Article

Forced-Choice False Recognition Controlling for Response Bias Correlates With Dissociative Amnesia Controlling for Imagery, but Not With Image Vividness Controlling for Dissociation

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Abstract

In the present study of false memory, subjects completed the Prevalence of Visual Imagery Test (PVIT), the Vividness of Visual Imagery Questionnaire (VVIQ), and the Curious Experiences Survey (CES); then, after generating visual images, viewing categorically related pictures, and viewing categorically related words, subjects completed forced-choice source recognition tests for whether they had "imaged" the word, the picture, or the image in a given category. Scoring higher on the CES Dissociative Amnesia/Fugue factor—controlling for the VVIQ and the PVIT—was associated both with poorer memory of the imaged source of visual images and with false memory of an imaged source for pictures. In contrast, greater image vividness on the VVIQ—controlling for CES factors—was not statistically associated with memory of an imaged source for images, pictures, or words. Greater image

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prevalence on the PVIT—controlling for CES factors—was associated with better memory of the imaged source of visual images and with less false memory of an imaged source for words.

Keywords
false memory, response bias, dissociative amnesia, image vividness, image prevalence

When source memory for imagined versus perceived experience is examined from the standpoint of individual differences, the question arises whether "false" source memory is associated with normal phenomena like vivid mental imagery or whether it is associated with psychopathological phenomena like dissociative amnesia. Notwithstanding the theoretical importance of this question, past studies associating false source memory either with vivid imagery or with dissociative amnesia tend to be deficient on two counts. First, most of these studies fail to ascertain that neither vivid imagers nor dissociators are adopting a more lenient response criterion, which leads to more "previously perceived" source attributions both for previously imaged items and for previously perceived items. Second, all such studies fail to control for the fact that more vivid imagery can be correlated with greater dissociation (Klinger, Henning, & Janssen, 2009; Lynn, Pintar, & Rhue, 1997; Waldo & Merritt, 2000). Thus, as Table 1 shows, all but three of the past studies associating false source memory with vivid imagery or with dissociation fail to differentiate false source memory from a biased response criterion that has nothing to do with memory per se; moreover, all three of the forced-choice recognition studies controlling for response bias fail to control for a possible correlation between more vivid imagery and greater dissociation.

In order to control for shifts in response criteria, the current study employs forced-choice recognition testing, which Schulman and Mitchell (1966) equate with signal-detection methods for controlling bias in response criteria and measuring true recognition of a signal's source. To control for possible correlations between dissociation and vivid imagery, the current study calculates partial correlations between memory and dissociation (controlling for vivid imagery) and partial correlations between memory and vivid imagery (controlling for dissociation). In addition, by focusing on correct source recognition for imaged items, the current study's design can compare the false source recognition of perceived pictures as "imaged" pictures and the false source recognition of perceived words as imaged words—given that pictures primarily share visual features with target images, whereas words evoke images that primarily share imaginal features with target images.

Table 1. Previous Research on Individual Differences in False Memory.

	Association of false memory with more vivid imagery	Association of false memory with greater dissociation
Studies susceptible to changing response criteria		
False recall of unpresented words		
Candel, Merckelbach, and Kuijpers (2003)	No association with CEQ	No association with DES
Dehon, Bastin, and Laroi (2008)		Positive association with DES
Platt, Lacey, Iobst, and Finkelman (1998)		No association with DES
Winograd, Peluso, and Glover (1998)	Positive correlation with VVIQ	No correlation with DES
Wright, Startup, and Mathews (2005)		No association with DES
False recall of unpresented pictures		
Niedzwienska (2000–2001)	Positive association with vividness	
Roberts (2002)	Positive association with QMI and VVIQ	
Falsely rated source recognition of imaged events		
Drivdahl and Zaragoza (2001)		No association with DES
Heaps and Nash (1999)	No association with VVIQ	Positive association with DES
Horselenberg et al. (2000)	Positive association with QMI	No association with DES
Hyman and Billings (1998)		Positive association with DES
Merckelbach, Muris, Horselenberg, and Stougie (2000)	Positive association with CEQ	Positive association with DES
Paddock, Noel, Terranova, Eber, Manning, and Loftus (1999)	No association with VMIQ	Positive association with DES
Wilkinson and Hyman (1998)	No association with VVIQ	Positive association with DES
Studies controlling for response criteria changes		
False forced-choice source recognition of imaged vs. perceived pictures		
Dobson and Markham (1993)	Positive association with VVIQ	
Markham and Hynes (1993)	Positive association with VVIQ	

(continued)

Table 1. Continued.

