An evaluation of the role of smoking context on a biobehavioral index of distress tolerance

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ABSTRACT

The present study evaluated the effect of smoking deprivation on a biobehavioral index of distress tolerance, breath-holding duration, among 43 adult smokers in a repeated measures test (Session 1 = smoking-as-usual, Session 2 = 12-h smoking deprivation). We theorized that distress tolerance is a context-dependent individual difference variable whose expression varies prospectively, within-individuals, as a function of smoking context. As predicted, participants' breath-holding duration was significantly shorter during an experimental session that immediately followed a 12-h smoking deprivation period than during a smoking-as-usual session. Furthermore, we theorized that among individuals with a pre-existing diathesis (i.e., psychiatric symptoms), smoking deprivation may activate a vulnerability process that decreases capacity to tolerate distress; in the absence of this stressor, these psychiatrically vulnerable smokers may express variable levels of distress tolerance. As predicted, we observed that level of psychiatric symptoms was significantly negatively correlated with breath-holding duration during the smoking deprivation, but not the smoking-as-usual session. These data advance our understanding of smoking and distress tolerance and the context-dependent phenomenology of distress tolerance.

Published by Elsevier Ltd.

There has been increased scientific attention addressing the role of distress tolerance in early lapse and relapse in smoking cessation (Brown, Lejuez, Kahler, & Strong, 2002; Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005). In this work, distress tolerance is typically defined as the ability to tolerate negative affect or aversive psychological or physical states (Brown et al., 2005). Conceptual models of early smoking lapse, and perhaps relapse, posit that during a quit attempt, persons with low distress tolerance may be characterized by an inability to tolerate negative affect, withdrawal symptoms, bodily states, and other aversive interoceptive cues (Brown et al., 2005). Specifically, a low threshold for tolerating negative affect and other aversive internal states that routinely occur during cessation (e.g., withdrawal symptoms, bodily sensations) may increase the likelihood of smoking behavior that is aimed at temporarily ameliorating—subjectively or objectively—such experiential distress (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Hajek, 1991; Parrott, 1999; Zvolensky, Schmidt, & Stewart, 2003).

Empirical work suggests distress tolerance may be related to sustained abstinence during a quit attempt. In some of the earliest work in this domain, Hajek and colleagues (Hajek, 1991; Hajek, Belcher, & Stapleton, 1987; West, Hajek, & Belcher, 1989) found that daily smokers with greater tolerance for distress (indexed by breath-holding duration) report longer duration of abstinence from smoking. Others have similarly found that daily smokers who relapse faster than their counterparts during quit attempts also are more likely to terminate aversive bodily and psychological sensations elicited by laboratory-based provocation tactics (e.g., difficult

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math tests, biological challenge procedures; Brandon et al., 2003; Brown et al., 2002). This empirical work suggests that distress tolerance, as indexed by biobehavioral indices such as breath-holding, may be an important explanatory factor in sustained smoking abstinence and early lapse.

Whereas extant work has focused on the role of distress tolerance in predicting sustained smoking abstinence, considerably less is known about factors that may affect distress tolerance, and in particular, the possible role(s) of smoking context on distress tolerance. Inspection of the literature identifies at least three key limitations. First, studies have not evaluated the impact of smoking deprivation, a central component of a cessation attempt, on distress tolerance. Specifically, there is an absence of prospective data pertaining to the stability of distress tolerance within-individuals over time and across smoking conditions or contexts.

