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Initial Evaluation of a Single-Item Screener to Assess Problematic Dietary Restriction

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Abstract

Purpose—Existing measures to assess restrictive eating conflate both problematic and healthy restrictive practices, and perceived restriction without reduced caloric intake. In this study, we devised and tested the utility of a single-item screener, the Dietary Restriction Screener (DRS), to assess problematic restriction.

Methods—94 individuals completed the DRS and measures assessing eating disorder symptoms, preoccupations, and rituals. Participants were given access to an ad libitum single-item test snack. Linear regressions were conducted to evaluate whether the DRS predicted eating disorder symptoms and snack intake after controlling for relevant covariates and a commonly-used restraint scale.

Results—The DRS significantly predicted eating disorder symptoms ($p < .001$), preoccupations ($p < .001$), and rituals ($p = .001$), and snack intake ($p = .017$) above covariates and an existing restraint scale.

Conclusions—The DRS may offer added utility in predicting problematic dietary restriction over existing measures, and is beneficial due to brevity and low burden.

Keywords

Restriction; Restraint; Dieting; Assessment

There is evidence that some forms of dietary restriction (i.e., reductions in caloric intake for weight and body image purposes [1]) are problematic. Individuals engaging in extreme dieting practices are 18 times more likely to develop an eating disorder [2], and at risk for excess weight gain [3]. It is important to identify individuals engaging in unhealthy restrictive eating, characterized by behavioral inhibition over eating coupled with disordered eating attitudes [1], and distinguish them from individuals engaging in healthy weight management, in order to allow for early and effective prevention and/or intervention. However, there long has been confusion regarding the definition and measurement of restrictive eating and, therefore, there are no measures that exclusively identify problematic dietary restriction.

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Two issues within the literature on restrictive eating have contributed to definitional and measurement confusion. The first pertains to the question of whether restriction is inherently problematic. As noted, self-reported restriction using existing measures has been linked to the development of eating disorders and obesity [2-3]. Yet, professional weight-loss programs, which include provision of a restrictive diet, have been associated with significant improvements in weight and bulimic symptoms [4-5]. Further, increases in dietary restraint are associated with dieting success among overweight individuals [6-7]. It is probable that different psychological approaches to caloric reduction are responsible for these discrepancies [8], however existing measures do little to distinguish problematic from healthy restriction.

Second, researchers have been unable to identify measures capturing the behavioral component of restriction (i.e., reduced caloric consumption). A number of multi-item measures have been developed to assess restriction, or the related construct of dietary restraint (reflecting intention to restrict), including the Restraint Scale [9], Dutch Restrained Eating Scale [10], Three Factor Eating Questionnaire-Restraint scale [11], and Eating Disorder Examination Restraint Subscale [12]. However, none consistently correlates with short- or long- term caloric intake when objectively assessed through test meal or doubly-labeled water techniques [13-14]. Such scales may be measuring “relative restriction” (eating less than *preferred*) or other cognitive, rather than behavioral, aspects of restriction [14].

Thus, “restrictive eating” has referred to both healthy and unhealthy behavioral inhibition over eating, as well as perceived restriction without reduced intake. Existing multi-item measures collapse together these discrepant experiences. One solution that has been offered to rectify these issues is to use a clearly defined single-item screener assessing whether individuals engage in disordered restriction [15]. However, psychometric concerns have been raised regarding use of single-item measures. The Spearman-Brown formula and reliability theory postulate that multi-item measures capture both true construct variance and measurement error [16]. Assuming random error across a measure, the impact on a multi-item measure should be negligible; however, internal validity cannot be similarly established for a single-item screener. An additional concern is that single-item screeners may not allow the same validity for multifaceted constructs as multi-item measures.

However, there are practical benefits of single-item screeners. Such measures are quick and easy to administer, leading to less burden on participants, researchers, and clinicians, and therefore ideally suited in situations in which time is limited (e.g., screening in primary care) or demands are high (e.g., longitudinal studies). Brevity can also reduce measurement error resulting from participant fatigue [16]. The pragmatic benefits of single-item measures have led some to inquire: “If one question works, why ask several?” [17, p. 344]. Single-item measures have been successfully implemented to measure constructs including depression, self-esteem, and quality of life [16, 18]. In the case of unhealthy dietary restriction, there is an additional benefit of a single-item screener. Existing multi-item restraint measures combine discrepant eating experiences; therefore, a single-item measure may *increase* construct validity since it can narrowly define the experience it seeks to measure, reducing the ambiguity associated with multi-item restraint scales.

