Perceived Body Image in Men and Women with Type 2 Diabetes Mellitus: Correlation of Body Mass Index with the Figure Rating Scale

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Abstract

Background: Body mass index (BMI) is often used to objectively measure body fat. Increasing BMI is directly associated with an increase in metabolic disease, such as type 2 diabetes mellitus (T2DM). The Figure Rating Scale (FRS) is a subjective measure of body fat. Subjective perceptions of body image may also relate to T2DM. This study sought to determine perception of body image in individuals with various levels of BMI.

Methods: Respondents (n = 13,887) to the US ***S***tudy to ***H***elp ***I***mprove ***E***arly evaluation and management of risk factors ***L***eading to ***D***iabetes (SHIELD) 2006 survey self-reported their weight and height for BMI calculation. On the gender-specific Stunkard FRS, respondents selected a figure most closely resembling their body image. Pearson correlation was computed between perceived body image and BMI for men and women separately. *T*-test analysis compared the mean differences between respondents with and without T2DM.

Results: Men with T2DM did not significantly differ from men without diabetes mellitus in mean BMI per body image figure except at the extremes in body image. Women with T2DM had a significantly higher BMI for the same body image compared with women without diabetes mellitus for most images ($p < 0.05$).

Conclusions: Individuals, particularly women, with T2DM may differ in their perception of body image compared with those without diabetes mellitus. It is unclear if these perceived differences increase the risk of T2DM, or if the diagnosis of T2DM alters body image perceptions.

Key words: body image, Figure Rating Scale, body mass index, type 2 diabetes mellitus

Introduction

Body fat is often objectively assessed by body mass index (BMI), which is determined by height and weight, and reported in units of kilogram/meter squared (kg/m^2). Body fat can be subjectively assessed by the Stunkard Figure Rating Scale (FRS) [1], which utilizes gender-specific body images. Both types of measurements are used to assess the relationship of body weight to adverse clinical outcomes.

Increasing BMI is associated with an increased prevalence of metabolic diseases [2], and BMI is a common objective parameter reported in clinical trials of patients with type 2 diabetes mellitus (T2DM), as well as in clinical trials of patients with hypertension, dyslipidemia, and obesity. The FRS has often been used to assess perceived body images among those of differing ages [3, 4], genders [3–6], racial and ethnic groups [3, 7–9], religion [10], and countries [11, 12], as well as among those with psychological/psychiatric conditions, such as eating disorders [3, 13, 14]. However, no prior study has evaluated the relationship of a gender specific FRS in T2DM patients and their correlation with self-reported BMI.

Methods

A cohort of individuals with a diagnosis of T2DM was identified from the **S**tudy to **H**elp **I**mprove **E**arly evaluation and management of risk factors **L**eading to **D**iabetes

(SHIELD), the largest survey study of its kind. SHIELD included an initial, cross-sectional, self-reported, screening questionnaire to identify areas of interest in the general population (which included individuals with T2DM). The baseline survey evaluated prior diagnoses, health status, health knowledge, attitudes, behaviors, and treatment. Annual follow-up self-reported surveys to the same recipients evaluated changes in behaviors, treatment, and health status. A detailed description of the SHIELD methodology has been published previously [15, 16].

In brief, in 2004, a screening survey was mailed to a stratified random sample of 200,000 US households, representative of the US population for geographic residence, household size and income, and age of head of household [17]. The head of household provided responses for up to 4 adult (aged $\geq$18 years) household members, resulting in a response rate of 63.7% (127,420 households for 211,097 adults). A subsequent baseline survey was sent to 22,001 selected individuals derived from the screening respondents. Since 2004, sequential and yearly SHIELD surveys captured self-reported information on health status, attitudes and behaviors, quality of life, and anthropometry from this sample. This analysis is based upon a cross-sectional sample, evaluating the relation between BMI and the Stunkard FRS, which was first included in the 2006 SHIELD survey (n = 13,877).

Respondents were categorized as having T2DM or no diabetes mellitus based upon self-report of having been told by a doctor, nurse, or other healthcare professional of

this diagnosis. T2DM was defined as a physician diagnosis of T2DM and age of onset >21 years of age. No diabetes mellitus was defined as no physician diagnosis of type 1 diabetes mellitus, T2DM, or gestational diabetes mellitus.

