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Implicit open-mindedness: Evidence for and limits on stereotype malleability ☆

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ABSTRACT

Although stereotypes have traditionally been regarded as stable, research has documented their considerable malleability. One potential source of such malleability is intrusion into the stereotype of other concepts also activated when the stereotype is activated. In three experiments we assessed the extent to which stereotypes were influenced by stereotypic, stereotype-unrelated, or counter-stereotypic traits activated in a completely unrelated context immediately prior to stereotype measurement. Across experiments, priming of stereotype-unrelated traits increased their inclusion in the stereotype, whereas priming of counter-stereotypic traits had no effect in the subsequently assessed stereotype. In Experiment 3 we collected perceived dispersion measures and showed that although priming counter-stereotypic traits had no effect on overall characterization of the target group, it boosted perceptions of the group's variability. We accounted for these results by extending Higgins' (1989) Synapse Model of knowledge accessibility to the stereotype domain.

> "Change is inevitable—except from a vending machine."Robert C. Gallagher

Imagine sitting around on a winter's night playing the game Dictionary[1] with friends. You have just provided a definition of the word "friendly," when the conversation turns to your recent trip to Italy. One of your friends asks: "I've never been to Italy, what are Italians like?" How likely are you to use the attribute "friendly" in describing Italians to your friend?

Stereotypes have long been conceived as mental representations of social groups and the characteristics that are supposedly typical of them (Hamilton, 1981). *Friendly* is apparently an attribute stereotypic of the Italian people (Cuddy et al., 2009). So, even if defining the word *friendly* in the game right before being asked about Italians happened merely by chance, it is somehow not surprising that you would then include the trait *friendly* in the cognitive sketch of Italians you draw for your friend.

Now, imagine the same series of events with a few changes. Imagine instead that you had just defined *confident* in Dictionary, would you now include *confident* in your description of Italians? Given that *confident* is not one of the attributes or trait dimensions that people think of as stereotypic of the Italian people (Cuddy et al., 2009), could the activation of such a stereotype-unrelated trait under such unrelated circumstances nevertheless change the characteristics you report to your friend as typical of Italians?

The present research addresses the extent to which stereotypes are vulnerable to transient contextual influences like the ones described, and attempts to understand the nature of mechanisms involved. In the pursuit of these goals, we first review recent evidence of the considerable fluidity of stereotypes (e.g., Garcia-Marques & Mackie, 1999; Garcia-Marques, Santos, & Mackie, 2006) and possible mechanisms that underlie such fluidity and thus make such contextual influence possible.

Stereotype stability and change

Traditionally, of course, stereotypes have been seen as largely immune to contextual influences. Stereotype stability is often taken for granted (Allport, 1954; Ashmore & DelBoca, 1981; Katz & Braly, 1933, 1935), playing as it does an important functional role in ensuring cognitive economy for the perceiver (e.g., Crocker, Fiske, & Taylor, 1984; Fiske, 1980; Fiske & Taylor, 1984; Taylor, 1981). According to this view, by representing the typical characteristics of social groups, stereotypes shield social perceivers from the hazards of coping with infinite detail.

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[1] In the game *Dictionary*, players take turns to pick a word (often an uncommon one) from a dictionary and copy its definition on an index card. Each of the other players writes a made-up definition for the word on an identical index card. The cards are shuffled and the definitions read aloud. The other players vote for the correct definition. Each player scores points each time another player votes for his or her definition.

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As a necessary consequence, stereotypes exhibit both temporal inertia and resistance to contextual influences (e.g., Hamilton & Trolier, 1986; MacArthur, 1982; Snyder, 1981), qualities made more likely by the automatic activation of established stereotypes (e.g., Bargh, 1994; Bargh, Chen, & Burrows, 1996; Devine, 1989; Dijksterhuis & van Knippenberg, 1998).

Although stability renders stereotypes effective, total insensitivity to changing circumstances would make them both detrimental and dangerous. In fact, as accumulating evidence suggests, some aspects of stereotypes show considerable malleability in the face of changing contexts and information. First, the accessibility of different exemplars or contexts can determine which stereotypes are activated. Macrae, Bodenhausen, and Milne (1995), for example, showed that a slight change in context had a significant effect on the stereotype automatically activated. Watching one of two versions of a video-clip showing the same stimulus woman using either a makeup brush or a pair of chopsticks facilitated lexical decisions of words associated with stereotypes about women or Chinese respectively. In another series of studies, Macrae, Mitchell, and Pendry (2002) showed that participants were able to make faster stereotypic judgments about category exemplars with familiar (John and Sarah) rather than unfamiliar (Isaac and Glenda) names, suggesting that prototypical exemplars were more likely than non-prototypic exemplars to activate a particular category.

Second, and more important to our concerns, the accessibility of specific exemplars or contexts can affect judgments and decisions about the content of stereotypes, including category and subtype descriptions (e.g., Coats & Smith, 1999; Smith & Zárate, 1992) as well as central tendency and variability judgments about the group as a whole (Garcia-Marques & Mackie, 1999, 2001). For example, Wittenbrink, Judd, and Park (2001) showed participants Black or White faces and asked them to make judgments of either positive or negative attributes. The Black and White faces were preceded by photos of either a church or a street scene. Participants' reaction times revealed much more automatic negativity toward Blacks if they had been exposed to exemplars in the context of the street scene compared to the context of a church. Indeed, in the latter context, significant automatic positivity toward Blacks was observed. The context also affected attitudes toward Whites—with more positive automatic attitudes in the church context—although the effect was weaker. Thus it appears that certain contexts led valence-relevant aspects of stereotypes to be differentially activated.

