HHS Public Access

Author manuscript

Am J Addict. Author manuscript; available in PMC 2018 April 19.

Published in final edited form as:

Am J Addict. 2016 December ; 25(8): 652–658. doi:10.1111/ajad.12460.

Grit in Patients with Substance Use Disorders

Margaret L. Griffin, Ph.D.[1,2], **Katherine A. McDermott, B.A.**[1], **R. Kathryn McHugh, Ph.D.**[1,2], **Garrett M. Fitzmaurice, Sc.D.**[3,4], and **Roger D. Weiss, M.D.**[1,2]

[1]Division of Alcohol and Drug Abuse, McLean Hospital, Belmont, MA 02478, USA

[2]Department of Psychiatry, Harvard Medical School, Boston, MA 02115, USA

[3]Laboratory for Psychiatric Biostatistics, McLean Hospital, Belmont, MA 02478, USA

[4]Department of Biostatistics, Harvard School of Public Health, Boston, MA 02115, USA

Abstract

Background and Objectives—Grit is an emerging concept in positive psychology, defined as the ability to be persistent and focused in pursuit of long-term goals. This concept has received a great deal of interest recently because of its robust ability to predict success and well-being across a wide variety of domains. The study aim was to examine the clinical relevance of the construct of grit among patients with substance use disorders.

Methods—Inpatients on a detoxification unit were enrolled from September 2013-August 2015 (N=673). Psychometric properties of the Short Grit Scale (Grit-S) were reported. We then examined sociodemographic and clinical variables that might be associated with grit in this population.

Results—In this sample of patients with substance use disorders, the total Grit-S demonstrated strong psychometric properties. Grit-S scores were higher among older patients and those who were employed; scores were lower among those never married, diagnosed with a co-occurring psychiatric disorder, or who had used heroin during the past month, according to bivariate analyses. Grit-S scores remained associated with age, employment, and presence of a co-occurring psychiatric disorder in adjusted analysis.

Conclusions and Scientific Significance—This study provides initial support for the utility of the Grit-S among those with substance use disorders; this novel measure has not been previously reported in clinical populations. Research examining grit prospectively is needed to determine whether the links between grit and outcomes observed in other populations apply to patients with substance use disorders.

Corresponding author: Roger D. Weiss, M.D., Division of Alcohol and Drug Abuse, McLean Hospital, 115 Mill St., Belmont, MA 02478, USA; rweiss@mclean.harvard.edu; Telephone: 617-855-2242; Fax: 617-855-2699.

An earlier version was presented at the 37th Annual Meeting of the Research Society on Alcoholism, Bellevue, WA, USA, June 21–25, 2014.

Declaration of Interest

Dr. Weiss has consulted to Indivior, U.S. WorldMeds, and GW Pharmaceuticals. All other authors declare they have no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

> "Nothing in the world can take the place of persistence. Talent will not; nothing is more common than unsuccessful men with talent. Genius will not; unrewarded genius is almost a proverb. Education will not; the world is full of educated derelicts. Persistence and determination are omnipotent."
>
> (Attributed to Calvin Coolidge)

INTRODUCTION

Substance use disorders are chronic conditions that require sustained and persistent effort to achieve long-term recovery. Recovery from a substance use disorder requires perseverance in dealing with a multitude of obstacles associated with relapse, such as acute and protracted withdrawal[1], social network influences[2], environmental triggers of craving[3], and stress[4].

The trait-level ability to be persistent and focused in the pursuit of long-term goals[5] is known as "grit;" this positive-psychology concept has received a great deal of interest recently because of its robust ability to predict success and well-being across a wide variety of domains. People with high levels of grit persevere despite obstacles, maintain long-term focus, and see difficult tasks through to their completion[6]. Research on grit has focused predominantly on its association with academic achievement. In a series of studies examining grit in a variety of educational settings, Duckworth and colleagues[5] found that university students with higher levels of grit achieved higher grade point averages than their peers, adjusted for college admission test scores (Scholastic Aptitude Test, or SAT). Grit was also associated with performance in the Scripps National Spelling Bee, adjusted for conscientiousness[6]; and was a better predictor of retention among West Point students (i.e., The U.S. Military Academy at West Point) following their first summer of rigorous military training than self-control, conscientiousness, or a composite measure of high school rank, SAT score, leadership potential, and physical aptitude[5]. Educators have come to view grit as a key skill to develop for the rigors of academic and professional goal-striving[7]; indeed, early efforts to increase students' ability to persevere in goal pursuit have shown promise in improving academic performance[8]. Grit appears to capture a specific ability to persist through particularly difficult situations.

