On the cognitive manipulation of economic preferences and productivity: experimental evidence.

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An exciting development in the anxiety manipulation literature is the emergence of randomized controlled field trials using cognitive behavioural therapy (Cook et al., 2014) and, more recently, cognitive bias modification (see Macleod and Mathews, 2012, for a review). These studies have shown that simple interventions in at-risk populations can lead to large changes in risky behaviours. In a striking example of the power of cognitive behavioural therapy, the intervention in Cook et al. (2014) teaches students simple strategies on how to cool down before taking a decision when aroused. The results are striking: these students experience a drop in their arrest rate of 40 percent relative to a control group. They also have better GPAs during the academic year, and many of the benefits seem to be longer-lasting than the intervention. Thus, while not affecting cognitive abilities directly, these intervention teach rules that help individuals deal with impulses that can often lead to bad outcomes. More recently, cognitive bias modification (CBM) has brought about a set of techniques that aim at modifying attentional and interpretive biases in processing information (Macleod and Mathews, 2012). For instance, it had been long documented that individuals with anxiety disorders display a strong attentional bias to negative information. Through CBM, individuals can be trained to focus less on negative information in a particular task. The research has shown that this carries over to information processing more generally: individuals trained on such tasks also report lower levels of anxiety in other domains. Long-term studies have shown substantial declines in anxiety of individuals (See et al., 2009).

These results raise fascinating perspectives in many dimensions: In the domain of risk preferences, anxiety has been shown to be directly linked to risk aversion and loss aversion (Hartley and Phelps, 2012) and that the same brain structures that underlie anxiety are also involved in the responsiveness to loss framing (De Benedetto et al., 2006).

In this paper we examine how the experimental manipulation of anxiety via a CBM paradigm can affect a number of economic and pro-social behaviours. The questions that we are interested in, starting with the most crucial, namely that out CBM treatment does indeed bring about a reduction in anxiety, are:

1. Does CBM lead to reduced state anxiety scores, under arousal?
   Given a reduction in anxiety via CBM, we also investigate whether this also leads to:

2. An increase in productivity/performance on a stress-inducing task

3. Increased self-confidence

4. Changes in risk preferences, such as risk aversion(Experimental evidence exists implying a positive correlation between stress and risk-taking. For instance see: Toledo, M., and Sandi, C. (2011).)

5. A higher rate of organ donation relative to a control group.

The sample consisted of 290 participants; participants scoring very low (<30) on the STAI-Trait were eliminated. Participants were randomly assigned to a control group (CG) or a treatment group (TG).

A cognitive bias modification (CBM) paradigm consisting of a modified dot-probe task was administered to both groups. Participants view a pair of faces juxtaposed left and right: one neutral and one angry. Subsequently, a probe appears behind one of the two faces and the participant must indicate as fast as possible whether the probe appeared on the left or the right on their PC. In the CG the probe appeared with equal probability behind any of the two faces. In the TG, it always appeared behind the neutral face. This protocol has been shown to reduce anxiety in the TG, in the presence of threatening stimuli; individuals are trained to consistently focus attention on the non-threatening stimuli . A meta-analysis which goes into details about these effects can be found in Hakamata et al. (2010).

Participants had to complete a total of 14 CBM tasks at home every weekday for a total of 3 weeks; the daily task lasted between 10 and 13 minutes. Before and after measures of the economic/behavioural variables were collected in the laboratory on two separate occasions. Participants also completed an additional CBM task in the laboratory. The economic/behavioural variables were measured in the following sequence:

1. IQ test: they had 10 minutes to reply to as many questions as they could.

2. Confidence game: confidence measures elicited in an incentive compatible manner: participants had to decide between a lottery with an increasing probability of winning and betting on their performance on the IQ test against another randomly selected participant. The later one switches away from the lottery to the IQ-bet, the more one is assumed to be confident.

3. STAI-trait and STAI-state questionnaires

4. Risk Aversion : decision between gambles and/or certain outcomes elicited in an incentive compatible manner

5. Organ Donation: a decision on whether to become an organ donor by filling in a card was only implemented in the second laboratory session.

We use a difference-in-difference procedure to estimate the treatment effects of CBM on the outcome variables. Due to the lack of theory relating to the functional relationship between anxiety and the outcome variables, we use non-parametric locally weighted polynomial regressions to estimate effects.

We find that the CBM treatment seems to reduce STAI-state anxiety significantly for the subsample of individuals with high STAI-trait anxiety. The CG shows no significant change in state anxiety. The TG, however, exhibits a significant decrease in state anxiety following CBM, among the participants who are chronically anxious by nature (Trait anxiety score above 43).

Thus, although our CBM treatment has not changed innate levels of anxiety, it has conditioned those highly prone to anxiety in general to perceive a stressful event (such as a timed IQ test) as less threatening than previously. This is consistent with the existing body of literature on CBM-based interventions.

In parallel, we find that the highly anxious subset of the TG observes an significant improvement in the mean IQ score. We argue that treatment by CBM reduces the ability of stress to interfere with one's capacity to exert the attention/effort needed to complete cognitively demanding tasks, thus boosting productivity in the highly anxious.

We do not find significant differences in confidence scores in a difference-difference setup between the CG and the TG. We do however, find that our sample exhibits typical overconfidence.

We are currently continuing to analyse the results on risk aversion and organ donation. Preliminary findings on risk aversion indicate the presence of a certainty effect: participants seem to exhibit decreased risk aversion when faced with a choice between two lotteries with uncertainty, compared to the choice between a certain outcome and a a lottery (holding expected values constant).

A full set of results will be ready by April 2015.