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The Role of Grit in a Self-directed Weight Control Intervention

Molly Wright

THE ROLE OF GRIT IN A SELF-DIRECTED WEIGHT CONTROL INTERVENTION

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Molly Wright

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Dr. Paul Fuglestad

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Dr. Lori Lange, Chair

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Table of Contents

List of Tables and Figures

Abstract

This study was conducted to investigate the possible relationship between an individual's level of the trait of GRIT (Duckworth et al., 2007) and the effectiveness of a health promotion and weight control intervention. Participants completed an initial online survey that consisted of the GRIT scale, demographic questions (age, gender, ethnicity), and health behavior questions, along with a baseline body measurement. Participants were randomly assigned to the control group (n = 34) or one of two treatment groups (n = 57). Those assigned to the treatment groups completed a 1 hour educational session and received intervention packets, while those in the control group only completed the survey. Participants completed another survey at 3 months and self-reported their weight. A mixed-design analysis of variance of weight change from baseline to 3 months was conducted using treatment group (treatment vs. control), GRIT score, and the interaction of treatment and GRIT score as predictor variables. A significant interaction was found between participants' Grit score and condition on weight change, (p = .034). Participants that scored higher on the Grit Scale tended to lose more weight in the treatment condition compared to those who scored lower. Additional analyses using each of the Grit subscales found that the Grit consistency subscale interacted with treatment condition (p = .036), but the Grit effort subscale did not. The results suggest that the qualities unique to the Grit consistency subscale may be worth considering in the context of health interventions.

The Role of Grit in a Self-directed Weight Control Intervention

Obesity and overweight have been estimated to cause 3.4 million deaths per year and 3.9% of years of life lost worldwide and has significantly increased over the last three decades (Ng et al., 2014). The prevalence of obesity in the United States in 2013-2014 had reached 35 percent among men and 40 percent among women (Flegal, Kruszon-Moran, Carroll, Fryar, & Ogden, 2016). Considering all of the health consequences associated with obesity (e.g., heart disease, diabetes, and stroke) and that it one of the most pressing public health concerns today, there have been many programs and interventions designed to decrease the prevalence of obesity. However, the effectiveness of these programs appears to have mixed results.

In a meta-analysis of the effectiveness of health interventions on physical activity, nutrition, and weight change, Plotnikoff et.al. (2015) found that health interventions in college aged populations were effective in increasing physical activity in 18 out of 29 studies. However, of the studies pertaining to nutrition, only 12 out of 24 of the studies found significant improvement, and of the studies looking at weight loss, only 4 out of 12 studies reported a significant difference following an intervention. In addition, a meta-analysis by Johnson, Scott-Sheldon, & Carey (2010) addressing health behavior change found that of the multiple health domains looked at, nutrition and physical activity had some of the smallest effect sizes ($d = .20$) compared to stress management ($d = .45$) or participation in health services ($d = .35$).

Considering the limited effectiveness of many traditional interventions concerning dietary changes and weight loss, it is understandable why many researchers are looking to individual differences in personality and motivations that may contribute to the effectiveness of weight loss programs. While many have found that self-efficacy and/or conscientiousness are significantly associated with lower weight and weight loss (O'Connell, & Sheikh, 2014; Sutin, &

Terracciano, 2016), many have failed to replicate these findings over a longer time period or post treatment (Singer, Swencionis, & Cimino, 2017; Linde, Rothman, Baldwin, & Jeffery, 2006). It seems that although traits having to do with determination, self-discipline, and consistency are important, a dimension of personality that is comprised of these qualities despite setbacks and over an extended period of time would be more predictive of long term weight change.

The construct of Grit (Duckworth, Peterson, Matthews, & Kelly, 2007), defined as passion and perseverance for long term goals, could possibly be a dimension of personality that distinguishes who is or is not successful at losing and maintaining weight loss. The Grit scale was developed to identify a factor that contributed to individuals' success independent of talent or IQ. Duckworth and colleagues found that higher scores on their scale were indeed predictive of success in several different populations. The results of a first study on a diverse sample of adults aged 25 and older found that after controlling for age, those individuals with higher educational attainment had higher Grit scores than those with less education. In another study using undergraduates from a large northeastern university, Duckworth et al. (2007) found that participants' Grit scores were positively associated with GPA even when controlling for SAT scores ($r = .34$). Interestingly, Grit scores were actually negatively associated with SAT scores ($r = -.20$), suggesting that Grit is indeed a separate construct from IQ.

