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The Role of Self-Control, Agentic Willpower, and the Behavioral Inhibition/ Activation Systems in Substance Abuse

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Abstract: *Objectives*: In two studies, we sought to explore the connections between willpower, behavioral inhibition/activation, and substance abuse. Two forms of willpower were explored: self-control and a newer construct named "agentic willpower." *Methods*: Study 1 utilized a mixed student/community sample with 167 participants who completed the following measures via Survey Monkey: BIS/BAS Scales; Brief Self Control Scale; Agentic Willpower Scale; and the Substances and Choices Scale. Study 2 was focused on substance abuse in undergraduate students and utilized 124 participants. The same measures were used as in Study 1. *Results*: Self-control was negatively correlated with the number of drugs used in the past month as well as substance abuse severity in both Studies 1 and 2. Higher agentic willpower was likewise related to lower substance abuse severity in both studies. BAS fun-seeking was significantly positively correlated with substance abuse severity and number of drugs used. In both studies, self-control mediated the relationship between fun-seeking and the severity of substance abuse/ number of drugs used. *Conclusions and Implication*: Fun-seeking individuals seemed to be prone to impulsivity, which in turn led to a higher likelihood of substance abuse as well as consuming a wider variety of drugs.

Keywords: Substance abuse, Self-control, Agentic Willpower, BIS/BAS, Fun-seeking.

Introduction

The current study investigated the connections between willpower, behavioral inhibition/activation, and substance abuse to better understand the complex mechanisms that are at play with addiction vulnerability. By exploring the relationships between these constructs, we hoped to better identify why some individuals are more susceptible to abusing substances both in the community and amongst college students.

Substance Use

According to the National Institute on Drug Abuse (2024), in 2021, 46.3 million people in the United States had a substance use disorder and yet only 6.2% of individuals received treatment. Arterberry et al. (2020), found that around 21.8% of college students qualify for DSM-5 substance use disorder and 4.6% are seeking treatment. These figures reveal a significant gap in individuals that have a substance use disorder and those that are in treatment, suggesting a need for mental health services, prevention, and outreach. Arterberry, et al. (2024) found that the first semester of college is a sensitive developmental window in which students are vulnerable to both substance use and mental health challenges as they navigate social pressures, newfound freedom, and higher levels of stress. Therefore, early prevention in this population may be key to prevent substance use disorders.

Willpower

The concept of willpower has primarily been studied in Psychology from the perspective of self-control. The famous "Stanford Marshmallow Experiments" by Mischel (1972) solidified this perspective as he effectively demonstrated that children who could delay gratification went on to have higher SAT scores (Mischel et al., 1989) and academic competence (Shoda et al., 1990). And yet, the lay public often thinks of willpower in different terms, as, for example, when describing someone who doggedly pursues their goals and overcomes obstacles. They describe such people as possessing an "iron will," being a "fighter," etc. This form of willpower is therefore agentic and action-oriented, rather than being geared towards *not* doing something (i.e. self-control). Recently, Sturman et al. (2025) found that an internal locus of control, self-efficacy, grit, and resilience all loaded on a common factor, which was dubbed "agentic willpower." This construct was defined as "the belief that one has control over, and can achieve, important outcomes, coupled with a determination to persevere through setbacks and stressors." Individuals with higher levels of agentic willpower were found to have lower depressive and anxiety symptoms, lower stress, higher happiness and satisfaction with life, and, in the case of students, higher GPA over the course of a semester.

Although the primary focus of the present study was on substance abuse, it also provided an opportunity to explore the connections between these different forms of willpower. One might expect that there would be a moderate correlation between the two constructs as individuals who persevere, overcome obstacles, etc. (i.e. agentic willpower) may also need to exercise self-control in pursuit of their goals. Where they may differ as it comes to substance abuse is that self-control should be linked to lower impulsivity and the ability to resist temptations. Agentic willpower may be linked to lower substance abuse as individuals high in grit and resilience may be less inclined to turn to drugs when facing obstacles. They may also recognize that the use of various substances will interfere with goal attainment.