A second, related limitation is that research has not attempted to determine whether distress tolerance is context-insensitive or context-sensitive. To the extent distress tolerance is context-insensitive, its expression will not significantly vary as a function of smoking context (i.e., between smoking-as-usual and smoking deprivation contexts). In one exception, Brown et al. (2002) tested termination of a mental arithmetic task and a biological challenge during a pre-quit smoking-as-usual session and then again on quit day session. These authors did not observe differences in the rate of dichotomously coded persistence (termination versus task completion) between the smoking-as-usual and quit-day administrations of these tasks (Brown et al., 2002). However, it is difficult to draw a clear inference from these findings in relation to the present question (i.e., the context-(in)sensitivity of distress tolerance) for a number of reasons. First, Brown et al. (2002) did not test duration of persistence within-subjects between the two smoking conditions. Thus, individual participants could have demonstrated different levels of distress tolerance in terms of duration of persistence regardless of whether rates of termination relative to task completion did not differ across smoking contexts. Second, a number of methodological issues reported by Brown et al. (2002) may limit inferences from these findings with respect to the present question. For example, the authors studied two groups of $n = 16$ daily smokers, potentially limiting the study's power to detect significant differences across smoking contexts. Also, the variability in distress tolerance across the two studied measures (arithmetic task and biological challenge) was markedly truncated, limiting between-subject and within-subject variability in distress tolerance needed to test its context-(in)sensitivity.

Finally, although multiple psychiatric symptoms, in particular anxiety, depression, and psychoticism symptoms, have been linked to risk for lapse and relapse (e.g., Breslau, Novak, & Kessler, 2004; Covey, Bomback, & Yan, 2006; Hitsman, Borrelli, McChargue, Spring, & Niaura, 2003; Zvolensky, et al., in press), mechanisms explaining these psychiatric symptom-relapse associations are not well understood. In this regard, it may be useful to evaluate the relations between psychiatric symptoms and distress tolerance (Brown et al., 2005). For example, it is possible that individuals with elevated levels of psychiatric symptoms may be vulnerable to experiencing a decreased capacity to tolerate distress when deprived of smoking. In this regard, smoking deprivation may be conceptualized as a stressful smoking-relevant context that may further deplete self-regulation resources already taxed by psychiatric symptoms and that are theoretically needed to tolerate distress. This reduced capacity to tolerate distress could thereby potentiate lapse and relapse to smoking.

The purpose of the present study was to evaluate the impact of smoking deprivation on the distress tolerance variable of breath-holding duration. First, we predicted that breath-holding duration would be context-dependent and therefore would vary prospectively among daily smokers as a function of smoking context. Specifically, we predicted that participants' breath-holding duration would be significantly shorter during an experimental session that immediately follows a 12-h nicotine deprivation period (Day 2 session) than during a smoking-as-usual experimental session (Day 1 session). This prediction was based on theorizing that distress tolerance functions as a context-sensitive individual difference variable whose expression varies prospectively, within-individuals, as a function of smoking context. Additionally, we hypothesized that greater levels of psychiatric symptoms would predict lower levels of breath-holding duration only during smoking deprivation. This exploratory prediction was based on the hypothesis that among individuals with a pre-existing psychological vulnerability (indexed by psychiatric symptoms), smoking deprivation may decrease capacity to tolerate distress.

1. Method

1.1. Participants

A total of 43 smokers (11 women; $M_{age} = 45.3$ years, SD = 12.2) were recruited through the general community in Menlo Park, CA via publicly-posted fliers in various local community settings. Fliers advertised a study related to smoking and invited smokers to contact the research team by phone. Exclusion criteria included: current suicidal ideation or plan, inability to speak or read English, or inability to provide informed consent (e.g. acutely psychotic, dementia). These exclusion criteria were used to ensure participant safety due to the moderately stressful experimental demands of smoking deprivation and tests of distress tolerance. No participants were excluded. Racial/Ethnic composition was as follows: 42% Caucasian, 30% African American, 9% Asian, 7% Hispanic/Latino, 2% Native American, and 9% reported "other" Racial/Ethnic identity. Participants reported completing a mean of 13.5 years (SD = 2.4) of education. Patients' employment status varied: 16% were employed full-time, 19% were employed part-time, 40% were unemployed and looking for work, 23% were unemployed and disabled, and 2% were retired. The study was conducted on two different days (two separate sessions). One participant who attended the first session of the experiment did not attend the second session.

Forty-seven percent of participants reported smoking 10 cigarettes or less per day, 42% reported smoking 11–20, 9.3% reported smoking 21–30, and 2% reported smoking 31 or greater. Thus, these participants were predominantly light (≤ 10 cigarettes/day) to