The importance of grit extends beyond the academic setting. In studies examining non-student populations, those with lower grit had less employment and relationship stability, including greater job attrition[9], more frequent career changes[6], and, among men, greater likelihood of divorce[9]. Furthermore, several studies have linked higher grit to greater psychological well-being, including lower suicidal ideation[10] and lower rates of burnout during surgical residency[11]. Those with higher levels of grit may have a healthier outlook on life: grit has been shown to be associated with work engagement[12] and is associated with an orientation toward pursuing engagement and meaning in life[13]. Thus, grit appears to be linked to a wide array of outcomes reflecting both achievement and well-being. The links between grit and psychological health (e.g., suicidal ideation) highlight this construct as potentially relevant to psychiatric disorders.

No published studies to date have examined grit in a clinical sample; grit may be relevant not only for achievement and well-being, but also for perseverance and sustained interest

during the process of recovery. The ability to sustain interest in the goal of recovery over the long-term is especially pertinent to those with a chronic problem such as a substance use disorder. Patients with substance use disorders need to abstain from substances of abuse day after day, despite challenges presented by stresses, psychological and physical pain, and cravings. The ability to sustain an abstinence goal and to persist in its achievement appears to thus be quite relevant for this patient population.

Patients with substance use disorders have exhibited deficits in areas that may overlap with grit, including self-control, studied extensively in patients with substance use disorders[14,15], and conscientiousness[16]. Although grit is associated with both traits, grit has been shown to have predictive validity for successful outcomes beyond these concepts[5,6] and may be particularly important in this population due to its relevance in the pursuit of arduous goals. Grit, however, has not been examined in a population with substance use disorders; it is therefore necessary to determine if methods of measuring grit are psychometrically sound in this population, and if grit is associated with similar characteristics as it is in non-clinical samples. It is further necessary to examine whether grit is distinct from other constructs that characterize patients with substance use disorders, such as craving and impulsivity, which may also contribute to difficulties with goal pursuit.

The overarching aim of this exploratory study was to evaluate the clinical relevance of grit in a sample of patients with substance use disorders. First, we examined the psychometric properties of the Short Grit Scale (Grit-S), a self-report measure of grit that has been validated in non-clinical and unselected samples[6]; our aim was to determine whether the Grit-S was reliable and valid among treatment-seeking patients with substance use disorders. Given a recent meta-analysis of the Grit-S, largely in student populations, that found subscale differences[17], we examined the psychometric properties of each subscale. We then examined whether grit was associated with markers of clinical severity and functioning among patients with substance use disorders. We hypothesized that low grit scores would be correlated with markers of difficulties in recovery, such as poor employment history and co-occurring psychiatric illness.

METHODS

Participants

This study was conducted in a 17-bed inpatient detoxification unit, which admits approximately 25 patients per week for an average of 4 days. Patients were invited to participate in a self-administered survey, completed on paper initially (n=189) and later via tablet computer (n=513). This study was approved by the McLean Hospital Institutional Review Board. Written informed consent was obtained after a complete study description. Of those approached September 2013-August 2015, 67.9% (704/1034) were enrolled; however, one of these was determined to be ineligible (having already completed the survey during a prior admission) and another one provided inconsistent data. Those who did not participate either refused (n=152), postponed participation and were then discharged (n=175), were ineligible (n=2), or withdrew consent (1). Reasons for refusal were not interested (n=97), privacy concerns (n=24), imminent discharge (n=25), and feeling unwell

(n=6). The sample size for the current analysis was N=673, as 29 patients failed to complete the Grit-S.

Measures

The Short Grit Scale (Grit-S)[6], an 8-item measure of grit, provides a total score and two subscale scores: Perseverance of Effort (sample item: “Setbacks don’t discourage me”) and Consistency of Interest (sample item, reverse scored: “New ideas and projects sometimes distract me from previous ones”). Scores range from 1 to 5, with higher scores indicating more grit. The Grit-S has demonstrated moderate internal consistency across several samples, with Cronbach’s alphas ranging from .73 to .83 for the total scale, .73 to .79 for the Consistency of Interest subscale, and .60 to .78 for the Perseverance of Effort subscale[6]. Test-retest reliability has been reported with correlations over 4–6 months of .61–.68 in student samples[6,18].