Study measures

Self-report of height and weight was used to calculate BMI (weight/height^2) in kg/m^2. Body image was assessed using the validated [18] Stunkard FRS [1]. The FRS consists of two gender-specific scales that contain nine schematic figures of women and nine figures of men, ranging from underweight to overweight. On this gender-specific scale, respondents selected a figure that most closely resembled their body image. For men, the scale of body images ranged from 1 to 9, with 1 being the thinnest body type and 9 being the largest, most obese type. For women, the scale of body images ranged from 10 to 18, using the same range of thinnest to largest as the men's scale.

Statistical analyses

Pearson correlation was computed between perceived body image and calculated BMI for men and women separately. *T*-test analysis compared the mean differences between respondents with T2DM and without diabetes mellitus. Median BMI was reported for each FRS image since some standard deviations were large. Statistical significance was set *a priori* as $p < 0.05$.

Results

For men responding to the FRS, 1,304 respondents had T2DM and 2,924 had no diabetes mellitus. For women responding to the FRS, 1,979 respondents had T2DM and 4,763 had no diabetes mellitus. T2DM respondents had greater mean BMI, greater mean age, generally less education, and lower household incomes and were less likely to be white than respondents with no diabetes mellitus (Table 1).

Based upon their mean BMI, men with T2DM did not significantly differ in their selection of FRS body image compared with men without diabetes mellitus, except at the extremes in body image (Figure 1). Median BMI per FRS image is shown in Figure 1. For body images 1, 2, and 9, men with T2DM had significantly higher mean BMI compared with men without diabetes mellitus ($p < 0.05$). Conversely, women with T2DM had a significantly higher BMI for the same body image compared with women without diabetes mellitus ($p < 0.05$) at all body images except for images 11 and 18. For images 11 and 18, women with T2DM had higher mean BMI compared with women without diabetes mellitus but the difference was not statistically significant ($p > 0.05$).

Body image perception for T2DM and no diabetes mellitus groups was significantly correlated with BMI for men and women ($p < 0.0001$) (Figure 2). Correlation coefficients

ranged from 0.68 to 0.70 for men and 0.75 to 0.79 for women, showing strong correlation.

Discussion

In the largest self-reported survey study of its kind, the SHIELD data revealed that compared with men without diabetes mellitus, men with T2DM generally did not significantly differ in their selection of a body image on the FRS, based upon similar mean BMI, except at the extremes in body image. In contrast, women with T2DM generally had a higher BMI for each body image that they felt best reflected their appearance compared with women without diabetes mellitus.

Limitations of this study include that only a small percentage (5%–8%) of household panels, like the SHIELD study, agree to participate, and the data tend to under-represent the very wealthy and very poor segments of the population and do not include military or institutionalized individuals [19, 20]. Another concern is that patients may not accurately self-report measurements such as height and weight. However, other studies have indicated that such self-reported measurements are accurate [21, 22]. Regarding the self-reporting of metabolic disease, prior analyses have demonstrated generally good correlation between the prevalence of T2DM as assessed by SHIELD when compared with the prevalence of T2DM determined by objectively measured surveys such as US NHANES [2, 23]. This is likely, in large part, because the diagnosis of diabetes mellitus is dependent upon a single parameter (glucose) that is generally

known and frequently measured. Conversely, SHIELD data have proven to have less correlation with NHANES when assessing the prevalence of metabolic diseases defined by multiple parameters that may be less known by patients (such as a diagnosis of "dyslipidemia," defined as abnormalities of any one of four lipid abnormalities: total cholesterol, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, and triglycerides [23]).

Also, the FRS may have limitations due to scale coarseness and constant height across the different images [24]. However, this scale is one of the most widely used assessment tools in body image and psychometric research [4–6, 8, 9] and reported to be valid and reliable [18]. Approximately, 20% of SHIELD respondents did not answer the body image question; however, the respondents with missing data were not significantly different from those who did respond. Finally, while perceived body images may vary among those of differing ages, genders, racial and ethnic groups, countries, and psychological profiles, no adjustments were made for these parameters in this analysis.

Self-reported survey data have advantages in specific circumstances. A main component of this analysis included the FRS. As opposed to the generally objective BMI, the FRS is entirely subjective. As such, ascribing BMI to individual images in the FRS cannot be done solely by objective analysis. Rather, the only manner to derive subjective data is to ask individuals to provide their perceptions. A self-reported survey completed within a home environment may be a more "objective" way to determine

subjective data, in that it is possible that individuals may be more comfortable, and thus more honest, in selecting body images than might occur in a clinical setting.