Agentic Willpower and Substance Abuse

There have been no studies, to date, that have examined the relationship between agentic willpower and substance abuse, which provided one of the rationales for the present research. Theoretically, we would expect that individuals who have a high level of drive, perseverance, resilience, etc. would be less likely to engage in substance abuse as abusing drugs could hinder them in reaching their goals. However, we also predicted that this relationship would be modest or moderate in magnitude, with self-control being the more important form of willpower in relation to substance abuse.

Although agentic willpower has not been studied directly in relation to substance abuse, there is evidence that its components are linked to drug use. For example, Leventhal (2018) found that alcohol use was related to an external locus of control, in a sample of undergraduate students. Likewise, higher self-efficacy has been linked to both the quantity and frequency of drug use (see Kadden and Litt, 2011 for a review). Although relatively few studies have examined grit in relation to substance abuse, one study found that adolescent Latinos with higher grit were less likely to abuse alcohol or marijuana (Guerrero et al., 2016). Other research has found grit to predict lower relapse risk in survivors of childhood abuse (King et al., 2020). Resilience, as a trait, has been shown to predict lower addiction potential (Rezai et al., 2021), lower lifetime alcohol and illicit drug use (Wingo et al., 2014), and overall substance use (Fadardi et al., 2010). Thus, all of the components of agentic willpower have been related to various aspects of substance abuse, which would lead us to believe that the broader construct would be related to both the frequency and severity of drug use. The inclusion of agentic willpower is a more parsimonious approach compared to using four separate measures for all of the component parts. Also, the broader construct better captures the beliefs (self-efficacy and locus of control) and resilience/grit, which would combine to lessen the use of substances when facing stressful circumstances.

Self-Control and Substance Use

Given that self-control is a critical component to an individual's ability to resist impulses, it should play a crucial role in substance use and addiction. Moffitt et al. (2011) found that children with low self-control were at higher risk of drug and alcohol use in adulthood. In regard to college students, many studies have found low self-control to be linked to binge-drinking and other problematic behavior associated with alcohol use (Gibbs & Giever, 1995; Gibson, 2004; Piquero et al., 2002; Sun & Longazel, 2008). Ford and Blumenstein (2013) found that low self-control was not only related to binge drinking in college students but also marijuana use and misuse of prescription medication. Given these consistent results, we expected to obtain a significant relationship between self-control and substance abuse in the present study. Our study also had the added advantage of including a wider variety of substances that have the potential for abuse.

BAS/BIS Systems

The Behavioral Activation System (BAS) and Behavioral Inhibition System (BIS) have been researched to understand psychopathology, motivation and personality. Gray (1970, 1987) explored BIS/BAS as motivation systems that relate to withdrawal behavior (BIS) and approach behavior (BAS). The BIS system is sensitive to punishment, non-reward, and novelty, effectively inhibiting goal-oriented behaviors as it is primarily oriented towards caution. Gray (1987) argued that the BIS system may be related to individual differences in anxiety and neuroticism. In contrast, the BAS system is sensitive to reward and is an appetitive orientation, prompting individuals to pursue their goals. Rather than caution, this system is more related to impulsivity.

In developing a self-report measure related to these systems, Carver and White (1994) further identified 3 components of the BAS: Drive, reward responsiveness, and fun-seeking. Drive is related to a dogged pursuit of one's goals. Reward responsiveness relates to "positive responses to the anticipation or occurrence of reward" (Carver & White, 1994). Fun-seeking, as might be expected, involves impulsiveness towards potentially rewarding situations and a desire to seek out such situations.