Demographic information, primary DSM-IV substance use disorder diagnosis, and additional DSM-IV psychiatric diagnoses were obtained from participants’ medical records. To establish that grit was not simply reflective of more severe substance use disorder, greater impulsivity, or stronger craving, several self-report questionnaires were collected to assess these characteristics.

The Brief Addiction Monitor[19] is a 17-item measure of substance use disorder severity, including days of substance use, risk factors for poor prognosis (e.g., negative mood, craving, and arguments with friends or family), and protective factors (e.g., attending self-help meetings, spending time with supportive people, and working). Items are ordinal, ranging from 0 to 4.

Impulsivity was assessed by the 27-item, self-administered Monetary-Choice Questionnaire[20]. This measure examines delay discounting, or the tendency to overvalue immediate relative to more distant rewards, and is a risk factor for the development of substance use disorders[21]. Each item requires the respondent to choose between smaller, immediate monetary rewards and larger, delayed monetary rewards. Scores range from 0 to 0.25, with higher scores reflecting a greater discounting of delayed rewards, hence more impulsivity. Test-retest reliability is strong, ranging between 0.77 for five weeks and 0.71 for one year[22].

The Craving Scale[23] is a 3-item measure of craving for a participant’s primary drug of abuse. Items measure desire to use the drug, likelihood of using it in the environment in which previous use occurred, and cue-induced urges to use, each on a 10-point scale (0 to 9). Scale scores range from 0 to 27, with higher scores indicating greater craving. The Craving Scale has previously demonstrated good internal consistency (α=.78)[23] and predictive validity for drug use among those with opioid[3] and other substance use disorders, including cocaine[23].

Statistical Analysis

Psychometric properties assessed for the Grit-S included internal consistency (using Cronbach’s alpha) and discriminant validity (using correlation coefficients) for the 673 out

of 702 participants with complete Grit-S data. Pearson correlation coefficients, independent t-tests, or one-way analysis of variance (with post-hoc t-tests) compared Grit-S scores by sociodemographic and clinical characteristics, followed by linear regression to examine these associations in an adjusted model. The adjusted model included gender and those characteristics with p-values <.05 in bivariate analysis (only the characteristic of primary opioid use disorder was excluded because it was redundant with heroin use). Data were analyzed using SPSS v.20.

RESULTS

Sample Description

The 673 participants were 18 to 82 years old, with a mean age of 37.6 (sd=14.2). Nearly all (93.5%, n=629) participants were white, and two-thirds (68.5%, n=461) were male. Almost half (46.2%, n=311) were employed, and most (53.2%, n=358) were never married. Most participants were admitted for primary alcohol use disorder (58.4%, n=393), followed by opioid use disorder (39.8%, n=268); the remainder had benzodiazepine, cocaine, or sedative use disorder (n=12). The majority of participants (76.8%, n=517) used their primary substance 16–30 days in the month prior to study participation. Two-thirds (67.8%, n=456) of participants had at least one co-occurring psychiatric disorder other than a substance use disorder; primarily depressive disorders (66.9%, n=305), followed by posttraumatic stress disorder (7.0%, n=32) and other anxiety disorders (15.4%, n=70), bipolar disorder (5.9%, n=27), and other disorders (4.8%, n=22).

Psychometric Properties of the Grit-S

We assessed the Grit-S, using the SMOG Readability formula[24]. Reading grade level was estimated to be ninth grade. The total Grit-S displayed good internal consistency overall (α=.74). Consistent with findings in other populations[6], the Consistency of Interest subscale had excellent internal consistency (α=.81), whereas the Perseverance of Effort subscale had lower internal consistency (α=.60). Scores for the total Grit-S were approximately normally distributed (range from 1.2–4.8), with both the mean and the median=3.1 and no discernible skew; subscales were similarly distributed. We examined correlations between the Grit-S and other distinct constructs to assess discriminant validity. The Grit-S demonstrated good discriminant validity, as all correlations with measures of impulsivity (r=−0.13, n=324), craving (r=−0.25, n=658), and risk and protective factors in recovery from substance use disorder (r's≤0.19, n=626–659) were low. Discriminant validity for the subscales was also supported (r's<.20 for consistency and <.23 for perseverance, all in the same direction as the total Grit-S. The subscale correlation was low but significant (r=.30, p<.001). A factor analysis with oblique rotation (promax) confirmed the two-factor structure of the scale, with eigenvalues=3.16 (39.5% of the variance explained) for consistency and 1.51 (18.9%) for perseverance.