The importance of the findings of this study is at least 2-fold. Firstly, given the large number of responders, this may represent the best available data in assigning BMI to individual FRS images. A review of the literature reveals limited information as to what BMI correlates to individual FRS images in men and women, with no prior similar analysis of this size having been published. A reasonable assignment of BMI values to individual FRS body images, as reported here, may assist future analysis of other populations in whom FRS is used.

Secondly, this is the first study to suggest that the diagnosis of T2DM, at least in women, may be associated with discrepancies in body images. The reasons for these discrepancies are unclear. Even though this study found a strong correlation between BMI and body image perception, misperception of one's own weight-related appearance is common [12]. Previous studies suggest that body image may be a risk factor for obesity [14, 25]. It is possible that it is a discrepancy of body image perception that might contribute to excessive body weight, and thus an increased risk for T2DM. Another possibility is that it is not a discrepancy of perceived body image that precedes the diagnosis of T2DM. Instead, it may be that after diagnosis of T2DM, patients may then develop an altered perception of body image. Once an individual is diagnosed with T2DM, little doubt exists that the patient's life changes in the form of altered insurance

rate status, interaction with family and friends, increased doctor visits (including routine eye examinations, foot examinations, etc), more frequent laboratory testing, and greater evaluation and management of multiple risk factors, especially regarding nutrition, physical exercise, lifestyle, blood pressure, and lipids. It could be that these daunting life changes upon being diagnosed with T2DM might result in alterations in multiple health-related perceptions, including perceptions of body image compared with those without diabetes mellitus. It is possible that once diagnosed with T2DM and confronted with its associated health and cost burdens, patients may then place less emphasis on body image.

Conclusion

Overweight individuals with T2DM may have different body image perceptions compared with other overweight individuals. This suggests potential opportunities for clinicians to incorporate the understanding of this unique challenge (and potential obstacle) in weight loss strategies. Some data suggest that no negative consequences (such as depression) are observed upon having and failing to meet weight loss expectations, even expectations that are thought to be unrealistic [26]. Nonetheless, if body image perception does have the potential to affect behavior, then having overweight T2DM individuals acquire a body image perception that is more consistent with those without diabetes mellitus may assist clinicians to better make the case for the need for weight reduction. Furthermore, because perception may influence behavior,

gender differences in body image perception suggest that overweight T2DM men and women may differ in optimal approaches and strategies directed at weight loss.

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Members of the SHIELD Study Group are: Harold Bays, MD, Louisville Metabolic and Atherosclerosis Research Center, Louisville, KY; Debbra D. Bazata, RD, CDE, St. Luke's Primary Care South, Overland Park, KS; James R. Gavin III, MD, PhD, Emory University School of Medicine, Atlanta, GA; Andrew J. Green, MD, Midwestern Endocrinology, Overland Park, KS; Sandra J. Lewis, MD, Northwest Cardiovascular Institute, Portland, OR; Michael L. Reed, PhD, Vedanta Research, Chapel Hill, NC; Jennifer G. Robinson, MD, University of Iowa, Iowa City, IA; and Helena W. Rodbard, MD, Rockville, MD. Tina Fanning of Vedanta Research, Chapel Hill, NC, also contributed to this report, performing data collection and analysis.

Declaration of competing interests:

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Authors' contributions:

HEB: participated in the design of the study and helped to draft the manuscript; DDB: participated in the design of the study and helped in reviewing the manuscript critically;

KMF: participated in the study design and coordination, carried out the data analysis and drafted the manuscript; SG: conceived of the study, participated in the study design, acquired funds, supervised the data collection and helped in critically reviewing the manuscript; and JRG: participated in the study design and helped in critically reviewing the manuscript. All authors read and approved the final manuscript.

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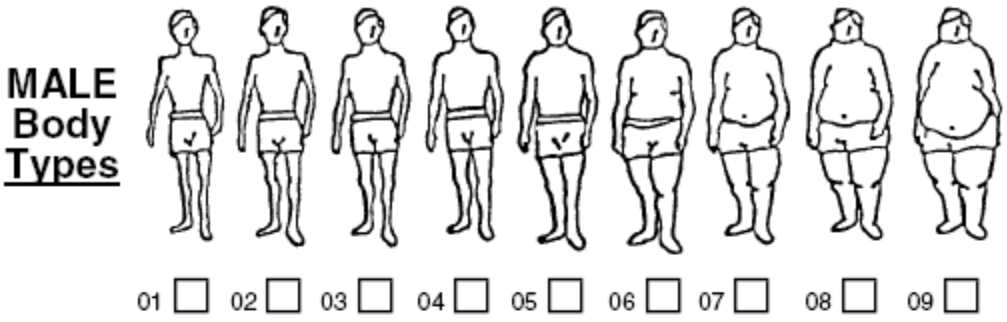
Table 1. Characteristics of SHIELD respondents with type 2 diabetes mellitus or no diabetes mellitus

