State, But Not Trait, Measures of Persistence Are Related to Negative Affect

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ABSTRACT. Objective: Task persistence describes the act of persisting with a difficult or effortful task. Although there are likely individual differences in persistence, the same person may also display different levels of persistence under different circumstances. This study sought to examine whether task persistence can be conceptualized as both a state and as a trait, and to examine the self-control strength model with negative affect as a drain on limited resources necessary for persisting. **Method:** Smokers with schizophrenia ($n = 43$), schizoaffective disorder ($n = 28$), and nonpsychiatric smokers ($n = 78$) seeking treatment at state-funded tobacco-dependence treatment clinics completed two behavioral measures and two self-report measures of task persistence along with a

measure of negative affect before their target quit date. **Results:** Analyses of covariance suggest that behavioral measures of persistence were significantly related to negative affect while two self-report measures of persistence were not. **Conclusions:** These findings suggest that behavioral, but not self-report, measures of persistence are related to negative affect. We argue that these behavioral measures capture “state” persistence whereas the self-report measures capture “trait” persistence. These data also lend support to the self-control strength model by suggesting that negative affect can drain the limited resources necessary for persisting with difficult behavioral tasks. (*J. Stud. Alcohol Drugs*, 74, 584–588, 2013)

THE SELF-CONTROL STRENGTH MODEL (Freeman and Muraven, 2010; Muraven, 2010; Muraven and Baumeister, 2000; Muraven and Slessareva, 2003) is a parsimonious theoretical explanation for task persistence—particularly state persistence. This model suggests that self-control is a limited resource, is changeable, and “involves overriding or inhibiting competing urges, behaviors, or desires” (Muraven and Baumeister, 2000, p. 247). To control one’s behavior, one must therefore expend limited resources that are subsequently depleted temporarily (Muraven and Baumeister, 2000). The self-control strength model (Freeman and Muraven, 2010; Muraven, 2010; Muraven and Baumeister, 2000; Muraven and Slessareva, 2003) explains how task persistence can vary not only between people but also within a person at different times. Although there are surely individual differences in task persistence, individuals’ persistence may vary based on the self-regulatory resources available to them in the moment. Through the lens of the self-control strength model, task persistence can therefore be seen as the use of one’s remaining inner resources. If self-regulatory resources are readily available, it will be easier to persist in reaching one’s goal. If self-regulatory resources are depleted, however, a person may have more difficulty persisting. Muraven and Baumeister (2000) describe coping with negative affect as one potential drain on limited self-control resources because using one’s inner resources to cope

with negative affect makes those resources less available for exhibiting self-control in other activities. The current study tests the hypothesis that, if coping with negative affect drains limited self-control resources, then (a) persistence will be negatively correlated with negative affect and (b) measures proposed to capture “state” persistence will be more highly related to current negative affect than will measures of “trait” persistence.

Method

Participants

Smokers were recruited from state-funded tobacco-dependence treatment clinics in urban areas of central New Jersey through clinician referrals or responses to recruitment flyers. Of the 203 smokers recruited, 149 ultimately met all inclusion criteria and were enrolled in the study. Potential participants were excluded for failing the diagnostic screening, already passing their quit date, already using U.S. Food and Drug Administration–approved cessation medications, changing their mind about participating, smoking more than 10 cigarettes per day, not planning to quit, having transportation issues, losing contact, and being unable to provide informed consent. All participants smoked at least 10 cigarettes per day, were older than age 18 years, and were willing to adhere to the study protocol. The original study compared smokers with and without schizophrenia or schizoaffective disorder because this population smokes at very high rates (de Leon and Diaz, 2005; Hughes et al., 1986). Smokers with a psychiatric diagnosis all met criteria for schizophrenia or schizoaffective disorder according to the *Diagnostic and Statistical*

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Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994); were stable on their current antipsychotic medication for 1 month; and demonstrated the capacity for providing informed consent (Folstein Mini-Mental Status Examination, score > 23; Folstein et al., 1975). Nonpsychiatric smokers were also screened using the Structured Clinical Interview for the DSM-IV (SCID-IV; First et al., 2002) to ensure that they did not have any other psychotic disorders, a current major depressive episode, or a current or past manic episode. The relevant SCID-IV sections were administered by a bachelor's-level research assistant with extensive training and supervision in SCID administration. Participants were excluded if they had made a previous quit attempt within the past 3 months to ensure that this was a new quit attempt rather than a continuation of a recent, failed attempt. This study was approved by the Institutional Review Board at the University of Medicine and Dentistry of New Jersey, and all participants provided written informed consent.

