Organizational Behavior and Human Decision Processes 146 (2018) 51–61

Contents lists available at ScienceDirect

Organizational Behavior and Human Decision Processes

journal homepage: www.elsevier.com/locate/obhdp

A formal model of goal revision in approach and avoidance contexts

Phillip Gee[a], Andrew Neal[a,*], Jeffrey B. Vancouver[b]

[a] The University of Queensland, Australia
[b] Ohio University, United States

ARTICLE INFO

Keywords:
Goal revision
Goal level
Decision making
Framing
Approach
Avoidance
Personality
Computational model
Risk preferences

ABSTRACT

We developed a formal model of goal revision based on contemporary accounts of decision making under risk and uncertainty. The model assumes that individuals anchor their goal level to their dynamically updated expectations of performance and make adjustments around the anchor point depending on their risk preference. Risk preference was hypothesized to be a function of goal framing and personality. To assess the model, 60 participants were asked to set and revise goals as they completed an Air Traffic Control simulation task. Fitted model parameters indicated that participants pursuing avoidance goals were more risk averse when setting and revising their goals than participants pursuing approach goals. Individuals with high levels of neuroticism were more sensitive to the effects of goal framing than those with low levels of neuroticism. These findings clarify the role of goal framing, risk preferences, and activated traits in goal revision.

A goal is an internal representation of desired or undesired end-states that serve to guide an organism's behavior (Austin & Vancouver, 1996; Carver & Scheier, 1998; Elliot, 2006). For example, one employee might aim to perform well at work in anticipation of some form of reward, while another may strive to avoid performing poorly to prevent some form of punishment. How a person sets and revises their goals over time can have long-ranging consequences on their achievements. People often have the discretion to choose the level of difficulty of the goals that they pursue, and revise them as their ability to perform changes. These choices may involve an element of risk. Whereas difficult goals are usually associated with greater reward, the likelihood of attaining the goal decreases as it becomes more difficult. For instance, an employee might choose between committing to an easier or more difficult work assignment, recognizing that the latter has greater risk and rewards. Theories of goal setting and self-regulation (Carver & Scheier, 1998; Locke & Latham, 1990) assume there is a dynamic process where people adjust the level of difficulty of the goals they pursue in response to feedback, which ensure that they do not pursue goals that are either too easy or too hard. However, whilst there is a long history of research on goal setting, relatively little research has examined the process by which goals are revised over time (Tolli & Schmidt, 2008).

The aim of the current paper is to develop a formal cognitive model that explains the process by which people adjust their goals across a series of discrete performance episodes. Our model draws on contemporary accounts of decision making under risk and uncertainty (Gigerenzer & Gaissmaier, 2011) together with current research on approach and avoidance motivation (Elliot, 2006) and interactionist theories of personality (Tett & Burnett, 2003) and behavior more generally (Bandura, 1986). Toward this end, we were inspired by the original research on goal level revision, or 'level of aspiration' as it was originally known over 70 years ago (Frank, 1935; Lewin, Dembo, Festinger, & Sears, 1944). Specifically, Frank (1935) defined level of aspiration as "the level of future performance in a familiar task which an individual, knowing his level of past performance in that task, explicitly undertakes to reach" (p. 119). The process implied by Frank (1935) represents a form of what is now known as "anchoring and adjustment," which is a cogntive heuristic that is commonly used whenever people have to estimate a quantity (Tversky & Kahneman, 1981). Our model assumes that people form an expectation of the performance level that they can achieve based on past performance and adjust their goal around that anchor point, depending on their risk preference. We assume that these risk preferences depend on whether people are pursuing approach or avoidance goals, and that personality traits, such as neuroticism, may modulate these effects.

Perhaps the most unique aspect of our endeavor is the use of computational modeling (Vancouver, Weinhardt, & Schmidt, 2010). We develop a simple, parsimonious model of goal level revision consistent with the current view of psychological decision making. To evaluate this model, we fit it to data from an experiment in which participants are required to set and revise approach or avoidance goals as they perform a complex task. We also compare our proposed model to the fits of a series of alternative models. In the sections below, we review the current state of knowledge regarding goal choice and revision;

* Corresponding author at: School of Psychology, University of Queensland, 4072, Australia.
E-mail addresses: phillip.m.gee@gmail.com (P. Gee), a.neal@psy.uq.edu.au (A. Neal).

https://doi.org/10.1016/j.obhdp.2018.03.002
Received 16 October 2014; Received in revised form 22 March 2018; Accepted 30 March 2018

present the model, the experiment, and the results; and discuss the implications of the findings for research and practice.

1. Existing research on goal choice and revision

As noted, research on the choice of goal level goes back to the 1930s (Frank, 1935). Studies conducted at the time examined a range of individual and situational factors that influence these choices, and concluded that people tend to set goals that exceed their prior performance (Lewin et al., 1944). In a meta-analysis of 78 studies of goal level revision, Wofford, Goodwin, and Premack (1992) found that the major determinants of individuals' goal level were past performance and ability. Other factors, such as expectancy of goal attainment, self-efficacy, and prior goal level were not significant predictors of goal level. However, the studies included within this meta-analysis were limited by methodological problems. For example, they tended to use very simple experimental tasks, often involving only two or three performance episodes and thus not allowing the goals to be well-informed by past experience (Phillips, Hollenbeck, & Ilgen, 1996). Furthermore, because of the limitations of statistical models available at the time they tended to rely on between-person designs and analyses. Yet goal revision is a dynamic process that unfolds within individuals over time, and as such needs to be studied at the within-person level across a series of performance episodes.