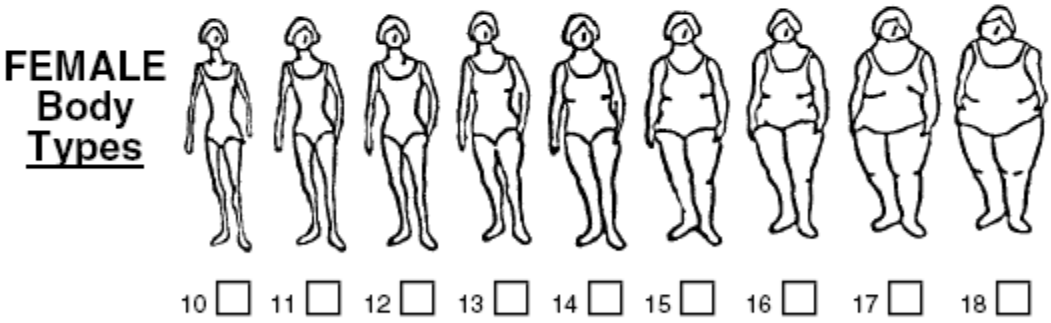
Characteristics	**T2DM (n = 3,283)**	**No diabetes mellitus (n = 7,687)**
Age, years, mean (SD)	61.3 (12.3)*	55.5 (16.2)
Males, %	39.7	38.0
White, %	85.5*	89.0
Education, % with no more than a high school degree	35.2*	28.6
Income, % with <$35,000	45.9*	34.9
BMI for men, mean (SD)	32.1 (7.1)*	30.1 (6.0)
BMI for women, mean (SD)	35.5 (9.0)*	30.4 (7.7)
Waist circumference for men, cm, mean (SD)	112.9 (20.0)*	107.4 (16.7)
Waist circumference for women, cm, mean (SD)	112.8 (19.8)*	99.7 (19.4)

*$p < 0.001$ vs. no diabetes mellitus

Figure 1. Body image figures and median body mass index (BMI) for men and women with and without diabetes. DM = diabetes mellitus; T2DM = type 2 diabetes mellitus



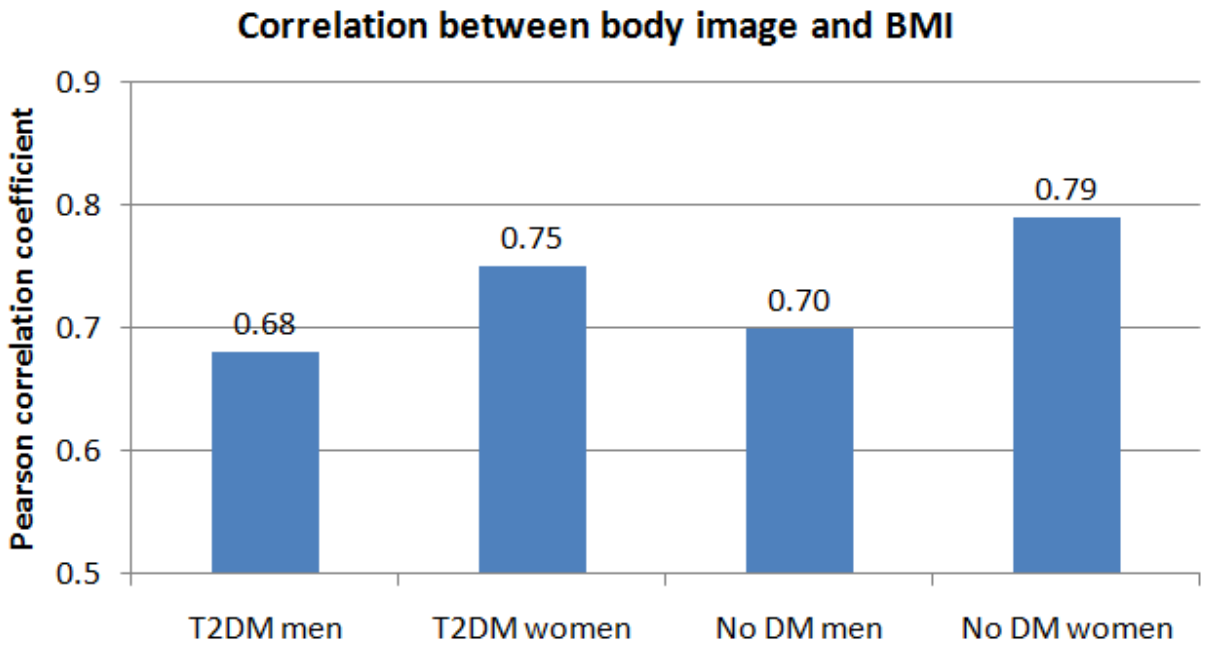
	01	02	03	04	05	06	07	08	09
T2DM BMI†:	24.7*,	23.4*,	23.6,	25.1,	27.8,	29.6,	33.0,	37.4,	44.5*
(n)	(26)	(31)	(34)	(79)	(177)	(334)	(365)	(155)	(103)
No DM BMI†:	21.8,	21.8,	23.7,	25.1,	27.1,	29.6,	32.5,	36.6,	40.4
(n)	(60)	(111)	(141)	(232)	(546)	(761)	(754)	(225)	(94)



