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## The influence of worry and avoidance on the Iowa Gambling Task



Jolijn Drost<sup>a,\*</sup>, Philip Spinhoven<sup>a,b,c</sup>, Anne-Wil Kruijt<sup>a</sup>, Willem Van der Does<sup>a,b,c</sup>

<sup>a</sup> Institute of Psychology, Leiden University, Wassenaarseweg 52, 2333 AK Leiden, The Netherlands

<sup>b</sup> Department of Psychiatry, Leiden University Medical Center, Leiden, The Netherlands

<sup>c</sup> Leiden Institute of Brain and Cognition, Leiden, The Netherlands

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### ABSTRACT

**Background:** It has been proposed that worry in individuals with Generalized Anxiety Disorder may be reinforced by a positive effect of worry on decision making, as reflected by a steeper learning curve on the Iowa Gambling Task (IGT). We hypothesized that this apparent positive effect of worry is dependent on the IGT parameters, in particular the absence of an opportunity to avoid decisions.

**Objective:** (1) To replicate previous findings on the effect of worry on IGT performance. (2) To examine the influence of avoidance opportunity on IGT performance. We hypothesized that the positive effect of worry on learning would be abolished or reversed by the opportunity to avoid.

**Method:** A standard IGT and a new IGT version that includes a pass (avoidance) option were completed by 78 and 79 participants, respectively.

**Results:** A beneficial effect of worry on learning in the standard version of the IGT was not observed. In the pass version of the IGT, worry status and avoidance were negatively associated with performance. Worry was not related, however, to pass usage. The hypothesized mediating effect of avoidance was non-significant.

**Limitations:** It is unclear to what extent these findings generalize to real-life decision making and how clinical status affects results.

**Conclusion:** The possibility to avoid a decision results in poorer IGT performance in high relative to low trait worriers. Possible explanations for these findings are discussed.

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### 1. Introduction

Within its 'normal' range, worrying is considered an ordinary and adaptive process containing positive and constructive aspects (e.g. Borkovec & Roemer, 1995; Davey, Hampton, Farrell, & Davidson, 1992). Yet in its pathological form the downsides overshadow or undermine these benefits and cause severe impairment (e.g. Wittchen, Carter, Pfister, Montgomery, & Kessler, 2000). Patients with generalized anxiety disorder (GAD) engage in this type of perseverative thinking despite its negative effects. There appear to be two possible reasons for continued worrying: (1) patients do not experience benefits (anymore) but simply do not know how to terminate this type of thinking even if they want to; and/or (2) there is a certain payoff (although maybe not recognized by the individual) like the reduction of anxiety due to the belief that one should prepare for every possible scenario.

It has even been suggested that worrying leads to improved decision making (Mueller, Nguyen, Ray, & Borkovec, 2010) on the Iowa Gambling Task (IGT). In the IGT (Bechara, Damasio, Damasio, & Anderson, 1994), four decks of cards are simultaneously presented to the participant. Each selection of a card leads to either an addition or subtraction of points (money). The task is designed in such a way that repeated selection of card decks A and B leads to long term net loss and repeated play of decks C and D leads to long term net gain. Participants are instructed to maximize their winnings. The reinforcement schedule is too complicated for participants to figure it out but they typically develop an intuitive preference for decks C and D.

People with GAD are hypervigilant and highly aware of any cues signalling potential danger (Mathews & MacLeod, 1986). It seems logical that these future oriented characteristics can have a beneficial effect on IGT performance. According to the Somatic Marker Hypothesis (SMH; Damasio, 1994, 1996), emotions and their accompanying bodily signals leave a trace in memory which directs our learning even before certain knowledge or patterns enter consciousness. Reactivation of this memory trace occurs when one is faced with a similar situation. This is hypothesized to influence

\* Corresponding author. Tel.: +31 71 5273377.

E-mail address: [jdrost@fsw.leidenuniv.nl](mailto:jdrost@fsw.leidenuniv.nl) (J. Drost).

decision making by encouraging advantageous and discouraging disadvantageous choices. From a SMH perspective one could argue that higher levels of (anticipatory) anxiety will install stronger somatic markers and therefore more quickly lead to successful performance on the IGT (Damasio, 1994, 1996; see also Werner, Duschek, & Schandry, 2009, p. 263).

So far, studies concerning anxiety have shown mixed results. Miu, Heilman, and Houser (2008) compared high and low trait anxious individuals and concluded that despite the fact that some of the anticipatory physical reactions were stronger in high trait anxious individuals, the low trait anxious group outperformed the high trait anxious group on the IGT. Werner et al. (2009), however, found that higher trait anxiety levels are associated with better IGT performance. These two studies measured trait anxiety, which overlaps with worry, but is not the same.

