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An Examination of Social Anxiety in Marijuana and Cigarette Use Motives among Adolescents

Ms. Renee Cloutier, BA,

University of North Texas, Psychology, 1155 Union Circle #311280, Denton, 76203 United States

Dr. Heidemarie Blumenthal, and

University of North Texas, Psychology, Denton, 76201 United States

Ms. Emily R Mischel

University of Arkansas, Psychology, Fayetteville, United States

Renee Cloutier: ReneeCloutier@my.unt.edu; Heidemarie Blumenthal: Heidemarie.Blumenthal@unt.edu; Emily R Mischel: ermische@uark.edu

Abstract

Marijuana and nicotine are two of the most widely used substances among adolescents in the United States. Symptoms of social anxiety (SA) typically emerge during early adolescence, and elevated levels are associated with increased substance-related problems despite inconsistent links to frequency of use. Substance use motives, and in particular coping motives, have been found to play an important role in understanding the heightened risk for use problems among those with elevated SA. Importantly, work to date has been conducted almost exclusively with adult samples; thus the current study examined whether similar patterns would emerge among adolescents. The current project included 56 community-recruited adolescents (ages 12–17 years; 41% girls) with a positive history of lifetime marijuana and cigarette use. Consistent with the adult literature, SA was not positively associated with frequency of use across either substance. Further, SA was positively associated with conformity use motives and unrelated to social or enhancement motives for both substances. Unexpectedly, SA was unrelated to coping use motives for either marijuana or cigarettes. These preliminary data highlight the need for future research designed to forward developmentally sensitive models of substance use behaviors and etiology.

Keywords

Motives; social anxiety; adolescent; marijuana; cigarette; substance use

Marijuana and nicotine are two of the most widely used substances among adolescents in the United States (Monitoring the Future; Johnston, O'Malley, Bachman, & Schulenberg, 2012). Recent data indicate that 40.7% of 9–12th graders report lifetime marijuana use, and 41.1% have tried smoking cigarettes (Center for Disease Control [CDC], 2014). Importantly, adolescence is characterized by an increase in certain risk-taking behaviors, including substance use (Arnett, 1999; Steinberg, 2008), and while a significant proportion of adolescents experiment with marijuana and/or nicotine, the majority do not go on to develop

use-related problems (Labouvie & White 2002). Nonetheless, adolescent substance use behaviors are positively correlated with patterns of use in adulthood (Flory, Lynam, Milich, Leukefeld, & Clayton, 2004; White, Pandina, & Chen, 2002), with earlier use associated with greater long-term problems (Ellickson, Tucker, & Klein, 2001). In an effort to better understand the progression to *problematic* use (cf. “normative” experimentation; Labouvie & White, 2002; Lee, Neighbors, Hendershot, & Grossbard, 2009), researchers have begun to identify subgroups of users who evidence elevated risk and examine cognitive factors related to use (e.g., expectancies, motives; Comeau, Stewart, & Loba, 2001; Newcomb, Chou, Bentler, & Huba, 1988).

A growing literature suggests that individuals with elevated social anxiety (SA) and social anxiety disorder (SAD) evidence increased risk for marijuana and nicotine use problems (e.g., Grant et al., 2005). Despite null or negative relations to frequency of use (Buckner, Bonn-Miller, Zvolensky, & Schmidt, 2007; Henry, Jamner, & Whalen, 2012), SAD consistently evidences unique predictive validity for increased marijuana (Buckner et al., 2008) and nicotine (Sonntag, Witchen, Hofler, Kessler, & Stein, 2000; Wittchen, Stein, & Kessler, 1999) use *disorders* in adulthood. For example, adolescents diagnosed with SAD (and not a substance use disorder) evidenced 6.5 greater odds of developing cannabis dependence across a 14-year follow-up period as compared to those without SAD (Buckner et al., 2008). Similarly, Sonntag and colleagues (2000) found that elevated social fears and SAD were associated with higher rates of nicotine dependence, including increased risk across a four-year follow-up period, in a sample of over 3,000 youth (14–24 year olds). Collectively, the data suggest that SA may confer risk for both marijuana and nicotine use problems (e.g., dependence); however, it is unclear how or why the positive association between elevated SA and use-related problems develops, particularly as the data indicate no or negative associations with *frequency* of use (e.g., Buckner, Bonn-Miller, et al., 2007; Henry et al., 2012). Accordingly, researchers have begun to examine use-related processes (e.g., motives) in an effort to better understand these relations.

