included in the present study may not have been intense enough (i.e., the stimuli were scored as medium arousing), which is a valid concern given that arousal, even more so than valence, is important in determining cognitive control (cf., Demanet, Liefooghe, & Verbruggen, 2011).

The absence of a significant correlation between dissociation and the scores on the Remote Association Task (RAT) may be explained in various ways. One possible account concerns the degree of free associations allowed in the various tasks. The RAT is a more rigid, rule constrained task because each problem requires only one correct answer: Relatively more linear and logical thinking and less "out of the box" thinking is required. Accordingly, individuals are perhaps less prone to freely associate and may not switch as easily to associations in seemingly disparate semantic categories. Hyperassociative thinking, increasing the probability that participants will drift too far away from the task at hand, thus might be contraindicated in the RAT. In other words, the task may index associative tendency and to a lesser extent hyperassociativity. In contrast, the other three association tasks provide more room for more free (hyper)association and divergent thinking, which includes coming up with words rapidly and filling in the first words that just 'pop up.' These tasks provide opportunities for more interindividual variation, as they allow (and especially the flexibility task, encourage) switches to other semantic domains, which may be a specific characteristic of highly dissociative individuals. Moreover, others have expressed the concerns that the RAT relies too much on (sensitivity to) language structure and does not capture associations based on functional relations (Worthen & Clark, 1971). That said, we acknowledge that our findings require replication. In clinical groups with relatively heightened dissociation scores, hyperassociativity might be documented on an array of association tasks.

As in previous research (Cosgrave et al., 2018; Giesbrecht, Lynn, Lilienfeld, & Merckelbach, 2008; Merckelbach et al., 2017), we found robust and significant correlations between dissociative experiences and measures of unusual sleep experiences, depression, cognitive failures, and alexithymia. Also, significant correlations were evident between fluency/flexibility measures, cognitive failures, and alexithymia, with regression analyses indicating that the relation between hyperassociativity and daytime depersonalization as well as the relation between hyperassociativity and nighttime unusual sleep experiences was carried by alexithymia and cognitive failures, both known predictors of dissociative experiences (see Lynn et al., 2019).

One possibility is that these relations are further mediated by emotional regulation such that hyperassociativity is associated with poor emotion regulation contributing to unusual sleep experiences, which, in the daytime, are manifested as depersonalization and as a propensity to cognitive failures. Furthermore, if alexithymia disrupts the ability to label and be aware of feelings, then it could interfere with the ability to regulate and monitor spontaneously arising emotions that, in turn, amplify hyperassociativity and compromise sleep at night and create a sense of numbness and detachment from the self during the day. Aksen, Polizzi, & Lynn (2020) reported that emotion dysregulation partially mediated the relation between sleep and dissociation, with additional findings implying bidirectional relations between sleep experiences and dissociation and emotion dysregulation and dissociation. Future studies would benefit from including measures of emotion regulation and cognitive failures, and assessing their association with hyperassociation, unusual sleep experiences, and alexithymia in longitudinal designs that permit causal inferences.

Some limitations in our research deserve mention. First, participants were required to fill in the first words that came to mind on the association tasks, but there is no objective way to verify if participants complied with this instruction or failed to report first associations. Future studies might use cognitive tasks such as the Number Reduction Task (Cosgrave et al., 2018), which requires divergent thinking to discover a hidden rule, in order to discern the connection between dissociative symptoms and scores on association. Moreover, future studies could explore the boundaries of adaptive versus maladaptive associativity and continue to investigate what tasks best discriminate hyperassociativity versus creativity or mental flexibility, for example. Additionally, research on hyperassociativity could usefully employ measures of semantic similarity among associations via natural language processing (Bollegala, Matsuo, & Ishizuka, 2012; Pawar and Mago, in press).

Second, whereas our research constitutes the first step in our investigation of hyperassociativity, our findings are limited to college students. Our conclusions, therefore, may not apply to clinical populations and require replication to assess the generalizability of our results to samples marked by greater psychopathology.

Third, our data do not contribute directly to the current theoretical debate regarding the genesis of the dissociative disorders. An important future variable to include in replication studies would be trauma history, as this variable is central in the ongoing debate between the posttraumatic model (conceptualizing the dissociative disorders as a coping response to severe childhood sexual and physical abuse; e.g., Dalenberg et al., 2012) and the sociocognitive perspectives of dissociation (emphasizing fantasy proneness, suggestion, suggestibility, cognitive failures, and sociocultural variables in dissociative disorders (e.g., Lilienfeld et al., 1999; Piper, 1997). Moreover, Barrett (1994) suggested that trauma is an antecedent to distortions of the sleep-wake cycle and unusual sleep experiences, which, we have suggested, is associated with hyperassociativity. Consistent with this hypothesis, sufferers from childhood trauma who reported sleep paralysis reported significantly higher levels of trait dissociation relative to those who reported no such unusual sleep experiences (McNally & Clancy, 2005).

Fourth, our research explored dissociation and hyperassociativity using measures of verbal associations. Future studies should evaluate the possibility that more impressive results would be obtained with imagistic information, consistent with the idea that highly dissociative individuals perceive connections or patterns among images where none exist, reflecting a tendency to generate remote associations (apophenia; DeYoung et al., 2012). This line of research also seems fruitful given the reported relation between dissociation and the disposition to experience extensive fantasy involvement/fantasy proneness (see Giesbrecht et al., 2008, for an opposing view see; Dalenberg et al., 2014).

In conclusion, our study is the first to report a relation between depersonalization and free association tasks. Also, we found tentative evidence for cognitive failures and alexithymia as contributing to the link between depersonalization and hyperassociativity (see Lynn et al., 2019). Nevertheless, to build a more definitive and complete model, it will be important to replicate and extend our findings and include measures of fantasy proneness, manipulate or examine other potential correlates of dissociative experiences (e.g., anxiety, emotion regulation), and better articulate the antecedents and boundaries of maladaptive vs. adaptive associational processes. As one possible model, trauma history might engender disrupted sleep, impaired emotion regulation, and increased anxiety, which interact to heighten hyperassociativity and in turn dissociative experiences and symptoms. Future studies might investigate experiential, cognitive, and behavioral avoidance to assess the possibility that hyperassociativity and consequent avoidance serve a maladaptive emotion regulation function; or conversely, that emotion regulation is a robust mediator of hyperassociativity. To this end, ecological momentary assessment of cognitions, emotions, and situational stressors might prove to be a viable investigational strategy.

CRediT authorship contribution statement

R.J.C. Huntjens: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Supervision, Project administration. **G.P.J. Janssen:** Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing. **H. Merckelbach:** Conceptualization, Writing – review & editing, Supervision. **S.J. Lynn:** Conceptualization, Writing – review & editing, Supervision.

Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jbtep.2021.101665.

Note. * = $p < .05$, ** = $p < .01$; RAT = Remote Associates Task; CES = Curious Experiences Survey.

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