

Research Article

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Relationship between body mass index and quality of life, use of dietary and physical activity self-management strategies, and mental health in individuals with polycystic ovary syndrome

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Abstract: Polycystic ovary syndrome (PCOS) can negatively affect health and well-being. This study aimed to assess quality of life, use of self-management strategies, stress, anxiety, and depression in people with PCOS, and the effect of body mass index (BMI) on these factors. An online survey was distributed on PCOS social media sites and email listservs. Categorical data were analyzed as counts and percentages. Relationships between BMI and scores for PCOS quality of life (PCOSQ), use of diet and physical activity self-management strategies, perceived stress scale, and hospital anxiety and depression scale were analyzed using simple linear regression analyses. Significance was set at $p < 0.05$. The median BMI of participants ($n = 101$) was 33.12 kg/m^2 . PCOSQ scores were similar across BMI groups for many domains. Linear regression analyses revealed that BMI predicted variation in weight and hirsutism scores. Self-management scores were low for all BMI groups. Linear regression analyses revealed no significant relationships between BMI and scores for self-management strategy categories. Most participants had moderate stress ($n = 55$, 59.8%), abnormal anxiety ($n = 50$, 56.2%), and normal depression ($n = 48$, 53.9%) levels. Linear regression analyses revealed no significant relationships between BMI and these scores. Individuals of all body sizes with PCOS may experience quality of life disruptions and mental health concerns and may utilize dietary and physical activity self-management strategies at a low level. In PCOS, quality of life and mental

health concerns should be assessed, in addition to metabolic impacts, and an individualized approach to increasing the use of self-management strategies should be implemented.

Keywords: polycystic ovary syndrome, PCOS, body mass index, self-management, health-related quality of life, mental health

1 Introduction

Polycystic ovary syndrome (PCOS), a common endocrine disorder, impacts approximately 9–18% of reproductive-aged women [1–5]. It is a disorder that impacts individuals of all body mass index (BMI) categories [2,6]. As a lifelong condition, PCOS is multi-factorial in nature and affects many aspects of health and well-being [2,7–9].

Health-related quality of life may be negatively impacted by PCOS [10–14]. In addition, PCOS patients with a higher BMI may experience lower health-related quality of life scores compared to those with a normal BMI [13,15–17]. Further, PCOS is associated with mental health concerns, including anxiety, depression, and increased stress, which have been found at higher levels in those with PCOS compared to controls [18]. In the general population, increasing BMI has been associated with decreasing mental health [19] and body weight may influence mental health in people with PCOS [20].

Lifestyle habits, including physical activity [21] and the use of dietary and physical activity self-management strategies [22], may positively impact health and well-being. However, individuals with PCOS may engage in dietary and physical activity self-management strategies at a low level [22]. Low levels of engagement may result in a further decrease in quality of life and an increase in mental health concerns. For example, engaging in more physical activity has been associated with increased health-related quality of life in adults with and without medical conditions [23–26], including in patients with PCOS [27]. BMI may

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predict self-management strategy use with prior research, indicating a possible inverse relationship between diet-related self-management strategies and BMI [28].

While some studies have investigated the influence of BMI on measures of health and well-being in people with PCOS, more research is needed. This study aimed to examine multiple measurements of health and well-being in PCOS in a single study. To do so, this study assessed the quality of life, use of self-management strategies, stress, anxiety, and depression in people with PCOS, and the effect of BMI on these factors.

2 Methods

2.1 Survey development

An online Qualtrics survey was developed that included demographic questions and self-reported height and weight, used to calculate BMI, along with four validated and publicly available surveys. Health-related quality of life was assessed using the validated Modified Polycystic Ovarian Syndrome Questionnaire (MPCOSQ) [29], stress levels were assessed using the perceived stress scale (PSS) [30], anxiety and depression levels were assessed using the hospital anxiety and depression scale (HADS) [31], and self-management strategies were examined using the validated scale, which has been used in recent PCOS research [22].