Comparison of Grit-S scores to Other Samples

Compared to a general sample of adults age ≥25 who participated in a voluntary online study of the Grit-S[6] (N=1554), our study sample of inpatients with substance use disorder had lower Grit-S scores (means=3.1 vs. 3.4; t(672)= −10.44, p<0.001). In fact, our sample

scored significantly lower ($p<0.001$) on the Grit-S than reports of other samples (means=3.4–3.9) of volunteers online[9,13] and high-achieving subjects[11,25], with one exception (mean=2.8 in another sample of online volunteers[13]).

Sociodemographic and Clinical Variables Associated with the Grit-S: Bivariate Analysis

We examined the association between demographic and clinical variables and grit in a bivariate analysis (Table 1). Grit-S scores were higher for older participants, those ever married, and those employed, whereas gender and race were not associated with Grit-S scores. Frequent use of the primary substance in the past month (defined as >15 days) and prior detoxification were not associated with Grit-S scores, but use of any heroin in the past month and the presence of a co-occurring psychiatric disorder were both associated with lower Grit-S scores. Frequency using the primary substance in the past month was also not associated with grit when measured on a 5-point ordinal scale. The effect sizes (Table 1) of these statistically significant associations are considered to be small to medium[26].

Primary substance use disorder diagnosis was also associated with Grit-S scores (Table 1): participants with primary alcohol use disorder had higher scores than those with primary opioid use disorder. Since patients whose primary substance of abuse was heroin have been shown to have worse clinical presentation than those who primarily abuse prescription opioids[27], we compared Grit-S scores by type of opioid use disorder. Indeed, heroin users had the lowest scores: the discrepancy in grit between those with alcohol versus opioid use disorder was larger for those who primarily used heroin (defined as use of heroin ≥4 days and prescription opioids <4 days in the month prior to treatment entry) or those who used a combination of heroin and prescription opioids (defined as use of both drugs ≥4 days in the past month). Participants with primary alcohol use disorder had higher Grit-S scores than those who primarily used heroin (n=393, mean (sd)=3.21 (0.68) vs. n=114, mean (sd)=3.00 (0.66); $t(505)= -2.97$, $p=.003$) and those who used a combination of heroin and prescription opioids (n=89, mean (sd)=2.98 (0.58); $t(480)= -2.99$, $p=.003$). There were no differences between those with alcohol use disorder and those who primarily abused prescription opioids (i.e., used heroin <4 days in the past month; n=61, mean (sd)=3.19 (0.56); $t(452)= -0.20$, $p<.84$). Because only 12 participants were diagnosed with a primary substance use disorder other than alcohol or opioid use disorder, statistical analysis of these participants would be unwarranted. Subscale analysis showed the same pattern for perseverance; however, consistency did not vary by primary substance use disorder diagnosis.

Sociodemographic and Clinical Variables Associated with the Grit-S: Multivariable Analysis

Multivariable regression was used to assess the relative contribution of sociodemographic and clinical variables associated with grit: gender plus the characteristics with p-values <.05 in bivariate analysis. Primary substance use disorder was excluded from the model because of overlap with heroin use. In the adjusted model (Table 2), age, employment status, and co-occurring psychiatric disorder were associated with Grit-S scores. Participants who were older or employed had higher Grit-S scores, whereas those with a co-occurring psychiatric disorder had lower Grit-S scores. The effect sizes (Table 2) of these statistically significant associations are considered to be small[26]. Neither heroin use nor marital status was

associated with total Grit-S scores in the adjusted model, as these bivariate associations were confounded with age (for heroin use and age, r=−0.52; for never married and age, r=−.60).

DISCUSSION

To investigate the potential clinical relevance of grit in patients with substance use disorders, we examined the association of the Grit-S with demographic and clinical characteristics in a sample of 673 inpatients with substance use disorders. The total Grit-S demonstrated strong psychometric properties, providing initial support for its use in this population. Adjusted analyses showed that lower Grit-S scores were associated with younger age, unemployment, and presence of a co-occurring psychiatric disorder. Interestingly, among patients with substance use disorder, younger age[28,29] and co-occurring disorders[28] have been associated with worse substance use outcomes.