In this paper, we conducted an initial examination of the adequacy of a single-item screener to identify individuals engaging in restrictive eating that is both *problematic* and linked to *objective* restriction. We developed a single-item screener, the Dietary Restriction Screener (DRS; See Appendix), to identify individuals engaging in problematic restriction. In order to determine whether the DRS identified individuals engaging in problematic and objective restriction, we examined: 1) Whether the DRS predicted self-reported disordered eating; 2) Whether the DRS predicted objectively measured restrictive eating during a laboratory test snack; 3) How the DRS compared to a frequently-used restraint scale, the Eating Disorder Examination Restraint Subscale (EDE-R) [12], in predicting eating disordered attitudes and objective restriction.

Methods

Participants

Participants were 94 individuals recruited through a psychology department website at a university in the Western United States for a study assessing health behaviors. Inclusion criteria included age ≥ 18 years and endorsement on a food frequency questionnaire of enjoying chocolate at least "somewhat" (i.e., score of 3 on a Likert scale ranging from 1 = not at all to 6 = extremely), to increase the probability that the test snack (i.e., bite-sized chocolate candies) would be appealing. Exclusion criteria included an endorsement of "never" consuming chocolate on the food frequency questionnaire and chocolate allergy. A local institutional review board approved all procedures.

Procedures

Following informed consent, participants were presented with sixteen ounces of a popular brand of bite-sized chocolate candies, which had been weighed on a food scale prior to administration. Candies were placed in a bowl in front of the participant who was then left alone for thirty minutes. During this time, the participant was instructed to consume the snack ad libitum while completing questionnaires on intra- and inter-personal traits (not examined in this study). Participants were provided the rationale that the candies were a token of appreciation for participating and were unaware that the snack was related to the study or consumption would be measured. After completing the questionnaires and test snack, participants had body weight measured and consecutively completed the Eating Disorder Examination [12], Yale Brown Cornell Eating Disorder Scale [19], and DRS with research staff. The DRS was completed last, approximately 1.5 hours following test snack, to reduce bias of test snack consumption on DRS answers. At the end of the study, candies were discretely reweighed to calculate caloric consumption. Researchers debriefed participants regarding the study purpose. During debriefing, researchers confirmed that participants were unaware that intake would be monitored and that they had not removed candies from the container without consuming them.

Measures

Demographics and other covariates—At screening, participants answered questions regarding demographics, including age, gender, and ethnicity. Following DRS administration, participants were asked to rate their hunger level at the beginning of the

experiment on a 10-point Likert scale (0 = not at all hungry to 10 = extremely hungry) in order to examine differences in hunger levels between restricting and non-restricting groups and to statistically control for the impact of hunger on snack intake.

Body Mass Index (BMI)—Participants self-reported height. Weight was measured using an Omron HBF-400 Body Fat Monitor and Scale. Participants removed outer garments and footwear before weighing. BMI was calculated according to standard protocol.

Caloric consumption—Chocolate candies were weighed on a digital scale (Oxo Good Grips Food Scale) before the participant arrived and at the end of the study. Caloric consumption was calculated by subtracting weight of the candies at the end of the experiment from that at the beginning and multiplying the deficit by the number of kilocalories per gram (1 gram = 5 kilocalories). Objective caloric restriction at test snack was operationalized in two ways: 1) Lower kilocalorie intake at test snack; 2) Refraining from consuming any of the test snack.

Disordered eating—The Dietary Restriction Screener (See Appendix) is a single-item screener designed to identify individuals recently engaging in problematic restriction. The DRS provides a thorough description and several representative examples of the construct of unhealthy dietary restriction, and inquires as to whether the participant has eaten in this manner within the past month. Participants endorsing any problematic dietary restriction within the past month are considered the “restricting group” and those denying recent problematic restriction the “non-restricting group.” The DRS takes two minutes to administer. In this study, participants were also asked to describe in detail a representative restrictive episode from the past month, allowing the researchers to further characterize these episodes (see online supplementary material). This description was considered to be separate from the DRS.