2.2 Recruitment and participants

Participants were recruited from January to February 2024 on social media sites aimed at an international audience of people with PCOS and through email listservs. Exclusion criteria included anyone under 18 years of age, adults who were unable to consent, women who were pregnant and breastfeeding, and prisoners.

A total of 147 individuals responded to the survey. After removing responses that did not answer questions beyond demographics ($n = 46$), a total of 101 were included in the data analysis. Participants were permitted to skip survey questions if desired. Therefore, the number of responses included in scoring and analysis for the various measurements differs. A total of 101 participants completed the demographic questions and the self-management strategy questions. A total of 95 participants reported height and weight utilized to calculate BMI, 96 participants completed the MPCOSQ questions, 92 participants completed the PSS questions, and 89 completed the HADS questions.

Informed consent: The informed consent was included on the first page of the survey and informed consent was obtained from all participants.

Ethical approval: Completed surveys were considered consensual. This study was approved by the Metropolitan State University of Denver Institutional Review Board. This study complied with all relevant national regulations and institutional policies and was conducted in accordance with the tenets of the Helsinki Declaration.

2.3 Survey scoring

Methods of scoring and summarizing data for each validated questionnaire were done according to the published protocols.

The MPCOSQ responses, utilized to examine health-related quality of life in PCOS, were scored on a seven-point Likert scale, with low scores reflecting worse quality of life [29]. Scores were totaled and categorized by the seven domains of the MPCOSQ (emotional disturbance, weight, infertility, hirsutism, acne, menstrual symptoms, and menstrual predictability) [29]. Scores were kept as continuous variables.

For the PSS scale [30], utilized to examine stress levels, scoring was allocated as 0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, and 4 = very often. Scores for questions four, five, seven, and eight were reversed (0 = 4, 1 = 3, 2 = 2, 3 = 1, and 4 = 0). Points allotted to each answer were based on published protocols and total scores were summed for every participant. Scores ranging from 0 to 13 were considered low stress, 14 to 26 moderate stress, and 27 to 40 high perceived stress [30]; participants were categorized accordingly. Scores were also kept as continuous variables.

The HADS [31], utilized to examine anxiety and depression, was scored for both depression and anxiety for all participants. Points allotted to each answer were determined based on published protocols. A total of 0–7 points was considered normal, 8–10 borderline abnormal, and 11–21 abnormal for both depression and anxiety [31]; participants were categorized accordingly. Scores were also kept as continuous variables.

The self-management strategies validated scale scores were categorized into diet (16 questions) and physical activity (12 questions) and then further categorized into behavioral or cognitive strategies [22]. Using a Likert scale of 1 (never), 2 (occasionally), 3 (often), 4 (very often), and 5 (always), scores were calculated as a mean for each strategy and averaged for each category [22]. Higher scores indicated a greater frequency of use of self-management strategies [22]. Scores were kept as continuous variables.

2.4 Data analysis

All data analysis was completed using SPSS, version 29. Categorical data were summarized as counts and percentages. All continuous variables were summarized as mean values and standard deviations for the total sample and different BMI groups.

Relationships between BMI (independent variable) and MPCOSQ, self-management strategies, PSS, and HADS scores (dependent variables) were analyzed using simple linear regression analyses. The linearity of relationships between variables was determined through visual inspection of scatterplots and the normality of residuals through visual inspection of histograms and normal probability plots of the residuals. Homoscedasticity of residuals was assessed by visual inspection of a plot of standardized residuals compared to standardized predicted values. The residual plots (histograms, normal probability plots, and plots of residuals vs predicted values) were inspected visually for outliers. Statistical significance was set at $p < 0.05$.

3 Results

3.1 Participant demographics

Demographic characteristics are included in Table 1. Most participants were between the ages of 26 and 35 ($n = 57$, 56.4%), from North America ($n = 70$, 69.3%), and diagnosed with PCOS more than 10 years ago ($n = 40$, 39.6%). The median current BMI was 33.12 kg/m² and most participants had a current BMI falling in the obese range ($n = 63$, 66.3%).

