

Mental health latent profiles and emotion regulation in women with polycystic ovary syndrome: a cross-sectional study

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Abstract

Introduction: Psychopathological disorders such as anxiety, depression and body image distress are common in women with PCOS and negatively impact their mental health. It is important to identify mental health latent subgroups of PCOS females and provide tailored measures to reduce psychopathological distress and improve their subjective well-being. **Methods:** LPA was conducted in Mplus version 8.3 to identify mental health latent profiles in women with PCOS based on the dual-factor approach. Differences in demographic and anthropometric variables, cognitive reappraisal, expressive suppression, and social support across mental health profiles were examined through multinomial logistic regression. **Results:** The current study identified three distinct mental health profiles within women with PCOS: Symptomatic but Content Profile Complete Mental Health Profile and Troubled Profile, with group proportions of 52.3%, 35.7%, and 11.1 %, respectively. The results of the multinomial regression analysis revealed that cognitive reappraisal and social support as predictors of positive mental health adjustment and expression suppression is an indicator of negative barriers in women with PCOS. **Conclusion:** This study identified three distinct mental health profiles in women with PCOS, which provides evidence for more precisely targeted interventions to address PCOS women's diverse needs of psychopathological symptoms and subjective well-being.

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Conclusion: This study identified three distinct mental health profiles in women with PCOS, which provides evidence for more precisely targeted interventions to address PCOS women’s diverse needs of psychopathological symptoms and subjective well-being.

Key Words: polycystic ovary syndrome; mental health; subjective well-being; expression suppression; cognitive reappraisal; latent profile analysis.

What is already known on this subject?

- Anxiety, depression and body image distress are common in women with PCOS and negatively impact their mental health;
- Traditionally, symptoms of mental illness (e.g., anxiety and depression) have been used to infer the presence or absence of optimal mental health;
- Successful emotion regulation is important to better-perceived mental health and failure in emotion regulation is associated with various mental disorders, particularly anxiety and depression.

What does this study add?

- This study identified three distinct mental health profiles within women with PCOS: Symptomatic but Content Profile Complete Mental Health Profile and Troubled Profile;
- 52.3% of women with PCOS were classified as Symptomatic but Content profile, in that they exhibited significant psychopathologic symptoms (anxiety and depression) yet still reported relatively high subjective well-being; 11.1% of PCOS women in the Troubled profile demonstrated significant anxiety, depressive symptoms, and body image distress, as well as the poor subjective well-being;
- The results of this study revealed cognitive reappraisal and social support as indicators of positive mental health adjustment and expression suppression as an indicator of negative barriers in women with PCOS.

INTRODUCTION

Polycystic ovarian syndrome (PCOS) is a common reproductive endocrine, metabolic disease in women of childbearing age, which is characterized by increased androgen, polycystic ovarian changes, irregular menstruation, obesity, hirsutism and acne(Sidra et al., 2019; Teede et al., 2010). Increasing evidence indicates that PCOS is associated with mood and psychiatric disorders. A systematic review by Cooney et al. (Cooney et al., 2017) that included 18 studies reported a 36.6% prevalence of depressive symptoms and a 41.9% prevalence of anxiety symptoms in PCOS women. Women with PCOS tend to view body image negatively and have lower body satisfaction(Kogure et al., 2019). Symptoms such as hirsutism, acne and hair loss can cause negative perceptions of body image in women with PCOS, mainly including dissatisfaction with their appearance, sexuality, and sense of self, thus reducing their body image satisfaction and negatively impacting their mental health(Becker et al., 2019; Neubronner et al., 2021; Xing et al., 2022; Yin et al., 2022). Overall, psychopathological disorders such as anxiety, depression and body image distress are common in PCOS women and negatively impact their mental health. Due to the importance of mental health, the guide recommends evaluating and managing mental health among this group of women(H. J. Teede et al., 2018).

