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Shorter communication

Uncertainty about perception and dissociation after compulsive-like staring: Time course of effects

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ABSTRACT

Repeated and compulsive-like checking reduces confidence in memory for the last check. Obsessive-compulsive (OC) patients are not only uncertain about memory, but may also be uncertain about perception, while this perceptual uncertainty may be associated with prolonged visual fixation on the object of uncertainty. It was reported earlier that, among healthy participants, prolonged staring at light bulbs or gas rings induces OC-like uncertainty about perception and feelings of dissociation [van den Hout, M. A., Engelhard, I. M., de Boer, C., du Bois, A., & Dek, E. (2008). Perseverative and compulsive-like staring causes uncertainty about perception. *Behaviour Research and Therapy, 46*, 1300–1304]. In that study, staring continued for 10 min. For patients, however, staring intervals seem to be considerably shorter. To test the clinical credibility of the paradigm as a model of the maintenance of OC perceptual uncertainty, we investigated whether the effects of staring materialize long before 10 min. Five groups of 16 undergraduates participated: one group did not stare at a gas stove while the others stared for 7.5, 15, 30 or 300 s. In the absence of staring, no pre-to-post increase in dissociation/uncertainty was reported, but after staring it was. The larger part of the observed dissociation/uncertainty after 5 min had occurred within 30 s, and around 50% of this maximal increase was reported between 7.5 and 15 s. Thus, even relatively short intervals of staring induce uncertainty about perception and dissociative experiences. Perseverative looking at objects may be a counter-productive OC strategy, which increases uncertainty about perception and may serve to maintain the disorder.

Introduction

Obsessive-compulsive (OC) patients tend to distrust their memory performance (Brown, Kosslyn, Breitner, Baer, & Jenike, 1994; Constans, Foa, Franklin, & Matthews, 1995; Dar, 2004; Dar, Rish, Hermesh, Fux, & Taub, 2000; Ecker & Engelkamp, 1995; Hermans, Martens, de Cort, Pieters, & Eelen, 2003; Hermans, Engelen, Grouwels, Loos, Lemmens & Pieters, 2008; Karadag, Oguzhanoglu, Ozdel, Atesci & Amuk, 2005; MacDonald, Antony, MacLeod, & Richter, 1997; McNally & Kohlbeck, 1993; Sher, Frost, & Otto, 1983; Tuna, Tekcan, Topçuoğlu, 2005; Zitterl, Urban, Linzmayer, Aigner, Demal, & Semlre, 2001). Most OC patients engage in perseverative checking (Tallis, 1995), and it has been shown that repeated checking has the ironical effect of enhancing memory uncertainty: when individuals engage in OC-like perseverative checking, confidence in memory is reduced (Ashbaugh & Radomsky, 2007; Boschen & Vuksanovic, 2007; Coles, Radomsky, & Horng, 2006; Radomsky, Gilchrist, & Dussault, 2006; van den Hout & Kindt, 2003a, b). Dissociative experiences are common in OC patients (Freyberger, Grabe, Goldschmidt, Lehmkuhl, Gänsicke, & Spitzer, 1999; Hand, Rufer, Fricke, Held, & Cremer, 2006b; Hand et al., 2006a; Merckelbach & Wessel, 2000; Muris, Merckelbach & Peeters, 2003; Versiani et al., 2007), and a plausible explanation is that self-reports about dissociation by OC patients relate to experiences during episodes of OC uncertainty and ritualising. Interestingly, after experimental OC-like checking, participants report similar dissociation-like experiences of ambivalence ("I remember doing it in a way, but it's all fuzzy") that are reported after clinical checking (Reed, 1985; van den Hout & Kindt, 2003b). This suggests, then, that OC uncertainty is reinforced by the very strategies that patients use to try to reduce memory distrust.

Recently, Hermans et al. (2008) documented that OC patients also report uncertainty about attention and perception. It was argued that OC uncertainty about visual perception is associated with a tendency to visually fixate on the object of uncertainty (van den Hout, Engelhard, de Boer, du Bois & Dek, 2008). Examples are staring at one's hands to determine if they are really clean, fixating on the light switch to decide whether it is really off, etc. The question ensues whether a side effect of OC-like staring is reduced

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trust in one's visual perception, just like perseverative checking reduces trust in memory.