	10	11	12	13	14	15	16	17	18
T2DM BMI†:	20.9*,	21.7,	23.1*,	25.7*,	29.2*,	33.8*,	37.9*,	43.5*,	48.4
(n)	(6)	(18)	(52)	(145)	(414)	(560)	(335)	(259)	(190)
No DM BMI†:	18.3,	20.1,	22.0,	24.2,	28.2,	32.3,	36.0,	41.0,	47.0
(n)	(48)	(207)	(341)	(742)	(1275)	(1136)	(604)	(272)	(138)

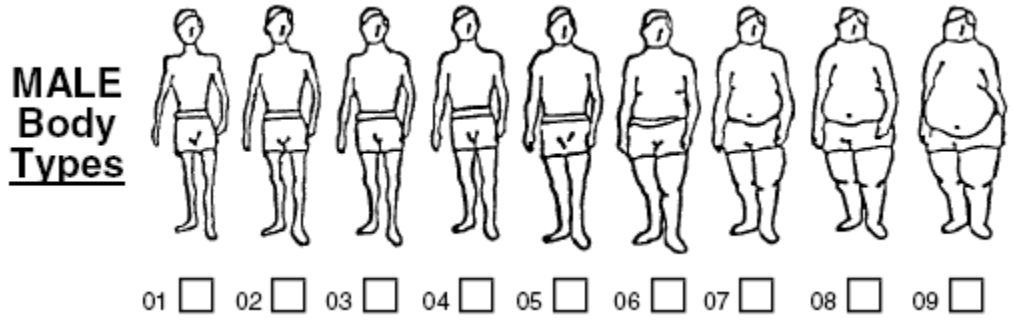
† Median BMI; *p <0.05

Figure 2. Correlation between Figure Rating Scale and body mass index (BMI)



Correlation significant for each group ($p < 0.0001$)

DM = diabetes mellitus; T2DM = type 2 diabetes mellitus



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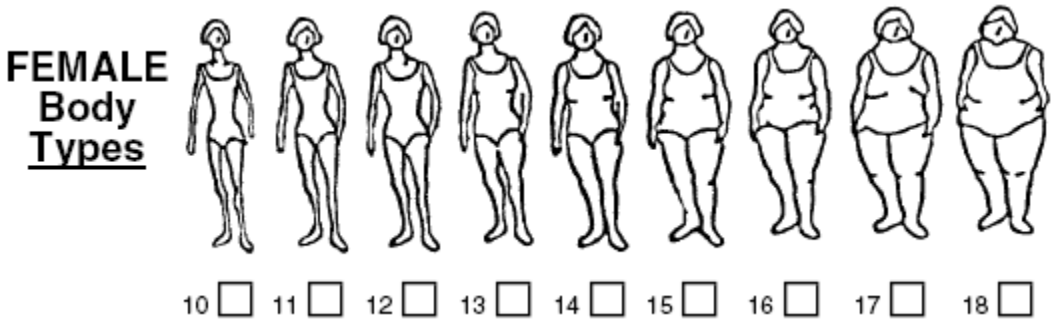
(n)	(60)	(111)	(141)	(232)	(546)	(761)	(754)	(225)	(94)