Cooper’s (1994) four-factor model suggests four overarching motivations for substance use: coping (i.e. reducing or avoiding negative affect), conformity (i.e. avoiding negative social outcomes), social (i.e. increasing positive social experiences) and enhancement (i.e. increasing positive affect). Originally developed to describe patterns of alcohol use, this model since has been extended to the examination of marijuana and cigarette use (e.g., Comeau, et al., 2001). Of these, negative reinforcement motives (i.e. coping, conformity) have been most consistently linked with marijuana and cigarette use among socially anxious individuals (Buckner, Bonn-Miller, et al., 2007; Buckner, Zvolensky, Jeffries, & Schmidt, 2014), and may account for the elevated SA-use problems relation (Buckner, Farris, Schmidt, & Zvolensky, 2014; Lewis et al., 2008).

Specifically, research indicates that the *manner* in which individuals with elevated SA use substances increases their risk for impairment (Buckner, Bonn-Miller, et al., 2007; Buckner, Zvolensky, Farris, & Hogan, 2013), mapping on to the coping- and conformity- related constructs identified in Cooper’s model. For instance, adults high in SA report (a) using marijuana or cigarettes to reduce anxiety associated with social situations, (b) enhanced craving of marijuana or cigarettes in anticipation of social situations or in response to social

cues, (c) relief of SA via marijuana or cigarette use, and (d) avoidance of social situations if marijuana or cigarettes were not available, all to a greater degree than low-SA comparison groups (Buckner, Ecker, & Vinci, 2013; Henry et al., 2012; Watson, VanderVeen, Cohen, DeMarree, & Morrell, 2012). Additionally, both SA symptoms and smoking cigarettes to cope with social situations predicted craving severity during a nicotine deprivation paradigm (Watson, et al., 2012). In one study that included adolescents, those with elevated SA reported more *urges* to smoke cigarettes surrounding interactions with friends as compared to low-SA adolescents (Henry et al., 2012). These urges may reflect an effort to manage anxious symptoms or a belief that smoking serves as an effective form of impression management (e.g., O'Callaghan & Doyle, 2001).

Taken together, current data suggest that elevated SA may be related to both coping and conformity motives for marijuana and cigarette use (e.g., Buckner, Bonn-Miller, et al., 2007); however, no work has yet directly examined these relations in an adolescent sample. The limited work is unfortunate given the normative rise (Essau, Conradt, & Petermann, 1999) and incidence of problematic SA (Burstein, Kattan, Albano, Avenevoli, & Merikangas, 2011; Essau et al., 1999), as well as high rates of substance use initiation (e.g., approximately 46% of 8th, 10th, and 12th graders have tried marijuana, 40% cigarettes; Johnston et al., 2012), evidenced during adolescence. Further, adolescence is a developmental period marked by new and more salient social stressors (e.g., initiation of romantic relationships; “imaginary” audience; Connolley & McIsaac, 2011; Galanaki, 2012), as well as risk for the more rapid transition from initial to problematic substance use as compared to adults (e.g., Deas, Riggs, Langenbucher, Goldman, & Brown, 2000). Finally, it is important to directly evaluate relations among adolescents specifically, as “downward extending” models derived from work conducted solely with adults may be misleading (Cicchetti & Rogosch, 1999).

The current study begins to address this gap by evaluating the relation between level of SA and primary motives for use in an adolescent sample of marijuana and cigarette users. Based on prior research, SA was expected to be positively associated with both coping- and conformity-based marijuana and cigarette use motives (but not social or enhancement motives), and that these relations would be robust to the inclusion of relevant covariates (i.e., age, overall level of anxiety). In an effort to complement the existing literature, the association between level of SA and frequency of marijuana and cigarette use also was examined; it was expected that SA would be either unrelated to, or negatively associated with, frequency of use.

Method

Participants

Participants were 56 adolescents (ages 12–17 years; 41% girls) recruited from the general community as part of a larger laboratory investigation on adolescent health-behaviors and emotional vulnerability ($N = 101$). As the larger investigation included possible assignment to a physical exertion task, exclusionary criteria were as follows: a) lifetime history of panic disorder, post-traumatic stress disorder, or alcohol use disorder; b) chronic cardiac (e.g., hypertension) or respiratory (e.g., asthma) problems related to physiological arousal; c)

current pregnancy; d) current suicidality; e) limited mental capacity or inability to provide informed, written assent to participate; or f) absence of a parent or legal guardian to provide written informed consent (for child participation) prior to participation. The larger study also included over-selection of youth reporting a prior history of substance use (including alcohol) at screening.