BAS/BIS, Agentic Willpower, and Self-Control

We anticipated that agentic willpower would be related to different components of the BAS, specifically drive and reward responsiveness. It stood to reason that those high in agency would also be more driven. BAS drive may seem conceptually similar, if not the same, as grit (one of the components of agentic willpower). However, BAS drive is thought to be more innate and biologically based, whereas grit could be learned and applied to long-term goals. BAS drive does not explicitly incorporate constructs such as self-efficacy, locus of control, or resilience, although we would expect it to be connected to these traits. Therefore, we anticipated a

significant, but not large, correlation between BAS drive and agentic willpower. It also stood to reason that those high in agentic willpower would exhibit a strong commitment to their goals because they are motivated by reward seeking.

In terms of self-control, one might expect it to be related to the BIS in that it is geared towards *not* engaging in certain behaviors. However, the BIS is motivated by caution, anxiety, etc. whereas it is not clear that this is the case for self-control. Also, self-control is often channeled in the pursuit of goals, whereas the BIS is related to withdrawal behaviors.

BAS/BIS and Substance Abuse

Given the impulsivity that is part of the BAS system, it is not surprising that it should be linked to substance abuse. In an epidemiological study, Johnson et al. (2003) found that individuals high on BAS fun-seeking were more susceptible to alcohol use diagnosis and drug abuse. Kim-Spoon et al. (2016) found that individual differences in inhibitory control play a moderating role in the relationship between reward sensitivity and substance use among early adolescents. Specifically, the association between high Behavioral Activation System (BAS) sensitivity and increased substance use appears to be stronger in adolescents with lower behavioral and neural inhibitory control. Similarly, Santens et al. (2018) discussed traits such as impulsivity and harm avoidance being linked to different clinical outcomes and coping strategies. Both findings suggest that individual differences in motivational and regulatory traits play a key role in substance use vulnerability. In the present study, we expected that the impulsivity related to fun-seeking would be associated with lower self-control, which, in turn, would relate to substance abuse severity and the number of different drugs that were abused. To our knowledge, previous studies have not looked at this particular pattern of relationships.

Overview of Study 1

The first study sought to examine the relationships between self-control, agentic willpower, the BIS/BAS systems, and substance use patterns in a mixed student/community sample. The majority of participants were from the community (as will be explained in the Methods) and completed the measures via Survey Monkey. Our hypotheses were pre-registered with OSF (https://osf.io/utr9v). The specific hypotheses for the present study were as follows:

1. Self-control will be negatively correlated with BAS fun-seeking. This would be in line with previous research but we needed to establish this relationship in advance of the mediation analysis (see hypothesis 9).
2. Self-control will be positively correlated with agentic willpower (we are expecting a small to moderate correlation). The connection between these two forms of willpower had not been previously examined.
3. Agentic willpower will be significantly positively correlated with BAS drive and reward responsiveness. No research had previously examined the

connections between these variables, although they should theoretically be linked, as we discussed in the Introduction.
4. Other than alcohol, BIS will be negatively correlated with the number of different drugs that were used in the past month and the severity of substance abuse. We controlled for alcohol in this hypothesis because we thought that it might be used by individuals high on BIS to overcome their inhibitory tendencies.
5. Self-control will be negatively correlated with the number of drugs used and the severity of substance abuse. Similarly to hypothesis 1, this finding would be in line with previous research but needed to be established prior to the mediation analysis.
6. Agentic willpower will be negatively correlated with the number of drugs used apart from alcohol. Note, insofar as people high in agentic willpower could be seen as striving for status, we thought this variable could be related to alcohol use. High need for power, particularly in males, has been linked to heavier alcohol use (Scoufis & Walker, 1982).
7. BAS fun-seeking will be positively correlated with the number of drugs used and the severity of substance abuse. BAS fun-seeking had been linked to substance abuse in previous studies but not using the wide array of drugs from the SACS, nor its severity scale.
8. BIS and gender will interact to predict alcohol use. Specifically, males high on BIS will be more likely to use alcohol and have higher severity scores. The rationale for this hypothesis came from the finding that males are more likely to self-medicate with alcohol for anxiety and mood disorders (Turner et al., 2018).
9. BAS fun-seeking will be related to lower self-control, which, in turn, will predict the number of drugs used and the severity of substance abuse (i.e. self-control will mediate the relationship between BAS fun-seeking and the number of drugs used and the severity of substance abuse). Again, although studies have linked self-control and substance abuse as well as fun-seeking and substance abuse, we know of none that have tested this mediational pathway.