Generally, psychological symptoms, such as anxiety and depressive symptoms, are used to assess whether an individual is in optimal mental health. However, several studies have shown that low scores on anxiety and depression scales do not necessarily mean that individuals have higher levels of well-being. Positive psychology believes that “mental health is not simply the elimination of negative factors such as mental illness but also the stimulation of well-being experience and positive skills”(Seligman, 2008). The Dual-Factor Model of Mental Health (DFM) suggests that mental health is not just the absence of mental illness or a high level of well-being but that it should include both the lack of mental illness and a high level of well-being (Clark & Malecki, 2022; King et al., 2022). Therefore, according to the Dual-Factor model of mental health, the population is divided into four categories : (1) complete mental health (low mental illness symptoms and high subjective well-being) ; (2) vulnerable (people with low psychological symptoms and low subjective well-being are prone to psychological problems in the future) ; (3) symptomatic but content (

people with high mental illness and high subjective well-being have strong psychological self-healing ability, and psychological problems often heal themselves ; (4) Troubled (people with high mental illness and low subjective well-being will show not only psychopathological symptoms but also have a poor psychosocial function)(Doll, 2008; Suldo & Shaffer, 2008). From the perspective of the DFM for mental health, well-being and psychopathology may be considered separate indicators of complete mental health. Someone may exhibit severe symptoms of psychopathology yet also demonstrate high subjective well-being. As far as research is known, psychopathological symptoms such as anxiety, depression, and body image distress are prevalent in women with PCOS and have become significant barriers to affecting the complete mental health of women with PCOS(Cooney et al., 2017; Kogure et al., 2019). Understanding how anxiety, depression, body-image distress, and well-being are related has important conceptual, theoretical, and practical implications for women with PCOS. Although several researchers have studied the perceived mental health of women with PCOS(Çetinkaya Altuntaş et al., 2022; Joshi et al., 2022), most studies are variable-centred analysis, which means that they assume that individuals usually experience the same pattern of anxiety, depression, body image distress and subjective well-being. However, there may be differences in patients' mental health not only at the individual level but also at the group level, which means that patients' mental health is heterogeneous. In the present study, we adopted a powerful method to classify subgroups based on latent mixture modelling to evaluate latent mental health profiles in a sample of women with PCOS through a latent profile analysis (LPA). We begin by defining the critical indicators used in the present study, including psychopathological symptoms (anxiety, depression, body image distress) and subjective well-being.

Specifically, it is crucial to identify the factors for women with PCOS in different subgroups and develop interventions to promote coping skills for those with high psychopathological symptoms (anxiety, depression, and body image distress) or low subjective well-being. An essential concept in understanding psychopathological disorders, emotion regulation is a goal-oriented process of monitoring, evaluating and regulating the generation and expression of emotions by perceiving internal and external environmental changes(Eisenberg & Spinrad, 2004; Song et al., 2022). The ability to effectively regulate negative emotions plays a crucial role in mental health, social functioning, and overall well-being(van Middendorp et al., 2005). Conversely, failure in emotion regulation is thought to increase the risk of later internalizing psychopathology, including depression and anxiety disorders. (Yan et al., 2018). Cognitive reappraisal and expression suppression are the most widely used emotion regulation strategies in regulating negative emotions (Gross & Jazaieri, 2014). Cognitive reappraisal is the most adaptive adjustment strategy, which positively changes the emotional experience. However, expression inhibition is usually considered a maladaptive adjustment strategy after the emotion is generated, related to the reduction of positive emotion, the decrease of life satisfaction and the more serious negative emotion(Aldao et al., 2010). However, the relationship between two types of emotion regulation styles (cognitive reappraisal and expressive suppression) and mental health is unknown in PCOS women. A further key aim of this study is to elucidate the association between mental health and emotion regulation strategies within established mental health latent profiles based on the Dual-Factor Model.