From the 101 participants meeting the criteria listed above, 68 had complete data on the predictor variables and endorsed lifetime marijuana or cigarette use. Consistent with extant work indicating that polysubstance use is common (e.g., Conway et al., 2013; Kessler et al., 2005), the majority of participants who endorsed marijuana use also endorsed cigarette use (89.9%), and those who endorsed cigarette use also endorsed marijuana use (94.3%). Accordingly, mono-users ($n = 11$) were excluded to provide a sample of only poly-users, resulting in a sample of 57 with complete marijuana and 49 with complete cigarette use data¹. Finally, the data from one participant was identified as an outlier (please see Preliminary Analyses below), thus the Primary analyses included a final sample of 56 participants.

The racial composition of the final sample was as follows: 83.9% Caucasian, 5.4% African American, 7.1% multiracial, and 3.6% “other”; with respect to ethnicity (Hispanic/Latino; not Hispanic/Latino), 9.1% identified as Hispanic/Latino. Data were collected from parents who accompanied participants to the laboratory (73% biological mothers) and were willing to disclose demographic information (58% of the sample). The median household income reported was \$60,000. Parental education was as follows: 2.7% did not complete high school, 13.5% received a high school diploma or equivalent degree, 27.0% completed some college, 32.5% held an Associate’s or Bachelor’s degree, 10.8% reported some graduate or professional schooling, and 13.5% completed graduate or professional school. Finally, 66.6% of parents reported being married or living with someone, 25.0% were divorced, 2.8% separated, and 5.6% never married.

Measures

Social anxiety—The *Revised Child Anxiety and Depression Scale - Social phobia subscale* (RCADS-SA; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000) was used as a continuous measure of SA symptoms. This 9-item self-report subscale includes items such as “I am afraid of looking foolish in front of other people” and “I worry about what others think of me,” which participants rate on a four-point Likert-type scale (0 = *never*, 1 = *sometimes*, 2 = *often*, and 3 = *always*) as to how often each statement reflects how they typically feel. Responses are summed to create a total SA score (i.e. possible range 0–27). The RCADS evidences sound psychometric properties, demonstrating convergent validity with existing measures of childhood anxiety and anxiety disorders, test-retest reliability (SA test-retest coefficient=.80), as well as internal consistency (e.g., current sample Cronbach’s alpha [α] = .86; Chorpita et al., 2000).

¹Seven poly-user participants had incomplete data on the cigarette motives measure, but because the sample was already constrained we elected to keep these cases in the marijuana analyses. Importantly, the marijuana analyses are not sensitive to the exclusion of these 7 participants (Final Model: $R^2 = .246$, $F(3, 45) = 4.904$, $p = .005$) and SA still accounted for a comparable amount of unique variance explained ($R^2 = .083$, $p = .031$)

Frequency of use—Frequency of marijuana and cigarette use were assessed via the *Adolescent Alcohol and Drug Involvement Scale* (AADIS; Moberg, 2000; Moberg & Hahn, 1991). Participants are asked to select a single response that best reflects how often they use marijuana or tobacco on a scale of 0 (*never used*) to 7 (*several times a day*). Each response point is accompanied by a written descriptor, and higher numbers reflect increased frequency of use (e.g., 2 = *several times a year*, 3 = *several times a month*). This face-valid scale has been shown to strongly correspond with clinical assessments of use patterns (i.e. non-use, abuse, dependence; Moberg & Hahn, 1991) and has been successfully employed in prior work examining substance use in similar community-based samples of adolescents (e.g., Blumenthal, Leen-Feldner, Frala, Badour, & Ham, 2010; Schuster, Hertel, & Mermelstein, 2013).

Motives for use—The *Teen Marijuana Motives Questionnaire* (TMMQ) and *Teen Smoking Motives Questionnaire* (TSMQ) are 20-item self-report measures adapted from the Drinking Motives Questionnaire-Revised (DMQ-R; Cooper, 1994) to quantify levels of Cooper's (1994) four motives: coping (e.g., "to forget my worries"), conformity (e.g., "so you won't feel left out"), social (e.g., "to enjoy a party"), and enhancement (e.g., "because it makes me feel good"), with regard to adolescent marijuana and cigarette use behavior (Comeau et al., 2001). Each subscale includes five items, rated on a scale of 1 (*almost never/never*) to 5 (*almost always/always*), indicating how often participants use marijuana or cigarettes for the listed reason. These measures evidence good psychometric properties in adolescent and young adult samples, including internal consistency (e.g., current sample: all α 's > .81), factorial validity, and criterion-related validity in predicting use problems (Comeau et al., 2000, 2001). To more directly examine each motivational dimension and minimize the influence of theoretically irrelevant (in)variance (e.g., "high" or "low" reporters), a proportional motive score was calculated for each factor, relative to the total sum of factor scores (Vitaliano, Maiuro, Russo, & Becker, 1987). For example, the proportional coping-subscale value was calculated by taking the sum of the coping-subscale score, then dividing that value by the total sum of scores from the measure (i.e. coping, conformity, social, enhancement; Vitaliano et al., 1987).