The introduction of multilevel, or random coefficient, models in the past two decades has enabled researchers to start examining changes in goal level over time. These studies have confirmed that people tend to revise their goals upwards when they meet or exceed their goal, but also that they tend to revise their goals downwards when they fail to meet their goal (Donovan & Williams, 2003; Ilies & Judge, 2005; Tolli & Schmidt, 2008). However, despite the progress that has been made in the study of goal revision at the within-person level, our understanding of the underlying dynamics remains limited. To understand the dynamics of a system, it is necessary to understand how the variables within it change over time, and how they interact reciprocally. Multilevel models provide very limited insights into these dynamics because they do not directly represent the process by which a variable changes over time (McArdle, 2009).

There have been few attempts to directly test a theory or model of the underlying psychological process in goal level revision. One exception is a study by Scherbaum and Vancouver (2010) that tested whether a control theory based computational model of only negative feedback loops (Powers, 1973) could account for goal revision. In particular, the model assumed that people would raise the level of a subordinate goal to help meet a superordinate goal, but only to the extent that the superordinate goal did not conflict with another superordinate goal. One way goal conflict was reduced was via increased efficiency in meeting the second superordinate goal. This model was tested in a task where efficiency increased over time to see if participants would revise the subordinate goal upwardly as that efficiency increased. Consistent with the predictions from the computational model, the study found that participants raised the level of the subordinate goal as efficiency increased. However, the study also found significant variability in this positive goal level revision across the participants, which the model did not attempt to explain. Moreover, the computational model only made a point prediction regarding the participants' degree of linear change in goal level, which most participants exhibited based on the behavioral data (i.e., what they did), but only about a third exhibited positive goal revision based on the self-reported goal level data (i.e., what they said). This may have been because the self-reported goal level had no consequences in the task (i.e., meeting or not meeting the self-reported goal was not tied to rewards or punishments), but it also opened the possibility that the changes in behavior were not a function of any changes to goal levels. Indeed, the computational model did not attempt to make a point prediction regarding each individual's actual goal level for each trial.

Of interest, a review of the goal choice literature by Klein, Austin, and Cooper (2008) noted that researchers examining goal choice typically draw on an expectancy-value framework rather than a control theory framework. Expectancy-value theories assume that people consider the subjective value of each goal and their expectancy of being able to achieve that goal. However, the expected-value account is typically used as a heuristic to help researchers identify variables that may predict goal choice, rather than as a formal theory that explains the process by which these choices are made. As a result, Klein et al. (2008) note that insufficient attention has been paid to the assumptions underlying this approach.

In particular, the expected-value framework draws on classical decision theory. Classical decision theory assumes that people make decisions rationally by calculating the expected utility of each decision option and selecting the option that maximizes expected utility. However, decision making research has demonstrated that people do not make decisions rationally (for reviews, see Busemeyer, 2015; Oppenheimer & Kelso, 2015; Weber & Johnson, 2009). Contemporary models of decision making assume that people simplify complex choice problems by using simple heuristics (Gigerenzer & Gaissmaier, 2011). Simple heuristics are often efficient and effective, particularly in a volatile and uncertain world. To our knowledge, no models have been developed that explain how people might use simple heuristics to adjust the level of difficulty of a goal that they are pursuing in a dynamic and uncertain environment.

2. A formal model of goal level revision

Similar to Scherbaum and Vancouver (2010), we sought to create a formal, computational model of goal level revision, but one that addressed the process of revising to a specific goal level and possible sources of individual differences in that goal level. Formal models are increasingly being used in psychology and cognitive science because they provide a precise mathematical description of the latent psychological processes thought to be responsible for observed phenomena (Busemeyer & Diederich, 2010; Lewandowsky & Farrell, 2011; Vancouver et al., 2010). Such precision reduces ambiguity regarding the theory one is using to explain a phenomenon and thus increases the possibility of shared understanding. Moreover, these models guarantee a level of internal consistency within the hypothesized processes because inconsistency would result in a model that could not be simulated or one whose results would not reproduce the phenomenon the theory purports to explain (Vancouver & Weinhardt, 2012).

In addition, because a formal model is specified mathematically, it is possible to fit the theoretical model directly to the data rather than fitting a statistical model of relations *implied* by a theory. This is particularly useful when dealing with dynamic systems that involve internal or unobserved processes because it is sometimes difficult to account for the behavior of these types of systems or evaluate alternative process models using traditional statistical approaches (DeShon, 2012). Because a formal model can be simulated, it is possible to examine whether the model can account for the observed trends in the data, and assess whether it provides a better account of the data than a series of alternative models. Furthermore, the researcher can examine how the parameters of the model respond to experimental manipulations, individual differences, or person x situation interactions. This strategy of model-based analysis has enabled researchers to test long-held assumptions, often with surprising results, in areas such as decision making (Rae, Heathcote, Donkin, Averell, & Brown, 2014), prospective memory (Heathcote, Loft, & Remington, 2015), and human factors (Vuckovic, Kwantes, Humphreys, & Neal, 2014).

In the current section, we present the formal model and develop a set of hypotheses regarding the impact of goal framing and neuroticism on the parameters of the model. The focus of the model is on achievement contexts where the goal level a person sets determines the threshold for obtaining rewards or avoiding punishments. A dynamic