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**Reactivity to instructed smoking availability and environmental cues:
evidence with urge and reaction time.**

Juliano and Brandon's 1998 study assessed whether cognitions associated with drug use (the belief in the availability of nicotine to use) also elicit reactivity. Their research partially stems from observations of former nicotine addicts experiencing difficulties and/or relapse in situations including stimuli related to their prior nicotine use. These observations indicate that drug related cues can potentially serve as CS's, or classically conditioned stimuli, that produce respective CR's, conditioned responses like urges or cravings, that tend to induce setbacks or even full relapse. Regardless of the reasons these CR's motivate drug use, such findings suggests that extinction-based interventions should reduce the risk of relapse.

Environmental cues have primarily been the focus of reactivity research; however researchers have documented the significance of assessing a fuller range of variables that could potentially be associated with drug administration. Included in these variables are cognitive factors, such as the belief that a particular drug is available. Also often unaccounted for in reactivity research is the role of learning. For instance, since cigarette availability would tend to precede smoking on a regular basis, then after multiple pairings the belief itself could become the conditioned stimulus eliciting conditioned responses like urges. This concept is similar with availability; after multiple US-CS pairings made in the context of availability, availability itself may begin to serve as the discriminative stimulus.

The primary objectives of Juliano and Brandon's study were to empirically examine if instructed availability of a drug, tobacco, is sufficient to produce urges for the drug, and to test

whether a cognitive cue, availability, is capable of eliciting reactivity. An additional goal of their research was to replicate the findings of a correlation between increases in reaction time and increases in urge, which would support the use of reaction time as a suitable measure of drug cue reactivity and provide support for the conceptualization of urge as a reflection of “nonautomatic processes resulting from the disruption of automatic drug use action plans” (46). Juliano and Brandon hypothesized the availability condition would produce increased urges compared to those of the unavailability condition while also boosting reactivity elicited by the environmental stimuli, and that reaction time would be correlated with and reflective of a similar pattern to that of self-reported urge.

The participants in the study consisted of 86 male and 46 female smokers (receiving compensation) between the ages of 18 and 63 with an arithmetic mean of about 33, smoking an average of about 27 cigarettes a day (with a standard deviation of around 9 cigarettes) for about 17 years (mean). The dependent variable was the measured urge, while the independent variables were smoking availability and smoking stimuli, both manipulated. There were 3 primary measures in the study: the self-reported urge to smoke, on a participant rated scale of 0 (indicating no urge) to 10 (indicating the greatest urge ever experienced); reaction time task, in the form of 6 baseline and 6 post-manipulation trials of pressing a button quickly in response to series of tones; and PANAS, a positive and negative affect schedule with a purpose of detecting any differential effect the experimental conditions had on affective state.

The research was conducted via a 2*2 (smoking availability * smoking stimuli) between subjects factorial design. Participants were randomly assigned to one of the four groups depending on their experience with the two factors: the first being the instructional set regarding the availability of smoking (either within 20 minutes or up to three hours without smoking); and

the second being the environmental stimuli, either smoking related (lighter, ash tray, cigarettes, etc.) or neutral (stapler, pen, pencil). All participants were directed to abstain from smoking for three hours prior to the session and to bring a pack of their favored brand of cigarettes to the appointment.

Upon their arrival, participants were told the purpose of the research was to study smoking and behavior and would last up to three hours (deception). The researchers obtained informed consent, collected a breath sample in order to measure the amount of carbon monoxide, and took the participant's cigarettes. Baseline urge ratings and PANAS responses were also taken at this time. Following these assessments, the experimenter performed one of the four manipulations according to the assigned group: available/smoking stimuli, available/neutral stimuli, unavailable/smoking stimuli, or unavailable/neutral stimuli; after which, each participant was again asked to rate their urge to smoke, complete the PANAS, and respond to another six RT (reaction time) trials. Immediately preceding their departure urge ratings were assessed for a final time, and the participants were debriefed.

A series of 2*2 analyses of variance indicated the groups were equivalent in terms of carbon monoxide level, age, years of smoking, baseline self reported urge to smoke, reaction time and PANAS affect scales, however participants in the smoking available condition averaged only 25 cigarettes per day versus the unavailable conditions 29 cigarette a day average ($p < .01$). Group differences in reaction time were evaluated using a 2 (smoking availability)*2 (stimuli) ANCOVA design with the second measure of urge (Urge 2) as the dependent measure and co-varying out the baseline assessed urge (Urge 1).

A main effect for smoking availability instructions was found, as was initially predicted, indicating participants who were told they could smoke reported greater urges than those told

they would have to abstain for three hours. A borderline significant interaction between availability and stimulus type (neutral stimuli versus smoking stimuli) was found, while the ANCOVA assessment with Urge 3 (the measurement of urge after all participants were informed the study was over and they could leave) as the dependent variable and the baseline urge assessment as a covariate revealed a main effect for stimuli. This indicated that participants exposed to smoking-related stimuli had greater urges than those exposed to neutral stimuli; however, neither a main effect nor an interaction was found for availability.

Significant main effects for smoking availability were found in the ANCOVA assessment with post-manipulation RT as the dependent measure and with mean baseline RT controlled. However, these effects seemed to be a function of a strong interaction between smoking availability and stimuli. The PANAS administered both at baseline as well as post-manipulation demonstrated no significant main effects or interactions, revealing that both information about the probability of smoking as well as the stimuli presented did not result in differential changes in affect.

There were no significant correlations between mean reaction times and urge ratings across all conditions or within any condition or between change scores. However, when only the first two RT trials were examined, reaction time and urge alterations were significantly associated (only) in the available/smoking stimuli condition, the condition that also elicited the greatest reported urge to smoke. This finding is consistent with the theory that urges should tax cognitive workload when the use of cigarettes is restricted.

The results of the study reveal that drug availability can moderate the effect of environmental cues in eliciting drug craving, at least in the case of tobacco smoking; however it was not able to identify the mechanism producing the moderating effect. In addition to this, the

main effect for availability was consistent with the prediction that cognitive variables may serve as conditioned stimuli on their own. In other words, urges may occur when an individual discovers the drug will be readily available soon, despite a physical absence of the drug or other external conditioned stimuli. Also provided through this research is preliminary evidence that an individual's cognitions influence cue reactivity, however there was no means of verifying what the participant was actually thinking despite the effort to manipulate cognitions. Furthermore, the presentation of smoking related cues did not reliably produce greater urge than did neutral cues, most likely due to either the degree the participants believed the drug was actually available to them or the subtlety of the cue.