The proportion scores were used as the outcome in all primary analyses, however identical post hoc analyses were conducted with the raw motives as well to draw comparisons. It was expected that the findings would be consistent with the primary motives, however the strength of the relations may vary as the raw scores include variance controlled for by the proportion scores.

Covariates—Given theoretical and empirical overlap with adolescent substance use, age (Chen & Jacobson, 2012; Swendsen et al., 2012), gender (Chen & Jacobson, 2012; Skeer et al., 2011), and overall level of anxiety (Marmorstein, White, Loeber, & Stouthamer-Loeber, 2009; Wolitzky-Taylor, Bobova, Zinbarg, Mineka, & Craske, 2012) were selected as covariates. The *Youth Self-Report – Anxiety problems subscale* (YSR; Achenbach & Rescorla, 2001) was used to assess overall anxiety. This six-item subscale includes items such as "I am too fearful or anxious" and is rated on a three-point scale (0 = *Not true*; 2 = *Very/Often true*) based on how well each item describes how the participant has felt during

the past six months. Responses are then summed to provide a total score. The YSR, including the anxiety problems subscale, consistently evidences acceptable psychometric properties, such as stability across time (3-year stability correlation coefficient=.60; Achenbach, Howell, McConaughy, & Stanger, 1995) and internal consistency (e.g., $\alpha = .64$ in the current sample; see Hughes & Melson, 2008 for a review).

Procedure

All procedures were approved by the University IRB prior to participant contact. Community recruitment efforts (e.g., flyers, radio advertisements) instructed interested adolescents and guardians to contact the laboratory, at which point they were given a detailed description of study procedures and youth completed a preliminary (confidential) telephone screening. Importantly, all participant data was kept confidential (including use status); parents and adolescents were made aware of this prior to screening and again at the laboratory. Adolescents eligible at this stage were invited to the laboratory (accompanied by a parent or legal guardian), written parental consent and adolescent assent were obtained, and screening criteria were again assessed and recorded. Parents interested and able to provide additional data (e.g., demographic forms) also signed an individual consent form and completed a small battery of questionnaires. Adolescent participants completed a randomly ordered packet of questionnaires, including those listed above, as well as a series of tasks not related to the current project (e.g., semi-structured interview; breath holding). Finally, both parties were thanked and debriefed, and adolescents were compensated \$40 for participation (participating parents were compensated \$5).

Results

Preliminary Analyses

First, scatterplots with the continuous predictors and each of the motives variables were examined for model linearity, then a scatterplot of standardized residuals and standardized predicted values were examined to evaluate homoscedasticity. The standardized errors were relatively evenly distributed across the range of the predicted values so the assumption was tenable. However, one outlying case had extreme standardized residuals on both the marijuana ($z = 3.78$) and cigarette ($z = 3.36$) conformity models, so was excluded from further analysis, resulting in a final sample size of 56.

Second, bivariate correlations were conducted to examine relations among all variables (see Table 1). Gender, a dichotomous variable, also was included in the correlation matrix with girls coded as '1' and boys as '0', thus positive correlations reflect higher scores among girls and negative correlations, higher scores among boys (see Henson, 2000). As can be seen in Table 1, RCADS-SA was negatively related to tobacco use frequency and unrelated to marijuana use frequency. Further, RCADS-SA was not related to enhancement motives for marijuana (Raw: $r = -.12$, $p = .371$; Proportion: $r = -.16$, $p = .241$) or cigarette (Raw: $r = .03$, $p = .825$; Proportion: $r = -.16$, $p = .270$) use, or social motives for marijuana (Raw: $r = -.11$, $p = .470$; Proportion: $r = -.14$, $p = .307$) or cigarette (Raw: $r = .042$, $p = .774$; Proportion: $r = -.14$, $p = .344$) use, but was positively correlated with conformity motives for use of both substances. Contrary to expectations, RCADS-SA was not associated with coping motives

for either marijuana or cigarettes. Accordingly, only conformity motives were assessed in the subsequent analyses.

