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Implicit Voodoo: Electrodermal Activity Reveals a Susceptibility to Sympathetic Magic

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Abstract
Although young children might be uncertain about the nature of certain representations, most modern adults would explicitly maintain that photographs have no ongoing physical connection the objects that they depict. We demonstrate here in three studies that destruction of a photograph of a sentimental object produces significantly more electrodermal activity than destruction of photographs of other control objects. This response is not attributable to anxiety about being observed whilst destroying the picture, nor is it entirely due to simple visual association – the same response occurs when the photograph does not resemble the object. We suggest that this effect may reflect a tacit acceptance of "sympathetic magic".

Keywords
Sympathetic magic, implicit arousal

In sympathetic magical belief, objects are causally connected to one another by dint of their similarity (Frazer, 1915). For instance, the doctrine known as the 'Law of Signatures', which assumed that substances that shared a resemblance were connected by occult forces, motivated medieval folk remedies and the practice of alchemy (as described in Della Porta's 16th century work *Magia Naturalis*; see Eamon, 1994). More tentatively, an implicit belief in this law might be involved in certain superstitious or magical notions even in scientifically literate adults today (e.g., Rozin and Nemeroff, 1990; Hood, 2009).

One of the most dramatic examples of modern sympathetic magic is the concern that damage to a representation can somehow harm the real-world person or thing that is represented. Some adults in pre-industrial societies believe that damaging a photograph of an individual can cause injury to that

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individual (Behrend, 2003), and even scientifically literate adults are reluctant to destroy photographs of someone they are close to (Rozin et al., 1986) or throw darts accurately at pictures of babies (King et al., 2007). Young children in the United States and Europe are often confused about the relationship between a picture and what it represents (DeLoache et al., 1998), and there is even some suggestion that older children believe that tearing apart a picture can destroy the depicted object (Beilin and Pearlman, 1991; though see Bloom, 2000 for a critical discussion).

We explore here whether the same sort of concerns might apply for Western adults – if tested in a sufficiently sensitive way, using photographs of sentimental objects. Such objects Include items that people acquire as children, such as blankets and toys, as well as those such as wedding rings and jewellery received from loved ones as adults. These have personal emotional value above and beyond their financial worth, and are thought be more valuable than perfect physical duplicates (Hood and Bloom, 2008).

Here we investigate whether the act of destroying photographs of sentimental objects produces significantly more physiological arousal than destroying photographs of other valuable possessions and control objects. We also examine whether destruction arousal is attributable to anxiety triggered by a publicly observed act of desecration of a photograph of a sentimental possession. Finally we test whether destruction arousal is solely attributable to the visual resemblance between the photograph and object – that is, is similarity necessary, or is representation itself sufficient?

Study 1: Does destruction of photographs of sentimental objects induce arousal?

This first experiment addressed whether destruction of photographs of childhood and adult sentimental objects produces a significant increase in arousal compared to photographs of control objects, including similar objects owned by other people, and other non-sentimental personal possessions.

Methods

Participants. Thirty-one adults (9 males and 22 females; mean age=27 years, SD=10 years) were included in the study.

Procedure. Participants asked to bring in (a) a sentimental object and (b) another valuable possession that they were not emotionally attached to. The sentimental objects fell into two categories – 16 subjects (12 females)

brought in childhood attachment objects (3 blankets and 12 toys) and 15 subjects (10 females) brought in jewellery (4 chains and 11 wedding/engagement rings). The valuable non-sentimental objects were typically items such as wallets, purses and mobile phones.

Each sentimental item was then matched with an unfamiliar sentimental item taken from another participant, and three photographs each were taken of the subject's sentimental item, the valuable non-sentimental item, and the unfamiliar sentimental item. These pictures were then divided into three sets, each containing a photograph of each kind of item in a counterbalanced order. Electrodermal activity (EDA) was recorded from the sole of one foot while the participant was instructed to "cut each photograph in half". The EDA signal was processed by a Biopac MP35 professional system (Biopac Systems). EDA was measured by applying an alternating current through disposable electrodes (hypoallergenic, vinyl-based medical sensors with a pre-applied chloride wet gel). The EDA signal was recorded at a gain of ×5000 and 200 Hz rate with Biopac software (Biopac Student Lab Pro©). A band stop-line frequency filter was applied. The dependent measure for statistical analysis was the first peak adjusted delta uMho transconductance measured between 1 and 4 s after each destruction, which was automatically calibrated independently for each participant by the acquisition software.