Duckworth et al. (2007) also examined whether Grit was predictive of retention rates among West Point freshmen cadets—a program that is notorious for its vigorous training schedule and high dropout rate. They predicted that Grit would be associated with the retention rate over their first summer at West Point and that it would be positively associated with military performance score and academic GPA one year later among those cadets that did not dropout. The results of their analysis found that Grit was not related to participants' SAT score,

Leadership Potential Score, high school class rank, or their score on a Physical Aptitude Exam. However, it was significantly related to self-control. Grit was found to be the best predictor of retention rate over the summer, with those scoring a standard deviation above average being 60% more likely to stay in the program than those scoring one standard deviation below and those scoring a standard deviation above for self-control only being 50% more likely to stay. However, self-control and Whole Candidate Score were better predictors of academic GPA in the following year than Grit, suggesting that Grit is more predictive of tasks that require perseverance when many other individuals tend to give up.

The final study by Duckworth et al. (2007) looked at the relationship between Grit and whether participants of the National Spelling Bee made it to the final round and how many times they had competed in the final competition in the past. Grit and age were significant predictors of making it to the final round. In addition, when self-control was added as a predictor, Grit and age were still the only significant predictors. Hours that contestants spent studying was found to mediate the relationship found between Grit and final round participation as Grit was found to be a significant predictor of study time when age was held constant. These results are particularly interesting, since they imply how Grit affects performance. However, while the results of Duckworth and Peterson's studies are certainly intriguing, it is interesting to consider whether Grit predicts success in other non-academic realms.

Grit's relationship to a health behavior was looked at in a study by Reed, Pritschet, and Cutton (2013), specifically in the form of exercise behavior and stages of the Transtheoretical Model of health behavior change. Their analysis found a predicted increase in exercise frequency through the five stages of the model (precontemplation, contemplation, preparation, action, and maintenance), and that both Grit and conscientiousness were significantly positively associated

with moderate and high intensity exercise but not low intensity. In addition, Grit significantly predicted exercise in the later stages (i.e., preparation, action, and maintenance) even after controlling for age, gender, BMI, and athletic status. However, conscientiousness failed to reach significance in this analysis for any stage. This study not only confirms that Grit can be a significant predictor in non-academic domains, but for health behavior change as well.

Silvia, Eddington, Beaty, Nusbaum, & Kwapil (2013) found that Grit is even related to physiological activity when individuals are caring out a task that requires mental effort. Specifically, they predicted that grittier individuals would have higher sympathetic cardiac processes while completing a challenging mental task then less gritty individuals. Cardiac autonomic activity was measured using an electrocardiogram (ECG) and an impendence cardiogram (ICG) at baseline and during the task, and Grit was measured using the Perseverance of Effort subscale and the Consistency of Interest subscales separately. The results of their multilevel analysis found that the Perseverance subscale was significantly associated with higher sympathetic activity and the Consistency subscale was associated with less sympathetic activity, implying that more effort was used by the people with higher perseverance scores. However, the researchers also concluded that those with higher Consistency scores placed less importance on the mental task since it was outside of their focused interests, therefore putting in less effort. The results of their study point out the differences between the two subscales and imply that these should be taken into consideration when evaluating Grit's predictive capabilities.

Despite these findings that Grit was predictive of academic achievement (Duckworth et al., 2007), retention rate in military school (Duckworth et al., 2007), likelihood of making the spelling bee final round (Duckworth et al., 2007), exercise behavior (Reed et al., 2013), and even sympathetic cardiac activity during a difficult mental task (Silvia et al., 2013) the construct has

never been applied to the effectiveness of health interventions for weight control. Considering the problem of obesity, particularly in the United States (Flegal et al., 2016), and the importance of individual differences on weight (Sutin & Terracciano, 2016), the following study was conducted to investigate the possible relationship between an individual's level of Grit and weight change in the context of a health promotion and weight control intervention. It is anticipated that those that score higher on the Grit Scale will tend to lose more weight in response to a weight control intervention than those who score lower.