Although the present study is the first to examine grit in inpatients with substance use disorders, the findings complement previous research on related constructs in this population. Those with substance use disorders demonstrate deficits in self-control[15] and conscientiousness[16], characteristics associated with, yet distinct from, grit[5,6]. Substance use disorders are further characterized by a number of cognitive control problems, including deficits in complex decision-making[30] and delaying gratification[31]. It is not surprising that inpatients with substance use disorders have lower grit than non-clinical samples[6,9,13] given results in related domains: greater impulsivity and a preference for short-term rewards[32] point to a present-focused mindset, one characterized by poor future planning.

Related constructs, including impulsivity and reward processing, do not consistently predict substance use disorder treatment outcome[33,34]; hence the construct of grit may be promising. Grit is unique in focusing on the ability to pursue a goal over the long-term, which may be relevant to the ability to adhere to a treatment regimen or to sustain abstinence. As demonstrated in a non-clinical population, grit can be a better predictor of successful goal pursuit than related concepts, such as self-control[5].

Variability within our sample merits consideration. In particular, employment and co-occurring psychiatric disorder both predicted grit scores in adjusted analysis, consistent with studies associating higher grit with greater job retention[9] and psychological well-being[13], as well as lower suicidal ideation and less severe depressive symptoms in non-clinical populations[10]. Further, the magnitude of effect sizes was similar to those reported in other studies in which grit scores differentiated between groups in important outcomes, for example, between West Point cadets who dropped out during basic training and those who continued[35]. Thus, in this clinical sample, variations in grit aligned with previous research on this construct. Further, the effect sizes of the associations between grit and clinical characteristics were of a small to medium magnitude. This magnitude of effect is not surprising for a study comparing participants within a clinical sample (i.e., inpatients receiving treatment for substance use disorders), and is comparable to the effects found for other clinically meaningful trait-level variables when comparing patients within substance use disorders samples (e.g., anxiety sensitivity)[36,37]. Larger differences in grit may characterize comparisons between more heterogeneous populations (e.g., social drinkers vs.

those with alcohol use disorder; adults with and without substance use disorders); future studies are needed to determine such differences.

Although scores may vary by context, the Grit-S showed good test-retest reliability in student samples[6,18]. Future research could assess grit longitudinally in a clinical population to examine variability over time and effects of life events. Such research could also provide evidence as to whether grit is constant across tasks or is context-specific, as is true for certain other personality traits, such as perfectionism[38], distress tolerance[39], and impulsivity[40]. For example, a person may demonstrate grit in pursuit of career goals but not in the pursuit of abstinence. Clarifying the nature of grit in various settings could be useful in understanding this emerging concept and in creating interventions to increase grit in those with broad or potentially context-specific deficits.

This study has several limitations. Since validated behavioral measures of grit are not available, our study relied exclusively on self-report assessment. Second, since participants were inpatients on a detoxification unit and many had recently relapsed, they may have interpreted some Grit-S items (e.g., “Setbacks don’t discourage me”) differently from respondents whose substance use disorder was more stable or respondents in non-clinical samples, who may not have completed the questionnaire in the context of a major setback. Finally, this study was cross-sectional in design and thus prospective associations between grit and clinical variables of interest (e.g., relapse) cannot be established. The current paper represents a first step to evaluate the reliability and validity of this measure in a clinical sample in order to justify its use in longitudinal studies. Because we did find some differences between Grit-S scores and subscale scores, and a lower correlation between the two subscales than that reported for other populations (r=.66) [17], future research in substance use disorder patients might examine the subscales as well as the total Grit-S.

Longitudinal designs examining the impact of grit over time are needed to establish the predictive validity of grit for substance use disorder outcomes. For example, studies examining whether grit is associated with treatment dropout and duration of abstinence will help to determine if grit might be a valuable target for intervention to enhance outcomes.