Results and Discussion

Calibrated first peak amplitudes of conductance were entered into a repeated measure ANOVA with independent within-participant variables of set order (1st, 2nd vs. 3rd), item (sentimental, control vs. possession) and between-participant variables of object type (childhood vs. jewellery) and sex (male vs. female). There were main effects for set order ($F(2,30)=10.52$, $P<0.01$, $hp^2=0.26$); post-hoc *t*-tests showed that the 1st set amplitudes were greater than both the 2nd and 3rd sets which did not differ (0.93 μMho vs. 0.49 μMho vs. 0.31 μMho, respectively; $P<0.05$ for 1st vs. 2nd and $P<0.001$ for 1st vs. 3rd, P=0.24 for 2nd vs. 3rd).

As predicted, a significant item effect ($F(2,30)=5.38$, $P<0.01$, $hp^2=0.12$) was found due to greater EDA amplitudes to the sentimental compared to the valuable and control items which did not differ (0.81 μMho for sentimental vs. 0.50 μMho for personal and 0.60 μMho for control items; $P<0.05$ for sentimental vs. control and $P<0.01$ for sentimental vs. personal, $P=0.25$ for personal vs. control). There was a non-significant main effect trend ($P=0.09$) of greater arousal following destruction in the childhood attachment group compared to the matrimonial jewellery group. No other significant main effects or interactions were found.

As predicted, then, cutting up a photograph of a sentimental possession produced significantly more arousal than other control objects.

Study 2: Is arousal due to observed destruction of photographs of sentimental objects?

Cutting up a photograph of a personal item is an act of destruction that may be perceived as a public display of rejection. Having been asked to bring in cherished objects, participants may have felt uncomfortable about then destroying a representation of the item in full view of the experimenter. This second study addressed whether the unobserved destruction of photographs of childhood sentimental objects still produced a significant increase in arousal compared to control objects.

Methods

Participants. Twenty-one adult participants (8 males and 13 females; mean age=20 years 8 months, SD=5 years 1 month) were included.

Procedure. Subjects were asked to bring in a childhood sentimental object and a valuable personal possession. Sentimental childhood objects were 15 teddies/stuffed animals and 6 blankets.

As in Study 1, EDA initial peak deviations were recorded from the foot of each participant as they cut up photographs of object. However, one minor difference was that we acquired a newer version of the recording system that produced a comparable measure of conductance measured in mV. Again this was measured over 1–4 s following destruction.

Each sentimental object was matched with a control object from another participant, and a personal non-sentimental valuable item. Nine photographs were produced and placed inside unmarked envelopes. These envelopes were divided into three sets, each of which comprised one copy of each item. Participants were handed each set consecutively, from which they chose one envelope at a time and cut up the picture inside while facing away from the experimenter so as to conceal which photograph was destroyed. Participants replaced the pieces of the photograph in the envelope and discarded them into a box. At the end of the session the order of destruction of photographs was determined from retrieving the envelopes.

Results and Discussion

Calibrated first peak amplitudes were entered into a repeated measure ANOVA with independent within-participant variables of set order (1st, 2nd vs. 3rd),

item (sentimental, control vs. possession) and sex as a between-participant variable. There were main effects for set ($F(2,38)=10.5$, $P<0.001$, $hp^2=0.36$); post-hoc *t*-tests showed that the 1st set amplitudes were greater than both the 2nd and 3rd sets which did not differ (0.62 mV vs. 0.41 mV vs. 0.4mV, respectively; $P<0.01$ for both 1st vs. 2nd and 3rd set and $P=0.68$ for 2nd vs. 3rd).

Again, a significant item effect ($F(2,38)=17.58$, $P<0.001$, $hp^2=0.48$) was found due to greater EDA amplitudes to the sentimental compared to the valuable and control items which did not differ (0.65 mV for sentimental vs. 0.41 mV for personal and 0.37 mV for control items; $P<0.001$ for both sentimental vs. personal and control, $P=0.31$ for personal vs. control). There were no other significant main effects or interactions. Hence, Study 2 replicated the increased anxiety observed in Study 1, even though the participant engaged in the destructive act unobserved.

In Study 3, we explore whether the effect could still be obtained when the photograph did not even look like the treasured possession. If so, this would indicate that there is something over and beyond visual similarity triggering the response.

Study 3: Is destruction arousal due to visual resemblance alone?

One simple explanation for the increased arousal due to cutting up a photograph of a cherished possession is that participants misattribute the visual representation for the real object. After all, adults show EDA arousal to pornography (Zuckerman, 1971) and aversive photographs (Taylor et al., 2000) and so one explanation for destruction anxiety is that the photograph triggers an associated response based on the visual resemblance. If so, then photographs that are visually unrepresentative of the depicted object should not elicit a destruction arousal response.