Method

Participants

Two hundred and two (44 male and 158 female) college students and staff from a southeastern university with a mean age of 25 ($SD = 9.05$) volunteered to take part in a health intervention program and fill out online surveys on Qualtrics prior to the intervention and three months after. The majority of participants were white (79%), with 15% of participants identifying as African American and 16% identifying as Hispanic/Latino. Two hundred and two participants filled out the baseline survey information, 150 completed an initial body measurement, and 94 participated in the three month follow up survey. Participants were given a $15 gift card as compensation at baseline and 3 months.

Measures

The Grit Scale (Grit-O; Duckworth et al., 2007) was used to measure participants' self-reported level of Grit, also defined as perseverance and passion for long term goals (see the Appendix for the full scale). The Grit scale consists of 12 items divided evenly into two subscales: Consistency of Interest (e.g. "I have I have been obsessed with a certain idea or project for a short time but later lost interest" [reverse scored]) and Perseverance of Effort (e.g.

"I have overcome setbacks to conquer an important challenge"). Responses to the 12 statements are measured on a 5 point Likert scale that ranges from *strongly disagree* to *strongly agree*, with higher scores representing more individual "grittiness." The Grit scale has shown adequate internal consistency for the overall scale and each subscale (α's > .78; Duckworth et al., 2007). In the present study, the overall scale and subscales were internally consistent (overall α = .81; Consistency α = .76; Effort α = .75). Mean scores were calculated for the overall scale and each subscale (overall M = 3.59; Consistency M = 3.15; Effort M = 4.03).

Procedure

Participants completed an initial survey on Qualtrics consisting of the Grit scale, demographic questions (age, gender, ethnicity, year in school), and health behavior questions. They also completed a baseline body measurement visit where they were weighed by study staff and had their blood drawn to assess lipids and glucose. Participants were randomly assigned to the control group or one of two treatment groups.[1] In the treatment conditions, participants completed a 1 hour educational session and received intervention packets that contained information about healthy food choices, exercise recommendations, strategies for successful weight control, dealing this lapses, and setting goals. Participants were asked to keep a daily log of what they ate and how much they exercised. They also received email reminders bi-weekly throughout the duration of the program to encourage them to stay on track. Those in the control group only filled out the survey and completed the body measurement visit. At 3 months, participants completed another survey on Qualtrics where they self-reported their weights.

Results

Analysis Plan

A mixed-design analysis of variance of weight change from baseline to 3 months was conducted using treatment group (treatment versus control), Grit score, and the interaction of treatment and Grit score as predictor variables. Further analyses were run using each of the Grit subscales. Age and gender were used as covariates in all analyses.

Overall Grit

As main effects, both Grit Scores, $F(1,85) = 3.04$, $p = .085$, and condition, $F(1,85) = 3.71$, $p = .057$, were marginal predictors of weight change. However, there was a significant interaction effect between participants' Grit Score and condition on weight change, $F(1,85) = 4.62$, $p = .034$. As seen in Figure 1, participants who scored higher on the Grit Scale (evaluated at 1 *SD* above the mean) tended to lose more weight in the treatment condition compared to those who scored lower on the Grit Scale (evaluated at 1 *SD* below the mean). In the treatment condition, those higher in grit were estimated to lose 3.63 lb on average, whereas those lower in grit were estimated to gain 0.86 lb on average. Grit did not appear to predict weight in the control group: those higher in Grit were estimated to gain 0.97 lb on average, and those lower in Grit were estimated to gain 0.57 lb on average.

Grit Effort and Consistency

To explore the independent effects of each Grit subscale, the above analysis was rerun using each of Grit Effort and Consistency. Grit Effort did not predict weight change as a main effect, $F(1,85) = 0.92$, $p = .34$, nor did it interact with treatment condition, $F(1,85) = 1.25$, $p = .27$. Grit Consistency did not predict weight change as a main effect, $F(1,85) = 2.28$, $p = .14$, but

did interact with treatment condition, $F(1,85) = 4.54$, $p = .036$. Thus, the effects of overall Grit reported above appear to be driven by Grit Consistency rather than Grit Effort.