Other disordered eating attitudes and behaviors were measured through the following interviews: 1) The Eating Disorder Examination (EDE) [12]: the gold standard of assessment for eating disordered attitudes and behaviors, which provides a global and four subscale scores (i.e., restraint, eating concern, shape concern, and weight concern), as well as information regarding any instances of objective and subjective binge eating and purging; 2) The Yale Brown Cornell Eating Disorder Scale (YBC-EDS) [19]: which assesses the presence and severity of eating disorder-related preoccupations and rituals, yielding a total score and preoccupation and ritual subscale scores. Both the EDE and YBC-EDS have been shown to demonstrate good validity [12; 19-20]. Measures demonstrated excellent internal consistency in this sample (Cronbach’s α = .941 for the EDE and .877 for the YBC-EDS).

Data analysis

Continuous variables were examined for normality. Test snack intake demonstrated an extreme positive skew; therefore, this variable was examined in two ways: 1) as a continuous log transformed variable (improving the regression model fit over analyses performed on the untransformed variable); 2) as a dichotomized categorical variable reflecting whether a participant consumed any of the test snack (yes/no). This variable was examined both

continuously and categorically because in the case of such extreme skew, in which a large number of observations fall in the most extreme end of the distribution (e.g., 0 kilocalories consumed), it has been suggested that dichotomization may allow more appropriate measurement [21]. Incidences of objective and subjective binge eating as identified by the EDE were relatively low within the sample; therefore, these items were combined to form a "loss of control eating" category. Independent t-tests and chi-square analyses were used to initially compare demographic and clinical variables between DRS restricting and non-restricting groups. For these analyses, a Bonferroni corrected alpha level of $p < .003$ was used due to the large number of comparisons (17 total).

In order to examine whether the DRS predicted eating disorder concerns, linear regressions were conducted in which covariates (age, gender, ethnicity, BMI) and the DRS were entered as independent variables and EDE total and subscale scores as dependent variables. For the YBC-EDS, the same regression model was tested with one exception: the EDE-R was added as an independent variable to determine the ability of the DRS to predict eating disorder symptoms above a widely-used restraint measure[1]. Similar binary logistic regressions (including covariates, EDE-R scores, and the DRS as independent variables) were conducted on categorical dependent variables reflecting whether individuals engaged in loss of control eating and purging. For analyses pertaining to restriction at test snack, hunger was also added as a covariate. Therefore, for test snack intake a linear regression was conducted in which covariates (age, gender, ethnicity, BMI, hunger), EDE-R scores, and the DRS were entered as independent variables. A similar binary logistic regression was conducted on test snack intake considered categorically (yes/no).

Results

Sample characteristics

Forty-five participants (47.9%) endorsed problematic dietary restriction within the past month, while 49 (52.1%) reported no recent unhealthy restriction using the DRS. Demographic and clinical characteristics of the sample (untransformed), as well t-test and chi-square results are included in Table 1. Compared to the non-restricting group, the restricting group endorsed greater eating disorder symptoms on EDE and YBC-EDS total and subscale scores, consumed fewer kilocalories at the test snack, and more frequently refrained from consuming any of the test snack. Representative examples of restrictive episodes described by participants are provided in online supplementary material.

Regressions predicting disordered eating

As highlighted in Table 2, controlling for covariates, the DRS was significantly associated with EDE global and subscale scores. Further, the DRS significantly predicted YBC-EDS total and subscale scores after controlling for covariates and EDE-R scores. The DRS was a stronger predictor of YBC-EDS total and ritual subscale scores than the EDE-R.

[1]This and the following regressions were repeated using only scores from the avoidance of eating item of the EDE-R, rather than the full scale, since it could be argued that the avoidance of eating item is designed specifically to capture restriction, while the EDE-R measures other constructs as well. However, regression results did not differ using this methodology. Therefore, only results using the EDE-R are reported.

The model predicting loss of control eating was significant, $\chi^2(6) = 17.66$, $p = .007$. However, controlling for covariates and EDE-R scores, the DRS was not a significant predictor in this model, $\chi^2(1) = 0.008$, $p = .928$. Similarly, while the model predicting purging was significant, $\chi^2(5) = 23.03$, $p = .001$, the DRS did not significantly contribute variance to this model after accounting for covariates and EDE-R scores, $\chi^2(1) = 0.11$, $p = .736$.