Our own work has also revealed both that stereotypes are malleable, even within individuals, and that this malleability depends on context (Garcia-Marques et al., 2006). In a series of studies, we assessed within-individual stability in the content and use of social category representations across sessions 2 to 4 weeks apart. Regardless of whether we looked at choice of the traits thought to be most stereotypic of a social category (Study 1), typicality ratings of various category members (Study 2), or retrieval of category exemplars (Study 3), the evidence pointed toward considerable malleability in people's representation of social categories (similar to the malleability found in representations of common non-social categories, Barsalou, Sewell, & Ballato, 1986; Barsalou, Spindler, Sewell, Ballato, & Gendel, 1987; Bellezza, 1984a, 1984b, 1984c). More importantly, in a final study we were able to show that the level of stability or flux in an individual's stereotypes over time depended crucially on whether the context in which the stereotype was activated was stable or changing. In this study, we assessed participants' stereotypes over time by asking them to choose 5 traits that best described a particular group in each of two sessions held 2 weeks apart. Before reporting their stereotypes in the first session, participants read a description of a single group member and rated his or her typicality. They read about and rated another different member of the group before reporting their stereotypes in the second session. The exemplars described were either stereotype-consistent or stereotype-inconsistent, and we manipulated the context in which the stereotype was assessed by crossing the stereotype consistency of the exemplar rated during the first session and the stereotype consistency of the exemplar rated during the second session. Results revealed that stereotype stability was largely a function of context stability. When the context was stable (the different exemplars activated in both sessions were either both stereotype-consistent or both stereotype-inconsistent), the degree of within-subject stereotype stability was considerable. When the context differed, stereotype stability greatly declined (particularly in the case of traits deemed central by our participants). Thus, our results showed both a considerable degree of malleability in stereotype representation, and that such malleability depended on the apparent incorporation of currently activated information (the activated exemplars) into the stereotype.

Stereotype reassembly: an avenue for context-driven stereotype malleability

We have argued that both our own and others' findings on stereotype malleability can be most parsimoniously explained by appealing to constructionist models of stereotypes (see Garcia-Marques et al., 2006; for a more general reference, see the Source of Activation Confusion Model, Ayers & Reder, 1998; Reder & Schunn, 1996). From a constructionist perspective, the information encoded in stored knowledge structures such as stereotypes, rather than being activated as an entire unchanging whole, must be retrieved and reassembled whenever it is required. We call the part of the stereotype that is reassembled at a given point in time a *working stereotype*.[2] Although information closely associated with the stereotype is more likely to be activated and become part of the working stereotype, the reassembly process is vulnerable to a number of influences. First, given the large amount of information usually associated with a stereotype, stereotype assembly is not exhaustive—not every item represented in the stereotype appears in the working stereotype. Second, other concepts activated in the immediate context in which reassembly occurs become available for potential inclusion in the working stereotype, particularly if people lack direct introspective access to the source of these contextually activated concepts.

If stereotypes are in fact constructed or reassembled, and are thus vulnerable to intrusion from contextually available information, the content of working stereotypes can be expected to show the effects of basic construct priming, a hypothesis which to our knowledge has not been directly tested. Construct priming effects are revealed when constructs presented non-obtrusively or even subliminally in an unrelated context bias how a subsequently presented ambiguous behavioral description is perceived, classified, or evaluated (Higgins, Rholes, & Jones, 1977; Srull & Wyer, 1979, 1980). Such effects are typically accounted for in terms of the Synapse Model (Higgins, 1989, 1996). According to the Synapse Model, knowledge is organized in a network of semantic constructs (cells) and associations (synapses). Constructs have certain activation potential (accessibility) which determines the amount of external stimulation necessary to shift them from a latent to an active state. When a construct reaches the activation threshold it becomes available for use. After this threshold is reached, activation tends to dissipate. Constructs are typically activated as a function of their applicability or fit (i.e., the similarity between their attributes and the present context). Thus, the activation of a construct reflects, in most cases, its relevance in a given context (Sedikides & Skowronski, 1991).

Construct priming effects are typically reflected in judgments made about ambiguous targets, and thus stereotypes as traditionally conceived have seemed invulnerable to such priming effects. If, however, stereotypes are viewed as flexible constructs whose attributes are differentially retrieved and reassembled in a working stereotype (Garcia-Marques et al., 2006), the potential for influence from primed

[2] We are grateful to John Skowronski for suggesting this term to us.

concepts becomes more obvious. A previously activated trait (the prime) might well end up being included in a working stereotype. Even then, however, it might seem that construct priming would operate only to reinforce stereotype stability: Since priming effects are generally considered to be limited by applicability, relevance, or fit effects (as noted above), only stereotype consistent primes might be expected to have any effect. Indeed, much of the evidence for contextual effects on stereotype content reviewed earlier can be characterized as reflecting applicability-driven priming effects: The priming of particular contexts or exemplars causes prime-consistent stereotypic content (whether in valence or substance) to be preferentially activated. In the Synapse Model, however, applicability does not determine a construct's use directly. Even if a construct's applicability is quite low, it can become available for use if it has already been activated in a prior context, particularly if there are no alternative constructs with greater applicability (for example when the information available about the target is sparse, vague, or non-diagnostic, see Higgins & Brendl, 1995), and particularly when perceivers are unaware of the source of activation of the extraneous material. Thus, even primes not directly relevant to stereotype content might have some influence if they were activated at the time a working stereotype was assembled.

Thus, with the assumption that stereotypes are flexible constructs whose components are reassembled when needed into a working stereotype, it appears that the content of working stereotypes could be vulnerable to the priming effects of even fortuitously activated stereotype-unrelated material. If so, information that is not and has never been associated with a stereotyped group or its members might be incorporated into the stereotype merely because it was already incidentally activated when the working stereotype is assembled. That is, priming effects might explain the vulnerability of stereotypes to transient context influences: Having just defined the word "confident" in the Dictionary game, you might well report that Italians are indeed, quite confident.

To ascertain whether stereotypes are indeed vulnerable to such influence, we activated constructs with varying degrees of stereotype relevance in an unrelated context and then in three experiments checked to see whether those concepts influenced either the content or the variability of the subsequently assessed stereotype. In an unrelated linguistic task completed immediately before stereotypes were assessed, we activated either a stereotypic or stereotype-unrelated trait (Experiment 1) or a counter-stereotypic or stereotype-unrelated trait (Experiments 2 and 3) and assessed their inclusion in the working stereotypes. In addition, Experiment 3 assessed the consequences of priming counter-stereotypic or stereotype-unrelated traits on a more subtle measure of stereotype fluidity—the perceived dispersion of members over corresponding trait dimensions.