T2DM BMI†:	20.9*,	21.7,	23.1*,	25.7*,	29.2*,	33.8*,	37.9*,	43.5*,	48.4
(n)	(6)	(18)	(52)	(145)	(414)	(560)	(335)	(259)	(190)
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(n)	(48)	(207)	(341)	(742)	(1275)	(1136)	(604)	(272)	(138)

† Median BMI; *p <0.05

Figure 1

Figure 2. Correlation between body image and BMI

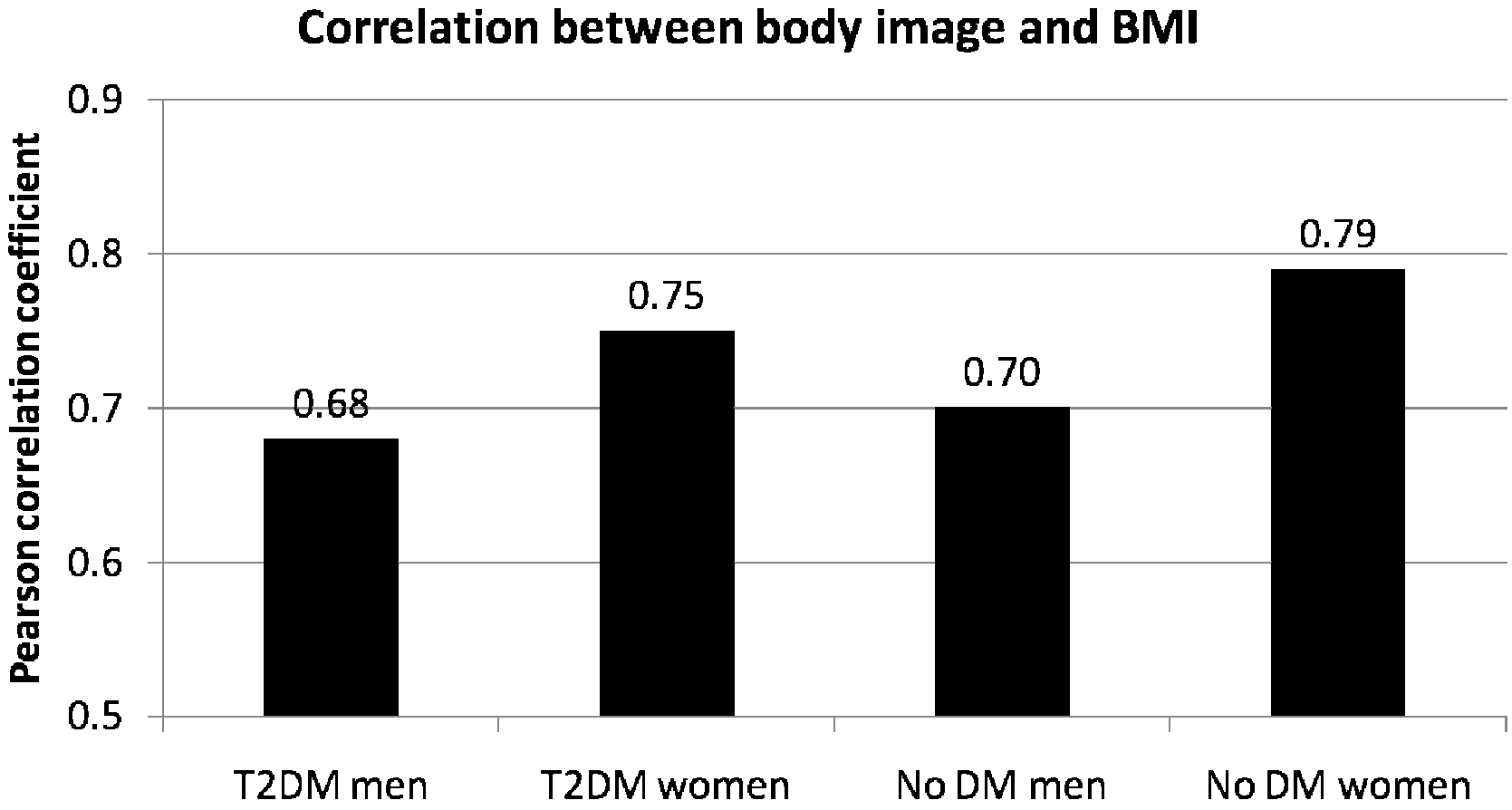

Figure 2