All participants were enrolled before their scheduled quit day and before they began taking any cessation medications. Of the 149 participants enrolled, 43 were diagnosed with schizophrenia, 28 were diagnosed with schizoaffective disorder, and 78 were nonpsychiatric smokers.

Procedure

Participants completed a measure of negative affect (i.e., Positive and Negative Affect Schedule [PANAS]; Watson et al., 1988) and four measures of persistence at the baseline appointment and were compensated \$30 for their time. Full procedures for the larger study are described in Steinberg et al. (2010).

Measures

We conceptualized behavioral measures of persistence (i.e., Mirror Tracing Persistence Task [Quinn et al., 1996] and Breath-Holding Task [Hajek et al., 1987]) as measures of "state" persistence because they measure persistence in the moment; it represents participants' current "state." We conceptualized self-report measures of persistence (i.e., the Temperament and Character Inventory—Persistence Scale [TCI-P] and Two-Item Persistence Measure) as measures of "trait" persistence because they ask participants to describe how they "usually act and feel." These measures are described in detail below.

Mirror Tracing Persistence Task. This task has been shown to increase participants' frustration and stress (e.g., Allen et al., 1997; Kaspruwicz et al., 1990) and has variously been labeled as a measure of task persistence and of distress tolerance. In the current study, participants traced eight geometric figures by hand while only viewing their hand

indirectly through a mirror. Participants were instructed that the experimenter would remove the copy of the shape from the box if they made even a very small error. Participants could then ask for a new copy of the shape to continue trying, or they could proceed to the next shape if they felt that it was unlikely that they could do any better. Experimenters told participants to proceed to the next figure if they were still trying after 5 minutes. Scores were determined by calculating the mean number of seconds spent on incomplete figures. Brandon et al. (2003) found coefficient α to be .92 for the mirror-tracing task. A computerized version of this procedure is also available (e.g., Daughters et al., 2005; MacPherson et al., 2008).

Breath-Holding Task. Participants were asked to hold their breath for as long as they could safely do so as a measure of persistence. This measure has previously been able to differentiate current smokers with a history of a quit attempt lasting at least 3 months compared with those unable to remain abstinent for at least 3 months (Brown et al., 2002), was related to the risk of lapsing in smokers making an unaided quit attempt (Brown et al., 2009), and predicted 7-day point prevalence abstinence at the end of treatment (Hajek et al., 1987). Zvolensky et al. (2001), however, did not find such a relationship.

Temperament and Character Inventory—Persistence Scale (Cloninger et al., 1994). The full ninth version of the TCI is a 240-item, true/false, self-report questionnaire that measures seven dimensions of personality, including the original three Tridimensional Personality Questionnaire scales. The present study used only the fourth scale, Persistence, which comprised eight items, yielding scores from 0 (*low persistence*) to 8 (*high persistence*). Kalman et al. (2010) report Cronbach's α to be .72 in their sample of adult smokers. Participants were instructed to rate items with respect to how they "usually act and feel."

Two-item Self-Report Persistence Measure (TP2; Steinberg et al., 2007). Two items from the Tridimensional Personality Questionnaire (Cloninger, 1987) with a modified response format (i.e., true/false changed to a 4-point scale) appeared to be consistent with task persistence (Steinberg et al., 2007). The items were: "I will keep trying the same thing over again even when I have not had success the first time" and "I will often continue to work on something, even after other people have given up." Total scores could range from 0 for *low persistence* to 8 for *high persistence*. In a sample of adolescents, internal consistency reliability was determined to be .73 (Steinberg et al., 2007). Participants were again instructed to rate items with respect to how they "usually act and feel."