Experiment 1

Experiment 1's primary goal was to assess the vulnerability of a stereotype to stereotype-unrelated material presented in an unrelated context. We primed a stereotypic or a stereotype-unrelated trait in an unrelated linguistic task immediately before having our participants engage in a second task, which required stereotype assembly. Participants provided a dictionary-like definition of one of two traits—*intelligence* or *friendliness*—and subsequently completed a stereotype assessment (the classic Katz & Braly, 1933, trait check-list task) for one of two target groups, computer programmer or childcare professional. This task has been used to assess temporal stability in stereotypes both in different generations of the same student population (Gilbert, 1951; Karlins, Coffman, & Walter, 1969; Katz & Braly, 1933) and as a function of manipulated context stability (Garcia-Marques et al., 2006). Depending on the target group that had to be described, the primes used were stereotypic or stereotype-unrelated. As described in more detail below, stereotype-unrelated traits are not inconsistent with the stereotype, but instead are independent of the stereotype. We defined traits as stereotype-unrelated if a) the trait was never mentioned as descriptive of the group, and b) its antonym was never mentioned as descriptive of the group. Thus, by definition, stereotype-unrelated traits are ones which have nothing to do with the stereotype.

In line with our application of the Synapse Model to stereotype assembling, we assumed that stereotype-assembly would be vulnerable to influence by contextually salient stereotype-unrelated information. More specifically, we predicted that priming stereotype-unrelated traits even in unrelated contexts would make participants choose them as best descriptors of the stereotyped group more often. No such effect was predicted when stereotypic attributes were primed because these attributes would always have a very high likelihood of being used to describe the group.

Method

Participants and design

Participants were 104 University of Lisbon students (43 males and 61 females), who volunteered for the study at the researcher's request. Participants were randomly assigned to the cells of a 2 prime (intelligence or friendliness) × 2 target group (computer programmer or childcare professional) × 2 trait type (stereotypic and stereotype-unrelated) mixed factorial design with the last factor within-participants.

Materials

Generation of the stereotype assembly checklist

A group of 20 psychology sophomores spontaneously generated a list of trait descriptions for eight social groups, including computer programmers and childcare professionals (used in Experiment 1) and construction workers and skinheads (used in Experiments 2 and 3), based on cultural stereotypes[3]. Based on the responses of two independent judges (inter-rater reliability .84), traits that overlapped in meaning were combined. Following Dovidio, Evans, and Tyler (1986), attributes mentioned by at least 20% of the sample were retained (excluding those generated for more than one group). These were deemed to be the cultural stereotypes for each of the four groups (see Appendix A). The antonyms of each of these attributes (excluding traits that overlapped with any stereotypic traits), as well as traits and their antonyms that were never generated to describe any of the pretested four groups (ugly, attractive, faithful, unfaithful, superstitious, honest, and dishonest) were added to create a 45-item checklist used to assess stereotypes.

Choice of group stereotypic and stereotype-unrelated traits

We classified a trait as stereotypic of a group if it was chosen as a best descriptor of the group by more than 20% of participants and if its antonym was never chosen as a best descriptor of the same group (we classified such antonyms as counter-stereotypic). We classified a trait as stereotype-unrelated if it was never chosen as a best descriptor of a group and if its antonym was never chosen as a best descriptor of the group.

For Experiment 1 we inspected the adjective checklist for traits that were both consensually generated for one of the groups (i.e., stereotypic) and non-generated traits for another group (i.e., stereotype-unrelated). According to these criteria, the trait friendly is stereotypic of childcare professionals (mentioned by 45% of the participants; its antonym unfriendly is never generated as descriptive of this group) and stereotype-unrelated for computer programmers (neither friendly nor unfriendly were ever chosen to describe computer programmer). On the other hand, the trait intelligent is stereotypic of computer programmers (mentioned by 50% of the participants; its antonym is never used

[3] We chose these target social categories because they were consensually identified by pre-test participants as strong (pervasive and clear-cut) stereotypes in contemporary Portuguese society and thus provided a conservative test for our stereotype context sensitivity hypothesis.

to describe computer programmers) and stereotype-unrelated to childcare professionals (neither intelligent nor unintelligent were chosen to describe the group, see also Garcia-Marques & Mackie, 1999; Santos, 2001, 2007). Further pretesting confirmed that the two traits were equally positive. Thus the traits friendly and intelligent were retained for use in Experiment 1.

Procedure

Participants were tested in small group sessions (maximum 10 persons). On arrival, participants were greeted and informed they would participate in two unrelated studies: a linguistics study and a study on impressions of social groups. To reinforce the two-experiment ruse, presentations of instructions and questions for the two tasks used different fonts and layouts.

Trait priming

The linguistic study served as a priming manipulation composed of two parts. In the first part, participants provided familiarity judgments for several words as part of the cover story. In the second part, participants were asked to provide dictionary-like definitions of two words: a neutral trait (conservative) and then the prime trait (intelligence or friendliness). The trait intelligent is stereotypic of computer programmers and stereotype-unrelated for childcare professionals, whereas the trait friendly is stereotypic of childcare professionals and stereotype-unrelated for computer programmers.

Stereotype assessment

After completing the priming task, participants were told that their next task (in fact the stereotype assessment) was about how people form impressions of groups. After a general introduction about the importance of research on people's impressions of social groups, task specific instructions read as follows:

> "*In this study, you will be asked to provide us with your impressions about a social group. We are not particularly interested in your personal impression but rather what you know to be the culturally shared beliefs about this social group. Please note that there are no right or wrong answers. We are interested in your first impressions, and not so much in what you think it is proper to say.*"

Following the procedure of Katz & Braly, 1933, participants then selected from the 45-trait checklist the five traits that best described either computer programmers or childcare professionals.

Trait descriptiveness ratings

Participants then evaluated the same group on fourteen 9-point trait-rating scales anchored by the trait and its antonym (e.g., show-off vs. discreet). Two of the rating scales referred to the traits used as primes across conditions (unintelligent vs. intelligent and unfriendly vs. friendly). The other items referred to non-primed stereotypic or stereotype-unrelated trait dimensions (dishonest vs. honest; shy vs. sociable; dynamic vs. passive; insensitive vs. sensitive; lazy vs. hard-working; show-off vs. discreet; trouble-maker vs. peaceful; ignorant vs. cultured; ill-mannered vs. polite; aloof vs. emotional; fragile vs. strong; vulgar vs. sophisticated).

Funnel debriefing then assessed participants' theories or suspicions regarding any connection between the priming and stereotype assembly task. Finally we fully debriefed and thanked participants.

Results and discussion

Suspicion

Only 3% ($n = 3$) of the participants conjectured as to possible connections about the two experimental tasks, and none of their speculations were accurate. Thus, data from all participants were retained for analysis.