Considering the relevance of perseverance and focus to the recovery process, the enhancement of grit may be an important target to consider in substance use disorder treatment. Indeed, stressing the importance of grit, i.e., the importance of not giving up despite obstacles and continuing to focus on the key goals of recovery, could be a helpful adjunct to standard substance use disorder treatment. If the assertion in the meta-analysis of Credé and colleagues[17] is correct, i.e., that “grit may be most useful when the task is difficult but well-defined,” then recovery from substance use disorder appears to be a good fit. In particular, those younger in age, unemployed, or with a co-occurring psychiatric disorder might benefit from a treatment that included a focus on increasing grit. Although no interventions to increase grit in a clinical sample have been published, the technique of Duckworth and colleagues[8] to teach young students to identify plans to overcome obstacles in goal pursuit has been shown to moderately increase school attendance and academic performance. Furthermore, interventions to improve other self-regulation traits, including delay discounting[41], self-control capacity[42] and distress tolerance[43], have previously been

efficacious. Whether grit can similarly be increased in patients with substance use disorders and whether increasing grit could improve treatment outcomes are promising areas for future research.

Acknowledgments

This work was supported by National Institute on Drug Abuse (Rockville, MD, USA) K24 DA022288 (RDW) and K23 DA035297 (RKM).

References

1. Northrup TF, Stotts AL, Green C, et al. Opioid withdrawal, craving, and use during and after outpatient buprenorphine stabilization and taper: a discrete survival and growth mixture model. Addict Behav. 2015; 41:20–8. [PubMed: 25282598]
2. McDonald LJ, Griffin ML, Kolodziej ME, Fitzmaurice GM, Weiss RD. The impact of drug use in social networks of patients with substance use and bipolar disorders. Am J Addict. 2011; 20:100–5. [PubMed: 21314751]
3. McHugh R, Fitzmaurice G, Carroll K, et al. Assessing craving and its relationship to subsequent prescription opioid use among treatment-seeking prescription opioid dependent patients. Drug Alcohol Depend. 2014; 145:121–6. [PubMed: 25454409]
4. Brady KT, Sinha R. Co-occurring mental and substance use disorders: The neurobiological effects of chronic stress. Am J Psychiatry. 2005; 162:1483–93. [PubMed: 16055769]
5. Duckworth AL, Peterson C, Matthews MD, Kelly DR. Grit: Perseverance and passion for long-term goals. J Pers Soc Psychol. 2007; 92:1087–101. [PubMed: 17547490]
6. Duckworth AL, Quinn PD. Development and validation of the Short Grit Scale (Grit-S). J Pers Assess. 2009; 91:166–74. [PubMed: 19205937]
7. Shechtman N, DeBarger AH, Dornsife C, Rosier S, Yarnall L. Promoting grit, tenacity, and perseverance: Critical factors for success in the 21st century (DRAFT FOR PUBLIC COMMENT). Washington, DC: U.S. Department of Education, Department of Educational Technology; 2013.
8. Duckworth AL, Kirby T, Gollwitzer A, Oettingen G. From fantasy to action: Mental contrasting with implementation intentions (MCII) improves academic performance in children. Soc Psychol Personal Sci. 2013; 4:745–53. [PubMed: 25068007]
9. Eskreis-Winkler L, Shulman EP, Beal SA, Duckworth AL. The grit effect: Predicting retention in the military, the workplace, school and marriage. Front Psychol. 2014a; 5:1–12. [PubMed: 24474945]
10. Kleiman EM, Adams LM, Kashdan TB, Riskind JH. Gratitude and grit indirectly reduce risk of suicidal ideations by enhancing meaning in life: Evidence for a mediated moderation model. J Res Pers. 2013; 47:539–46.
11. Salles A, Cohen GL, Mueller CM. The relationship between grit and resident well-being. Am J Surg. 2014; 207:251–4. [PubMed: 24238604]
12. Eskreis-Winkler L, Shulman EP, Duckworth AL. Survivor mission: Do those who survive have a drive to thrive at work? J Posit Psychol. 2014b; 9:209–18. [PubMed: 24748898]
13. Von Culin KR, Tsukayama E, Duckworth AL. Unpacking grit: Motivational correlates of perseverance and passion for long-term goals. J Posit Psychol. 2014; 9:306–12.
14. Loree AM, Lundahl LH, Ledgerwood DM. Impulsivity as a predictor of treatment outcome in substance use disorders: Review and synthesis. Drug Alcohol Rev. 2015; 34:119–34. [PubMed: 24684591]
15. Nielsen DA, Ho A, Bahl A, et al. Former heroin addicts with or without a history of cocaine dependence are more impulsive than controls. Drug Alcohol Depend. 2012; 124:113–20. [PubMed: 22265192]
16. Martin ED, Sher KJ. Family history of alcoholism, alcohol use disorders and the five-factor model of personality. J Stud Alcohol. 1994; 55:81–90. [PubMed: 8189730]
17. Credé M, Tynan MC, Harms PD. J Pers Soc Psychol. American Psychological Association; 2016. Much Ado About Grit: A Meta-Analytic Synthesis of the Grit Literature; 1–20.