3.2 PCOS quality of life scores

The mean total PCOS quality of life scores for the seven domains are included in Table 2. Lowest scores were observed for the obese BMI group for some, but not all, domains, indicating poorer quality of life in some areas for obese participants. Linear regression analyses (Table 2) revealed that BMI explained 15.3% of the variation in weight scores [$R^2 = 0.153$, $\beta = -0.311$, Std. Err. = 0.077, $t(90) = -4.029$, $p < 0.001$, negative relationship] and 4.7% of the variation in hirsutism scores [$R^2 = 0.047$, $\beta = -0.149$, Std. Err. = 0.071, $t(90) = -2.101$, $p = 0.038$, negative relationship]. BMI explained 3.9% of the variation in total quality of life scores, but this was not quite significant [$R^2 = 0.039$, $\beta = -0.566$, Std. Err. = 0.297, $t(90) = -1.910$, $p = 0.059$,

Table 1: Demographic characteristics of participants

Demographic characteristics	Number of participants (%)
<i>Age (n = 101)</i>	
18–25	19 (18.8)
26–35	57 (56.4)
36–45	21 (20.8)
46+	4 (4.0)
<i>World region of residence (n = 101)</i>	
Europe	21 (20.8)
North America	70 (69.3)
Others ¹	10 (10.0)
<i>Education level (n = 101)</i>	
High school (upper secondary) graduate or less	17 (16.9)
Associate's or trade school	12 (11.9)
Bachelor's degree	33 (32.7)
Master's degree or higher	39 (38.6)
<i>Years ago diagnosed (n = 101)</i>	
Less than 3 years ago	17 (16.8)
3–5 years ago	17 (16.8)
6–10 years ago	27 (26.7)
More than 10 years ago	40 (39.6)
<i>Current BMI category (n = 95)²</i>	
Normal or underweight	12 (12.6)
Overweight	20 (21.1)
Obese	63 (66.3)
Median BMI, current, in kg/m ² (range)	33.12 (18–63)

¹Asia, South Asia, Oceania, Caribbean, South America, Central America.

²Participants were permitted to skip survey questions if desired. Therefore, the number of responses included in the analysis for the various measurements differs.

negative relationship]. No other significant predictive relationships were found between BMI and quality of life domain scores. Residuals were approximately normally distributed as assessed by visual inspection of normal probability plots.

3.3 Self-management strategy scores

Dietary and physical activity self-management strategies utilized by participants are included in Tables 3 and 4. Detailed question scores are presented in Table 3, and total scores for each category are presented in Table 4. Total dietary and physical activity self-management scores were similar (2.90 ± 0.59 and 2.89 ± 0.79 , respectively). The highest total self-management score was the cognitive, physical activity score (3.26 ± 0.73 ; Table 4). Self-management scores for all areas were similar across BMI groupings (Table 4). Linear regression analyses (Tables 3 and 4) revealed no

Table 2: Comparison of MPCOSQ (PCOS quality of life)¹ scores between BMI categories (a), and results of eight separate regression analyses with MPCOSQ scores as the response variables and BMI as the (continuous) predictor variable (b)

(a) PCOS quality of life scores versus BMI category				
Variable	All participants (<i>n</i> = 96) ² Mean (SD)	Normal BMI (<i>n</i> = 12) Mean (SD)	Overweight BMI (<i>n</i> = 20) Mean (SD)	Obese BMI (<i>n</i> = 60) Mean (SD)
Emotional disturbance	20.98 (7.04)	22.75 (7.44)	22.30 (7.18)	20.40 (7.08)
Weight	15.20 (7.23)	22.08 (10.75)	17.05 (5.68)	13.53 (5.68)
Infertility	13.20 (4.57)	13.42 (3.00)	12.40 (3.93)	13.32 (5.00)
Hirsutism	17.22 (6.24)	21.17 (5.13)	18.60 (6.43)	16.25 (6.16)
Acne	19.58 (7.82)	23.17 (4.43)	19.20 (6.53)	18.85 (8.74)
Menstrual symptoms	11.15 (4.41)	11.92 (5.85)	10.70 (3.73)	11.00 (4.40)
Menstrual predictability	6.67 (3.81)	7.83 (4.24)	7.25 (3.80)	6.42 (3.74)
Total	103.99 (25.91)	122.33 (25.79)	107.50 (26.53)	99.77 (24.78)