Stereotype assessment

To analyze trait checklist selections we ascertained the percentage of participants by condition that selected the primed stereotypic and stereotype-unrelated traits to describe the target group. For the stereotypic trait, we looked to see whether intelligent was used to describe computer programmers more after intelligence had been primed than when friendliness had been primed, and whether friendly was used more often to describe childcare professional when friendliness had been primed than when intelligence had been. For the stereotype-unrelated trait, we looked to see whether intelligence was used to describe child care professionals more after intelligence had been primed than when friendliness was primed, and whether friendly was used more often to describe computer programmers when friendliness had been primed than when intelligence had been (Table 1). There were no effects for target group or trait word and we collapsed across those replications. We first computed a Chi-square test on the four cells formed by crossing the trait primed (stereotypic vs. stereotype-unrelated) with the trait chosen (stereotypic vs. stereotype-unrelated). This analysis showed that the type of trait primed had a differential effect on the type of trait chosen, $\chi^2(1) = 12.14$, $p < .0005$. More importantly, Fisher exact probability test follow-ups indicated no effect of primes on stereotypic trait choices. That is, the stereotypic trait was often and equally chosen, independently of the trait primed (stereotypic vs. stereotype-unrelated, respectively, 94% vs. 90%, $p = .358$). In contrast, the same tests indicated that selection of the stereotype-unrelated trait did increase when it had been primed relative to when a stereotypic trait was primed (respectively, 42% vs. 12%, $p = .001$, one-tailed). Thus activation of a stereotype-unrelated trait in an unrelated context nevertheless increased the probability of that trait being included in the group stereotype.

Trait descriptiveness

We computed two single-factor (prime: stereotypic trait vs. stereotype-unrelated trait) ANOVAs, one for ratings of the stereotypic trait (intelligence for computer programmers; friendliness for childcare professionals) and one for ratings of the stereotype-unrelated traits (intelligence for childcare professionals; friendliness for computer programmers). Results showed no significant effect of priming on how descriptive of the group the stereotypic trait appeared to be (Mstereotypic prime = 7.94, Mstereotype-unrelated prime = 7.69, $F(1,102) = 2.59$, $p = .110$, $Mse = .627$, $\eta_p^2 = .02$). However, the same analysis for descriptiveness of stereotype-unrelated traits revealed a significant effect of prime, $F(1,102) = 10.72$, $p = .001$, $Mse = 1.66$, $\eta_p^2 = .10$), showing that exposure to stereotype-unrelated primes increased the extent to which participants felt the stereotype-unrelated trait described the group (Mstereotype-unrelated prime = 6.42, Mstereotypic prime = 5.60). Although the ratings of the groups on stereotypic traits (intelligent for computer programmers and friendly for childcare professionals) were unaffected by the priming manipulation, having the stereotype-unrelated trait (friendly for computer programmers and intelligent for childcare professional) activated increased how characteristic of the group participants thought that stereotype-unrelated trait

Table 1
Percentage of participants choosing stereotypic and stereotype-unrelated traits, and ratings of stereotypic and stereotype-unrelated traits, by priming condition.

Type of prime	Stereotypic trait		Stereotype-unrelated trait	
	Choice (%)	Rating	Choice (%)	Rating
Stereotypic	94	7.94	12	5.60
Stereotype-unrelated	90	7.69	42	6.42

was. Once again, activation of a stereotype-unrelated trait in an unrelated context nevertheless increased the extent to which that trait was seen as characteristic of the group.

These results supported the prediction that contextually activated primes can influence stereotypes even when they are unrelated to stereotypic beliefs. Consistent with our extension of the Synapse Model to stereotype assembling, traits that would otherwise be completely unrelated to the description of a specific group were more likely to be incorporated into a working stereotype merely because they were fortuitously activated in a proximal context. Thus, it appears that stereotypes can come to include context-dependent information, even if such information is stereotype-unrelated.

What are the boundary conditions of such effects? It seems unlikely that all context-available information could potentially be incorporated into a stereotype. After all, why store stereotypic information in the first place if reassembling that information were completely vulnerable to transitory contexts? From the perspective of the Synapse Model, the applicability of a given activated construct might be constrained by the relative applicability of other available constructs. Although activated stereotype-unrelated information might be easily assumed to be part of the assessed beliefs and applied, it seems less likely that activated concepts completely at odds with other available information would be so easily incorporated. Thus one constraint on wholesale context dependency may well arise when some assembled elements are inconsistent with the majority of activated beliefs. Thus although contextually activated stereotype-unrelated information might be easily incorporated into the working stereotype, as demonstrated in Experiment 1, contextually activated counter-stereotype information might be much less likely to be accepted as representative of one's beliefs, and thus much less likely to be incorporated into the assessed stereotype. We explored this possibility in Experiment 2.

Experiment 2

In Experiment 2 we used the same experimental paradigm as Experiment 1, but changed the two target groups. By using construction workers and skinheads as target groups, the primed concepts (intelligence or friendliness) became counter-stereotypic (construction workers were described as unintelligent; skinheads were described as unfriendly; see also Garcia-Marques & Mackie, 1999) or stereotype-unrelated (intelligence and non-intelligence were stereotype-unrelated for skinheads; friendliness and unfriendliness were stereotype-unrelated for construction workers). Following Experiment 1, we predicted that contextual priming of the stereotype-unrelated trait (compared to priming the counter-stereotypic trait) would increase both the likelihood the stereotype-unrelated trait would be included in the working stereotype and the extent to which that trait was seen as descriptive of the group. In contrast, however, we expected priming of a counter-stereotypic trait to have no effect on inclusion of that trait in the stereotype or on its descriptiveness ratings. Because the counter-stereotypic information made salient by contextual priming would directly contradict the stereotypic information activated by thinking about the group, we expected counter-stereotypic information to be much less likely than stereotype-unrelated information to be incorporated into the working stereotype.

Method

Participants and design

Participants were 84 University of Lisbon students (27 males and 57 females) who volunteered for the study at the researcher's request. They were randomly assigned to the cells of a 2 prime (intelligence or friendliness) × 2 target group (construction worker or skinhead) × 2 trait type (stereotype-unrelated and counter-stereotypic) mixed factorial design, with the last factor within-participants.