18. Hill PL, Burrow AL, Bronk KC. Persevering with positivity and purpose: An examination of purpose commitment and positive affect as predictors of grit. Journal of Happiness Studies. 2016; 17:257–69.
19. Cacciola JS, Alterman AI, Dephilippis D, et al. Development and initial evaluation of the Brief Addiction Monitor (BAM). J Subst Abuse Treat. 2013; 44:256–63. [PubMed: 22898042]
20. Kirby KN, Marakovic NN. Delay-discounting probabilistic rewards: Rates decrease as amounts increase. Psychon Bull Rev. 1996; 3:100–4. [PubMed: 24214810]
21. Bickel WK, Koffarnus MN, Moody L, Wilson AG. The behavioral- and neuro-economic process of temporal discounting: A candidate behavioral marker of addiction. Neuropharmacology. 2014; 76(Pt B):518–27. [PubMed: 23806805]
22. Kirby KN. One-year temporal stability of delay-discount rates. Psychon Bull Rev. 2009; 16:457–62. [PubMed: 19451368]
23. Weiss RD, Griffin ML, Mazurick C, et al. The relationship between cocaine craving, psychosocial treatment, and subsequent cocaine use. Am J Psychiatry. 2003; 160:1320–5. [PubMed: 12832248]
24. McLaughlin GH. SMOG grading — a new readability formula. Journal of Reading. 1969; 12:639–46.
25. Duckworth AL, Quinn PD, Seligman MEP. Positive predictors of teacher effectiveness. J Posit Psychol. 2009; 4:540–7.
26. Cohen J. A power primer. Psychol Bull. 1992; 112:155–9. [PubMed: 19565683]
27. Sigmon SC. Characterizing the emerging population of prescription opioid abusers. Am J Addict. 2006; 15:208–12. [PubMed: 16923666]
28. Dreifuss JA, Griffin ML, Frost K, et al. Patient characteristics associated with buprenorphine/naloxone treatment outcome for prescription opioid dependence: results from a multisite study. Drug Alcohol Depend. 2013; 131:112–8. [PubMed: 23333292]
29. Schuman-Olivier Z, Weiss RD, Hoeppner BB, Borodovsky J, Albanese MJ. Emerging adult age status predicts poor buprenorphine treatment retention. J Subst Abuse Treat. 2014; 47:202–12. [PubMed: 24953168]
30. van der Plas EA, Crone EA, van den Wildenberg WP, Tranel D, Bechara A. Executive control deficits in substance-dependent individuals: A comparison of alcohol, cocaine, and methamphetamine and of men and women. J Clin Exp Neuropsychol. 2009; 31:706–19. [PubMed: 19037812]
31. Kirby KN, Petry NM. Heroin and cocaine abusers have higher discount rates for delayed rewards than alcoholics or non-drug-using controls. Addiction. 2004; 99:461–71. [PubMed: 15049746]
32. Hanson KL, Luciana M, Sullwold K. Reward-related decision-making deficits and elevated impulsivity among MDMA and other drug users. Drug Alcohol Depend. 2008; 96:99–110. [PubMed: 18384979]
33. Boog M, Goudriaan AE, Wetering BJ, Polak M, Deuss H, Franken IH. Rash impulsiveness and reward sensitivity as predictors of treatment outcome in male substance dependent patients. Addict Behav. 2014; 39:1670–5. [PubMed: 24837083]
34. Passetti F, Clark L, Mehta MA, Joyce E, King M. Neuropsychological predictors of clinical outcome in opiate addiction. Drug Alcohol Depend. 2008; 94:82–91. [PubMed: 18063322]
35. Kelly DR, Matthews MD, Bartone PT. Grit and hardiness as predictors of performance among West Point cadets. Mil Psychol. 2014; 26:327–42.
36. Lejuez CW, Paulson A, Daughters SB, Bornovalova MA, Zvolensky MJ. The association between heroin use and anxiety sensitivity among inner-city individuals in residential drug use treatment. Behav Res Ther. 2006; 44:667–77. [PubMed: 16002042]
37. Lejuez CW, Zvolensky MJ, Daughters SB, et al. Anxiety sensitivity: a unique predictor of dropout among inner-city heroin and crack/cocaine users in residential substance use treatment. Behav Res Ther. 2008; 46:811–8. [PubMed: 18466878]
38. Dunn JGH, Gotwals JK, Dunn JC. An examination of the domain specificity of perfectionism among intercollegiate student-athletes. Pers Individ Dif. 2005; 38:1439–48.
39. Sirota AD, Rohsenow DJ, Dolan SL, Martin RA, Kahler CW. Intolerance for discomfort among smokers: Comparison of smoking-specific and non-specific measures to smoking history and patterns. Addict Behav. 2013; 38:1782–7. [PubMed: 23254229]