The data for both Study 1 and Study 2 is available at OSF: https://osf.io/pdmka/overview?view_only=bb1bdc9d221d497d93b2a1f040b97074.

Methods

Participants and Procedure

A total of one-hundred and sixty-seven participants (125 female, 41 males, 1 non-binary) completed measures of agentic willpower, behavioral inhibition/activation systems, self-control and substance use on Survey Monkey. The average age of the participants was 38.83 (SD=14.89). The ethnic breakdown was as follows: White (n=151, 91%); Black/ African American (n=4, 2.4%); Hispanic/Latino (n=4, 2.4%); Asian (n=3, 1.8%); and two or more races (n=4, 2.4%). Participants included both university students and their family members, resulting in a mixed student/community

sample. Participants completed informed consent and knew their responses were kept anonymous. There were no competing interests to declare for both studies.

Measures

Note that Cronbach's alpha is reported for all measures from both studies in Tables 1 and 2. The values were all in the acceptable range (i.e. .7 or higher) with the exception of the fun-seeking subscale from the BIS/BAS scales in Study 2, which was .64. Despite the lower internal consistency, the variable was nevertheless significantly associated with a number of outcomes (see Results for Study 2). We did not test the "number of drugs" variable (see description of SACS below) for internal consistency as we did not expect the relevant items to hang together (i.e. use of one drug does not necessarily predict the use of another).

Table 1. *Correlations between Study Variables and Descriptive Statistics – Study 1*

	1.	2.	3.	4.	5.	6.	7.	Mean	SD	Alpha
1. Self-control								42.63	9.26	.86
2. Agentic willpower	.57**							43.52	6.23	.79
3. BIS	-.22*	-.29**						21.67	4.22	.84
4. BAS fun-seeking	-.36**	.01	.07					11.18	2.51	.74
5. BAS drive	-.02	.21*	.01	.56**				11.23	2.15	.76
6. BAS reward	.00	.18*	.38**	.43**	.52**			16.95	2.31	.75
7. Sub. abuse- severity	-.46**	-.19*	.06	.28**	.05	-.06		1.71	3.50	.90
8. Number of drugs	-.29**	-.08	-.15	.20*	.01	-.01	.37**	1.27	.90	

Note. * Correlation significant at p=.05. ** Correlation significant at p=.001

Table 2. *Correlations between Study Variables and Descriptive Statistics – Study 2*

	1.	2.	3.	4.	5.	6.	7.	Mean	SD	Alpha
1. Self-control								41.36	9.31	.85
2. Agentic willpower	.52**							41.74	5.94	.77
3. BIS	-.16	-.33**						22.22	4.31	.85
4. BAS fun-seeking	-.34**	-.05	-.07					12.09	2.22	.64
5. BAS drive	-.02	.13	.03	.35**				11.29	2.22	.72
6. BAS reward	.05	.19*	.23*	.25*	.34**			17.22	2.19	.75
7. Sub. abuse- severity	-.49**	-.27*	.00	.23*	.00	-.16		1.90	3.29	.87
8. Number of drugs	-.37**	-.07	-.03	.29**	.11	.00	.39**	1.13	.92	

Note. * Correlation significant at p=.05. ** Correlation significant at p=.001

Agentic Willpower Scale (AWS; Sturman, Bremser, and Defoe, 2025).

The AWS consists of 12 items tapping grit, locus of control, resilience, and self-efficacy, which together provide a measure of agentic willpower. The response options are on a Likert scale ranging from 1=strongly disagree to 5=strongly agree. The measure has demonstrated good internal consistency and factorial validity (Sturman et al., 2025). Evidence for construct validity came from its relations to lower depression, anxiety, and stress and positive relationships to age, income, happiness, and satisfaction with life. It was also able to prospectively predict GPA at the end of a semester (Sturman et al., 2025).