(b) Regression analyses of PCOS quality of life scores versus BMI						
Response variable	R ²	Intercept	Slope (β)	Std. Err.	<i>t</i>	<i>P</i> -value
Emotional disturbance	1.2%	24.02	−0.085	0.082	−1.040	0.301
Weight	15.3%	26.01	−0.311	0.077	−4.029	0.000**
Infertility	0.3%	12.20	0.027	0.052	0.524	0.602
Hirsutism	4.7%	22.47	−0.149	0.071	−2.101	0.038*
Acne	0.2%	20.90	−0.041	0.092	−0.452	0.652
Menstrual symptoms	0.2%	10.32	0.022	0.051	0.421	0.675
Menstrual predictability	0.5%	7.75	−0.028	0.044	−0.645	0.521
Total	3.9%	123.67	−0.566	0.297	−1.910	0.059

The reported *t*-test statistic values and *p*-values are for the test of the null hypothesis that the true regression slope is zero.

¹Study of Barnard et al. [29].

²Participants were permitted to skip survey questions if desired. Therefore, the number of responses included in the analysis for the various measurements differs.

Significance codes: ***p* < 0.001; **p* < 0.05.

significant predictive relationships between BMI and the total scores for the different self-management strategy categories.

Dietary behaviors (Table 3) that scored highest included looking for information about nutrition and healthy eating (3.47 ± 1.12), thinking about ways to do better next time if healthy foods are not eaten (3.41 ± 1.08), and watching what they eat (3.35 ± 1.02). Within the physical activity questions, the question “I think about the benefits of being active” scored the highest at 3.79 ± 0.93 . Other highest physical activity scores included participants knowing when they should do more activity (3.50 ± 1.12) and selecting physical activities that they enjoy (3.14 ± 1.15).

With regard to dietary behaviors, participants most struggled with seeking information about their weight from a general practitioner (1.98 ± 1.21), saying positive things about eating healthy food (2.45 ± 1.12), and keeping track of how much or what they eat (2.34 ± 1.29). For physical activity behaviors, participants most struggled with making plans to ensure they get enough physical activity (2.14 ± 1.25), asking for help from friends and family to stay

active (2.32 ± 1.28), and sticking to plans to be active each week (2.61 ± 1.14).

3.4 Stress, anxiety, and depression scores

Most participants had moderate stress levels (*n* = 55, 59.8%), followed by high stress (*n* = 24, 26.1%) and low stress levels (*n* = 13, 14.1%). Abnormal anxiety levels (*n* = 50, 56.2%) were reported at the highest rate, followed by borderline abnormal anxiety (*n* = 20, 22.5%) and normal anxiety levels (*n* = 19, 21.3%). Finally, most participants reported normal depression levels (*n* = 48, 53.9%). Borderline abnormal depression levels were found in 24.7% (*n* = 22) and abnormal depression in 21.3% (*n* = 19) of the participants. When mean scores for stress, anxiety, and depression were compared across BMI categories, normal-weight individuals had the highest stress scores and lowest anxiety and depression scores (Table 5). Overweight individuals had the highest anxiety and depression scores (Table 5). Distinct groupings in