Positive and Negative Affect Schedule—Negative Subscale. We instructed patients to rate 11 items describing negative affect from *very slightly or not at all* to *extremely* with respect to how they have been feeling during the past 7 days. Scores could range from a low of 0 to a high of 44.

TABLE 1. State, but not trait, measures of persistence are related to negative affect

Variable	High <i>M (SD)</i>	Low <i>M (SD)</i>	Cohen's <i>d</i>	[95% CI]
Mirror tracing*	15.09 (10.62)	11.42 (9.07)	.3742	[.0481, .7003]
Breath holding*	14.35 (10.52)	11.14 (8.94)	.4316	[.1068, .7565]
TCI-P	14.24 (9.83)	11.71 (10.04)	.2585	[-.0721, .5892]
TP2	13.64 (9.33)	12.68 (10.88)	.0969	[-.2306, .4245]

Notes: TCI-P = Temperament and Character Inventory–Persistence Scale; TP2 = Modified two-item Tridimensional Personality Questionnaire.

* $p < .05$.

Results

Participants

Of the 149 participants ultimately meeting all inclusion criteria, 52.4% were nonpsychiatric control smokers and 47.6% met the criteria for schizophrenia or schizoaffective disorder. Approximately half were female (53%) and married (49.7%). The mean age was 44.1 years ($SD = 10.9$). Racial and ethnic backgrounds included African American (56.4%), White (31.5%), Latino (6.7%), Native American (1.3%), and other (3.4%). Most of the participants (81.2%) reported currently receiving public assistance, and most were unemployed (83.9%). Participants reported smoking almost a pack per day ($M = 19.43$ cigarettes, $SD = 9.8$).

Nonpsychiatric smokers were more likely to be female, $\chi^2(1) = 4.77$, $p = .029$, and less likely to be unemployed, $\chi^2(1) = 8.25$, $p = .004$, or to receive public assistance, $\chi^2(1) = 18.86$, $p < .0001$ compared to smokers with psychiatric illness. As reported in Steinberg et al. (2010), nonpsychiatric participants persisted longer on the mirror-tracing task and scored higher on the two-item self-report measure than did participants with schizophrenia or schizoaffective disorder.

Negative affect and diagnosis

We conducted an analysis of variance to examine differences in negative affect across participants with schizophrenia ($n = 43$), participants with schizoaffective disorder ($n = 28$), and a nonpsychiatric population ($n = 78$). Analysis of the main effect of diagnosis resulted in a statistical trend, $F(2, 148) = 2.40$, $p = .094$, with planned comparisons indicating no differences in negative affect between those with schizophrenia versus schizoaffective disorder ($p = .977$), no diagnosis versus schizoaffective disorder ($p = .109$), and a trend indicating greater negative affect for smokers with schizophrenia compared to those with no diagnosis ($p = .058$).

Negative affect and nicotine dependence

We computed a Pearson correlation coefficient to examine the relationship between negative affect and score on the

Fagerström Test for Nicotine Dependence (FTND; Heatherton et al., 1991). We detected a small, nearly significant correlation ($r = .158$, $p = .0541$) and therefore decided to include the FTND score as a covariate in the analyses of covariance (ANCOVAs) listed below.

Negative affect and task persistence

We dichotomized each of the four measures of persistence (“high” or “low”) based on the median split of each distribution. We then conducted separate ANCOVAs with negative affect as the dependent variable and persistence as the independent variable. Psychiatric diagnosis and nicotine dependence (i.e., score on the FTND) were included as covariates. Four separate ANCOVAs indicated that greater negative affect was significantly related to lower mirror-tracing persistence, $F(1, 146) = 4.00$, $p = .0473$, and to lower breath-holding persistence, $F(1, 148) = 5.25$, $p = .023$, but not to scores on the TCI-P, $F(1, 148) = 2.98$, $p = .087$, or on the two-item measure of persistence, $F(1, 148) = 0.39$, $p = .532$.