Brief Self-Control Scale (BSCS: Tangney, Boone, and Baumeister, 2018).

The BSCS is a 13-item measure designed to assess self-control. Response options are on a 1-5 scale of agreement with 1=not at all and 5=very much. Tangney et al. (2018) found the instrument to show good internal consistency and test-retest reliability. They also found support for construct validity in its relationship with adjustment, self-esteem, GPA, and personality variables like conscientiousness and emotional stability. Interpersonally, self-control was related to a positive family environment and a secure attachment (Tangney et al., 2018).

BIS/BAS Scales (Carver and White, 1994).

The BIS/BAS scales were created to assess the Behavioral Inhibition System (BIS) and Behavioral Activation System (BAS). The instrument has three subscales related to behavioral approach: Drive, fun-seeking, and reward responsiveness. There are 24 items rated on a 4-point scale ranging from 1=very true for me and 4=very false for me. The initial validation study by Carver and White (1994) found 4 factors corresponding to the subscales. Internal consistency was adequate for the subscales (although it was a little low for the fun-seeking scale) and they demonstrated stability, as demonstrated in a test-retest analysis. All of the BAS scales were related to extroversion, as might be expected, and the fun-seeking scale was further related to hypomania. In a situation where subjects expected punishment, those high on the BIS proved to be more nervous than others.

Substances and Choices Scale (SACS; Christie et al., 2007).

The SACS was originally developed for use in adolescents, and, as our sample in study 2 was close to this age range (i.e. the sample included many freshmen college students), we thought it might be appropriate. Also, we assumed that the scale could be used with adults, seeing as the items do not seem to be specific to adolescence, but rather substance use in general. The SACS has the advantage of assessing the frequency of use for specific drugs and providing an overall severity score while not being overly long. The SACS lists the most widely used illicit drugs and asks respondents the frequency of their use in the past month. Response options include: Did not use, once a week or less, more than once a week, and most days or more. The severity of drug abuse is assessed with 10 items using three response options: Not true, somewhat true, and certainly true. We also created another dependent variable by adding all of the different substances used in the past month (the number of drugs used). Christie et al. (2007) obtained high levels of internal consistency and test-retest reliability for the SACS. They also found high levels of convergent validity with other measures of substance abuse. In partial support of its use in adults, the SACS showed relatively high internal consistency in both studies (see Tables 1 and 2).

Results

Correlations

Table 1 shows the key correlations in the study, corresponding to hypotheses 1, 2, 3, 5, and 7. As hypothesized, self-control was significantly negatively related to BAS fun-seeking and agentic willpower. The latter correlation was in the moderate to strong range (r=.57). Agentic willpower was significantly related to both BAS drive and BAS reward, although the correlations were modest. Self-control was significantly negatively related to both the severity of substance abuse and the number of drugs used. Agentic willpower was significantly negatively related to the severity of substance abuse but not the number of drugs used. BAS fun-seeking also

showed significant correlations with severity of substance abuse and the number of drugs used in a positive direction (i.e. higher fun seeking relating to higher drug use).

To test hypotheses 4 and 6, the number of drugs used in the past month were tabulated, excluding alcohol, and then correlated with BIS and agentic willpower. Hypothesis 4 was not supported as BIS was neither correlated with the number of drugs used (minus alcohol; r=-.09, p=.251) nor severity of substance abuse (r=.06, p=.454). On the other hand, hypothesis 6 received support as agentic willpower was significantly correlated with the number of drugs used, minus alcohol (r=-.19, p=.022).