Van den Hout et al., (2008) reported experimental evidence in support of this conjecture. Healthy volunteers were asked to look at an object (a gas stove or a light bulb) during a pre-test and a post-test. In between these tests, participants in the experimental condition were asked to stare at the same object that was used during the pre-test/post-test. Staring was defined as prolonged fixation on an object with reduced blinking and eye movement. Participants in the control condition stared at an object that was different from the object used in the pre-test/post-test. Both in the experimental and control conditions, dissociation increased after staring; the effects were equally strong. Critically, both conditions showed an increase in perceptual uncertainty; the effect was significantly stronger in the experimental group. The fact that induced dissociation was equally strong in the control condition, while induced uncertainty was stronger in the experimental condition, was explained by the fact that many of the items used to assess state-dissociation related to general feelings (e.g., "Do you feel disconnected to your body?"), and were not related to the object individuals looked at. The uncertainty-items, however, were all related to the perception of the object individuals looked at during the pre-test/post-test.

While this was taken to suggest that OC-like prolonged looking at objects might result in dissociative uncertainty, it should be noted that in the van den Hout et al., (2008) experiment, participants were instructed to stare at the object for *10 min*. This 10-min interval was chosen to be on the safe side and maximize chances of finding effects. Meanwhile, though we do not know of any ethological data on the duration of perseverative staring in OCD, clinical experience suggests that 10 min of staring is unusually long, even for seriously disturbed patients. If dissociation and perceptual uncertainty would not occur after OC-like staring during a substantially *shorter* interval, this would discredit the experiment as a sound model of OC uncertainty. In order to critically test the validity of the staring paradigm as a model of OC visual perseveration, it was decided to determine the boundaries of the paradigm and compare the effects of not staring with staring for 7.5, 15, 30, and 300 s.

Method

Participants

Eighty volunteer undergraduate psychology students from Utrecht University participated (15 males; mean age 22.3 years, SD = 4.2). They received a small remuneration.

Design and procedure

The within-group factor of the 2 × 5 mixed factorial design was Time: participants had to look at a gas stove for 2 s during a pre-test and a post-test. The between-group factor was Duration: in between the pre-test and post-test, participants ($N = 16$ per group) were asked not to look at the stove (i.e., 0 s condition) or to stare at it for 7.5 s, 15 s, 30 s or 300 s. The intervals were determined in pilot studies. The experiment had 3 phases: (1) pre-test; (2) staring; (3) post-test, and the participants were randomly allocated to one of the five duration conditions. They were seated at a table with a real-life 1-ring gas stove at 75-cm distance. Instructions were written on a sheet and were handed out by the experimenter who was sitting behind the participant. Participants were asked not to move their chair during the experiment. At the pre-test and post-test, participants were to look at the gas stove for 2 s, and then to complete the questionnaires. In between the pre-test and post-test, participants in the 0 s condition were asked to do a word-puzzle for 300 s without looking at the stove. Between the pre-test and post-test, participants in the 7.5 s condition were asked to do the puzzle for $300 - 7.5 = 292.5$ s and then to stare at the gas stove for 7.5 s, participants in the 15 s condition did the puzzle for 285 s and then stared at the stove for 15 s, participants in the 30 s condition did the puzzle for 270 s and then stare for 30 s, while participants in the 300 s condition stared the whole time. Participants were asked not to talk, avert their gaze, or blink their eyes. The instructions stressed the importance of concentrating on the object.

Assessments

Dissociation

Dissociation was measured with 5 items from a translated version of the 'Clinician-Administered Dissociative State Scale' (CADSS; Bremner et al., 1998; Holmes, Brewin, & Hennessy, 2004), which includes depersonalization, derealisation, and amnesia. The CADDS was developed as a measure of state dissociation to be used in repeated measurement designs. It has excellent reliability and consistency, and it adequately discriminates patients with dissociative complaints from controls. Given the experiences and considerations by van den Hout et al., (2008) (see Introduction), it was decided to use items that relate to dissociative experiences of visual perception and adapt their content to the present task. The items were:

(1) The gas stove seemed unreal or dreamlike
(2) It seemed as though the gas stove looked different than I expected
(3) I felt that the colours and intensity of the gas stove had decreased
(4) I perceived the gas stove as if I was in a tunnel, or as if I was looking through a lens
(5) It seemed as though I was looking at the gas stove through fog, as if it was further away and unclear

Items were rated on a 5-point scale anchored with 0 (not at all) and 4 (extremely. It was decided to use the total score of the 5-item version of the CADSS that ranged from 0 to 20.