Regressions predicting objective restriction

As highlighted in Table 2, the DRS significantly predicted test snack intake after controlling for covariates and EDE-R scores. In contrast, the EDE-R did not significantly predict test snack intake. The model predicting not consuming any of the test snack was also significant, $\chi^2(7) = 21.35$, $p = .003$. In this model, the DRS significantly predicted test snack restriction, $\chi^2(1) = 5.73$, $p = .017$, while EDE-R scores did not, $\chi^2(1) = 0.660$, $p = .417$. The DRS restricting group was approximately five times more likely to refrain from eating the test snack than the non-restricting group.

Discussion

The results suggest that the DRS, a single-item screener designed to assess problematic restrictive eating, is effective in identifying individuals with elevated eating pathology who engage in dietary restriction. The DRS restricting group, compared to the non-restricting group: 1) Endorsed greater eating disorder cognitions and behavior; 2) Consumed fewer kilocalories at a test snack; and 3) Were more likely to refrain from consuming any of the test snack. Further, the DRS outperformed a commonly used restraint scale, the EDE-R, in predicting eating disorder rituals and test snack intake.

The results of this study suggest that the DRS, unlike other measures designed to assess problematic dietary restriction, not only predicts eating disorder symptoms, but also predicts short-term objectively measured caloric intake. Though comparison to other restraint measures is needed, the DRS outperformed the EDE-R in predicting both caloric intake and whether an individual would consume anything during a laboratory test snack. Thus, the DRS may have greater ability to distinguish short-term objective restriction than multi-item measures. Overall, the DRS better predicted measures pertaining to the behavioral, rather than psychological, aspects of restriction compared to the EDE-R. For instance, the EDE-R slightly outperformed the DRS in predicting eating disorder-related preoccupations by the YBC-EDS ($\beta = .394$ versus .360). However, the DRS more effectively predicted YBC-EDS rituals compared to the EDE-R ($\beta = .396$ versus .276). This suggests that one advantage of the DRS over existing restraint scales may be in identifying individuals engaging in restrictive *behavior* as opposed to *intentions*. A screener more accurately identifying individuals engaging in behavioral restriction could aid in differentiating the relative impact of eating disordered attitudes with and without restrictive behaviors.

Thus, despite concerns regarding the utility of a single-item screener compared to multi-item scales, the DRS was more effective than a widely-used restraint scale in characterizing patterns associated with restrictive eating, while taking less time to administer. This suggests that the demonstrated pragmatic value of the DRS in measuring disordered restriction may

be more important than the hypothesized psychometric value of multi-item measures. However, even if the scale did little more than provide a shorter alternative to existing measures, the value of efficiency ought not be overlooked. Over half of individuals exhibiting eating disordered behavior do not seek treatment; therefore, effective screening for disordered eating in routine points of healthcare contact (e.g., primary care) is needed [22]. In such settings, it is necessary to conduct broad screening of multiple problem areas simultaneously; therefore, a single-item screener of problematic restriction would prove more practical than lengthier measures. While the DRS is not intended as a diagnostic tool, it may be useful as a screener to identify individuals warranting further investigation regarding problematic eating. Single-item screeners capturing a wide severity range of potentially problematic behaviors are often used in such settings to determine areas in which further assessment is needed. For instance, the Adolescent Health Review [23], a screening tool designed for behavioral screening of adolescents in primary care, asks the following single-item (yes/no) question to screen for eating disordered behavior: “During the last 30 days, did you vomit, take laxatives, or use diet pills to lose weight or keep from gaining weight?” In the same way, the DRS is promising as an efficient tool suited for situations in which lengthier assessment is impractical.

An important point to consider is whether the DRS measures that which it was designed to measure. One concern that could be raised is that this screener, similar to other measures designed to assess restriction, actually assesses restraint (i.e., intention to restrict). The objective test snack data dispel this concern. Multi-item restraint measures rarely correlate with short-term intake [13], however the DRS predicted short-term intake in this study. Further, according to restraint theory [24], if the DRS were measuring restraint it would be expected to demonstrate associations with loss of control eating and purging, but not necessarily objective restriction. In this study, the opposite pattern of results was detected, suggesting that the DRS does not measure restraint. Further data are needed to determine whether the DRS predicts longer-term restriction. Nonetheless, even predicting short-term unhealthy restriction shows utility for the DRS.

