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Optimistic belief updating despite inclusion of positive events

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ABSTRACT

A recent methodology – namely, the belief update task – used in the study of unrealistic optimism has provided a mechanistic account of how people maintain positive illusions about their future in the face of disconfirming evidence. This methodology has been used in a series of neuroscientific studies and neural moderators of unrealistic optimism have been established. A subsequent critique of the belief update task by Shah et al. (2016) has cast doubt over the validity of these findings however, with the authors instead suggesting that apparent optimistic belief updating is in fact a statistical artefact resulting from a flawed methodology. Specifically, Shah et al. assert that the inclusion of positive events in the belief update task can help test the validity of the optimistic account of belief updating, while proponents have suggested that caution should be taken when adapting this task to study positive life events because there is a lack of accurate information regarding the likely frequency of such events. Using a subset of the life events used by Shah et al., the current paper demonstrates that optimistic belief updating should still be observed when positive life events are included in the belief update task.

1. Introduction

In everyday life, people are often faced with decisions that require them to estimate the likelihood of certain events happening to them in the future (Tversky & Kahneman, 1974). Folk-wisdom dictates that *knowledge is power* and, indeed, the classical view of human judgment predicts that future projections should rely on accurate, objective and unbiased evidence (e.g. Trope, 1980). However, this normative account has been challenged by a second school of academic thought, one that takes a cognitive-affective perspective of judgement formation. This school has suggested that an optimism bias is a vital component of healthy psychological functioning (Garrett et al., 2014 Korn, Sharot, Walter, Heekeren, & Dolan, 2014; Strunk, Lopez, & DeRubeis, 2006; Taylor & Brown, 1988; Tyler and Rosier, 2009) and that humans have a pervasive tendency to make systematically biased probability assessments when estimating personal risks (Sharot, 2011; Sharot, 2012). This line of reasoning suggests that people ultimately ignore warning signs in order to maintain positive hedonic feelings and, consequently, that human cognition acts in a manner more aligned to the philosophy *ignorance is bliss.*

A few recent papers have critiqued the evidential basis for unrealistic optimism and cast some doubt over the validity of the methodologies used to study both comparative and absolute optimism (Harris & Hahn, 2011; Harris, Shah, Catmur, Bird, & Hahn, 2013; Shah, Harris, Hahn, Catmur, & Bird, 2016). If accurate, this account of the literature is worrisome given the use of unrealistic optimism in explaining a number of behavioural effects that occur in applied settings, including health (Dillard, McCaul, & Klein, 2006; Jansen et al., 2011; Shepherd, 2002; van der Velde, Hooykas, & van der Joop, 1992; van der Velde, van der Joop, & Hooykas,

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1994), business and finance (Calderon, 1993; Kappes & Sharot, 2015; Puri & Robinson, 2007) and anti-social behaviour (e.g., reckless driving; DeJoy, 1989; White, Cunningham, & Titchener, 2011). It is worth noting that Shah and colleagues concede that while they doubt the existence of a general optimism bias, some specific groups of people such as smokers and gamblers could have higher than average levels of optimism, suggesting that optimism is a trait rather than a pervasive cognitive bias. Nonetheless, given the widespread interest in unrealistic optimism and the recent alternative interpretation of the empirical findings, it is particularly important that tests are conducted to systematically investigate the robustness of the methods used to study optimism bias.

1.1. Measuring unrealistic optimism

1.1.1. The comparative method

Unrealistic optimism was traditionally measured by comparing participants' perceived chances of experiencing negative and positive life events with how likely they thought such events were to happen to people generally (Weinstein, 1980). Unrealistic optimism, or an optimism bias, is said to exist when people expect that their personal future outcomes are more favourable than would be predicted by a normative model of estimation (Harris & Hahn, 2011; McKay & Dennett, 2009) and, indeed, results from studies using this 'comparative method' suggest that healthy people generally expect more positive and less negative things to happen to them than the average person (Shepperd et al., 2015).