Perceptual uncertainty

Uncertainty was assessed with the following 5 items that were scored on 10 mm Visual Analogue Scales (0 = does not apply to me, 100 = applies to me).

(1) "It was as though I saw it, but it wasn't definite enough"
(2) "I saw it in a way, but it was all fuzzy"
(3) "I realized that I saw it, but the image was not clear somehow"
(4) "What I have seen during the last 10 s of observing the gas stove (or light bulb), felt reliable"
(5) "I felt confident about what I saw during the last 10 s of looking at the gas stove/light bulb"

The first three items were taken from van den Hout & Kindt (2003b), and were quotes from OC patients, given by Reed (1985), that related to memory uncertainty during checking. For the purpose of the present experiment, these items were adapted to relate to perception. The fourth item came from the 'Brief Cognitive Confidence Questionnaire' (BCCQ; Hermans et al., 2008), which has a one-item subscale assessing confidence in perception and reads: "What I have seen, is reliable". The present formulation is an adaptation for the present task. The fifth item was derived from pilot studies, and simply asked for confidence in perception. The combined scale was the average of the 5 items, and ranged from 0 to 500.

Results

Dissociation

With regard to dissociation, Table 1 shows that dissociation systematically intensified as the duration of the staring increased from 0 s to 300 s.

A 2 (Time: pre-test vs. post-test) × 5 (Duration: 0 vs. 7.5 vs. 15 vs. 30 vs. 300 s) mixed ANOVA was carried out with Time as within-group factor and Duration as between-group factor. The Time effect was significant [$F(1,75) = 45.04$; $p < 0.001$], indicating that scores increased significantly from pre-test to post-test. The Duration effect was also significant [$F(4,75) = 9.08$; $p < 0.001$], showing that scores were higher in the longer Duration conditions. Finally, the significant Time × Duration interaction [$F(4,75) = 9.09$; $p < 0.001$] reflected that the pre-to-post increases were higher in the longer duration conditions. Following up on the ANOVA, pair-wise comparisons were carried out for all 5 duration conditions and *t*-values are given in Table 1. In the 0 s condition, there was a slight but significant *decline* in dissociation, but in all four staring conditions, scores were significantly higher at the post-test relative to the pre-test.

Perceptual uncertainty

The effects on uncertainty show a rather similar pattern (cf. Table 1): the longer the staring, the stronger the uncertainty. The 2 × 5 ANOVA revealed an effect of Time: scores were higher at the post-test [$F(1,75) = 23.89$; $p < 0.001$]. The Duration effect was significant as well [$F(4,75) = 6.96$; $p < 0.001$], reflecting the fact that scores were higher in the longer duration conditions. Finally, the pre-to-post increases were larger in the higher duration conditions as indicated by a Time × Duration interaction [$F(4,75) = 4.88$; $p < 0.001$]. Pair-wise comparisons revealed, identical to the results on dissociation, no increase in the 0 s condition and significant increases in the 15 s, 30 s, and 300 s conditions. In contrast to the dissociation results, the increase in uncertainty in the 7.5 s condition was not significant (see Table 1).

Further analyses

Next to testing the hypothesis, it was decided to calculate the correlations between the two dependant variables and the time–intensity curve (Meilgaard, Civille, & Carr, 2007) of the increases in dissociation and uncertainty. Scores on dissociation and uncertainty were correlated both at the pre-test ($r = 0.43$; $p < 0.001$) and at the post-test ($r = 0.79$; $p < 0.001$), while the pre-to-post increases were likewise significantly correlated ($r = 0.75$; $p < 0.001$). A comprehensive impression of the dose–response relationship is given by the time–intensity curve of Fig. 1. The "dose" is simply the duration of staring, given here in real time, while the response (intensity) is given as the pre-test minus post-test difference in dissociation/uncertainty, expressed as the percentage of the maximum change observed after 300 s.