Discussion

The goal of this study was to address whether individual differences in the trait of Grit were associated with the outcome of a brief, self-directed weight control intervention. As hypothesized, the results suggest that an individual's level of Grit is indeed related to the amount of weight loss achieved following a health intervention. The participants that were assigned to a treatment group lost significantly more weight than those in the control condition if they also scored higher on the trait of Grit. Interestingly, it appears that an individual's score on the Consistency of Interests subscale was more influential concerning the impact of this health intervention. This contradicts findings from previous studies (Bowman, Hill, Denson, & Bronkema, 2015; Muenks, Wigfield, Yang, & O'Neal, 2017; Wolters & Hussain, 2015) that found that the Perseverance of Effort subscale was a better predictor of educational and academic outcomes. While Perseverance of Effort may be a more important factor of success in academic realms, our results suggest that Consistency of Interests over time is what matters for achieving weight loss goals. It could be that it matters more that a person is able to stay on the health plan they committed to for a longer period of time then how much effort they put in to it. Although effort and making lifestyle changes is certainly important, the ability to stay focused and on track seems to be more vital in the context of losing weight. This is understandable considering that many people attempting to lose weight start out putting a lot of effort into it but quickly lose interest over time and stop following their plan, which is consistent with the limited effectiveness of health interventions on weight loss found by Plotnikoff et.al (2015). In addition, according to the results of a study by Von Culin, Tsukayama, and Duckworth (2014) investigating Grit and

motivation orientations, Grit Consistency was inversely associated with an orientation toward pleasure. Since the Grit Consistency subscale was found to be the driving factor behind this association, it is possible that the Consistency subscale is a better reflection of an individual's ability to sacrifice immediate pleasure to achieve their longer term goals. Considering the results of this study, it would be beneficial to include measures of motivation and self-control to further look at this possibility.

The results of this study have various practical implications for those designing programs for health behavioral change. By assessing an individual's level of Grit prior to the program, it would be possible to identify people that might need extra encouragement or reminders to stay on track. Additionally, the type of program could be tailored to the individual according to how they scored on the Grit Scale. Finally, for those that score lower, particularly on the Consistency subscale, it would be useful to have them increase their Grit by partaking in a training program. However, an effective program to increase Grit has yet to be developed (Crede et al., 2016), even though the effectiveness of programs for related constructs such as resiliency (Kent, Rivers, & Wrenn, 2015; Smith, Shatté, Perlman, Siers, & Lynch, 2018) have shown promise. However, more research is needed first to find whether it is possible to increase a person's level of Grit or if it is a relatively stable trait.

There were several limitations to this study, starting with the small number of participants due to the attrition between the initial survey and the 3 month follow up. Additionally, although participants were weighed and measured at baseline, weight was self-reported at the 3 month follow up survey following the intervention. Consequently, this limits the reliability of the results considering that participants could have underreported their weight at the 3 month follow-up, although there is no reason to think self-reported weights would vary by Grit. Another limitation

to the present study was the relatively short time period between the initial survey and follow up, as a longer time period would be needed to determine if the resulting weight loss was sustainable long term. Finally, it is not clear whether the weight loss seen in this study is due to better food choices, different sleeping patterns, more physical activity, or other health behavior change. It would be beneficial to examine what specific health behavior change(s) contributed to the higher weight loss of grittier individuals in future studies.

Conclusion

Overall, the findings of the present study that grittier individuals lost significantly more weight gives evidence to Grit's predictive abilities beyond the academic and performance realms examined in past studies (Duckworth et al., 2007; Reed et al., 2013; Silvia et al., 2013). In addition, considering that Grit Consistency was the driving force behind this association, this suggests the importance of analyzing the two subscales independently in future studies pertaining to health behavior. Although more research is needed to verify these results, Grit and particularly Grit Consistency could be an important individual difference variable to consider for weight-loss interventions in the future.

References

Bowman, N. A., Hill, P. L., Denson, N., & Bronkema, R. (2015). Keep on truckin' or stay the course? Exploring grit dimensions as differential predictors of educational achievement, satisfaction, and intentions. *Social Psychological & Personality Science*, *6*(6), 639-645. doi:10.1177/1948550615574300

Credé, M., Tynan, M. C., & Harms, P. D. (2017). Much ado about grit: A meta-analytic synthesis of the grit literature. *Journal of Personality & Social Psychology*, *113*(3), 492-511. doi:10.1037/pspp0000102

Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the Short Grit Scale (GRIT–S). *Journal of Personality Assessment*, *91*(2), 166-174. doi:10.1080/00223890802634290

Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality & Social Psychology*, *92*(6), 1087-1101. doi:10.1037/0022-3514.92.6.1087.