In the domain of worry/GAD two recent studies stand out. Pajkossy, Dezső, and Paprika (2009) targeted the influence of state anxiety, trait anxiety and worry on IGT performance in a student sample ( $N = 50$ ). For each construct of interest low, medium, and high groups were formed. The authors concluded that state anxiety and worry had a positive effect on IGT performance whereas trait anxiety had a negative influence. This pattern is difficult to understand and may be a chance effect in a relatively small sample in which post hoc tests did not reveal significant differences unless Bonferroni corrections were ignored. Mueller et al. (2010) selected 27 participants meeting GAD criteria (assessed through questionnaire) and compared their IGT performance to that of a control group ( $n = 20$ ). The GAD group learned to choose the advantageous decks (C and D) over the disadvantageous decks (A and B) significantly faster than the control group. GAD patients therefore seem to benefit from their future-oriented hypervigilant characteristics in this form of decision making. This could constitute a potential mechanism underpinning the recurrent engagement in worry by positively reinforcing worry as a constructive strategy.

If this effect is replicable, the question remains to what extent this is relevant for real-life decision making. Studies have shown, for instance, that high trait worriers possess the ability to successfully solve problem solving tasks when forced to do so, but they seem to never arrive at this stage of problem solving in real life, because worrying and avoidance undermine the preceding stages of problem solving. High worriers have a negative problem orientation, tend to avoid problems and lack confidence in their own problem solving abilities (e.g. Davey, 1994; Drost, Watkins, & Spinhoven, submitted for publication).

The IGT in its standard form is one of a somewhat artificial nature and does not involve decision in a social context. In particular, the IGT represents a forced-choice decision making process. The lack of option to not make a decision makes it less suitable for studying disorders in which avoidance is a main mechanism of maintenance. The mental procrastination and dwelling on certain issues that is characteristic of worriers may lead them to avoid making decisions. In order to examine the role of such avoidance behaviour in decision making, the current study used both the standard IGT and a newly developed adaptation of the IGT that included a pass option (IGT-P).

The aim of the present study was to investigate whether worriers will engage in passing on the IGT-P and how this influences their performance. In the standard IGT condition we expected to replicate Mueller et al.'s (2010) findings of high worriers learning significantly faster than controls to choose the advantageous decks. For the IGT-P, we hypothesized that worriers out of uncertainty will choose the pass (i.e. avoid) option more often than low-worriers and that this will negatively influence their learning process. Anxiety symptoms were also measured, in order to check whether any results are specific to worry.

## 2. Materials and methods

### 2.1. Participants

Inclusion criteria were an age of between 17 and 35 years, good command of the Dutch language and being from Middle or North-West European descent (because of genetic analyses that will be reported elsewhere). Participants were recruited through advertisements at the university.

### 2.2. Materials

#### 2.2.1. Questionnaires

The Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) consists of 16 items rated on a 5-point Likert scale and measures trait worry independently from the content of the worry (Davey, 1993; Molina & Borkovec, 1994). It has high internal consistency, good test–retest reliability and is unaffected by social desirability (Meyer et al., 1990). Internal consistency in the present study was high, namely  $\alpha = 0.92$  in the total sample. The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) is a 14-item self-report questionnaire consisting of two subscales measuring anxiety (7-items) and depression (7-items) symptoms during the last week. Internal consistency, discriminant and concurrent validity, and test–retest reliability are satisfactory (Bjelland, Dahl, Haug, & Neckelmann, 2002; Spinhoven et al., 1997). In the present study internal consistency (total sample) of HADS-A was  $\alpha = 0.74$  and of HADS-D  $\alpha = 0.77$ .

#### 2.2.2. Iowa Gambling Task (IGT)

The standard IGT as proposed by Bechara et al. (1994) consisted of 100 trials divided over 5 blocks (20 trials each). Each trial started with a display of 4 decks of cards (A, B, C, D) on a computer screen of which participants selected a card by clicking the cursor on the deck of interest. Once a card was selected feedback was given on the amount won and lost in that trial and the total amount left was shown. Each card simultaneously consisted of a gain and a loss. Decks A and B had a fixed gain of 100 as opposed to 50 in decks C and D. The amount that was lost varied across decks and was non-systematic (A: either 0 or between 150 and 350, B: 0 or 1250, C: 0 or between 25 and 50, D: 0 or 250). Choosing exclusively from decks A or B led to a net loss of 250 over 10 card selections and was therefore *disadvantageous*. Decks C and D resulted in a net gain of 250 when selected exclusively during 10 trials. The IGT-P (pass version) had exactly the same setup, but each trial also included a pass button. The pass choice was visualized on the screen by the top 4 cards being removed without revealing their value. In reality no “pass” took place and the cards/decks were merely put on hold. The total number of trials remained 100.

### 2.3. Procedure

Participants were tested in a laboratory setting. They signed an informed consent form before the data collection started. The PSWQ, HADS and IGT were all completed on a computer. Participants were assigned to either the standard IGT or the IGT-P based on their participant number, which was assigned in order of testing. Overall time spent on the data collection (including the data for the other experiments) was up to 90 min per person. Participants could choose to receive course credits or a small payment for their participation. In addition, participants also received their possible gains (but not losses) on the IGT at a rate of 1 eurocent per 10 points gained.

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