Procedure

The same two-experiment ruse, in which participants first offered definitions of words (the prime manipulation) and then offered their impressions of a group (the stereotype assessment task), was used again in Experiment 2, except that participants were asked about construction workers and skinheads (see Appendix A). We were able to use the same primes used in Experiment 1 since the pretesting results indicated that both friendly and intelligent fit the criteria of being both stereotype-unrelated for one group (neither the trait nor its antonyms were ever generated for that group) and counter-stereotypic for the other group (it was the non-generated antonym of the most frequently generated trait for the other group). The trait friendly was simultaneously stereotype-unrelated for construction workers and counter-stereotypic of skinheads; the trait intelligent was simultaneously stereotype-unrelated for skinheads and counter-stereotypic of construction workers. Thus, use of these same primes allowed for both replication of the effects of contextually priming stereotype-unrelated traits and extension to the impact of contextual priming of counter-stereotypic traits. After the priming task participants completed the same stereotype assembly and trait descriptiveness tasks as described for Experiment 1, and completed the same funnel debriefing.

Results and discussion

Suspicion

Since only 5% ($n = 4$) of the participants speculated about connections between the priming task and the group impression task and since all of these speculations were marginal to the true aim of the experiment, no data were excluded from analysis.

Stereotype assessment

We ascertained the percentage of participants by priming condition that selected the critical stereotype-unrelated (intelligence for skinheads, friendliness for construction workers) and counter-stereotypic (intelligence for construction workers and friendliness for skinheads) traits to describe the target group (see Table 2; there were no effects for target group or trait word and we collapsed across those replications). We again first computed a Chi-square test on the four cells of the trait primed (counter-stereotypic vs. stereotype-unrelated) by the trait chosen (counter-stereotypic vs. stereotype-unrelated) design, which showed that the type of trait primed had a differential effect on the type of trait chosen, $\chi^2(1) = 5.30$, $p < .0213$. Replicating the effects of Experiment 1, Fisher exact probability test follow-ups indicated that primed stereotype-unrelated traits were more likely to be selected as descriptive of the group (relative to when counter-stereotypic traits were primed, 17% vs. 0%, $p = .006$, one-tailed). In contrast, the same follow-up test, showed no effect of primes on counter-stereotypic trait selection. That is, inclusion of the counter-stereotypic trait in the stereotype remained very infrequent regardless of whether it was primed or not (counter-stereotypic prime vs. stereotype-unrelated prime, respectively, 5% vs. 2%, $p = .500$, one-tailed). Priming stereotype-unrelated traits increased their inclusion in the stereotype, but priming counter-stereotypic traits did not.

Table 2
Percentage of participants choosing counter-stereotypic and stereotype-unrelated traits, and descriptiveness ratings of counter-stereotypic and stereotype-unrelated traits, by priming condition.

Type of prime	Counter-stereotypic trait		Stereotype-unrelated trait	
	Choice (%)	Rating	Choice (%)	Rating
Counter-stereotypic trait	5	7.19	0	5.07
Stereotype-unrelated trait	2	7.14	17	6.26

Trait descriptiveness

We computed two single-factor (prime: counter-stereotypic trait vs. stereotype-unrelated trait) ANOVAs, one for ratings of the counter-stereotypic trait (friendliness for skinheads, intelligence for construction workers) and one for ratings of the stereotype-unrelated trait (intelligence for skinheads; friendliness for construction workers). The ANOVA for the stereotype-unrelated trait, again replicating the results of Experiment 1, revealed a significant main effect of prime type, with stereotype-unrelated primes increasing the descriptiveness of the stereotype-unrelated trait relative to counter-stereotypic primes (Mcounter-stereotypic prime = 5.07 and Mstereotype-unrelated prime = 6.26, $F(1,80) = 14.22$, $p = .0003$, $Mse = 2.63$, $\eta_p^2 = .15$). In contrast, the ANOVA for the counter-stereotypic trait revealed no effect of prime on the ratings of counter-stereotypic traits (Mcounter-stereotypic prime = 7.19 and Mstereotype-unrelated prime = 7.14, $F(1,80) = 0.03$, $p = .865$, $Mse = 1.65$, $\eta_p^2 = .00$). Irrelevant to our predictions, the counter stereotypic trait was seen as less descriptive of construction workers (unintelligent, $M = 6.60$) than it was for skinheads (unfriendly, $M = 7.74$; $F(1,80) = 16.62$, $p = .0001$, $Mse = 1.650$, $\eta_p^2 = .17$). Once again, priming of stereotype-unrelated traits made them seem more descriptive of the target group, but no such effect was found for counter-stereotype traits.

Experiment 2 thus replicated Experiment 1 in showing that stereotype-unrelated information activated in an unrelated context can be incorporated into the stereotype, as shown by both trait selection and descriptiveness ratings, allowing stereotypes to achieve contextual sensitivity. Experiment 2 revealed in addition a constraint on the extent to which information fortuitously activated in an unrelated context might be incorporated into a working stereotype: information that ran counter to prior beliefs was not absorbed into the stereotype merely because it was activated at the same time the stereotype was assessed. From the perspective of the Synapse Model, this constraint can be explained in terms of the relative applicability of other constructs simultaneously available for inclusion in the reassembled stereotype. Note that the exclusion of stereotype-inconsistent constructs occurred in conditions in which the applicability of the extraneous information is relatively reduced because its use would be incompatible with the use of the other activated constructs. Nevertheless, we contend that if stereotypes are vulnerable to inclusion of extraneous information during reassembly, some impact of the primed material might be seen in more subtle measures of the working stereotype.

Experiment 3

Although Experiments 1 and 2 relied on well established measures of central tendency to reveal the impact of contextually activated information on stereotypes, stereotypes are not merely lists of attributes, and central tendency revision is not the only index of stereotype malleability. Theoretically, central tendency and perceived variability are two different parameters of the mental representation of social groups. The first evaluates the perceived modal or prototypical representation of the target group. The second indexes the degree of variability a social group is seen as having with respect to a specific dimension. Changes in either parameter can thus reflect stereotype malleability or fluidity. We have shown, for example, that even in the absence of change in the perceived central tendency of a stereotyped group, change in other parameters like perceived group variability can occur (Garcia-Marques & Mackie, 1999, 2001). If stereotypes are being reassembled, and are thus truly vulnerable to the effects of serendipitously activated material, such material will leave its mark. Even if the relative applicability of counter-stereotypic information reduces its impact on measures of perceived central tendency, its presence during the reassembly process might nevertheless be indexed by measures of perceived variability (at least in the case in which contextually salient information is counter-stereotypic). We again activated counter-stereotypic or stereotype-unrelated trait constructs in an unrelated linguistic task. In this experiment we assessed the stereotype not only by using the trait checklist measure of central tendency, but also by the perceived dispersion of group members over corresponding trait dimensions. Because this is a more implicit assessment of the stereotype representation, previously demonstrated to be sensitive to the priming of atypical exemplars (Garcia-Marques & Mackie, 1999, 2001), we expected to see the impact of even counter-stereotypic information activated in an unrelated context on the reassembled stereotype.