Social support is defined as the physical, cognitive and emotional support that individuals in society use social network relationships to get(Gottlieb & Bergen, 2010). Social support considerably impacts physical and mental health and has been identified as an important protective factor against negative emotional states(Guo et al., 2022; Yu et al., 2020). Studies have consistently shown that social support can help individuals reduce the impact of stressors on themselves and play an essential role in regulating individual mental health(Al-Dwaikat et al., 2022; Ning et al., 2022; Suffredini et al., 2022; Yu et al., 2020). Additionally, studies reported that when a woman receives positive social support from her family, her body image perception improves (Liu et al., 2021). Studies also reported that social support was associated with greater subjective well-being and life satisfaction(Brajša-Žganec et al., 2018; C. Liu et al., 2022). However, it remains unclear whether social support has protective effects on PCOS women. Therefore, another purpose of the current study is to evaluate the relationship between social support and different mental health latent profiles in women with PCOS.

This study had the following aims. First, we sought to identify latent subgroups of PCOS females based on their psychopathological symptoms (anxiety, depression, and body image distress) and subjective well-being

through a dual-factor approach using LPA. Second, we aimed to analyze and understand the characteristics of different mental health subgroups and examined differences in emotion regulation strategy and social support among the extracted profiles. Finally, we tried to identify predictors of mental health profiles in PCOS women through multinomial logistic regression. We hope this study will contribute to the understanding of the complete mental health of PCOS women and provide the rationale to design appropriate measures to reduce anxiety, depression, and body image distress in PCOS women with the ultimate aim of improving their subjective well-being.

METHODS

Design

We conducted a cross-sectional design.

Participants

We conducted this cross-sectional study at the Gynecology and Center for Reproductive Medicine of the *****. From May to September 2022, non-pregnant women with PCOS aged 18 to 50 years attending the hospital's gynecology and medical reproduction centre were recruited for this study, and each participant met Rotterdam criteria (H. Teede et al., 2018): oligomenorrhea or amenorrhea, together with clinical or biochemical hyperandrogenism, polycystic ovaries, or both. Exclusion criteria: (1) participants with severe cardiovascular, liver, kidney and other organic diseases or malignant tumours; (2) participants with mental illness or cognitive impairment.

Ethics

This study was approved by the Institutional Review Board of ***** (the number: *****).

The researchers used unified instructions to guide participants in filling out the questionnaire. The questionnaire is completed independently by the participants. The questionnaire will be collected on the spot and checked to ensure the authenticity and integrity of the questionnaire. Participants were informed that they could withdraw from the study at any time during the research, and their right to obtain disease-related information and knowledge was not compromised. Each participant provided written informed consent before participation in the study, as outlined in the Declaration of Helsinki.

Data collection

Demographic variables included age, marital status, educational level, BMI, hirsutism, and acne. Body Mass Index (BMI) was calculated as the weight ratio in kilograms to the square height in meters (kg/m²). According to the Chinese Body Mass Index (BMI) standard consensus statement, patients were divided into normal weight (BMI < 25) and overweight/obesity (BMI ≥ 25). Clinical assessment of hirsutism was determined by physicians using the Ferriman-Gallwey scoring (FGs) system to grade nine body parts from 0 (no hirsutism) to 4 (severe hirsutism). The total score ranges from 0 to 36, with five or more considered positive for hirsutism in China.

Generalized Anxiety Disorder-7 (GAD-7) is an instrument for screening and assessing the severity of generalized anxiety developed by Spitzer et al. in 2006 (Spitzer et al., 2006). The GAD-7 scale consists of 7 entries and can assess the severity of anxiety in the last two weeks. The scale is scored 0-3 depending on the frequency of anxiety symptoms, with a total score of 0-21, where 0-4 is no anxiety, 5-9 is mild anxiety, 10-14 is moderate anxiety, and 15 or more is severe anxiety. Patients with a total score of greater than or equal to 5 on the GAD-7 are usually considered to have a generalized anxiety disorder (Löwe et al., 2008). The Cronbach's alpha coefficient for the GAD-7 in this study was 0.92.

