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Resurgence as Choice

Timothy A. Shahan*, Andrew R. Craig

Utah State University, United States

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ABSTRACT

Resurgence is typically defined as an increase in a previously extinguished target behavior when a more recently reinforced alternative behavior is later extinguished. Some treatments of the phenomenon have suggested that it might also extend to circumstances where either the historic or more recently reinforced behavior is reduced by other non-extinction related means (e.g., punishment, decreases in reinforcement rate, satiation, etc.). Here we present a theory of resurgence suggesting that the phenomenon results from the same basic processes governing choice. In its most general form, the theory suggests that resurgence results from changes in the allocation of target behavior driven by changes in the values of the target and alternative options across time. Specifically, resurgence occurs when there is an increase in the relative value of an historically effective target option as a result of a subsequent devaluation of a more recently effective alternative option. We develop a more specific quantitative model of how extinction of the target and alternative responses in a typical resurgence paradigm might produce such changes in relative value across time using a temporal weighting rule. The example model does a good job in accounting for the effects of reinforcement rate and related manipulations on resurgence in simple schedules where Behavioral Momentum Theory has failed. We also discuss how the general theory might be extended to other parameters of reinforcement (e.g., magnitude, quality), other means to suppress target or alternative behavior (e.g., satiation, punishment, differential reinforcement of other behavior), and other factors (e.g., non- contingent versus contingent alternative reinforcement, serial alternative reinforcement, and multiple schedules).

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* Corresponding author at: Department of Psychology, Utah State University, Logan, UT 84322, United States.
E-mail address: tim.shahan@usu.edu (T.A. Shahan).

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1. Introduction

Resurgence is typically defined as an increase in a previously extinguished behavior when a more recently reinforced behavior is also placed on extinction (e.g., Cleland et al., 2001; Epstein, 1985; Lattal and Wacker, 2015). The phenomenon is potentially clinically important because it is likely a source of relapse of problem behavior following widely used treatments involving differential reinforcement of alternative behavior (i.e., DRA; see Volkert et al., 2009, for discussion). In such treatments, a problem behavior is placed on extinction and a more appropriate alternative behavior is reinforced (e.g., a functional communication response). Resurgence is said to occur when the problem behavior increases as a result of omission of reinforcement for the alternative behavior during treatment lapses or when treatment ends. In addition to such undesirable outcomes, resurgence might also contribute to the generation of more positive behavioral effects. For example, the phenomenon might be involved when historically effective behavior recurs under changing circumstances to allow for appropriate adaptation, problem solving, and creativity (e.g., Epstein, 1985; Shahan and Chase, 2002). Thus, a more thorough understanding of resurgence could have far reaching implications for understanding how temporally distant past experiences provide a source of potential behavior (be it good or bad) under current conditions.

Despite the definition of resurgence above, both early (e.g., Epstein, 1985) and more recent (e.g., Lattal and Wacker, 2015) treatments of the phenomenon have suggested that it might extend to circumstances where either the historic or more recently reinforced behavior is reduced by other non-extinction related means (e.g., punishment, satiation, decreases in reinforcement rate). This broader view of resurgence is appealing because the recurrence of previous behavior under such conditions may indeed reflect the same general processes, and it also more easily accommodates potentially related clinical phenomena. The theory of resurgence developed here is consistent with this broader view of the phenomenon.

The purpose of this paper is to present a theory of resurgence in which the phenomenon is considered to result from the same processes generally thought to govern choice. In short, the general theory proposed here suggests that resurgence arises from changes in the *relative* values of two (or more) options across time: one that was historically more valuable and one that has been more recently valuable. The merits of pursuing a choice-based theory of resurgence are manifold. First, as we will more fully development below, it is relatively straightforward to characterize behavior in resurgence preparations as resulting from an ongoing choice between a target and an alternative behavior. Second, a choice-based theory provides an account of resurgence that allows it to be incorporated into an overarching choice-based account of operant behavior—an account that has served as a cornerstone for the field. Third, the long tradition of well-developed quantitative theories of choice provides numerous insights into how the determinants of resurgence might be formalized quantitatively.

Although the theory we will present is grounded in the more general conception of resurgence discussed above (e.g., Epstein, 1985; Lattal and Wacker, 2015), most empirical data and the two dominant accounts of resurgence have focused on extinction-induced resurgence in the more restrictive sense. Thus, we will begin by reviewing these two accounts, specifically Behavioral Momentum Theory (Shahan and Sweeney, 2011) and Context Theory (see Trask et al., 2015, for a recent statement)—focusing primarily on their shortcomings. Next, we will provide a general description of a choice-based account and then provide an example of how that account might be formalized to provide a more specific quantitative model of extinction-induced resurgence. Finally, we will explore how a choice-based theory might be applied to other resurgence-inducing operations. Along the way, we will consider existing areas in need of additional research and novel predictions of the choice-based theory.

2. Behavioral Momentum Theory of Resurgence

Behavioral Momentum Theory (e.g., Nevin and Grace, 2000) provides a quantitative account of the persistence of operant behavior under conditions of disruption. The theory suggests response rates and response strength (i.e., resistance to change) are two separate aspects of behavior controlled by different processes. Response rates are governed by the contingent response-reinforcer relation, but resistance to change is governed by the Pavlovian discriminative stimulus-reinforcer relation. As a result, all sources of reinforcement within a discriminative-stimulus context, be they contingent on the target behavior, non-contingent, or even contingent on a different behavior, are predicted to contribute to the persistence of the target behavior under conditions of disruption. This prediction has been widely confirmed under a variety of circumstance (e.g., Nevin et al., 1990; Shahan and Burke, 2004; see Nevin and Shahan, 2011, for review).

The extension of Behavioral Momentum Theory to resurgence (Shahan and Sweeney, 2011) is based specifically on the augmented momentum model of extinction (Nevin and Grace, 2000). This model suggests that decreases in behavior during extinction result from increasingly disruptive effects across time of: a) terminating the contingency between a response and a reinforcer and, b) generalization decrement from removal of reinforcers from the context. The model suggests that experience with higher rates of reinforcement within a discriminative-stimulus context prior to extinction

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