Flegal, K. M., Kruszon-Moran, D., Carroll, M. D., Fryar, C. D., & Ogden, C. L. (2016). Trends in obesity among adults in the United States, 2005 to 2014. *JAMA: Journal of the American Medical Association*, *315*(21), 2284-2291. doi:10.1001/jama.2016.6458

Johnson, B. T., Scott-Sheldon, L. A., & Carey, M. P. (2010). Meta-Synthesis of Health Behavior Change Meta-Analyses. *American Journal of Public Health*, *100*(11), 2193-2198. doi:10.2105/AJPH.2008.155200

Kent, M., Rivers, C. T., & Wrenn, G. (2015). Goal-Directed Resilience in Training (GRIT): A Biopsychosocial Model of Self-Regulation, Executive Functions, and Personal Growth

(Eudaimonia) in Evocative Contexts of PTSD, Obesity, and Chronic Pain. *Behavioral Sciences (2076-328X)*, *5*(2), 264-304. doi:10.3390/bs5020264

Linde, J. A., Rothman, A. J., Baldwin, A. S., & Jeffery, R. W. (2006). The impact of self-efficacy on behavior change and weight change among overweight participants in a weight loss trial. *Health Psychology*, *25*(3), 282-291. doi:10.1037/0278-6133.25.3.282

Muenks, K., Wigfield, A., Yang, J. S., & O'Neal, C. R. (2017). How true is grit? Assessing its relations to high school and college students' personality characteristics, self-regulation, engagement, and achievement. *Journal of Educational Psychology*, *109*(5), 599-620. doi:10.1037/edu0000153

Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., & ... Oti, S. O. (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: A systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*, *384*(9945), 766-781. doi:10.1016/S0140-6736(14)60460-8

O'Connell, M., & Sheikh, H. (2014). Personality and self-control: The curious case of successful weight loss. In A. M. Columbus, A. M. Columbus (Eds.), *Advances in Psychology Research, Vol. 99* (pp. 131-141). Hauppauge, NY, US: Nova Science Publishers.

Plotnikoff, R. C., Costigan, S. A., Williams, R. L., Hutchesson, M. J., Kennedy, S. G., Robards, S. L., & ... Germov, J. (2015). Effectiveness of interventions targeting physical activity, nutrition and healthy weight for university and college students: A systematic review and meta-analysis. *The International Journal of Behavioral Nutrition & Physical Activity*, *12*.

Reed, J., Pritschet, B. L., & Cutton, D. M. (2013). Grit, conscientiousness, and the transtheoretical model of change for exercise behavior. *Journal of Health Psychology*, *18*(5), 612-619. doi:10.1177/1359105312451866.

Silvia, P. J., Eddington, K. M., Beaty, R. E., Nusbaum, E. C., & Kwapil, T. R. (2013). Gritty people try harder: Grit and effort-related cardiac autonomic activity during an active coping challenge. *International Journal of Psychophysiology*, *88*(2), 200-205. doi:10.1016/j.ijpsycho.2013.04.007.

Singer, A., Swencionis, C., & Cimino, C. (2017). Motivation, self-efficacy and weight Lloss in a randomized controlled weight loss intervention. *New School Psychology Bulletin*, *14*(1), 1-11.

Smith, B., Shatté, A., Perlman, A., Siers, M., & Lynch, W. D. (2018). Improvements in resilience, stress, and somatic symptoms following online resilience training: A dose–response effect. *Journal of Occupational & Environmental Medicine*, *60*(1), 1-5. doi:10.1097/JOM.0000000000001142

Sutin, A. R., & Terracciano, A. (2016). Personality traits and body mass index: Modifiers and mechanisms. *Psychology & Health*, *31*(3), 259-275. doi:10.1080/08870446.2015.1082561

Von Culin, K. R., Tsukayama, E., & Duckworth, A. L. (2014). Unpacking grit: Motivational correlates of perseverance and passion for long-term goals. *The Journal of Positive Psychology*, *9*(4), 306-312. doi:10.1080/17439760.2014.898320