Regression Analyses

Two regression analyses were performed to test for moderation/interaction effects (hypothesis 8) and mediation (hypothesis 9). For hypothesis 8 (males high on BIS will be more likely to use alcohol and have higher severity scores), we first created an interaction term by multiplying gender with BIS scores. The one non-binary individual was not included in the analysis as we anticipated that this could lead to error. In the first regression analysis, gender, BIS and the interaction term were entered as predictors of alcohol use. None of the predictors emerged as significant. A second regression was performed with the same predictors and severity of drug use as the outcome. Again, none of the predictors were significant. Therefore, hypothesis 8 was not supported.

Hypothesis 9 (self-control will mediate the relationship between BAS fun-seeking and the number of drugs used as well as the severity of substance abuse) could be tested with two regression analyses (one for each dependent variable), as per Baron and Kenny (1986), rather than more complex SEM or path analyses. We should note that both the independent variable (BAS fun-seeking) and mediator (self-control) were significantly associated with each other and both dependent variables (the number of drugs used and severity of abuse; see correlations in Table 1). In the first regression analysis, BAS fun-seeking and self-control were entered as predictors of the number of drugs used. Self-control emerged as a significant predictor (β=-.25, p=.004) but BAS fun-seeking did not (β=.11, p=.206), indicating mediation according to Baron and Kenny (1986). In the second regression, severity of substance abuse was entered as the outcome. Again, self-control mediated the relationship between BAS fun-seeking and severity of substance abuse as it came through as a significant predictor (β=-.41, p=.001) but BAS fun-seeking did not (β=.13, p=.094). In other words, self-control statistically accounts for the relationship between fun-seeking and substance abuse. Therefore, hypothesis 9 was supported.

Discussion and Implications for Study 1

The hypotheses were by and large supported, with the exception of hypotheses 4 and 8, which, in retrospect, perhaps did not have a sufficient theoretical basis. We had assumed that alcohol may serve as “liquid

courage" for males who tend to be more cautious, nervous, etc. but this did not prove to be the case. Overall, the BIS was not significantly linked to substance abuse severity or the number of drugs used, which came as something of a surprise. We had assumed that the withdrawal and lack of novelty seeking that is part and parcel of the BIS system would be linked to lower substance abuse.

Agentic willpower was significantly related to the severity of substance abuse but not the number of drugs used. It should be noted that the correlation with severity of substance abuse was relatively modest. As anticipated, self-control showed more robust correlations with both severity and the number of drugs used, which is in line with the literature and meshes with lay conceptualizations of willpower in the context of drug use (i.e. the use of willpower to break addiction such as when one goes "cold turkey"). Unsurprisingly BAS fun-seeking was related to severity and the number of drugs used, although the correlations were more modest than we had expected, and these relationships were fully mediated by self-control. This would suggest that fun seeking is related to greater impulsivity (i.e. less self-control), which, in turn, predicts substance abuse.

Overview of Study 2

The purpose of study 2 was to examine the same relationships as in study 1 but specifically in undergraduate university students. Historically, the undergraduate party scene has been of concern to parents, school administrators, and local authorities and, as such, we felt this population was worthy of study in its own right. In the present research, undergraduate Psychology students completed the same measures as in Study 1 over Survey Monkey. For the sake of space, we will not list the hypotheses seeing as they were the same as in Study 1 with the following exceptions: hypothesis 8 was omitted, and alcohol use was not omitted from hypotheses 4 and 6. We should also note that for hypothesis 6 in the OSF registry, agentic willpower was only hypothesized to relate to the number of drugs used in the past month and severity of substance abuse was not included (unlike Study 1), which was an error on our part. We would certainly have anticipated this relationship given the results of Study 1. Therefore, that data is also reported below. The hypotheses were pre-registered at https://osf.io/vn7wt.