With respect to the theoretically derived covariates, chronological age was negatively correlated to conformity use for marijuana but not cigarettes, and YSR anxiety problem scores were positively associated with conformity use for marijuana but not cigarettes. Chronological age and YSR anxiety problem scores were included for both models to allow for meaningful comparisons across substances. Gender was unrelated to conformity use for both marijuana and cigarettes, so was not included as a covariate.

Proportional Motives

Separate hierarchical regression analyses were conducted to examine the relation between RCADS-SA and primary conformity motives for marijuana and cigarette use (see Table 2). Covariates (i.e. age, YSR anxiety problems) were entered at Step 1, accounting for a significant proportion of the variance in primary conformity motives for marijuana, but not cigarette use. For both models, RCADS-SA was included at Step 2, and remained a statistically significant predictor of primary conformity motives in each; however, the full model was only significant for marijuana (Final step: $F[3, 52] = 5.23, p = .003$) and not cigarettes (Final step: $F[3, 45] = 2.10, p = .113$)².

Raw Motives

Additional hierarchical regressions were conducted to examine the relation between RCADS-SA and *raw* conformity motives for marijuana and cigarette use (see Table 2). The final models were statistically significant for both marijuana (Final step: $F[3, 52] = 3.62, p = .019$) and cigarettes (Final step: $F[3, 45] = 3.89, p = .015$). Again, covariates were entered at Step 1 accounting for a statistically significant proportion of the variance in raw conformity motives for marijuana, but not cigarettes. For both models, RCADS-SA was included in Step 2 and was a statistically significant predictor for cigarettes but not marijuana raw conformity motives.

Discussion

A growing body of work indicates a link between SA and negative reinforcement motives for marijuana (e.g., Buckner, Ecker et al., 2013) and cigarette (e.g., Watson et al., 2012) use. Although this research suggests elevations in both coping and conformity motives for use among socially anxious marijuana and cigarette users, research to date has primarily focused on coping (Buckner, Zvolensky, et al., 2013). Research to date has also been conducted exclusively with adult samples; thus, the current study examined whether identified relations among SA and marijuana/cigarette use motives would be replicated among adolescents. The

²Because there were so few mono-cigarette ($n=4$) and -marijuana ($n=7$) users, these cases were excluded to provide a sample of only poly-users for the primary analyses. However, we re-ran the analyses with these cases included to ascertain whether the findings held. When cigarette-only users were included in the analyses ($n=53$), social anxiety remained a significant predictor of primary conformity motives for cigarette use, accounting for 8.2% of the unique variance in the overall model $F(1,49) = 4.502, p = .039$. Conversely, when the marijuana-only users were included in the analyses ($n=63$), SA fell below traditional criteria for statistical significance in relation to conformity motives, $R^2 = .05; F(1,59) = 3.421, p = .069$.

current study also adds to the existing literature by examining the role of *primary* (as opposed to simply elevated) use motives.

Overall, hypotheses were partially supported. Specifically, SA was positively related to primary conformity motives for both marijuana and cigarette use, even while controlling for relevant covariates. Importantly, the lack of statistical significance for the overall cigarette conformity motives model was likely a consequence of including covariates with absent bivariate relations to the outcome. Even without those predictors, however, the effect size was almost half ($R^2=.12$) that seen in the model for marijuana ($R^2=.23$) conformity motives, suggesting that the effects of SA may not be as potent for self-reported conformity use motives for cigarettes. Also consistent with findings among adults, level of SA was unrelated to enhancement or social motives for either substance. However, contrary to expectations, coping motives for marijuana and cigarette use were unrelated to level of SA at the zero-order level. Next, as expected, SA evidenced a negative relation to tobacco use frequency and no relation to marijuana use frequency. These data uniquely contribute to the present literature as they identify both convergence (e.g., in regard to frequency of use, conformity motives) and divergence (i.e. in terms of coping motives) with work conducted in adult marijuana and cigarette users.