Method

Participants and design

Participants were 142 University of Lisbon students (59 males and 83 females) who volunteered for the study at the researcher's request. They were randomly assigned to the cells of a 2 prime (intelligence or friendliness) × 2 target group (construction worker or skinhead) × 2 trait type (stereotype-unrelated and counter-stereotypic) mixed factorial design, with the last factor within-participants.

Procedure

The procedure was identical to the one followed in Experiments 1 and 2. Participants first provided a dictionary-like definition of either intelligence or friendliness (the prime manipulation) and subsequently completed the stereotype assessment and trait descriptiveness measures for either construction workers or skinheads. Next, all participants responded to two perceived dispersion measures. First, participants estimated the percentage (from 0% to 100%) of members in the target group who had the stereotypic, the counter stereotypic, the stereotype-unrelated, and the opposite of the stereotype-unrelated traits (the percentage estimates task; Park & Rothbart, 1982; Park & Judd, 1990). Finally, participants were shown an array of 15 distributions that systematically combined five levels of central tendency and three levels of dispersion and selected the distribution they thought best represented the target group as a whole for the stereotypic trait and again for the non-stereotypic trait (the distribution matrix task; Garcia-Marques & Mackie, 1999). Participants then completed the same funnel debriefing as described earlier.

Results and discussion

Suspicion

Again, since only 7, 6% ($n = 6$) of the participants speculated about connections between the priming task and the group impression task and all of their speculations were unrelated to the true aim of the experiment, no data were excluded from analysis.

Stereotype assessment

We again ascertained the percentage of participants by priming condition that selected the critical stereotype incongruent traits (intelligence for construction workers and friendliness for skinheads) and the critical stereotype-unrelated traits (intelligence for skinheads, friendliness for construction workers) to describe the target group (see Table 3; there were no effects for target group or trait word and we collapsed across those replications). Fisher exact probability tests revealed a marginally significant effect suggesting that primed stereotype-unrelated traits were more likely to be selected as descriptive of the group (relative to when counter-stereotypic traits were primed, 10% vs. 0%, $p = .061$, one-tailed), results that converge with the effects obtained in Experiments 1 and 2. In contrast, Fisher exact probability tests indicated no effect of primes on counter-stereotypic trait selection. That is, the counter-stereotypic trait was never chosen, independently of the trait primed (counter-stereotypic vs. stereotype-unrelated, respectively, 0% vs. 0%), replicating the findings of Experiment 2. Thus activation of a stereotype-

Table 3
Percentage of participants choosing counter-stereotypic and stereotype-unrelated traits, and descriptiveness ratings of counter-stereotypic and stereotype-unrelated traits, by priming condition.

Type of prime	Counter-stereotypic trait		Stereotype-unrelated trait	
	Choice (%)	Rating	Choice (%)	Rating
Counter-stereotypic trait	0	7.28	0	4.21
Stereotype-unrelated trait	0	7.12	10	5.22

unrelated trait in an unrelated context increased the probability of that trait being included in the group stereotype, but contextual priming of counter-stereotypic traits did not.

Trait descriptiveness

We computed two single-factor (stereotype-unrelated or counter-stereotypic trait primed) ANOVAs, one for ratings of the counter-stereotypic trait (friendliness for skinheads, intelligence for construction workers) and one for ratings of the stereotype-unrelated trait (intelligence for skinheads; friendliness for construction workers). We reverse scored participants' ratings so that higher values (1 to 9) indicate greater stereotypicality. Results revealed no significant effect of priming on how descriptive of the group the counter-stereotypic trait appeared to be (*M*counter-stereotypic prime = 7.28, *M*stereotype-unrelated prime = 7.12, $F(1,77) = .23$, $p = .629$, $Mse = 2{,}08$, $\eta_p^2 = .00$). In contrast, perceived descriptiveness of the stereotype-unrelated traits was significantly affected by the prime, $F(1,77) = 13.71$, $p = .0004$, $Mse = 1.50$, $\eta_p^2 = .15$, showing that exposure to stereotype-unrelated primes increased the extent to which participants felt the stereotype-unrelated trait described the group (*M*counter-stereotypic prime = 4.21, *M*stereotype-unrelated prime = 5.22). Once again, activation of a stereotype-unrelated trait in an unrelated context increased the extent to which that trait was thought of as characterizing the group, but activating a counter-stereotypic trait in the same way did not.

Percentage estimate measures of variability

Following Park and Rothbart (1982), we subtracted the percentage estimated to have the counter-stereotypic trait from the percentage estimated to have the stereotypic trait, as well as the percentage estimated to have the opposite of the stereotype-unrelated trait from the percentage estimated to have the stereotype-unrelated trait. The first difference score reflects the extent to which group members are seen as uniformly or variability dispersed as regards the stereotypic trait (high scores indicate that many in the group are perceived as having the stereotypic attribute and few in the group as having the counter-stereotypic attribute whereas lower scores indicate greater perceived variability on the stereotypic trait). The second difference score indicates greater perceived uniformity (high scores) or variability (low scores) on the stereotype-unrelated trait. A one-way ANOVA on the stereotype difference scores revealed a marginally significant effect of type of prime, $F(1,77) = 3.15$, $p = .08$, $Mse = 657.92$, $\eta_p^2 = .04$, suggesting that exposure to counter-stereotype primes tended to decrease perceived uniformity on the stereotypic trait ($M = 48.5$) compared to exposure to the stereotype-unrelated prime ($M = 58.7$; see Table 4), as we had expected if re-assembly of the stereotype was occurring when the counter-stereotypic trait was activated. In contrast, the prime manipulation had no such effects on perceived variability on the stereotype-unrelated trait, $F(1,77) = .16$, $p = .689$, $Mse = 609{,}89$, $\eta_p^2 = .00$, with the same relative percentage being seen as having the stereotype-unrelated trait regardless of whether the stereotype-unrelated ($M = 28.9$) or the counter-stereotypic trait ($M = 31.2$) was primed.