40. Tsukayama E, Duckworth AL, Kim B. Resisting everything except temptation: Evidence and an explanation for domain-specific impulsivity. Eur J Pers. 2012; 26:318–34.

41. Magen E, Kim B, Dweck CS, Gross JJ, McClure SM. Behavioral and neural correlates of increased self-control in the absence of increased willpower. Proc Natl Acad Sci U S A. 2014; 111:9786–91. [PubMed: 24958892]

42. Oaten M, Cheng K. Longitudinal gains in self-regulation from regular physical exercise. Br J Health Psychol. 2006; 11:717–33. [PubMed: 17032494]

43. Brown RA, Bloom EL, Hecht J, Moitra E, Herman DS, Stein MD. A pilot study of a distress tolerance treatment for opiate-dependent patients initiating buprenorphine: rationale, methodology, and outcomes. Behav Modif. 2014; 38:730–59. [PubMed: 24973401]

TABLE 1

Sociodemographic and clinical characteristics associated with the Grit-S

Participant characteristic		Mean	SD	d	t/F	p-value
Sociodemographic[a]						
Gender	Male (n=461)	3.15	0.65	.07	−0.82	.41
	Female (n=209)	3.10	0.69			
Race	White (n=629)	3.13	0.66	−.09	0.53	.60
	Other (n=35)	3.19	0.69			
Marital status	Never married (n=358)	3.01	0.64	−.41	5.45	<.001
	Other (n=314)	3.28	0.66			
Employment	Yes (n=311)	3.25	0.66	.34	−4.44	<.001
	No (n=345)	3.03	0.65			
Clinical						
Used primary substance, past month[b]	≤15 days (n=155)	3.13	0.64	<.01	0.02	.99
	>15 days (n=517)	3.13	0.67			
Used heroin, past month	Yes (n=230)	2.98	0.63	−.36	4.48	<.001
	No (n=443)	3.22	0.66			
Co-occurring psychiatric disorder	Present (n=456)	3.07	0.65	−.28	3.42	.001
	Absent (n=217)	3.26	0.67			
Prior detoxification	Yes (n=297)	3.16	0.65	.10	−1.10	.27
	No (n=196)	3.09	0.68			
Primary substance use disorder [c]						
	Alcohol (393)	3.21	0.68	8.62	<.001	
	Opioids (268)	3.04	0.62			
	Other (12)	2.66	0.53			

[a] For the continuous variable of age, effect size r=.24, p<.001

[b] For frequency used primary substance analyzed as an ordinal variable, r=−.03, p=.50.

[c] Effect sizes & post hoc comparisons:

for alcohol vs. opioid use disorder, ES=.18; t(659)=3.28, p=.001; and

for alcohol vs. other substance use disorder, ES=.60; t(403)=2.81, p=.01

TABLE 2

Sociodemographic and clinical predictors of Grit-S score in a linear regression model of patients with substance use disorder (N=652)

Participant characteristic	B[a]	SE	d[a]	t	p-value
Sociodemographic					
Male	.05	.05	.08	0.94	<.35
Age	.01	<.01	.13	3.44	.001
Never married	−.10	.06	−.15	−1.55	.12
Employed	.17	.05	.27	3.36	.001
Clinical					
Heroin use, past month	−.08	.06	−.12	−1.23	<.22
Co-occurring psychiatric disorder	−.20	.05	−.31	−3.64	<.001

[a]Cohen's d for dichotomous variables and a partial correlation for age