Table 3: Self-management strategies¹ utilized by individuals with PCOS

Variable ¹	Mean (SD)
<i>Dietary cognitive questions¹ (n = 101)</i>	
I make plans to change my diet/drinking habits	3.31 (1.11)
I look for and healthy eating information from books, magazines, internet, etc.	3.47 (1.12)
If I don't eat healthy foods, I think about ways to do better next time	3.41 (1.08)
I can stop myself from over eating	2.63 (1.08)
I make sure I have time to prepare healthy meals	2.73 (1.09)
I decide what to eat at the last minute	2.76 (0.98)
I say positive things to myself about eating health food	2.45 (1.12)
I seek information about my weight from my general practitioner	1.98 (1.21)
<i>Dietary behavioral questions¹ (n = 101)</i>	
I read labels to help me choose healthy food	3.22 (1.23)
I eat healthy food	3.17 (0.88)
I watch what I eat	3.35 (1.02)
I watch my weight	3.27 (1.26)
I have food available for quick healthy meals	2.91 (1.03)
I replace snacks with healthy alternatives	2.56 (0.90)
I weigh myself regularly	2.77 (1.53)
I keep track of what I eat and how much I should eat	2.34 (1.29)
<i>Physical cognitive questions¹ (n = 101)</i>	
I know when I should do more activity	3.50 (1.12)
I think about the benefits of being active	3.79 (0.93)
I try to think more about benefits of physical activity and less the hassles	3.14 (1.08)
When I set goals, I choose physical activities that I enjoy	3.14 (1.15)
I read articles about the benefits of being active from magazines, books, or the internet	2.72 (1.19)
<i>Physical behavioral questions¹ (n = 101)</i>	
I do things to make walking or other activities enjoyable	3.11 (1.09)
I plan ahead of time to be active	2.83 (1.28)
I can stick to my plans and be active each week	2.61 (1.14)
I keep track of how much physical activity I do each week	2.59 (1.36)
When I get off track with my physical activity, I find ways to get back on track	2.77 (1.17)
I ask my friends and family to walk with me to help me stay active	2.32 (1.28)
I make back up plans to make sure I get enough physical activity	2.14 (1.25)

¹The study of Cowan et al. [22].

the scatterplot of depression scores versus BMI indicated that normal BMI individuals reported no depression, overweight individuals reported high depression, and obese individuals reported depression levels in moderate ranges. Linear regression analyses (Table 5) revealed no significant predictive relationships between BMI and stress, anxiety, or depression scores.

4 Discussion

In this study, quality of life scores demonstrated that individuals of all BMI levels may experience impacts on quality of life due to their PCOS symptoms and challenges. Obese participants reported lower quality of life scores in some domains in this study, but linear regression analyses revealed that BMI significantly predicted only weight and hirsutism scores with increasing BMI, leading to a decrease in quality of life in these two areas. Total quality of life scores were highest for the normal BMI group and appear to decrease as BMI increases, indicating that BMI may impact overall quality of life. However, linear regression analysis did not quite support the significance of this relationship. Although the relationship between BMI and quality of life did not quite attain statistical significance in our study, it is quite possible that it would have attained significance had our sample size been larger.

Prior studies examining the impact of BMI on quality of life in people with PCOS have generally indicated that increasing BMI leads to decreasing quality of life [13,15–17,32]. However, upon phenotypical analysis, data indicate that people of all PCOS phenotypes experience some level of quality-of-life disruption, including those with milder PCOS symptomology [12]. The influence of BMI or the severity of PCOS on quality of life may not be fully understood, and those with a normal BMI should not be overlooked in quality of life assessments or research. Finally, it is possible that the influence of BMI on quality of life may be complicated by other factors such as dysmorphic concerns, infertility issues, eating disorder symptoms, and demographics [32–34]. Future studies should ensure normal BMI individuals are included in quality of life analyses and confounding factors that may impact quality of life should be considered.

The use of self-management strategies, including both dietary and physical activity, in PCOS has the potential to positively impact mental health, quality of life, and others. Physical activity, for example, has been found to increase health-related quality of life in adults regardless of medical conditions [23–26], including in patients with PCOS [27]. However, prior research indicates that people with PCOS utilize self-management strategies at a low level [28]. Findings from this study support prior research. Few studies have examined the impact of BMI on the use of self-management strategies in people with PCOS. Data that exist suggest that BMI may be inversely associated with the use of dietary self-management strategies [28]. Our findings indicate that BMI is not associated with the use of dietary or physical activity self-management strategies and that people at all BMI levels may utilize self-management strategies at a low level.