The raw motives analyses were only partially consistent with the primary motives analyses. Specifically, for marijuana SA was not a statistically significant predictor for raw conformity motives; for cigarettes, the final model accounted for more variance in raw (21%) than primary (12%) conformity motives, but SA as a predictor still accounted for the same amount of variance ($R^2=9\%$). Although we had anticipated similar results across both proportion and raw scores, the varying magnitude is not entirely unexpected. Indeed, the decision to use the proportion scores was an attempt to control for theoretically irrelevant variance, such as that introduced by participants who respond high or low across all items. Thus, it is not surprising that the patterns and direction were consistent across analyses but the magnitude of the effects varied. Further, the questions asked by these models are themselves distinct. Where raw scores address whether SA predicts elevated levels of motives regardless of the other motives, the proportion scores ask how much does SA predict *primary* motives for use. Regardless, given the small sample size, future work directly testing these two approaches will be needed.

The failure to identify a significant link between level of SA and marijuana or cigarette coping motives stands in contrast with work conducted using adult samples (e.g., Buckner, Bonn-Miller, et al., 2007; Buckner, Heimberg, Matthews, & Silgado, 2012; Watson et al., 2012). For example, the positive association between SA and coping motives has been evidenced across retrospective self-report (Buckner, Bonn-Miller, et al., 2007), as well as real-time laboratory-based assessments (Buckner, Ecker, et al., 2013; Buckner et al., 2006). Although the level of SA (i.e., RCADS-SA $M=9.10$) in the current sample is comparable to that found in other, large-scale studies of community-recruited adolescents (Chorpita et al., 2000), it is still relatively low. Future work should examine these relations among adolescents with clinical levels of SA, who may be more likely to use marijuana or cigarettes for coping motives. Further, one assumption that underlies such tension-reduction (e.g., Conger, 1956) or self-medication (Gehricke et al., 2007) models is that users have had

enough experience with a substance to be motivated to use it for coping-related purposes. From a behavioral perspective, coping motivated use must be learned through repeated pairings of experienced negative affect and negative affect relief (Cheetham, Allen, Yucel, & Lubman, 2010), which adolescents may not have yet gained.

Social and legal constraints limit adolescents' access to both marijuana and tobacco, inherently limiting opportunities to associate the use of either substance with remittance of (social) stress-related negative affectivity. Emerging evidence also suggests that adolescents' beliefs about the effects of illicit substances may be primarily informed by external sources (e.g., peers, media; Andrews, Hampson, & Peterson, 2011; Snyder & Nordoff, 2011), and the use of illicit substances for negative affect relief may emerge later in adolescence (e.g., Newcomb et al., 1988). Together, the combined effect of limited stressor-consumption trials and externally-driven expectations may serve to protect most socially anxious adolescents from learning to use marijuana or cigarettes for coping-related purposes, at least *regularly*, during this time period. However, adolescence is a period in which more sophisticated ways of responding to stress are developing, beginning with observation of others' coping responses and mimicking of those behaviors (Kliewer, Fearnow, & Miller, 1996), as well as later advancements in the understanding and control of volitional responding (e.g., Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000). Therefore, while adolescents may not use marijuana or cigarettes to cope *initially*, learning to do so may happen quite rapidly, particularly among socially anxious youth (i.e. telescoping). The current study consisted of youth who simply had lifetime experience with marijuana and tobacco, but were not necessarily regular users. This is both a strength, as it is a more generalizable sample to a population of interest for prevention scientists (i.e. early users), and a weakness, in that the small sample may not have contained enough heavy users to appropriately test the model. In addition to replication of the current findings, future efforts will require prospective data with larger samples of users along the continuum to directly evaluate these developmental processes, including when, how, and at what rate these important transitions occur.

The link between SA and conformity use motives for marijuana and cigarettes is consistent with other work, which has explored how SA relates to use motives broadly (e.g., Buckner, Bonn-Miller, et al., 2007). Related work has found social interactions, both in the laboratory (Buckner, Ecker, et al., 2013) and in the field (Henry, et al., 2012), to elicit marijuana and cigarette cravings. One study using ecological momentary assessment (EMA) to examine contextual factors related to cigarette use among socially anxious adolescents found that, like adults, adolescents with greater SA symptoms do not use more frequently than their low-SA peers; however, they report more *urges* to smoke surrounding friend interactions (Henry, et al., 2012). While these urges may reflect an effort to manage anxious responding, they also may be related to the belief that smoking serves as an effective form of impression management, an important quality, particularly for those with high SA and low self-perceived success in their impression management abilities without substance use (O'Callaghan & Doyle, 2001). Once established as a social lubricant, socially anxious individuals (more so than others) may quickly learn to rely on substance use to relieve anxiety in social situations (Sonntag et al., 2000).