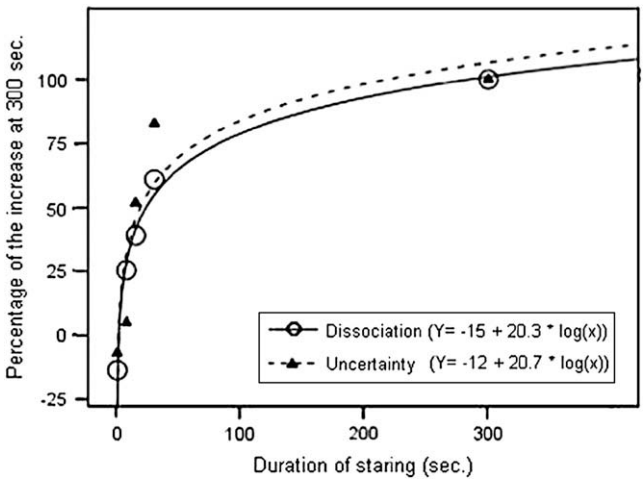

Fig. 1. Pre-to-post increases in uncertainty about perception and dissociation as a function of the duration of visual perseveration. "Log" denotes a logarithmic function with base e (a.k.a. the natural logarithm or ln).

The data on both dissociation and uncertainty follow a log-linear trend, the relevant formulas being given in Fig. 1. After 15 s, some 50% of the maximum effect (observed after 5 min) was already present for uncertainty, while for dissociation this was 40%. After 30 s, 82% of the maximum uncertainty and 62% of the maximum dissociation was reported. Apparently, then, dissociation and perceptual uncertainty occur relatively early after visual fixation starts, with the larger part of the effect occurring within 30 s.

Discussion

Some OC patients are uncertain about the trustworthiness of their visual perception and stare, for example, at washed hands or turned-off gas stoves to increase certainty. It was reported earlier (van den Hout et al., 2008) that such staring ironically induces dissociative uncertainty if it continues for 10 min. It was argued that for the staring-paradigm to be a credible experimental model of OCD, the effects of perseveration on uncertainty should occur quickly after the onset of visual fixation. This was indeed observed. Fig. 1 shows that the induced dissociation and uncertainty follow a log-linear trend: the larger part of the dissociation/uncertainty that was observed after 5 min was already present within 30 s, while around 40–50% of the maximal increase (5 min staring) was reported by the group that stared for only 15 s.

Thus, the earlier observation that prolonged staring induces dissociative uncertainty is no artefact from extreme prolongation: even relatively short episodes of visual fixation on stimuli induce feelings of dissociation and uncertainty about perception. The normal pattern of alternating eye-movements and fixations serves to monitor and 'supervise' automatic behaviour, while this monitoring itself is largely an automatic routine (Land, Mennie, & Rusted,

Table 1
Effects of visual perseveration for 0, 7.5, 15, 30, and 300 s on dissociation and uncertainty about perception.

	0 s		7.5 s		15 s		30 s		300 s	
	Dissociation	Uncertainty	Dissociation	Uncertainty	Dissociation	Uncertainty	Dissociation	Uncertainty	Dissociation	Uncertainty
Pre-test	6.3 (1.3)	63 (68)	6.7 (1.8)	121 (124)	6.9 (1.6)	86 (73)	7.1 (1.8)	112 (98)	6.8 (1.8)	121 (117)
Post-test	5.4 (0.6)	53 (44)	8.2 (3.1)	128 (96)	9.2 (3.2)	161 (88)	10.7 (3.5)	232 (139)	12.7 (4.5)	266 (119)
t(paired) ($n = 16$)	−2.28*	−0.95 (ns)	2.28*	0.24 (ns)	2.61*	2.96**	4.36**	4.15**	4.9**	3.08**
ES (Cohen's *d*)	0.57	0.24	0.58	0.06	0.66	0.73	1.09	1.03	1.23	0.77

*$p < 0.05$; **$p < 0.01$; ns, not significant.

1999). To the degree that OC patients not only try to carry out automatic motor routines, like moving a handle, in an attentive, effortful way but also do the visual monitoring extensively and prolonged, the result will be ironical and uncertainty will be reinforced rather than reduced. This is reminiscent to experimental findings on perseverative checking. It was documented that checking 20 times induces memory distrust (Ashbaugh & Radomsky, 2007; Boschen & Vuksanovic, 2007; Radomsky, Gilchrist, & Dussault, 2006; van den Hout & Kindt, 2003a, b). Just like one may argue that staring for 10 min is clinically implausible, checking 20 times is more than what is usually observed in OC patients. But just like Coles et al. (2006) documented that checking between 2 and 5 times is sufficient to create distrust in memory, the present study indicates that the ironical effects of visual perseveration occur rather quickly.