Table 4: Comparison of PCOS self-management strategy¹ scores between BMI categories (a), and results of eight separate regression analyses with PCOS self-management strategy scores as the response variables and BMI as the (continuous) predictor variable (b)

(a) PCOS self-management strategy scores versus BMI category				
Management strategy	All participants (<i>n</i> = 101) Mean (SD)	Normal BMI (<i>n</i> = 12) ² Mean (SD)	Overweight BMI (<i>n</i> = 20) Mean (SD)	Obese BMI (<i>n</i> = 63) Mean (SD)
Dietary total	2.90 (0.59)	2.92 (0.64)	2.76 (0.56)	2.94 (0.61)
Physical activity total	2.89 (0.79)	2.88 (0.80)	2.95 (0.77)	2.92 (0.80)
Cognitive dietary	2.84 (0.53)	2.94 (0.67)	2.74 (0.46)	2.87 (0.54)
Behavioral dietary	2.95 (0.81)	2.91 (0.75)	2.78 (0.87)	3.00 (0.83)
Cognitive physical activity	3.26 (0.73)	3.38 (0.91)	3.18 (0.62)	3.31 (0.72)
Behavioral physical activity	2.63 (0.98)	2.52 (0.95)	2.79 (1.04)	2.64 (0.97)
Cognitive total	3.00 (0.54)	3.11 (0.72)	2.91 (0.46)	3.04 (0.54)
Behavioral total	2.80 (0.81)	2.73 (0.73)	2.78 (0.89)	2.83 (0.82)

(b) Regression analyses of PCOS self-management strategy scores versus BMI						
Response variable	<i>R</i> ²	Intercept	Slope (β)	Std. Err.	<i>t</i>	<i>P</i> -value
Dietary total	0.2%	2.80	0.003	0.007	0.417	0.677
Physical activity total	0.4%	3.11	−0.005	0.009	−0.611	0.543
Cognitive dietary	0.2%	2.77	0.002	0.006	0.377	0.707
Behavioral dietary	0.1%	2.84	0.003	0.009	0.344	0.732
Cognitive physical activity	0.4%	3.47	−0.005	0.008	−0.635	0.527
Behavioral physical activity	0.3%	2.85	−0.006	0.011	−0.513	0.609
Cognitive total	0.0%	3.04	−0.001	0.006	−0.093	0.926
Behavioral total	0.0%	2.84	−0.001	0.009	−0.100	0.920

The reported *t*-test statistic values and *p*-values are for the test of the null hypothesis that the true slope is zero.

¹The study of Cowan et al. [22].

²Participants were permitted to skip survey questions if desired. Therefore, the number of responses included in the analysis for the various measurements differs.

Table 5: Comparison of stress, anxiety, and depression¹ scores between BMI categories, and results of three separate regression analyses with stress, anxiety, and depression scores as the response variables and BMI as the (continuous) predictor variable

(a) Stress, anxiety, and depression scores versus BMI category				
Variable	All participants Mean (SD)	Normal BMI Mean (SD)	Overweight BMI Mean (SD)	Obese BMI Mean (SD)
PSS	<i>n</i> = 92 ² 22.16 (6.99)	<i>n</i> = 11 27.73 (4.50)	<i>n</i> = 19 16.68 (5.95)	<i>n</i> = 56 21.89 (5.92)
Anxiety score	<i>n</i> = 89 10.99 (4.60)	<i>n</i> = 10 6.80 (4.02)	<i>n</i> = 16 15.00 (3.01)	<i>n</i> = 63 10.63 (4.28)
Depression score	<i>n</i> = 89 7.39 (4.15)	<i>n</i> = 10 1.20 (0.79)	<i>n</i> = 16 13.88 (1.96)	<i>n</i> = 63 6.73 (2.43)

(b) Regression analyses of stress, anxiety, and depression scores versus BMI						
Response variable	<i>R</i> ²	Intercept	Slope (β)	Std. Err.	<i>t</i>	<i>P</i> -value
PSS	0.3%	22.81	−0.039	0.082	−0.479	0.633
Anxiety score	0.1%	11.50	−0.015	0.054	−0.270	0.787
Depression score	0.0%	7.58	−0.005	0.049	−0.108	0.914

The reported *t*-test statistic values and *p*-values are for the test of the null hypothesis that the true slope is zero.