Wolters, C. A., & Hussain, M. (2015). Investigating grit and its relations with college students' self-regulated learning and academic achievement. *Metacognition & Learning*, *10*(3), 293-311. doi:10.1007/s11409-014-9128-9

Footnotes

1. Although not the focus of the present investigation, the messages and activities in the treatment groups were framed in terms of promotion focus (emphasizing the benefits of engaging in target behaviors) or prevention focus (emphasizing the prevention of negative outcomes by engaging in target behaviors; Higgins, 1997). The content and duration of the intervention groups was otherwise identical and they were treated as one treatment group in the present analysis.

Appendix

Grit Scale

(Rated on a 5-point scale from *not at all like me* to *very much like me*)

2,3,5,7,8,11=Consistency of Interest, 1,4,6,9,10,12=Perseverance of Effort.)

1. I have overcome setbacks to conquer an important challenge.

2. New ideas and projects sometimes distract me from previous ones.*

3. My interests change from year to year.*

4. Setbacks don't discourage me.

5. I have been obsessed with a certain idea or project for a short time but later lost interest.*

6. I am a hard worker.

7. I often set a goal but later choose to pursue a different one.*

8. I have difficulty maintaining my focus on projects that take more than a few months to complete.*

9. I finish whatever I begin.

10. I have achieved a goal that took years of work.

11. I become interested in new pursuits every few months.*

12. I am diligent.

* =*reverse scored*

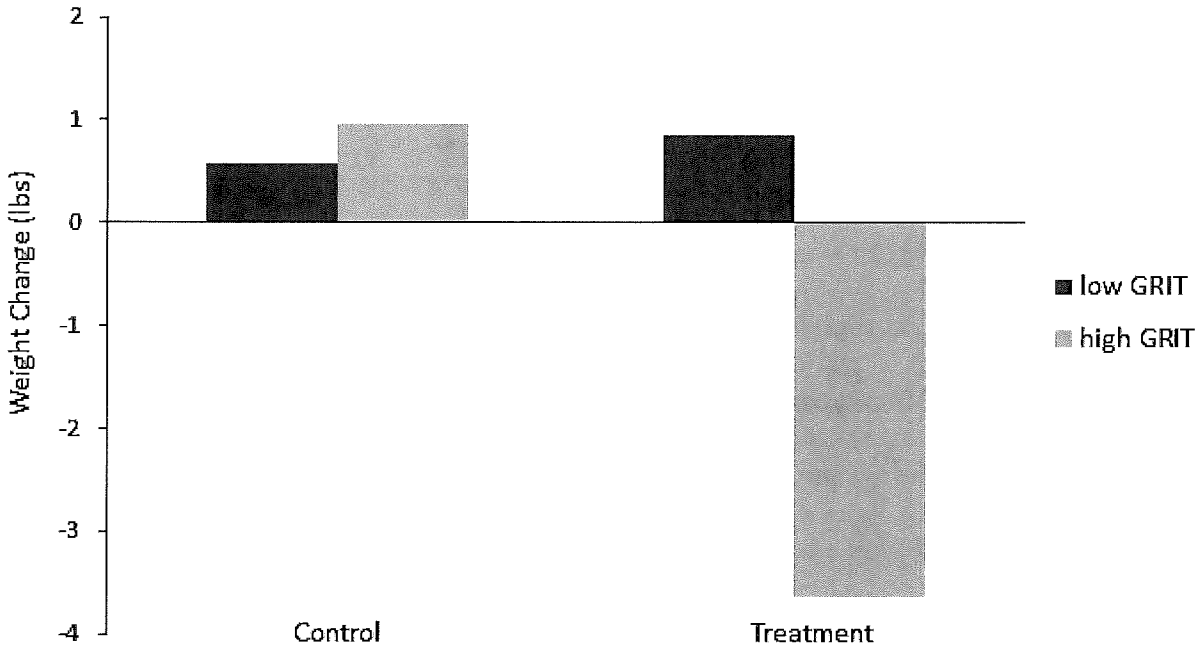

Figure 1. Predicted weight change from baseline to 3 months by condition and Grit score (estimated at ±1 *SD*).