The Patient Health Questionnaire 9 (PHQ-9) was developed by Kroenke et al. (Kroenke et al., 2001) to assess depressive symptoms based on the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). The scale consists of 9 items, each of which takes a Likert-4 scale to assess participants' depressive symptoms in the past two weeks, with the total score representing the severity of

depression, classified as minimal (0-4), mild (5-9), moderate (10-14), and moderate-severe/severe depressive symptoms ([?|15). This study used a score greater than or equal to 5 as the cut-off for positive depressive symptoms. In this study, Cronbach's coefficient of the scale was 0.84.

The Body Image States Scale (BISS) was developed by Cash et al. in 2002 (Cash et al., 2002) and was used to measure satisfaction with body image. There are six items in the questionnaire, using Likert's 9-point scoring method, of which 1, 3, and 5 adopt positive scoring; items 2,4 and 6 were scored in reverse. The higher the BISS score, the more positive the body image. A lower total score means more severe body image distress. The internal consistency was considered good(Cronbach alpha=0.77) (Cash et al., 2002). In this study, Cronbach's coefficient of the scale was 0.84.

Subjective well-being was measured by the Index of Well-Being scale (IWB) was used in this study to measure the level of subjective well-being in women with PCOS. The scale was developed by Campbell(Campbell et al., 1976). It contained two subscales, the overall effective index and the life satisfaction scale, with eight entries for the overall well-being index and one for the life satisfaction scale. The scale is scored on a Likert7 scale, and the total score is the sum of the mean score of the overall affective index scale and the score of the life satisfaction scale (weighted at 1.1). The total score ranges from 2.1 to 14.7, and higher scores indicate an increased sense of well-being. The scale has good internal consistency, and Cronbach's alpha coefficient for this scale in this study was 0.95.

The Emotion Regulation Questionnaire (ERQ) was developed by Professor Cross(Gross, 2013) of Stanford University based on the Process Model of Emotion Regulation. The scale contains ten items, divided into two dimensions: cognitive reappraisal and expressive inhibition, with six items for cognitive reappraisal and four for expressive inhibition. Each item was rated on a Likert scale of 1-7, with one representing "completely disagree" and seven representing "completely agree". The frequency of use of the emotion regulation strategy was positively correlated with the score. The internal consistency coefficient of the cognitive reappraisal dimension in this study was 0.78, and the internal consistency coefficient of the expressive suppression dimension was 0.80.

The Multidimensional Scale of Perceived Social Support (MSPSS) scale(Zimet et al., 1990), which contains 12 entries divided into three dimensions: family support, friend support, and other support, was used in this study to assess the degree of support perceived by women with PCOS for various social supports. The scale assesses each item using a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree), with a total score ranging from 12 to 84. The total score indicates the full degree of social support felt by the individual, with higher scores indicating better perceived social support. In this study, Cronbach's alpha for this scale was good at 0.94.

Data analysis

The latent class model is an individual-centred method to analyze the characteristics of different groups of people and the differences in various indicators between different categories, identify high-risk groups, and provide a basis for targeted intervention measures(Howard & Hoffman, 2018). LPA was conducted in Mplus version 8.3 to identify mental health latent profiles in women with PCOS based on the dual-factor approach. Given the differences between PHQ-9, GAD-7, BISS and IWB scales, we converted the total scores of these four scales into Z scores for latent profile analysis. We start from a zero model, gradually increase the number of potential categories for model fitting, and select the most suitable model based on the parameters of fitting indicators such as AIC, BIC, entropy index, BLRT, and LMR while considering the interpretability and practical significance of each category. The optimally appropriate model is selected based on the following model-fit indices (Table 2): (1) model fit was determined using the Akaike information criterion (AIC), Bayesian information criterion (BIC) and sample-size adjusted Bayesian information criterion (aBIC), with smaller values indicating a better fit; (2) the Lo-Mendell-Rubin likelihood ratio test (LMR LRT) and bootstrap likelihood ratio test (BLRT), in which $p < 0.05$ indicates that the tested model fits better(Toker & Green, 2021); (3) Entropy ranges from 0 to 1, whereby a higher value indicates higher classification utility, and a value of > 0.80 indicates a highly differentiated latent profile.