¹Previous studies [30,31].

²Participants were permitted to skip survey questions if desired. Therefore, the number of responses included in the analysis for the various measurements differs.

Utilization of self-management strategies may or may not lead to behavior change. For example, nutrition self-management strategies have been found to not be associated with diet quality or energy intake [28]. Data in other areas of health and medicine indicate that self-management strategies alone do not increase behavior change and that factors like self-efficacy or addressing social supports must also be included in interventions [35–39]. Prior research has indicated that people with PCOS do not have lower self-efficacy compared to healthy counterparts [40–42]. However, this relationship may be complicated by demographic factors such as BMI and socioeconomic status, which could influence self-efficacy [43]. Greater self-efficacy may also be associated with greater illness acceptance and illness acceptance is tied to improved self-management [43]. Finally, additional factors, including health literacy, may influence both self-efficacy and the implementation of self-management strategies [44].

There may be many complexities to the implementation of self-management strategies and level of self-efficacy in people with PCOS, and all ultimately have the potential to influence quality of life. Interventions that include not only self-efficacy but also health literacy, education about the lifelong impact of PCOS on health, and PCOS acceptance alongside education about self-management have the potential to improve the quality of life in PCOS. These interventions may achieve growth in self-management by taking an individualized approach to deal with the many unique confounding factors that influence self-efficacy and self-management of PCOS. Based on findings from this study indicating that people of all body sizes with PCOS struggle with self-management, these interventions should be provided to all body sizes in PCOS care.

Mental health concerns exist for those with PCOS. Anxiety, depression, and stress have been found at higher levels in those with PCOS compared to controls [18,45–47]. Increasing BMI has been associated with an increased risk for depression or anxiety [19,20,47]. Stress tolerance may be lower in individuals with PCOS who have a normal BMI [48], although results are conflicting [49]. Findings from our study indicate that while individuals with a normal BMI may report higher levels of stress and lower levels of anxiety or depression compared to overweight and obese participants, all three mental health areas may not be significantly associated with BMI. Anxiety, depression, and stress levels in people with PCOS may be complicated by impacts of the disorder, such as infertility, acne, insulin resistance, as well as other life matters, including finances, contraceptive use, and exercise habits [47,50,51].

BMI may predict quality of life in certain domains like weight and hirsutism. However, individuals of all body

sizes with PCOS may experience quality of life disruptions. Additionally, all body sizes of PCOS may experience low levels of dietary and physical activity self-management. Finally, while a higher BMI may be linked to anxiety and depression, it is possible that individuals with a normal BMI may experience greater levels of stress.

This study had important limitations to note. Height and weight, utilized to calculate BMI, were self-reported, and respondents may have under or overestimated their current weight. Additionally, all survey responses were self-reported. Finally, sample size and sample demographics may limit the generalizability of the findings to a broader audience. Sample size may have been negatively impacted by survey length due to the inclusion of multiple health and well-being assessment tools. However, while survey length was a limitation, it was also a strength in that the survey included multiple measures of health and well-being in a single study.

5 Conclusion

PCOS is a complex disorder that impacts people of all body sizes. PCOS symptomology may negatively impact the quality of life and mental health. Individualized and comprehensive care is necessary to adequately address the many concerns of PCOS and this care should be inclusive of people of all body sizes. Programs and providers should aim to assess quality of life and mental health concerns in addition to metabolic impacts in people with PCOS. Further, to enhance self-management of PCOS through lifestyle behaviors, programs and providers should recognize the factors that can influence the implementation of self-management strategies, such as health literacy and PCOS acceptance. Future research should examine health and well-being in individuals of all body sizes with PCOS, including those with a normal BMI. Future studies should also consider the many confounding factors that have the potential to influence measures of health and well-being in PCOS.

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