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Implicit and explicit measures of spider fear and avoidance behavior: Examination of the moderating role of working memory capacity

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ABSTRACT

Background and objectives: Avoidance behavior is central to several anxiety disorders. The current study tested whether avoidance behavior for spiders depends on a dynamic interplay between implicit and explicit processes, moderated by the availability to exert control through working memory capacity (WMC).
Methods: A total of 63 participants completed an approach-avoidance task, an implicit association test, a spider fear questionnaire and a behavioral avoidance test that included an assessment of approach distance as well as approach speed. WMC was measured by a complex operation span task. It was hypothesized that in individuals with low WMC, implicit avoidance tendencies and implicit negative associations predict avoidance behavior for a spider better than the explicit measure, whereas in high WMC individuals, the explicit measure should better predict avoidance behavior than the implicit measures.
Results: Results revealed that WMC moderated the influence of implicit negative associations, but not implicit avoidance tendencies, on spider approach distance but not the speed of approaching. Although explicit spider fear directly influenced avoidance behavior, its impact was not modulated by WMC.
Limitations: Participants in our study were from a non-clinical sample, which limits the generalizability of our findings.
Conclusions: These findings suggest that implicit processes might become more pertinent for fear behavior as the ability to control such processes wanes, which may be particularly relevant for anxiety disorders given their association with lowered executive control functioning. As such, training procedures that specifically target implicit processes or control abilities might improve treatment outcomes for anxiety disorders.

1. Introduction

While Tina is taking her bike from the shed, she notices a big, hairy spider. She jumps back and runs outside, leaving the bike behind. The inability to control such automatic impulses may eventually give rise to excessive, pathological forms of behavioral avoidance (Barlow, 2002; Beckers, Krypotos, Boddez, Effting, & Kindt, 2013). Given that avoidance behavior is critical to several anxiety disorders (American Psychiatric Association, 2013), it is of theoretical and clinical importance to understand the factors that determine behavioral avoidance. The present study specifically examines the role of automatic processes, controlled processes, and executive control in the emergence of avoidance behavior in spider fear.

Dual-process models (e.g., Beevers, 2005; Wiers et al., 2007) state that psychopathological behavior is jointly determined by two systems of information processing. Automatic action impulses derive from a fast, implicit system in which affectively laden associations in memory are automatically activated upon perceiving an object and predispose individuals to either approach or avoid

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(i.e., action tendency). By contrast, long-term goals and expectancies reside in a slower, explicit system in which reasoning and decision-making processes activate controlled, goal-directed behavior. The relative influence of both processes on behavior is assumed to critically depend on the availability of executive control functions such as working memory capacity (WMC; Hofmann, Gschwendner, Friese, Wiers, & Schmitt, 2008), which determines the capability for shielding explicit from implicit processes (Barrett, Tugade, & Engle, 2004). Individuals dispositionally differ in WMC and these individual differences are presumed to moderate the expression of the two information-processing systems. Under conditions of low WMC, there is limited cognitive capacity for explicit processes to override the influence of implicit processes, resulting in implicit processes gaining stronger control over behavior as a result (Hofmann et al., 2008). Accordingly, dual-process models predict that implicit processes have a stronger influence on behavior in individuals relatively low in WMC, whereas explicit processes have a stronger influence on behavior in individuals relatively high in WMC.

There is accumulating evidence supporting the moderating role of executive control functioning in approach behaviors such as food consumption, sexual interest (Hofmann et al., 2008), aggressive behavior (Hofmann et al., 2008; Wiers, Beckers, Houben, & Hofmann, 2009), smoking (Grenard et al., 2008), and alcohol use (Grenard et al., 2008; Houben & Wiers, 2009; Peeters et al., 2012; Thush et al., 2008). For instance, several studies showed that implicit alcohol associations predict drinking behavior more strongly in individuals with low compared to high levels of executive control (e.g., Grenard et al., 2008; Thush et al., 2008). The reversed pattern has been observed for explicit alcohol associations, such that these associations predict alcohol use better in individuals with high compared to low levels of executive control (Thush et al., 2008). Recently, Peeters et al. (2012) reported similar results regarding the impact of action tendencies on drinking behavior: Alcohol approach tendencies had a stronger impact on alcohol use for individuals low in executive control compared with those high in executive control. These findings collectively provide empirical support for executive control moderating the impact of different types of implicit processes (e.g., implicit associations and action tendencies) and explicit processes on approach behavior. While it has been argued that such principles may also apply to avoidance behavior (Strack & Deutsch, 2004), research in this area is remarkably scarce.