Importantly, conformity motives are also related to the development of problematic substance use (e.g., alcohol; Cooper, 1994) and among adults, have been shown to partially mediate the relation between SA and use problems (Lewis et al., 2008). Work directly linking conformity motives with marijuana or cigarette use problems among socially anxious youth is limited; however, peers are known to play an important role in decision-making processes related to substance use (Chein et al., 2011; Urberg et al., 2003), and work with adults has indicated a positive relation between SA and conformity motives (Buckner, Bonn-Miller, Zvolensky, & Schmidt, 2007). Cooper (1994) posited that conformity motives may be primary among early users who have yet to internalize alternative patterns. Thus, it is possible that early use, which typically occurs in group settings (Kobus, 2003), is marked primarily by conformity use motives, particularly among youth with higher levels of SA. Although the cross-sectional nature of the current study and retrospective reporting precludes drawing conclusions on developmental changes, it is interesting to note that chronological age was negatively related to conformity marijuana motives across the entire sample (see Table 1). Longitudinal designs that directly assess the trajectory of use motives and their relation to problems among socially anxious youth is needed. Specifically, work designed to test the different pathways from SA to problems (e.g., mediated by conformity or coping) as a function of age or experience warrants further investigation. Further, more sophisticated assessments (e.g., EMA; Henry et al., 2012) and participant recruitment strategies (e.g., repeated measures, time-lagged; see Schaie, 1992) will be needed to ascertain the role of environment (e.g., peer pressure) and individual difference (e.g., conformity/coping motives) factors across development.

Importantly, there are some key limitations of the motives questionnaires used in the current project. First, the TMMQ and TSMQ are modifications of a scale originally validated with alcohol use (Cooper, 1994), and thus do not reflect marijuana (e.g., expansion; Simons, Correia, Carey, & Borsari, 1998) or cigarette (e.g., affiliative attachment; Piper et al., 2004) specific motives that also may be relevant. Second, the coping motives scale is comprised of items that are a generic merging of anxiety and depressive specific factors (Grant, Stewart, O'Connor, Blackwell, & Conrod, 2007). The way the coping subscale is formatted may not tap into the complex nature of anxiety-related coping use motives, substance use, and substance use problems. Third, there is a degree of conceptual overlap in coping and conformity use motives, particularly as it relates to SA. Using a substance so 'others won't kid them about not using' or 'to be liked' are central concerns of an individual with SA, and thus may in fact reflect early coping-related use. Recent work examining SA in relation to alcohol and marijuana use problems among adults have modified SA measures to ask about substance use to cope with or avoid feared social situations or outcomes (Buckner, Heimberg, et al., 2011; Thomas, Randall, & Carrigan., 2003). An important next step will be to validate and incorporate such measures of using to cope, with SA specifically, into studies of adolescents.

The current findings must be interpreted in light of several additional considerations. First, the sample was relatively small and demographically homogenous (e.g., Caucasian/White, higher SES), and included only adolescents and parents willing and able to attend a laboratory visit. Some of the inconsistencies reflected in the analyses are likely a consequence of the small sample. Importantly, while the strength of relations fluctuated with

the inclusion of mono-users, which impacted tests of statistical significance, the directions were consistent. We believe this highlights the need for work with larger and more diverse sampling strategies (e.g., via school screening, community-based assessments) in this area. Second, the sample was comprised of adolescents who had endorsed both marijuana and tobacco use. Because a minority of the overall sample had endorsed only marijuana ($n = 7$) or tobacco ($n = 4$) use, analyzing them as separate groups (i.e. mono-users) was not possible. Future researchers may want to consider examining differences in use motives across mono- and poly-users. Further, the AADIS assessed frequency of *tobacco* use, whereas the motives questionnaire (TSMQ) asked about cigarette use specifically; while lifetime rates of cigarette use are higher on average than that of smokeless tobacco products among this age group (CDC, 2014), it is possible that some of the participants had not actually smoked cigarettes, invalidating their responses to the SMQ and thereby reducing our statistical power to detect an effect. Future efforts will need to include questions relating to cigarette use frequency specifically, as well as existing and emerging (e.g., electronic cigarettes) tobacco and nicotine use products broadly. Third, the current study did not assess use-related problems, which did not allow for a full comparison of how the patterns of SA and use-related *problems* may (or may not) differ between adolescents and adults. Clearly, research including indices of substance-related problems, among both clinical and non-clinical samples, is needed. Finally, the current study was cross-sectional and as such cannot directly speak to developmental or clinical processes; rather, it highlights where age-related differences *may* exist to help guide future prospective studies. Importantly, as the relations between SA and coping are a significant divergence from what has been found with adult samples, it is critical to replicate these patterns in independent samples.