Once the optimal mental health latent class was determined, we used SPSS 26.0 for subsequent analysis after the determination of the latent profiles. We conducted a series of analysis of ANOVAs to examine the differences in anxiety, depression, body image satisfaction and subjective well-being among different latent profiles. Differences in demographic and anthropometric, cognitive reappraisal, expressive suppression, and social support across mental health profiles were examined through multinomial logistic regression.

RESULTS

Demographic and Anthropometric Characteristics

477 samples were included in the current study. The mean age of this sample was 27.22 years ($SD = 5.37$), with the majority being $BMI < 25$ ($n = 358$, 75.1%). Approximately two-fifth ($n = 199$, 41.7%) of the women exhibited symptoms of hirsutism. Married participants were 52.0% ($n = 248$), and two-thirds of participants were undergraduates ($n = 305$, 63.9%).

Identifying Latent Mental Health Profiles

This study analyzed potential profiles for anxiety, depression, body imagery distress, and subjective well-being in 510 women with PCOS. A series of five LPAs were conducted to obtain the optimal model, and the fit indices for each group of potential profiles are detailed in Table 1. The AIC, BIC, and aBIC continuously decreased, and all Entropy values were more than 0.8, increasing the number of latent classes. Although the subsequent four-profile and five-profile solutions showed lower IC values, the fit indices decreases were smaller, meaning IC values were flattening (DiStefano & Kamphaus, 2006). Additionally, the Lo-Mendell-Rubin likelihood ratio test suggested an optimal fit for models with three profiles or fewer. After examining the model's fit indices, entropy, parsimony, and interpretability, the three-profile solution was found to be the optimal class solution (AIC = 13616.29, BIC = 13691.30, aBIC = 13634.17, LMR $p = 0.002$, BLRT $p < 0.001$). Considering all fitting indexes and practical clinical significance, the 3-profile model was regarded as the optimal model in this study, with observed entropy of 0.81, suggesting women with PCOS were correctly classified approximately 81% of the time (Ferguson et al., 2020).

Based on the dual-factor model, the mental health latent profile labels for women with PCOS by assessing the parameters and clinical significance of the mental health profile (i.e., GAD-7, PHQ-9, BISS, and IWB; see Table 2 and Figure 1). Generally, the first profile was labelled as Symptomatic but Content profile ($n = 259$, 53.2%) had comparatively moderate anxiety and depression symptoms but experienced comparatively content subjective well-being (Figure 1). The second profile labelled Complete Mental Health profile ($n = 169$, 35.7%), had high life satisfaction and experienced low anxiety, depression, and body-image distress (Figure 1). Finally, because the women with PCOS were characterized with statistically significant highest anxiety and depression symptoms, higher body-image distress and lower subjective well-being compared to other profiles, group three was called the Troubled profile ($n = 49$, 11.1%) (Figure 1).

Characteristics of Mental Health Profiles and Differences in Emotion Regulation Strategy and Social Support

Table 2 compares mental health (well-being, body-image satisfaction, anxiety, and depressive symptoms) and emotion regulation strategies across the identified three profiles (Symptomatic but Content, Complete Mental Health, and Troubled). Pairwise post hoc comparisons revealed significant differences in anxiety, depression, body image distress, and subjective well-being among all the assessed profiles. The differences across the three profiles on mental health were also displayed with standardized scores (Z scores) in Figure 1. Among the three profiles, the PCOS women in the Symptomatic but Content profile showed relatively moderate anxiety and depressive symptoms and comparatively content of subjective well-being. The mental health in the Complete Mental Health profile displayed the highest levels of subjective well-being and lowest levels of anxiety, depressive symptoms, and body image distress. By contrast, PCOS women in the Troubled profile demonstrated the highest level of anxiety, depressive symptoms, and body image distress, as well as the lowest level of subjective well-being. Among the body image satisfaction score, post-hoc statistical analysis showed no significant difference between the Symptomatic but Content profile and Troubled profile.