There is, however, extensive research suggesting that implicit and explicit processes each play a unique role in a variety of fear-related behaviors. Several studies have demonstrated that implicit and explicit processes have incremental predictive validity for fear-related behavior (e.g., Egloff & Schmukle, 2002; Klein et al., 2012; Rinck & Becker, 2007). Rinck and Becker (2007), for example, showed that avoidance tendencies explained additional variance in overt avoidance behavior for spiders in children beyond self-reported spider fear. There is also emerging evidence that implicit and explicit indices of spider fear are differentially related to components of fear-related behavior (e.g., Asendorpf, Banse, & Mücke, 2002; Huijding & de Jong, 2006; Van Bockstaele et al., 2011). Finally, implicit and explicit indicators of anxiety–relevant associations appear to explain unique variance in the onset and course of anxiety disorders (Glashouwer, de Jong, & Penninx, 2011, 2012). Whereas these studies examined the link between information processes and aspects of anxiety-related behavior, the role of executive control as a moderator is largely unknown.

In the field of anxiety, executive control has been examined as a moderator mainly with respect to cognitive processing biases (instead of behavior) (Derryberry & Reed, 2002; Lonigan & Vasey, 2009; Salemink, Friese, Drake, Mackintosh, & Hoppitt, 2013; Salemink & Wiers, 2012). In line with dual-process models of anxiety (Mathews & Mackintosh, 1998) stating that processing biases can be considered as the joint outcome of information processes and executive functioning, Salemink et al. (2013) provided evidence for a moderating role of executive control regarding threat-related interpretive bias: Individual differences in executive control moderated the relationship between indicators of implicit and explicit social anxiety and interpretive bias. Given the crucial role of avoidance behavior in anxiety, the current study examined whether avoidance behavior for spiders depends on a similar dynamic interplay between implicit and explicit processing on the one hand and executive functioning on the other hand. To our knowledge, only one study exists that has applied a similar perspective to social anxiety (Gorlin & Teachman, 2015). A moderating role of executive functioning was found for the relationship between implicit processes and several anxiety indices but, unexpectedly, not for avoidance behavior.

In the present study, we tested whether executive control functioning (as indicated by WMC) moderates the relative influence of implicit and explicit processing on avoidance behavior for spiders. Specifically, we hypothesized that indicators of implicit spider fear (i.e., negative associations and avoidance tendencies) impact stronger on avoidance behavior in individuals relatively low in executive control, given their greater difficulty in overriding implicit processes. Conversely, we hypothesized that indicators of explicit spider fear would impact stronger on avoidance behavior in individuals relatively high in executive control, given their greater capability to shield the influence of implicit processes.

2. Methods

2.1. Participants

Participants were selected from a larger sample ($N = 1037$) of students at the University of Amsterdam who completed a spider fear questionnaire (Spider Phobia Questionnaire, SPQ, range: 0–31; Klorman, Weerts, Hastings, Melamed, & Lang, 1974).

To get a broad range of spider fear, we randomly invited students who scored in the lower quartile (SPQ < 3; 69 students), in the interquartile (SPQ 3 to 11; 150 students), and in the upper quartile (SPQ > 11; 188 students) of whom 27 students finally agreed to participate (3 low, 14 middle, 10 high). Additionally, we recruited individuals via advertisements on the university website. This resulted in a sample of 63 participants of who received either course credits or €11 for participation. As we excluded one participant due to procedural errors, the final sample consisted of 62 participants with a mean age of 21 years ($SD = 2.3$; 47 females).

2.2. Measures[1]

2.2.1. Depression anxiety stress scales (DASS)

The short version of the DASS (DASS-21; Lovibond & Lovibond, 1995) was used to assess levels of depression, anxiety, and stress. Participants rated the extent to which each of 21 items applied to them for the past week on a 4-point Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much). Cronbach's alpha's for the subscales indicate adequate internal consistency (range: .82–.90 in a non-clinical population; Henry & Crawford, 2005). Alpha coefficients in the present study ranged from .68 to .83.

[1] Only those measures relevant for the current hypotheses are presented here. Participants also completed a questionnaire regarding the AAT and IAT stimuli and two non-validated questionnaires concerning their general rating of spiders and butterflies and their attempts to control feelings of anxiety.