The second concern could be that the DRS identifies individuals engaging in moderate, rather than unhealthy, restrictive practices, since one could argue that consuming less candy is a positive dietary practice. However, there are several lines of evidence suggesting that the DRS measures problematic restriction. First, the descriptions of dietary restriction in the DRS (e.g., “Restrictive eating occurs any time you intentionally eat less *than seems appropriate*”) and examples of restrictive eating (e.g., “eating an apple for dinner”) clearly highlighted restrictive eating as an extreme or disordered behavior. Second, descriptions of restrictive episodes provided by participants reflected good understanding of the extreme or rigid nature of the construct (see online supplementary material). Third, the DRS restricting group scored higher on measures of eating disorder symptoms than the non-restricting group. If the DRS were identifying healthy restriction, the opposite pattern would be expected, as healthy weight management techniques are associated with fewer eating disorder symptoms [4-5]. The EDE scores among the restricting group were lower than those typically reported by individuals with eating disorders. However, similar results have been reported for individuals endorsing loss of control eating; non-clinical samples of individuals with loss of control eating tend to have lower EDE scores compared to eating

disorder samples, however, even infrequent loss of control eating predicts eating disorder development [25]. Thus, the DRS restricting group may also be at elevated risk of developing an eating disorder, even with EDE scores below the clinical range. Future studies ought to investigate the ability of the DRS to prospectively predict eating disorder symptoms and to differentiate restriction in a wide range of eating situations (e.g., multi-item meals).

The study must be considered within its limitations. In order to establish the validity of the DRS, we relied partially on self-report, including of variables such as height, potentially introducing bias. However, a strength of the study is the inclusion of an objective measure of dietary restriction. There is also a possibility that behavior during the test snack impacted answers on the DRS, which was administered later in the experiment. However, the veiled purpose of the snack and extended time between test snack and administration of the DRS make it unlikely that answers on the DRS were profoundly impacted by snack intake.

With regard to the screener itself, we sought to provide several representative examples of problematic restriction. However, by no means are these examples exhaustive. Further, though this screener is much briefer than many other measures designed to capture problematic restriction, it was administered in interview format, arguably increasing administration burden. Participants appeared to easily grasp the construct of unhealthy restriction (see online supplementary material); therefore, it is likely that this screener could be translated to questionnaire format. Finally, this screener clearly captures a range of severity of restrictive eating, from infrequent to regular restricting. Future research ought to examine the DRS administered in questionnaire format and allowing for quantification beyond a yes/no answer (e.g., frequency of problematic restriction).

This study provides initial support that a single-item screener, the DRS, can identify individuals engaging in problematic dietary restriction. The DRS may provide greater efficiency and accuracy in measuring behavioral aspects of restrictive eating. This can allow for more clarity in restriction research, more effective screening of individuals engaging in unhealthy restrictive eating, and possibly better prevention and/or treatment of individuals at risk for disordered eating.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Appendix: Dietary Restriction Screener

We are interested in assessing restrictive eating. Restrictive eating occurs any time you intentionally eat less than seems appropriate for the situation out of concern for your body

shape and/or weight. I am going to give you a few examples of what I mean by restrictive eating.

- Restrictive eating can mean eating an amount of food that most others would think is too little. For example, eating an apple for dinner or fasting all day could be considered restrictive eating.
- Restrictive eating can mean eating far less than others in a similar situation. For example, eating a diet frozen meal at Thanksgiving dinner with family could be considered restrictive eating.
- Restrictive eating can mean eating less than is appropriate for your body size or hunger level. For example, if you are very hungry or are underweight and you eat only a small salad for dinner, this could be considered restrictive eating.

Have there been any times within the past month when you have eaten in this manner because you were concerned about your body shape and/or weight?