Discussion

This study sought to distinguish between measures of state, as compared with trait, persistence and to examine each concept's relationship to negative affect. As hypothesized, negative affect was associated with state, but not trait, persistence. As shown in Table 1, the significant relationships were associated with small to medium effect sizes. This finding that persistence may be related to one's current state (i.e., negative affect) rather than persistence being an immutable trait is consistent with reports that distress tolerance (a sister concept to task persistence) may be sensitive to current circumstances (e.g., state of tobacco withdrawal) (Bernstein et al., 2008; Leyro et al., 2010).

As reported by Steinberg et al. (2012), statistical trends indicated that mirror-tracing persistence and breath-holding endurance (conceptualized here as state measures of persistence) were similar to one another, and the two self-report questionnaires (conceptualized here as trait measures of persistence) were similar to one another. The two state persistence measures were unrelated to the two trait per-

sistence measures, however. These data suggest that these sets of measures are measuring different constructs, and the currently reported data lend support to the suggestion that the behavioral measures of persistence are capturing “state” persistence, whereas the self-report measures are capturing “trait” persistence. The behavioral measures are capturing the participants’ persistence in the moment; it is their current state. Alternatively, the self-report measures are asking participants how they “usually act and feel,” thus conceptualizing persistence as a trait. We see this distinction as comparable to Spielberger’s conceptualization of state versus trait anxiety or state versus trait anger (Spielberger and Sydeman, 1994). Although Bernstein et al. (2011) and McHugh et al. (2011) reported a similar association between self-report and behavioral measures of distress tolerance, they did not specifically conceptualize these as state versus trait differences.

Although we equate state persistence with behavioral measures and trait measures with self-report measures, it is clear that self-report measures could be developed to measure state persistence. We argue that the self-report measures used in this study asking participants how they “usually act and feel” suggests that they are measuring the participants’ view of their own trait rather than how they happen to be at the moment. Individuals may be predisposed toward a certain level of persistence (i.e., persistence as a trait), yet they may also transiently display different levels of persistence based on their current circumstances (persistence as a state).

In addition to distinguishing between trait and state persistence, these data provide partial support for the self-control strength model (Freeman and Muraven, 2010; Muraven, 2010; Muraven and Baumeister, 2000; Muraven and Slessareva, 2003). The self-control strength model has demonstrated that those previously exerting self-control drank more alcohol (Muraven et al., 2002) and were more likely to smoke (Shmueli and Prochaska, 2009) than were those who did not previously exert self-control. Additionally, Abrantes et al. (2008) demonstrated that the relationship between negative affect and early smoking lapse was greater in smokers with low task persistence compared to those with higher task persistence. Similarly, Perkins et al. (2012) recently reported a relationship between higher negative affect and lower distress tolerance. In the current study, negative affect may have served to reduce the participants’ inner resources, thus making it more difficult for them to demonstrate self-control (i.e., continue a frustrating mirror-tracing task or hold their breath for a longer period).

One limitation of this study is that persistence was measured on the same day as the negative affect rather than in a prospective design in which we could measure the effect of negative affect on later persistence. Although these concurrent data demonstrate an association between negative affect and persistence, we cannot infer causation. A prospective design would be more persuasive. In addition, although it

makes theoretical sense that mirror tracing and breath holding capture state persistence and the TCI-P and two-item persistence measure capture trait persistence, we cannot rule out the possibility that our data simply reflect an artifact of behavioral versus self-report. An additional limitation of this study is that the sample really comprises three subsamples (those with schizophrenia, those with schizoaffective disorder, and those without a psychiatric diagnosis). Although the subsamples were important for the original data analyses (Steinberg et al., 2010, 2012), they complicate the interpretation of this secondary data analysis. We minimized this limitation, however, by including participant diagnosis as a covariate in these analyses.

In conclusion, these data provide partial support for the self-control strength theory and suggest that investigators studying concepts such as persistence or distress tolerance should consider whether they wish to measure a state or a trait and choose their measures accordingly.

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