Methods

Participants. A further 30 adult participants (10 males and 20 females; mean age=25 years 6 months, SD=11 years 5 months) were recruited.

Procedure. Subjects were asked to bring in a childhood sentimental object. The objects were 21 teddies/stuffed animals, 6 blankets and 3 other toys.

As in Study 1, each sentimental item was then matched with a control item. To make the match as visibly similar as possible, we searched internet image databases of same category items. Examples are shown in Figure 1. Three photographs were taken of each subject's sentimental item, the valuable non-sentimental item, and the control item, with each photograph reprinted three

(a) Original Sentimental Object

(b) Blurred Image of Object

(c) Control Object From Another

(d) Control Valuable Personal Item

Figure 1. Typical examples of photographic stimuli used in Study 3. (a) An owner's authentic childhood object. (b) An "accidentally" blurred photograph was created for destruction. This was matched to a control object of someone else's similar object (c), as well as a photograph of valuable non-sentimental possession belonging to the participant (d).

times. However, the photograph of the sentimental item was deliberately distorted by the experimenter by taking a close-up, unfocused picture producing an image with no discernable structure (see Figure 1b). To account for this to the participant, the experimenter apologised and explained that it had "accidentally" been taken out of focus but that it was still acceptable for the study. Post-test independent observers could not recognise the objects in the blurred images and agreed that the control pictures (Figure 1c) were more similar to the originals (Figure 1a). Again first peak EDA amplitudes in mV were measured as the participant cut each of the nine photographs in half in a counterbalanced order.

Results

Calibrated first peak amplitudes were entered into a repeated measure ANOVA with independent within-participant variables of set order (1st, 2nd vs. 3rd), item (sentimental, control vs. possession) and sex as a between-participant variable. There were main effects for set ($F(2,56)=8.58$, $P=0.001$, $hp^2=0.24$); post-hoc *t*-tests showed that the 1st set amplitudes were greater than both the 2nd and 3rd sets which did not differ (0.63 mV vs. 0.43 mV vs. 0.34 mV, respectively: $P<0.05$ for 1st vs. 2nd, $P<0.01$ for 1st vs. 3rd and $P=0.07$ for 2nd vs. 3rd).

A significant item effect ($F(2,56)=4.17$, $P<0.05$, $hp^2=0.13$) was found due to greater EDA amplitudes to the sentimental compared to the valuable object (0.56 mV for sentimental items vs. 0.40 mV for personal vs. 0.43 mV for control, $P<0.05$ for sentimental vs. personal, $P<0.05$ for sentimental vs. control and $P=0.57$ for control vs. personal). There were no other significant main effects or interactions.

In sum, destruction of a photograph that has little visual resemblance to a childhood sentimental item produces more arousal than destruction of control photographs, even though these control photographs visually resemble the childhood sentimental item more closely.

General Discussion

In three separate studies, we demonstrated that adults showed a greater EDA first peak amplitude response while destroying a photograph of a sentimental object in comparison to another valuable personal possession or someone else's matched object. Study 1 revealed that the effect was marginally stronger for childhood sentimental objects compared to matrimonial objects acquired in adulthood. The remaining studies concentrated solely on childhood attachment objects. Study 2 showed that arousal was not due to anxiety triggered by

a public display of destruction of personal sentimental childhood objects. Study 3 showed that the response was not solely attributable to the physical resemblance of the photograph to the object. This suggests that a simple explanation that arousal was triggered by perceptual factors – that, at some level, participants mistook the photograph for the real thing – is not sufficient to explain destruction anxiety.

This last finding suggests that the "law of similarity" also extends to referents as well as objects that visually resemble each other. The assumed effect of voodoo dolls, for instance, might be due to the fact that such dolls are referents of their victims, not that they resemble them. Indeed, analysis of European witchcraft practices over the pre-enlightenment period reveals that physical resemblance was less crucial than the symbolic reference. Effigies used in different forms of spells and charms were believed to be more potent when they contained human hair and clippings of the intended victim (Merrifield, 1987). Again such notions still resonate today as the efficacy of magical causation can be enhanced by attaching someone's name on a piece of paper on to a voodoo doll before sticking pins into it (Pronin et al., 2006).

We would predict arousal responses to be even stronger if photographs of loved ones were used, rather than just objects. There is also likely to be a stronger effect if we tested individuals who are inclined towards sympathetic magical beliefs. In particular, as we noted above, children may be more credulous, perhaps endorsing sympathetic magic at both an explicit and an implicit level. It might turn out that the case of sympathetic magic illustrates a more general phenomenon (as discussed in Hood, 2009), in which beliefs about magic and the supernatural emerge very early in development, come to be explicitly rejected, but live on in the adult mind at an implicit level.

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