In addition, we examined the differences in emotion regulation strategies and social support across three latent mental health profiles. Overall, there were significant differences among the three profiles in cognitive reappraisal, expressive suppression, and social support. As shown in table 2, PCOS women in the Complete Mental Health profile reported the highest cognitive reappraisal and social support scores and the lowest expressive suppression scores. That is, PCOS women in this profile, with the best social support, used more cognitive reappraisal and less expressive suppression to regulate emotions. By contrast, the PCOS women in the Troubled profile demonstrated the highest expressive suppression scores and the lowest cognitive reappraisal scores and social support scores. PCOS women in this profile earned the worst social support and used more expressive suppression and less cognitive reappraisal to regulate emotions. Finally, the PCOS patients in the Symptomatic but Content profile displayed moderate expressive suppression scores, cognitive reappraisal scores, and social support scores.

Multinomial Logistic Regression: Predictors of Mental Health Profiles

We performed a multinomial logistic regression analysis with mental health profile as the dependent variable and age, BMI, hirsutism, acne, education level, marital status, cognitive reappraisal, expressive suppression, and social support as independent variables. The complete mental health profile was used as the reference group for regression analysis. Table 3 shows the multinomial logistic regression results. Acne was a significant predictor of being classified as a mental health profile. Compared with the complete mental health profile, the odds of being in the symptomatic but content profile was 0.58 for PCOS women with acne compared with PCOS women without acne. Therefore, in this sample, PCOS women with acne were $1/0.58 = 1.72$ times more likely to be in a symptomatic but content profile rather than a complete mental health profile than PCOS women without acne.

More importantly, the odds of being in a symptomatic but content profile (rather than a complete mental health profile) were 1.06 for women with PCOS with higher expression suppression relative to PCOS women with lower expression suppression. Likewise, PCOS women with higher expression suppression had 1.17 odds of being in a troubled profile (as opposed to a complete mental health profile) relative to women with PCOS with lower expression suppression. In addition, social support significantly predicted profile classification in women with PCOS. Compared with the complete mental health profile, for each unit increase in social support, the probability of being classified as a symptomatic but content profile (Odds Ratio = 0.93, $p < 0.01$) or a troubled profile (Odds Ratio = 0.90, $p < 0.01$) decreased. In other words, for every unit increase in social support, the possibility of PCOS women in a complete mental health profile is $1/0.93=1.08$ times that of a symptomatic but content profile, and the possibility of a complete mental health profile is a troubled profile $1/0.90=1.11$ times. Finally, cognitive reappraisal was not essential in predicting the classification between symptomatic but content profile and complete mental health profile. However, for each unit increase in cognitive reappraisal, women with PCOS were $1/0.88=1.14$ times more likely to be in the complete mental health profile than in the troubled profile (Odds Ratio = 0.88, $p < 0.01$).

DISCUSSION

This study aimed to identify latent mental health profiles among women with PCOS. Based on the DFM of mental health and positive psychology perspective, this study conceptualized psychopathology indices (anxiety, depression, and body image distress) and subjective well-being as mental health totality in women with PCOS. A latent profile analysis identified three distinct mental health profiles within women with PCOS: Symptomatic but Content Profile, Complete Mental Health Profile and Troubled Profile, with group proportions of 52.3%, 35.7%, and 11.1 %, respectively. In addition, the mental health latent profiles were further examined in their relationships with the emotion regulation strategies, social support, and demographic and anthropometric data. Compared to the Complete Mental Health profile, the Symptomatic but Content Profile and Troubled profile were associated with social support, cognitive reappraisal, expressive suppression, and acne.