Methods

Participants and Procedure

As in study 1, all surveys were completed on Survey Monkey. Participants were undergraduate Psychology students who received course credit for their participation. All participants provided informed consent and were told that their responses were anonymous and confidential. A total of 124 students participated in the research (90 female, 29 male, and 5 non-binary/ gender fluid) with an average age of 19.94 (SD=2.77). The sample was much more diverse than that of study 1. The racial breakdown was as

follows: White (n=73, 58.9%); Black/African American (n=18, 14.5%), Hispanic/Latino (n=13, 10.5%), two or more races (n=13, 10.5%), Asian (n=5, 4.0%), and American Indian/Alaskan native (n=2, 1.6%). Forty-six students were in their first year of study (37.1%), 33 in their second year (26.6%), 32 in their third year (25.8%) 12 in their fourth year (9.7%), and 1 other (.8%). Seventy (56.5%) lived on campus and 54 (43.5%) lived off campus.

Measures

The measures were the exact same as in study 1 (see above for descriptions) with the exception of the demographics questions, which included additional information such as year of study and living circumstances.

Results

Correlations

As can be seen in Table 2, the overall pattern of correlations for Study 2 was broadly similar to those in Study 1. Self-control was negatively correlated with fun-seeking and was moderately positively correlated with agentic willpower, confirming hypotheses 1 and 2. Agentic willpower was significantly correlated with BAS reward (albeit modestly) but not BAS drive, lending only partial support to hypothesis 3. Similar to Study 1, BIS scores were neither significantly related to substance abuse severity, nor the number of drugs used, disconfirming hypothesis 4. In support of hypothesis 5, self-control showed moderate and significant negative correlations with substance abuse severity and the number of drugs used. Agentic willpower was not related to the number of drugs used, disconfirming hypothesis 6, although it was significantly negatively correlated with severity of substance abuse, and this correlation was slightly larger than that observed in Study 1. BAS fun-seeking showed significant positive correlations with both the severity of substance abuse and the number of drugs used, confirming hypothesis 7.

Regression Analyses

Two regression analyses were performed to test hypothesis 8. Again, Baron and Kenny's (1986) conditions for mediation analysis were used. As in Study 1, both the independent variable (BAS fun-seeking) and mediator (self-control) were significantly associated with each other and both dependent variables (the number of drugs used and severity of abuse). In the first regression analysis, BAS fun-seeking and self-control were entered as predictors of the number of drugs used. Both BAS fun-seeking (β=.19, p=.038) and self-control (β=.29, p=.002) emerged as significant predictors of the number of drugs used, indicating only partial mediation for self-control. The second regression analysis featured the same predictors but had severity of substance abuse as the dependent variable. This time, self-control was a significant predictor of severity of abuse (β=-.43,

p=.001), whereas BAS fun-seeking was not (β=.09, p=.310), indicating mediation. Again, self-control statistically accounted for the relationship between fun-seeking and substance abuse. Therefore, hypothesis 8 was mostly supported.

Discussion and Implications for Study 2

Study 2 utilized undergraduate students as opposed to the mixed student/community sample from Study 1 and yet the results were very similar. One might have expected greater differences given that the sample was much younger (19.94 years on average vs. 38.83 years) and much more diverse, which possibly speaks to the universality of the underlying mechanisms that govern willpower, BIS/BAS, and substance abuse. As in Study 1, agentic willpower was not related to the number of drugs used but was related to the severity of abuse. In retrospect, we should have changed this hypothesis to only include severity of abuse for the current study but did not do so as Study 2 was intended to serve as a semi-replication of Study 1. Another difference between the studies was that agentic willpower was not related to BAS Drive. This could possibly owe to the age difference between the samples (we know that agentic willpower is positively correlated age) but the study was not equipped to examine this possibility and it remains speculative.

General Discussion and Implications

Of all of the potential correlates of substance abuse severity and frequency of use, self-control emerged as the strongest across both studies. BAS fun seeking was also reliably related to these outcomes but the effect disappeared once self-control was accounted for. One interpretation of the finding is that fun-seeking individuals may be prone to substance abuse severity because they tend to be more impulsive (i.e. the inverse of self-control). The finding emerged in both studies, which would seem to lend the interpretation some credibility but only a longitudinal study could properly test whether fun-seeking leads to impulsivity, and, in turn, substance abuse.