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Table 1

Comparison on demographic and clinical variables between Dietary Restriction Screener (DRS) restricting and non-restricting groups

Dependent Variable	DRS restricting group (*n* = 45) *Mean (SD)*	DRS non-restricting group (*n* = 49) *Mean (SD)*	*df*	t / χ^2	*p*
Age (years)	22.60 (6.68)	20.71 (6.21)	92	-1.418	0.159
BMI (kg/m^2)	24.88 (4.69)	22.80 (3.90)	92	-2.348	0.021
EDE Global score	1.67 (1.09)	0.35 (0.37)	92	-7.983	<0.001*
EDE Restraint score	2.12 (1.37)	0.50 (0.81)	92	-7.075	<0.001*
EDE Eating Concern score	0.54 (0.85)	0.02 (0.09)	92	-4.333	<0.001*
EDE Shape Concern score	2.14 (1.54)	0.53 (0.66)	92	-6.684	<0.001*
EDE Weight Concern score	1.88 (1.26)	0.35 (0.46)	92	-7.956	<0.001*
YBC-EDS Total score	9.12 (5.26)	2.67 (3.19)	92	-7.257	<0.001*
YBC-EDS Preoccupation score	4.76 (2.97)	1.37 (1.44)	92	-7.127	<0.001*
YBC-EDS Ritual score	4.37 (3.11)	1.31 (2.20)	92	-5.544	<0.001*
Hunger rating	2.71 (2.21)	2.14 (2.13)	92	-1.268	0.208
Test snack consumption (kilocalories)	74.00 (112.80)	144.69 (203.06)	92	3.617	<0.001*
	71.11%	69.39%	1	0.033	1.000
Ethnicity (% Caucasian)	77.78%	81.63%	1	0.216	0.798
Gender (% female)	34.09%	14.58%	1	4.801	0.049
Loss of control eating (% endorsing)	15.55%	2.04%	1	5.503	0.026
	44.44%	12.24%	1	12.155	0.001*
Purging (% endorsing)					
No intake at test snack (%)					

*denotes Bonferroni corrected significant level of $p < .003$

Table 2

Linear regressions examining the Dietary Restriction Screener (DRS) as a predictor of eating disorder attitudes and behavior

Dependent variable	Independent variables	R^2 adjusted	*F*	*p*	*β*	*SE*
EDE Global score		0.491	18.978	<0.001**		
	Age			0.747	-0.025	9.708
	Gender[a]			<0.001*	-0.298	0.193
	Ethnicity[a]			0.609	-0.039	0.171
	BMI			0.020*	0.185	0.018
	DRS[a]			<0.001**	0.604	0.160
EDE Restraint score		0.370	11.925	<0.001**		
	Age			0.937	-0.007	14.277
	Gender[a]			0.021*	-0.196	0.284
	Ethnicity[a]			0.117	-0.133	0.251
	BMI			0.678	0.036	0.027
	DRS[a]			<0.001**	0.590	0.235
EDE Eating Concern score		0.188	5.300	<0.001**		
	Age			0.694	0.039	7.578
	Gender[a]			0.050	-0.188	0.151
	Ethnicity[a]			0.312	-0.097	0.133
	BMI			0.079	0.175	0.014
	DRS[a]			<0.001**	0.386	0.125
EDE Shape Concern score		0.431	15.092	<0.001**		
	Age			0.390	-0.072	13.989
	Gender[a]			<0.001*	-0.319	0.278
	Ethnicity[a]			0.946	0.005	0.246
	BMI			0.015*	0.205	0.027
	DRS[a]			<0.001**	0.523	0.231

Dependent variable	Independent variables	R^2 adjusted	*F*	*p*	*β*	*SE*
	EDE-R score			0.015*	0.276	0.248
	DRS[a]			0.001*	0.396	0.679
Test meal intake (kilocalories)		0.251	5.457	<0.001*		
	Age			0.005*	0.273	11.186
	Gender[a]			0.796	-0.024	0.230
	Ethnicity[a]			0.084	0.164	0.201
	BMI			0.275	-0.104	0.021
	Hunger rating			0.038*	0.194	0.042
	EDE-R score			0.936	-0.009	0.083
	DRS[a]			0.017*	-0.284	0.229

[a]Coding for categorical variables: Gender (0 = female, 1 = male); Ethnicity (0 = Caucasian, 1 = Other ethnicity); DRS (0 = Non-restricting, 1 = Restricting)

*p < .05

**p < .001