As far as we know, the present study describes for the first time a comprehensive mental health latent profile (anxiety, depression, body image distress, and subjective well-being) of PCOS women based on the DFM of

mental health and positive psychology perspective. In this study, according to DFM, three (Complete Mental Health, Symptomatic but Content, and Troubled) of the four assumed mental health profiles appeared in PCOS women. A vulnerable profile (people with low psychological symptoms and low subjective well-being are prone to psychological problems in the future) was not found. The possible reasons for this are described below. Specifically, the need for fertility may be a watershed in women's mental health with PCOS. First, without the need to have children, most women with PCOS showed good mental health, with only a portion of PCOS women showing symptoms of anxiety and depression due to menstrual disorders, obesity, and acne, and general well-being was not compromised (Bazarganipour et al., 2013; Joshi et al., 2022). Second, when women with PCOS want children, parental urgency, stigma, work stress, and repeated hospital visits may lead to high anxiety and depression symptoms and significantly lower subjective well-being (Dybciak et al., 2022; Ee et al., 2020).

The current study labelled three nonparallel mental health latent profiles: Symptomatic but Content Profile, Complete Mental Health Profile, and Troubled Profile. The proportions of the three profiles were 52.3%, 35.7%, and 11.1 %, respectively. Our results indicated that mental health problems (anxiety and depressive symptoms, body image distress, and decreased subjective well-being) were widespread and prevalent in PCOS women, supporting previous results of a high prevalence of psychopathology and poor quality of life in PCOS women (Bahadori et al., 2022; Xing et al., 2022; Yin et al., 2022). On the one hand, 52.3% of women with PCOS were classified as Symptomatic but Content profile, in that they exhibited significant mental illness symptoms (anxiety and depression) yet still reported relatively high subjective well-being. On the other hand, the Troubled profile of women with PCOS included 11.1% of the sample. These PCOS women may have the worst mental health status, characterized by clinically significant symptoms of anxiety and depression, body image distress, and poorly perceived well-being. The existence of three unique mental health profiles indicates that subjective well-being is not simply an illness without psychopathology and that psychopathology and subjective well-being coexist in women with PCOS. The LPA method used in this study offers an important new strategy for the early identification of mental health problems of PCOS women in general and the identification and classification of psychopathology (anxiety, depression, and body image distress) and subjective well-being. And these results may help to develop tailored intervention strategies for reducing mental health distress in different profiles of PCOS women. Specifically, transdiagnostic interventions should be designed to address the coexisting psychopathology of anxiety and depressive symptoms and body image distress and improve subjective well-being in women with PCOS.

Another noticeable finding in this study was that having acne was a significant antecedent predictor of membership classification between the Complete Mental Health profile and Symptomatic but Content profile. Previous studies revealed that acne was significantly associated with an increased risk for anxiety and depressive symptoms (Kocak & Ugurlu, 2022). As shown by Ekramzadeh et al. (Ekramzadeh et al., 2020), most PCOS women (90%) considered acne as one of the leading causes of fear, sadness, reduced self-confidence, and loss their physical attractiveness. In this sense, early diagnosis and timely assessment of the severity of acne are essential in women with PCOS. However, inconsistent with previous studies (Wang et al., 2021; Yin et al., 2022; Zachurzk et al., 2021), we did not find direct relationships between overweight or obesity and mental health in women with PCOS. The different findings may be due to the insufficient number leading to the bias. Because in this study, lean PCOS women (BMI<25) account for the vast majority of this study sample (75.10%), with less than one-third (24.90%) was obese/overweight PCOS women (BMI≥25). Therefore, more large-sample, high-quality prospective studies are needed to further confirm these preliminary findings.