Despite these limitations, these preliminary data suggest novel developmental insights into the growing literature linking SA with substance use behaviors and motives. These findings lay the foundation for future investigations designed to forward developmentally-sensitive models of anxiety and substance use as well as advancements of targeted intervention efforts.

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Table 1

Descriptive Statistics and Zero-Order Correlations

Variable	Mean (SD)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Chronological Age	16.28 (1.17)	-	-.15	-.16	.10	.20	.05	.06	.02	.15	.05	-.33**	.01	-.18	.14
2. Gender	0.41 (0.50)	-	-	.38**	.20	.06	-.26*	-.04	.45**	-.07	.33**	.20	.16	.18	-.05
3. YSR Anx	56.20 (6.56)	-	-	-	.51**	-.09	.02	.16	.14	.30*	.22	.23*	-.13	.35**	.01
4. RCADS-SA	9.71 (5.22)	-	-	-	-	-.28*	-.20	.35**	-.06	.43**	.08	.31**	-.05	.31**	-.07
5. Tobacco Freq	2.77 (2.12)	-	-	-	-	-	.26*	-.45**	.29*	-.18	.35**	-.09	.17	.09	.25*
6. Marijuana Freq	3.14 (2.01)	-	-	-	-	-	-	-.32*	-.02	-.02	.17	-.53**	-.12	-.09	.35**
7. SMQ Conform-P	0.22 (0.08)	-	-	-	-	-	-	-	-.45**	.66**	-.53**	.19	-.14	.03	-.21
8. SMQ Coping-P	.027 (0.10)	-	-	-	-	-	-	-	-	-.34**	.80**	.13	.28*	.16	.13
9. SMQ Conform Raw	1.42 (0.64)	-	-	-	-	-	-	-	-	-	-.00	.08	-.15	.38**	.17
10. SMQ Coping Raw	1.88 (1.11)	-	-	-	-	-	-	-	-	-	-	.09	.14	.38**	.29*
11. MMQ Conform-P	0.15 (0.07)	-	-	-	-	-	-	-	-	-	-	-	-.15	.63**	-.49**
12. MMQ Coping-P	0.23 (0.06)	-	-	-	-	-	-	-	-	-	-	-	-	-.22	.61**
13. MMQ Conform Raw	1.41 (0.73)	-	-	-	-	-	-	-	-	-	-	-	-	-	.10
14. MMQ Coping Raw	2.31 (1.02)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: RCADS: Revised Children's Anxiety and Depression Scale; SMQ: Smoking Motives Questionnaire (cigarettes); MMQ: Marijuana Motives Questionnaire; YSR: Youth Self Report.

* $p < .05$,

** $p < .01$

Table 2
Level of Social Anxiety Predicting Conformity Motives for Marijuana and Cigarette Use

Predictor	R ²	t	β	r_s^2	p	R ²	t	β	r_s^2	p
Dependent Variable: MMQ Conformity Proportion						Dependent Variable: MMQ Conformity Raw				
Step 1	.14				.017	.14				.019
Age		-2.36	-.30	.77	.022		-.946	-.12	.22	.348
YSR Anxiety Problems		1.42	.18	.37	.163		2.65	.34	.89	.013
Step 2	.23				.003	.17				.149
Age		-2.94	-.37	.48	.005		-1.25	-.16	.18	.216
YSR Anxiety Problems		-0.07	-.01	.23	.943		1.41	.214	.72	.164
RCADS Social Anxiety		2.45	.36	.42	.018		1.46	.220	.57	.149
Dependent Variable: SMQ Conformity Proportion ^a						Dependent Variable: SMQ Conformity Raw				
Step 1	.03				.478	.12				.051
Age		.538	.08	.08	.593		1.33	.19	.18	.189
YSR Anxiety Problems		1.16	.17	.82	.252		2.29	.32	.72	.027
Step 2	.12				.113	.21				.015
Age		0.07	.01	.02	.946		.870	.12	.10	.389
YSR Anxiety Problems		-0.13	-.02	.21	.898		.85	.13	.42	.400
RCADS Social Anxiety		2.16	.36	.99	.036		2.19	.35	.90	.034

Note: $N = 56$ (Analyses: $n = 56$ Marijuana; $n = 49$ Cigarettes). β = standardized beta. r_s^2 = squared structure coefficient.

^a overall model was not statistically significant.