The results of studies using this comparative method have come under attack though, in particular by Harris and Hahn (2011) who showed that unbiased simulated agents would produce seemingly optimistic answers when responding to questions used in the comparative method. Because the extant research showing optimism in humans was therefore suggested to be confounded, it was of great interest to academics on both side of this debate when a new methodology – one that did not rely on people's comparisons between themselves and the average person – not only provided additional evidence in support of a general optimism bias but also presented neuroscientific evidence to explain how this bias is maintained.

1.1.2. The belief update task

This relatively new research paradigm developed by Sharot, Korn and Dolan (2011; called the belief update task) has provided further evidence to support the existence of an optimism bias as well as a mechanistic account to explain how unrealistic optimism persists in the face of disconfirming evidence. Participants in this task are asked to estimate the likelihoods of certain adverse life events happening to them in the future and are subsequently presented with base rate statistics which display the probabilities of these events occurring to someone in the same sociocultural environment as them. In a second phase of the task, participants are asked to re-estimate their personal risk for each of the life events.

The amount that participants update their estimates in response to base rate feedback is used as a measure of how much they incorporate new information into their belief systems. Belief updates are compared across two trial types; trials in which participants receive desirable information and those in which they receive undesirable information. Trials are classified as 'desirable' or 'undesirable', depending on the valence of the event and whether the base rate is higher or lower than the participant's initial estimate (IE) of the likelihood of the event happening to them.

Several studies have shown that healthy participants generally update their beliefs more when base rates are desirable compared to undesirable (for a review, see Sharot & Garrett, 2016) and have concluded that this mechanism, whereby beliefs selectively update in response to desirable information, is responsible for pervasive unrealistic optimism. Using neuroimaging techniques, Sharot and colleagues have also shown dissociable patterns of neural activation in response to such desirable and undesirable information. For example, Sharot et al. (2011) found that desirable estimation errors were positively correlated with activation in the left inferior frontal gyrus (IFG), medial frontal cortex (MFC) and right cerebellum, whilst undesirable estimation errors were negatively correlated with activation in the right IFG. More crucially, activation in the right IFG differed as a function of individual differences in trait optimism. Individuals with high trait optimism scores exhibited reduced tracking of undesirable estimation errors in the right IFG relative to those with low scores. This latter finding suggests that trait optimism is linked to reduced neural coding of undesirable estimation errors. But despite the vast array of behavioural and neuroscientific evidence in support of the belief updating hypothesis (Garrett & Sharot, 2014; Garrett et al., 2014; Kuzmanovic et al., 2015; Moutsiana et al., 2013, 2015; Sharot, Guitart-Masip, Korn, Chowdhury, & Dolan, 2012; Sharot, Kanai et al., 2012; Sharot et al., 2011), there have also been some concerns expressed regarding the methodology that may invalidate these results (Harris et al., 2013; Shah et al., 2016).

1.1.2.1. Updating for positive life events. One critique made by Shah et al. (2016) is that the belief update task traditionally only asked participants to make estimates for negative life events. Sharot et al. (2011) asked participants to estimate the likelihood of events happening or not happening to them in an attempt to overcome this issue, but a Bayesian analysis conducted by Shah et al. (2016) showed that estimating the likelihood of a negative event not happening is not equivalent to estimating the likelihood of a positive event happening. They argued that if a biased task design, rather than biased participants, was causing seemingly optimistic updating, the reverse bias (i.e. a pessimism bias) should be observed in trials where positive events are used and the statistical design of the task is flipped. And, indeed, Shah et al. (2016) found a pessimistic pattern of updating when human participants were presented with positive events in this task, suggesting that optimistic updating is caused by a statistical artefact rather than a feature of human cognition. This finding is contentious, however, because a subsequent study did not find this reversal effect when using positive events and, in fact, showed optimistic updating for these stimuli too (Garrett & Sharot, 2017).

It is also important to note that previous studies of comparative optimism have reported a 'valence effect'; participants were shown to exhibit more unrealistic optimism for negatively framed future events than positively framed events (Gold & de Sousa,