	Association of false memory with more vivid imagery	Association of false memory with greater dissociation
False forced-choice source recognition of filmed versus described event		
Aleman and de Haan (2004)	No association with VVIQ	No association with CEQ

Note. CEQ = Creative Experiences Questionnaire; DES = Dissociative Experiences Survey; QMI = Questionnaire upon Mental Imagery; VMIQ = Vividness of Movement Inventory Questionnaire; VVIQ = Vividness of Visual Imagery Questionnaire.

Method

Procedure

After reading, signing, and returning an informed consent form approved by UMass Lowell's institutional review board, each subject was provided with an answer sheet for Kunzendorf's (1982) Prevalence of Visual Imagery Test (PVIT), Marks' (1973) Vividness of Visual Imagery Questionnaire (VVIQ), and Goldberg's (1999) Curious Experiences Survey (CES). All test items on each of the three surveys were read aloud by the test administrator, and subjects made written responses on their answer sheets. Accordingly, on the first of 16 items on the PVIT, subjects heard the word *girl* and checked off whether a visual image (e.g., of a girl) or a word association (e.g., *boy*,) came to their mind first. On the first of 16 items on the VVIQ, subjects imaged "the exact contour of face, head, shoulders and body" of a relative or friend and rated their image's vividness on a scale ranging from5 = *perfectly clear and as vivid as normal vision* to 1 = *no image*. On the first of 31 items on the CES, subjects rated how frequently they "drove or rode somewhere without remembering later what happened during all or part of the trip."

Subsequently, subjects watched PowerPoint slides with accompanying audio recordings. At 5-s intervals, they heard a recorded instruction to "view the word___" (with a new word completing the instruction) and saw this new word on the accompanying slide, or they heard a recorded instruction to "view the ___" (completed by the verbal label for a new picture) and saw this picture on the accompanying slide, or they heard a recorded instruction to "visually imagine a ___" (completed by the verbal label for a new visual image) and saw a blank slide. Twenty sets of these three types of slides with auditory instructions were presented, and across three groups of subjects, the presentation of particular items as a picture, word, or image was counterbalanced within a set. The three categorically related items in the 20 sets were (1) deer, moose, buffalo; (2) pig, horse, cow; (3) bear, wolf, lion; (4) sheep, goat, camel; (5) zebra, giraffe, elephant; (6) panther, leopard, tiger; (7) beaver,

squirrel, rabbit; (8) poodle, greyhound, bulldog; (9) swan, pelican, goose; (10) eagle, owl, stork; (11) turkey, duck, chicken; (12) ostrich, penguin, peacock; (13) dolphin, whale, walrus; (14) lizard, turtle, frog; (15) orchid, rose, carnation; (16) pine tree, birch tree, palm tree; (17) pear, tangerine, apple; (18) pineapple, coconut, banana; (19) celery, cucumber, radish; and (20) asparagus, carrot, broccoli.

At the end of the PowerPoint presentation, participants were audibly presented with a succession of prerecorded tests for sets 1–20, in that order, where the test for each set audibly presented the three verbal labels corresponding to the set's picture, word, and image. During the test of each set, participants used a second answer sheet and circled the verbal label for which they remembered generating an image. At the completion of testing, participants were debriefed.

Subjects

The research subjects were general psychology students who signed up on the UML Psychology Department's subject-pool web site. A total of 154 subjects—57 males and 97 females whose ages ranged from 18 to 54 ($M = 19.34$, $SD = 3.98$)—participated in the study's three counterbalanced sessions, and 151 of them generated analyzable scores. All subjects received General Psychology course credit for their participation.

Results

The mean of image vividness ratings on the VVIQ was based on a rating of 5 representing greatest vividness, in accordance with our Method section and in reverse of Marks' (1973) method. The *image first* responses on the 16 PVIT items, which exhibited moderate internal reliability (Cronbach's $\alpha = .52$), were summed in accordance with Kunzendorf's (1982) method.