The study also provided an opportunity to further investigate the newly formulated construct of agentic willpower. The agentic and self-control aspects of willpower showed a moderate correlation with each other. This is perhaps unsurprising given that both self-control and agency are necessary for goal achievement (see, for example, Duckworth and Gross, 2014 for a compelling discussion on how grit and self-control work together). As hypothesized, agentic willpower was related to BAS drive and reward responsiveness in study 1 but only BAS reward responsiveness in the college sample. These correlations were in the anticipated direction but relatively weak. Interestingly, agentic willpower showed stronger (negative) correlations with BIS in both studies, which we had not anticipated, although it would make sense theoretically. Insofar as people

who are high in agentic willpower could be described as "go-getters," we would not expect them to be inhibited and cautious.

Agentic willpower was modestly related to the severity of substance abuse in both studies. This would suggest that those who are more goal-driven, persistent, and resilient are less likely to abuse drugs, although there are many exceptions. Clearly, the self-control component of willpower is a more important predictor of substance abuse severity and frequency, which we had expected.

Future Directions and Limitations

As noted previously, although it is tempting to read causation into cross-sectional mediation analyses, a longitudinal study would be required to determine whether fun-seeking actually leads to changes in self-control, which, in turn, predicts substance abuse. The directionality problem comes into play: We cannot say conclusively that substance abuse does not lead to fun-seeking or diminish self-control/agentic willpower. This study could only demonstrate statistical associations. A future study could space out the assessments to get a better understanding of the causal nature of the relationships, ideally in both a community sample and college student sample.

Besides the limitation of a cross-sectional design, the current study also utilized self-report measures, which are subject to social desirability bias, especially when considering sensitive topics such as substance abuse. One mitigating factor in these studies was that the surveys were set to be anonymous and participants were told of that setting in the informed consent. Nevertheless, there is the distinct possibility that some participants may not have been forthright in the reporting of their substance use. The restricted range that we observed, with the bulk of people in the two samples participating in zero or minimal drug use, could owe partly to social desirability or could just be the nature of the community and college. Despite the restricted range, we were still able to find significant relationships between the key variables (although they would have likely been more robust with greater variability in substance abuse). A final limitation with the sole use of self-report measures, is the possibility that common method variance could have played a role in the results, either inflating or deflating the correlations.

Another obvious issue stems from the fact that the samples were obtained from small towns and the generalizability of the findings to larger urban areas, with a wider range of demographic groups, is questionable. This was particularly pronounced in Study 1 where 91% of the sample was white. The sample was obtained from upstate New York and is representative of the area, but certainly not the country, nor other countries for that matter. The sample in Study 2 was more representative of the broader population in terms of ethnicity, but, of course, lacked generalizability to the overall population in terms of age. The focus of the study was undergraduate students and, while it was roughly representative

of first-year Psychology students, it certainly included more females and was younger in age than the overall undergraduate population.

Finally, it should be mentioned that, in Study 1, students and friends/family members were given the same ID number. This was done for course credit purposes and to increase the anonymity of responses, which should theoretically encourage more honest responding to questions about substance abuse. Nevertheless, this approach made it impossible to disentangle student responses from those of friends/family and raises the possibility that substance abuse patterns may "cluster." Specifically, friends and family members may share a propensity, or lack thereof, towards substance abuse.

Conclusion

The current studies were unique in the sense that they showed the relationship between self-control, BIS/BAS systems, and substance abuse across a variety of different drugs, both in a (mostly) community sample and in an undergraduate sample. The findings were remarkably consistent across studies with the hypotheses for both being largely supported. If nothing else, the current research supports the value of examining self-control and the behavioral inhibition/activation systems in relation to substance abuse and helps identify areas for future research.

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Neither author had any conflicts of interest associated with the current research.

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Author's Contributions
Both authors contributed significantly to the research project.

Ethics Approval
The ethical review board for the use of human subjects considered the research "exempt" and, therefore, not requiring approval. Informed consent was obtained from all participants.

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