Distribution choice measures of centrality and variability

Because the distribution matrix from which participants made their selection independently manipulated central tendency and dispersion, the measure is relatively immune to the artifactual consequences of central tendency polarization in dispersion parameters (Garcia-Marques & Mackie, 1999; Ostrom & Sedikides, 1992). The following analyses focus separately on each of these parameters.

For the perceived central tendency parameter, we computed two single-factor (prime: stereotype-unrelated vs. counter-stereotypic) ANOVAs. The first analyzed distribution choices on the stereotypic/counter-stereotypic dimension (unfriendliness for skinheads, unintelligence for construction workers). Higher values on this measure (1 to 5) correspond to more stereotypic views of the target group. Results showed no significant effect of priming on central tendency judgments for the stereotypic dimension (*M*counter-stereotypic prime = 4.54, *M*stereotype-unrelated prime = 4.50, $F(1,77) = .04$, $p = .838$, $Mse = .697$, $\eta_p^2 = .00$). Given their shared sensitivity to the central tendency, it is not surprising that this finding converged with the pattern of results already obtained with the stereotype assessment and trait descriptiveness measures (see Table 5).

The second ANOVA focused on distribution choices on the stereotype-unrelated dimension (unintelligence for skinheads; unfriendliness for construction workers). Higher values indicate that the central tendency is closer to the trait primed (because intelligent and friendly are always presented in the right side of their respective scales). Incorporation of the prime would thus be revealed by higher values in central tendency when a stereotype-unrelated trait was primed than when it was not. Supporting our hypothesis that stereotype-unrelated primes would be more frequently incorporated into the stereotype, the central tendency was closer to the stereotype-unrelated trait when that trait was primed than when it wasn't, $F(1, 77) = 5.93$, $p = .017$, $Mse = .758$, $\eta_p^2 = .07$ (*M*counter-stereotypic prime = 1.92 and *M*stereotype-unrelated prime = 2.40).

For perceived dispersion parameters, we computed two single-factor (prime: counter-stereotypic trait vs. stereotype-unrelated trait) ANOVAs: one for distribution choices on stereotypic dimension (unfriendliness for skinheads, unintelligence for construction workers) and one for distribution choices on the stereotype-unrelated dimension (unintelligence for skinheads; unfriendliness for construction workers). Higher values (which range from 1 to 3) on this measure indicate that the group is seen as more variable. Results revealed an almost significant effect of priming in perceived dispersion along the stereotypic dimension (*M*counter-stereotypic prime = 1.69, *M*stereotype-unrelated prime = 1.43, $F(1,77) = 3.87$, $p = .053$, $Mse = .365$, $\eta_p^2 = .05$), supporting our hypothesis that counter-stereotypic priming would increase perceptions of dispersion in the target group. The average distribution chosen was more dispersed when a counter-stereotypic trait was activated compared to when it wasn't (see Table 6). The same analysis for the stereotype-unrelated dimension also revealed a significant effect of prime on distribution choices $F(1,77) = 17.55$, $p = .0001$, $Mse = .436$, $\eta_p^2 = .19$), showing that exposure to stereotype-unrelated primes increased the extent to which participants perceived the group as more dispersed on that dimension (*M*counter-stereotypic prime = 2.10, *M*stereotype-unrelated prime = 2.72). These results suggest that priming

Table 4
Percentage estimate differences, by priming condition.

Type of prime	Percentage estimate differences	
	Stereotypic-minus-counter-stereotypic (%)	Stereotype-unrelated-minus-antonymous of stereotype-unrelated (%)
Counter-stereotypic trait	48.5	31.2
Stereotype-unrelated trait	58.7	28.9

Table 5
Distribution matrix choices on perceived central tendency of stereotypic/counter-stereotypic and stereotype-unrelated dimensions, by priming condition.

Type of prime	Perceived central tendency	
	Stereotypic/counter-stereotypic dimension	Stereotype-unrelated dimension
Counter-stereotypic trait	4.54	1.92
Stereotype-unrelated trait	4.50	2.40

even a single trait in an unrelated context can result in both perceived central tendency and perceived dispersion change (for similar results, see Garcia-Marques & Mackie, 1999).

Experiment 3 thus replicated Experiments 1 and 2in showing that stereotype-unrelated information activated in an unrelated context can be incorporated into the stereotype, as shown by both trait selections and typicality ratings. Converging support for that hypothesis was also obtained in Experiment 3 from a different measure—the perceived central tendency measure from the distribution matrix task. Results from Experiment 3 also replicated and extended Experiments 1 and 3 in showing that primed counter-stereotypic information had no impact on trait selection, typicality ratings, or perceived central tendency distribution matrix choices. Thus, counter-stereotypic information activated in an unrelated context did not seem to influence the working stereotype. Results from the perceived variability measures, however, revealed that it did. Activation of counter-stereotypic information when stereotype reassembly took place led participants to see the target group as more variable, as indicated both by their choice of flatter distributions in the distribution matrix task, and their tendency to see fewer of the group members as having stereotypic attributes and more as having counter-stereotypic attributes.

General discussion

In three studies, we assessed the extent to which stereotypes were influenced by material activated immediately prior to stereotype measurement but in a completely unrelated context. In our studies, we primed stereotypic, counter-stereotypic, and stereotype-unrelated traits in an unrelated task and assessed whether those primed concepts were incorporated in the subsequently reported stereotype.

The results of all three studies converge to show that traits formerly unrelated to a specific stereotype can become "one of the best descriptors of the group" when fortuitously primed by an unrelated task. Note that the key point in these results is that, in contrast with most stereotype change or stereotype priming procedures (for reviews, see Hewstone, 1994; Richards & Hewstone, 2001), the stereotype-unrelated information was never associated with group members or the group as a whole. This feature of our paradigm is important because it ensures that the critical stereotype-unrelated information was not deliberatively used to revise the stereotype. Thus, it suggests, instead, that in our paradigm, stereotype-unrelated information is involuntarily incorporated into the working stereotype during stereotype assessment. Our results thus reveal a potent means by which context sensitivity can contribute to stereotype malleability.