Ratings of the subjects' scores on the CES were factor analyzed by means of a Principal Component Analysis and Varimax Rotation. Table 2 displays loadings greater than .450, as well as the loadings less than our −.450, on the analysis's four interpretable factors: first, a Derealization/Depersonalization factor accounting for 26% of the CES variance and exhibiting high internal reliability (Cronbach's $\alpha = .87$); second, an Absorption/Imagination factor accounting for 9% of the CES variance and exhibiting moderately high internal consistency (Cronbach's $\alpha = .66$); third, a Dissociation/Automatism factor accounting for 6% of the CES variance and exhibiting moderately high internal reliability (Cronbach's $\alpha = .71$); fourth, a Dissociative Amnesia/Fugue factor accounting for 5% of the CES variance and exhibiting moderately high internal consistency (Cronbach's $\alpha = .62$). Eleven CES items did not load above the .450 criterion or below the −.450 criterion on any of the four interpretable factors.

Table 2. Loadings of CES Items on the Four Interpretable Factors.

CES item	Factor 1: Derealization/ Depersonalization	Factor 2: Absorption/ Imagination	Factor 3: Dissociative Automatism	Factor 4: Dissociative Amnesia/ Fugue
(4) Found myself dressed in clothes I didn't remember putting on.	0.648			
(7) Had the experience of feeling as though I was standing next to myself, or watching myself as if I was looking at a different person.	0.628			
(8) Was told that I sometimes do not recognize a friend or family member.	0.478			0.479
(9) Found that I had no memory for some important event in my life.	0.474			
(11) Had the experience of looking in a mirror and not recognizing myself.	0.774			
(12) Had the experience of feeling that other people, objects, and the world around me were not real.	0.732			
(13) Had the experience of feeling that my body did not belong to me.	0.770			
(15) Had the experience of not being sure whether things I remember happening really did happen, or whether I just dreamed them.	0.476			
(16) Had the experience of being in a familiar place but finding it strange and unfamiliar	0.492			
(14) Had the experience of remembering a past event so vividly that it felt like it was really happening.		0.462		

(continued)

Table 2. Continued.

CES item	Factor 1: Derealization/ Depersonalization	Factor 2: Absorption/ Imagination	Factor 3: Dissociative Automatism	Factor 4: Dissociative Amnesia/ Fugue
(18) Found that I became so involved in a fantasy or daydream that I felt like it was really happening.		0.499		
(28) Felt as though I was looking at the world through a fog so that people and objects appeared far away or unclear.		0.707		
(29) Felt like I was dreaming when I was awake.		0.740		
(30) Felt like I was disconnected from my body.		0.648		
(25) Found evidence that I had done things that I did not remember doing.			0.676	
(26) Found writings, drawings, or notes among my belongings that I must have done but cannot remember doing.			0.683	
(27) Found that I heard voices inside my head that told me to do things or that commented on things that I was doing.			0.655	
(5) Found new things among my belongings that I did not remember buying.				0.700
(6) Was approached by someone I didn't know who called me by another name or who insisted that he or she had met me before.				0.493
(10) Had the experience of being accused of lying when I did not think that I had lied.				0.626

Note. Only factors loadings greater than 0.450 or less than −0.450 are included.

Correlations between subjects' correct and false recognition scores, their PVIT and VVIQ scores, and their CES factor scores were calculated. As Table 3 shows, the PVIT was positively correlated with correct source recognition for imaged items and was negatively correlated with false source recognition

Table 3. Simple and Partial Correlation Coefficients for Correct and False Recognition by Dissociation and Imagery.

	Correct source recognition for imaged item	False source recognition for perceived picture	False source recognition for perceived word
Simple correlations of PVIT and VVIQ scores with correct and incorrect recognition			
PVIT	.196*	−.133	−.211**
VVIQ	.011	−.007	−.009
Simple correlations of CES factor scores with correct and incorrect recognition			
CES Factor 1 Derealization/ Depersonalization	−.082	.032	.140
CES Factor 2 Absorption/Imagination	−.015	−.020	.085
CES Factor 3 Dissociative Automatism	−.064	.057	.035
CES Factor 4 Dissociative Amnesia/Fugue	−.243**	.269**	.027
Partial correlations controlling for all four CES factor scores			
PVIT	.176*	−.113	−.202*
VVIQ	.022	−.013	−.023
Partial correlations controlling for PVIT and VVIQ scores			
CES Factor 1 Derealization/ Depersonalization	−.070	.023	.128
CES Factor 2 Absorption/Imagination	−.010	−.024	.081
CES Factor 3 Dissociative Automatism	−.058	.053	.029
CES Factor 4 Dissociative Amnesia/Fugue	−.231**	.260**	.008