When participants did not stare in between the pre-test and post-test, no dissociation/uncertainty was reported, but after staring it was, and a dose–response relationship was apparent: the longer the staring, the stronger the dissociation/uncertainty. Still, there was no control condition in which participants stared at another object than the one used during the pre-test/post-test. With regard to perceptual uncertainty, it is unlikely that such a control condition would yield identical effects: in an earlier study that did include such a control condition, effects of staring on uncertainty were larger in the experimental group (van den Hout et al., 2008). In that study, staring effects on dissociation were equally strong in the experimental and control groups. It is plausible that the latter finding was due to the items used to assess dissociation in the van den Hout et al., (2008) study (see Introduction). Although the possibly irrelevant items were removed from the present measure of dissociation (see *Assessments*), it remains unclear if participants would also report as much dissociation at the post-test if, earlier, they had been staring at another object. Note that to the degree that this holds true, the implication is that the dissociative effects of visual perseveration *generalise.* This would render visual fixation as an extra problematic safety strategy.

Dissociation and uncertainty were both measured, but the nature of the relationship between them is unclear. They were strongly correlated ($r = 0.75$), and it seems likely that they tap into slightly different aspects of an experiential end-point of perseveration that contains a representation of sensory attributes (including colour, intensity, detail, etc.) that is less rich than before perseveration.

The present study was carried out with healthy participants, and the data imply that uncertainty induced by visual perseveration is a normal phenomenon. Would the effects of visual perseveration be different for OC patients? OC patients attempt to "monitor closely and take control over processes that would otherwise operate in automatic and well-practiced ways" (Salkovskis, 1988; p. 40). This preference for serial processing and attending to small details rather than larger organizing features is obvious in clinical compulsions, but it has also been found on tests that are unrelated to OC concerns, both in clinical OC patients (Buhlmann, Deckersbach, Engelhard, Cook, Rauch, Kathmann, Wilhelm, Savage, 2006; Savage, Baer, Keuthen, Brown, Rauch, & Jenike, 1999) and in individuals with subclinical OC tendencies (Soref, Dar, Argov, & Meiran, 2008). Possibly, a preference for focused and serial processing is also apparent from spontaneous eye-movements with OC patients displaying longer fixation intervals, and this could easily be tested. But even if it were true, that would not imply that the *effects* of staring would be different for OC patients relative to controls. While this is an open issue, there is no a priori reason to assume that such patient-control differences exist.

Uncertainty/perseveration in OCD is not limited to memory-distrust/checking and perception-distrust/staring. Patients may, for example, doubt if they properly understand a written line and re-read it several times, or they may be uncertain if they might make unwanted movements and sustain attention on their hand muscles. It is tempting to speculate that for such other combinations of uncertainty and perseveration too, the latter reinforces the former. Re-reading lines or repeating sentences (e.g. "It is clean, it is clean, I know it is clean, It is clean etc.") may, for instance, foster 'semantic satiation' (Pynte, 1991) and render the meaning of sentences less, rather than more, apparent. Clearly, then, there is room for research here. First, there is little theory and scarce data in the general psychological literature on the cognitive effects of OC-like perseveration. Controlled laboratory studies on the effects of perseveration should be welcomed. Second, such studies should be informed by phenomenological descriptions and ethological analyses of real-life clinical perseveration. The notion that OC patients engage in 'visual perseveration' to reduce uncertainty was the starting point of this study, but it was based on unsystematic reports by patients and incidental observation of their behaviour. It would be worthwhile to document what cognitive functions (perception, attention, episodic/semantic memory, language etc.) are subjects of clinical OC uncertainty, how these uncertainties relate to perseveration and what forms these perseverations take. In the present context it would be interesting to know what exactly the duration of visual perseveration is and how many saccades are involved. Typically, self-reports of patients serve as the database for clinicians but on-the-spot ethological studies may provide a rich source of data.

Finally, the findings reported here underscore that motivating patients to quit perseverative rituals is a rational treatment strategy. Apart from serving to disconfirm alarming threat beliefs, it prevents the OC problems from being fuelled by the normal cognitive effects of perseveration.

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