The current study also explored the differences between three mental health profiles regarding cognitive reappraisal, expression suppression, and social support. Importantly, we assessed and revealed cognitive reappraisal and social support as indicators of positive adjustment and expression suppression as an indicator of negative barriers in women with PCOS. Specifically, women with PCOS belonging to the Complete Mental Health profile showed lower expressive suppression and higher social support than PCOS women in the Symptomatic but Content profile and Troubled profile. Indeed, compared to the Complete Mental Health profile, women with PCOS in the Symptomatic but Content profile and Troubled profile both ex-

perienced significant mental illness symptoms, including anxiety symptoms, depressive symptoms and body image distress. Expression inhibition is at the stage of emotional response adjustment, that is, after the physiological mechanisms of emotion have been activated; therefore, expression inhibition refers to the behaviour of individuals who consciously inhibit their emotional expression when emotions are aroused (Bebko et al., 2011; Lambert, 2007). Generally, expression suppression as a maladaptive strategy typically hurts an individual's physical and mental health and leads to unhealthy psychological states such as anxiety and depression (Eftekhari et al., 2009; Tyra et al., 2021). Therefore, we believe that increasing the utilization of expressive suppression may be a significant predictor of poorer psychopathological symptoms (anxiety, depression, and body image disturbance) and subjective well-being. This further emphasizes the importance of reducing expression suppression as an emotion regulation strategy for coping with mental health problems such as anxiety and depression induced by PCOS. Social support refers to the moral and material support and assistance provided to individuals at all levels of society and family and is an essential part of social psychology (Finfgeld-Connett, 2005). Social support could promote self-protection, alleviate individual mental health problems (e.g., anxiety and depression), and increase an individual's subjective well-being (Al-Dwaikat et al., 2022; Ozbay et al., 2007; Shumaker & Brownell, 1984). Although social support has been shown in other populations to help reduce anxiety, and depressive symptoms, manage emotions, promote positive body image cognition, and improve well-being (Al-Dwaikat et al., 2022; Bi & Wang, 2022; Faraci & Bottaro, 2022; Y. Liu et al., 2022), there are few studies in women with PCOS. This study revealed that women with PCOS in the Complete Mental Health profile received more social support and had significantly more significant mental health status than the other two. From this perspective, how strengthening emotional and social support may be an essential direction to help women with PCOS improve their mental health in the future.

Finally, we found that when the Complete Mental Health profile was served as the reference group, PCOS women in the Troubled profile had a low level of cognitive reappraisal. PCOS women in the Complete Mental Health profile applied more cognitive reappraisal to regulate their emotions. As a regulation strategy focusing on antecedents, cognitive reappraisal is often an effort to regulate emotional experiences before they arise and change one's perception of things (Koval et al., 2015; Lazarus & Alfert, 1964). As an adaptive emotion regulation strategy, cognitive reappraisal has been shown to offer protection against the development of psychopathologies (Brown et al., 2022; Liang et al., 2022; Su et al., 2022). Thus, when faced with stressors from PCOS, cognitive reappraisal may enable women with PCOS to reconstruct these situations in a way that successfully alters the emotional experience, increasing self-efficacy in stress reduction and stress relief as well as further reducing anxiety and depressive symptoms, body image distress, and further improving subjective well-being by reinterpreting emotional events.

Limitations

Several limitations pertain to the study. First, Our study is a cross-sectional design, and a multilevel model cannot assess the stability of the latent profile over time. Future research should focus on different time points after PCOS diagnosis and use latent transition analysis on longitudinal data to examine latent profile changes empirically. Second, the current study results are limited by our lack of a more comprehensive and balanced sample of PCOS, such as PCOS women (BMI < 25) account for the vast majority of this study sample (75.10%), with less than one-third (24.90%) was obese/overweight PCOS women (BMI [?] 25). Therefore, further research with a larger sample size and a less heterogeneous population is needed. Third, we conducted this study using data using an entire sample of a hospital in China, compromising its generalizability to other regions and countries with different cultural backgrounds. Fourth, excluding participants under 18 limited the data on adolescents with polycystic ovary syndrome (under 18 years).

Conclusion

This study identified three distinct mental health profiles in women with PCOS, which provides evidence for more precisely targeted interventions to address PCOS women's diverse needs of psychopathological symptoms and subjective well-being. Transdiagnostic interventions should be developed and targeted for women with PCOS in different mental health subgroups, including decreasing expressive suppression and

strengthening cognitive reappraisal and social support.

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