Note. Across 20 trials, the mean number of correctly recognized imagery labels was 13.0 ($SD = 6.6$); the mean number of incorrectly recognized picture labels was 4.3 ($SD = 5.5$); and the mean number of incorrectly recognized distracter labels was 2.6 ($SD = 2.6$). The mean number of *image first* responses on the PVIT was 10.6 ($SD = 2.1$), and the mean rating per VVIQ item was 3.9 ($SD = 0.5$). VVIQ = Vividness of Visual Imagery Questionnaire; PPIT = Prevalence of Visual Imagery Test; CES = Curious Experiences Survey.

*Two-tailed $p < .05$. **Two-tailed $p < .01$.

for perceived words. Both these correlations remained significant when all four CES factors were statistically controlled for. Neither the VVIQ nor CES Factors 1 through 3 had significant correlations with correct or false source recognition. The fourth CES factor measuring dissociative amnesia/fugue was negatively correlated with correct source recognition for imaged items and was positively correlated with false source recognition for perceived pictures. The latter two correlations remained significant when the PVIT and VVIQ covariation was statistically controlled for.

To determine whether the fourth CES factor interacted with the PVIT or the VVIQ, an analysis of variance with three factors—above versus below median on the fourth CES factor, above versus below median on the PVIT, and above versus below median on the VVIQ—was computed for each of the study's three dependent variables: correct source recognition for imaged items, false source recognition for perceived pictures, and false source recognition for perceived words. In the first ANOVA, the mean number of imaged items correctly recognized as *imaged* by participants below median on the fourth CES factor ($M = 14.4$ items, $SD = 6.0$) was significantly greater than the mean number of imaged items correctly recognized as *imaged* by participants above median on the fourth CES factor ($M = 11.4$ items, $SD = 6.8$)—$F_{1,146} = 8.00$, $p < .005$; no other factors and no interactions were statistically significant. In the second ANOVA, the mean number of perceived pictures falsely recognized as *imaged* by participants below median on the fourth CES factor ($M = 3.1$ pictures, $SD = 4.8$) was significantly lower than the mean number of pictures falsely recognized as *imaged* by participants above median on the fourth CES factor ($M = 5.8$ pictures, $SD = 5.8$)—$F_{1,146} = 9.43$, $p < .005$; no other factors and no interactions were statistically significant. In the third ANOVA, the mean number of perceived words falsely recognized as *imaged* did not differ significantly across any of the three factors, any of the 3 two-way interactions, or the three-way interaction.

Discussion

In the present study, scoring higher on the CES Dissociative Amnesia/Fugue factor—controlling for scores on the VVIQ and the PVIT—was associated both with poorer memory of the imaged source of visual images and with false memory of an imaged source for pictures (and was not associated with false memory of an imaged source for words). In contrast, greater image vividness on the VVIQ—controlling for all four dissociation factors on the CES—was not statistically associated with memory of an imaged source for images, pictures, or words. Interestingly, greater image prevalence on the PVIT—controlling for all four dissociation factors on the CES—was associated with better memory of the imaged source of visual images and with less false memory of an imaged source for words (and was not statistically associated with false memory of an imaged

source for pictures). The CES Dissociative Amnesia/Fugue factor, the VVIQ, and the PVIT had no interactive effects on either correct source memory or false source memory.

Unlike most studies in Table 1, the current study is truly a study of false memory, because forced-choice source recognition controlling for response biases is employed. In addition, unlike all of the studies in Table 1, the current study is a true measure of false memory's correlation with dissociation and image vividness, because of the use of partial correlation. Finally, unlike all other studies of false memory, the present study measured the prevalence of visual images and found it to be correlated with better memory for the source of images. Taken together, these findings indicate that false source memory free of any response biases is associated with the psychopathological phenomenon of dissociative amnesia rather than the normal phenomenon of vivid mental imagery.

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