Table 6
Distribution matrix choices on perceived dispersion of stereotypic/counter-stereotypic and stereotype-unrelated dimensions, by priming condition.

Type of prime	Perceived dispersion	
	Stereotypic/counter-stereotypic dimension	Stereotype-unrelated dimension
Counter-stereotypic trait	1.69	2.10
Stereotype-unrelated trait	1.43	2.72

We predicted such effects on the assumption that when the stereotype is needed, perceivers reassemble it. Their building blocks for doing so are the multiple pieces of knowledge that are accessible and salient. The category label probe to memory no doubt activates much of this material, but some is activated for other reasons. Although the assembled working stereotype is an amalgam of what came from memory and what was activated contextually, perceivers may not always or even typically be aware of why information is active, so the line between the two kinds of information is not clear. From the perspective of the Synapse Model, any piece of information can be incorporated into the reassembled stereotype as long as it is activated and as long as it is not incompatible with information that has higher applicability.

At the same time, the results of Experiments 2 and 3 revealed a reliable boundary condition on the finding that information activated in a stereotype-unrelated context might nevertheless be incorporated into the content of stereotype. Priming counter-stereotypic traits under these conditions did not increase their inclusion in the stereotype: participants failed to include them as "best descriptors" or as highly descriptive of the group. Thus our results show both a means by which context sensitivity could contribute to stereotype malleability, and a limit on that contribution. Consistent with the Synapse Model, we anticipated such an effect because other traits with a degree of activation similar to the primed counter-stereotypic trait were incompatible with the prime, limiting the applicability of the primed trait. This constraint on the impact of the counter-stereotypic trait meant that its presence in the context appeared to make no contribution to stereotype malleability.

Our previous research has, however, clearly demonstrated that stereotype change is not restricted to central tendency revision. Namely, we have shown that absence of change in the perceived central tendency of a stereotyped group can co-exist with change in other parameters like perceived group variability (Garcia-Marques & Mackie, 1999, 2001). These findings made us ask about the fate of highly activated information that appeared not to impact the stereotype. Was the absence of effects in the perceived central tendency of stereotyped groups an indication that in this case, priming ceases to produce *any* effect?

Although never directly addressed by the proponents of the Synapse Model it seems plausible to consider that the applicability of any piece of information depends on the specific requirements of the task. Thus whereas the simultaneous activation of opposite traits may limit the applicability of at least one of these traits and probably signals the need for editing or monitoring an overall characterization of the stereotyped group, a different scenario may occur for perceived dispersion judgments. In this case, the simultaneous activation of opposite traits may simply indicate high group variability. Thus in Experiment 3, we primed our participants with counter-stereotypic traits but this time we assessed perceived dispersion. And although (as in Experiment 2) priming counter-stereotypical traits did not affect perceptions of central tendency, a priming effect did emerge in perceptions of dispersion.

Although we have argued that the Synapse Model can be extended to help explain specific stereotype change effects, we acknowledge that a number of differences differentiate the two literatures. Specifically, research in the construct priming literature typically: a) uses relatively simple trait constructs whereas stereotypes are more complex structures composed of several trait constructs and other components; b) takes constructs as predefined knowledge primitives with fixed meanings whereas recent perspectives on stereotypes view them as flexible constructs with fuzzy borders whose meaning can change as a function of context (Garcia-Marques et al., 2006); c) uses exemplars of constructs as target stimuli, whereas the stereotype stability and change literature uses construct features as targets; d) uses ambiguous or vague target stimuli whereas the relevant stereotype literature uses clear or diagnostic trait features as targets; and e) assesses the perception, classification, and judgment of specific exemplars whereas the stereotype literature is concerned with in addition the dispersion of the

exemplars. Regardless of these differences, we argue that the Synapse Model can nevertheless be applied to the stereotype change literature for several reasons. First, although constructs in the priming literature are assumed to be predefined knowledge primitives, new constructs in a semantic network can at the very least take on the meaning that corresponds to the associations currently activated. Second, if we take complex constructs (e.g., stereotypes) as priming targets, then their complexity and fuzziness can be functionally equivalent to the ambiguity of the target exemplars used in priming research. That is, the assembled composition of these complex constructs (their meaning) can vary as a function of the information activated by either the preceding or immediate context. Third, if multiple working stereotypes based on the same stereotype can vary, then their ability to cue specific exemplars can also vary and, as a result, exemplar dispersion becomes a relevant consideration. Not only do we believe that our current understanding of the processes underlying stereotype change can be enhanced by incorporating insights from the priming literature, but we also contend that conversely, insights from the stereotype change literature can provide a broader view of priming phenomena, for example by drawing attention to key variables like perceived variability currently ignored in the priming literature.

In fact, it is tantalizing to wonder about the effects of priming on perceived variability in general. For instance, Higgins et al. (1977) presented their participants with an ambiguous description of a target named Donald, who could be characterized by a considerable degree of either assertiveness or aggressiveness. Without priming, participants split almost 50/50 in the way they characterized Donald. Primed participants, however, characterized the target overwhelmingly according to the prime whenever the prime was applicable (i.e., the traits assertive or aggressive). In non-applicable conditions (e.g., participants were primed with traits like neat or obedient), priming had no discernible effects. But would the activation of neat have no effect whatsoever? Drawing a parallel with the current research, we might expect that some residual effect of priming neat could be found on more subtle measures. Could such activation for example, change estimations of the likelihood that assertiveness and neatness co-occurred, either in the target or in the population as a whole? Only future research can answer these kinds of questions uniquely generated by this novel extension of the Synapse Model.

Although we have focused on the Synapse Model, we see our results as also compatible with the other proposals like the Source of Activation Confusion Model (Ayers & Reder, 1998), the Relevance of a Representation Model (Eitam & Higgins, in press) or the Situated Inference Model (Loersch & Payne, 2011). In spite of their differences, these approaches converge in highlighting the malleability and context-dependency of human cognition, as does the current research.

Our results demonstrate once again the malleability of social stereotypes, and once again the crucial role of contextual sensitivity in promoting that malleability. Although the current research has raised many questions, we see these as strengths of the constructionist approach, and in particular of the extension of the Synapse Model, as a framework for contributing to the solution of one of the perennial puzzles of stereotypes and other knowledge structures—their enduring and yet context-dependent nature.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.jesp.2012.05.013.

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