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The impact of experienced discrimination and self-stigma on sleep and health-related quality of life among individuals with mental disorders in Hong Kong

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Abstract

Purpose For many individuals with mental disorders, stigma may represent a potent stressor that can disrupt sleep and impair health and quality of life. In this study, we tested a stigma model of sleep health, hypothesizing that public stigma (as indicated by experienced discrimination) and internalized stigma (as indicated by self-stigma content and process) would affect sleep and, in turn, health-related quality of life (HRQoL) among individuals with mental disorders.

Methods A total of 282 individuals with mental disorders from Hong Kong, China, completed questionnaire measures of experienced discrimination, self-stigma content and process, sleep disturbance, and physical and mental HRQoL. Structural equation modeling and Bootstrap analyses were conducted to analyze the relations among the variables.

Results Structural equation modeling showed that experienced discrimination was positively associated with self-stigma content and process, which were, in turn, linked to greater sleep disturbance and consequently poorer physical and mental HRQoL. Bootstrap analyses further demonstrated that experienced discrimination had significant indirect effects on sleep disturbance, via self-stigma content and process, and on physical and mental HRQoL, via self-stigma content and process and sleep disturbance.

Conclusions Theoretically, this study highlighted the importance of considering the contributions of both public and internalized stigma, and differentiating between self-stigma content and process, when evaluating the sleep quality and health status of individuals with mental disorders. Practically, this study pointed to the necessity of developing anti-stigma and anti-self-stigma interventions at societal and individual levels in order to reduce stigma-related stress and improve sleep and health outcomes among individuals with mental disorders.

Keywords Discrimination · Self-stigma · Sleep disturbance · Health-related quality of life · Mental disorders

Introduction

Sleep disturbance is common among individuals with mental disorders [1, 2]. Research shows a higher prevalence of sleep difficulties and disorders among individuals with mental disorders compared to the general population [3]. In particular, individuals with mental disorders tend to have lower sleep efficiency, longer sleep latency, shorter sleep duration, more insomnia symptoms, and greater daytime sleepiness [4, 5]. These sleep problems may increase the risk and severity of physical illnesses (e.g., immune impairment, hypertension, heart disease) and mental disorders (e.g., psychosis, depression, anxiety) [6–8], which may further impair social, occupational, and role functioning and reduce life satisfaction [9, 10], that is, general fulfillment of wants and needs for life [11]. The potential cumulative effects are decreases in health-related quality of life (HRQoL) [12, 13], defined objectively as reduced ability to perform daily activities (i.e., poorer functioning) and subjectively as increased negativity toward everyday life (i.e., poorer well-being), due to compromised health [14, 15].

In order to address the detrimental effects of sleep disturbance on individuals with mental disorders, it is critical to identify risk factors for poor sleep in this population. To

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date, research has documented a range of biological and illness-related factors that may contribute to sleep disturbance among individuals with mental disorders [16, 17], but relatively few studies have examined how environmental or psychosocial conditions may affect sleep quality among them [18]. It is noteworthy, however, that, from bio-behavioral perspectives, optimal sleep is facilitated by psychological perceptions of safety and social belonging, whereas environmental threats and psychosocial stressors that heighten vigilance and alertness are antithetical to restful sleep [19]. Therefore, psychosocial factors may play an important contributory role in the development and maintenance of sleep disturbance among individuals with mental disorders.

For many individuals with mental disorders, public stigma may constitute a psychosocial stressor that can disrupt sleep [20]. Public stigma refers to stereotypical beliefs and prejudicial attitudes endorsed by the general population toward individuals with a discredited attribute [21]. Public stigma has been known to adversely affect individuals with mental disorders [22]. Research shows that the public endorse negative stereotypes about mental disorders, separate themselves and individuals with mental disorders into "us" versus "them" division, and confer status loss and discrimination to individuals with mental disorders [23, 24]. As a result of the public stigma, individuals with mental disorders are often stigmatized as unpredictable, dangerous, and incompetent [25]. They may experience persistent disapproval and criticism from their families and friends [26]. Moreover, they may be rejected, excluded, and ignored by community members and experience unfair treatment in housing, schooling, employment, health care, and social services [27, 28]. Such discriminatory experiences may represent a significant source of social threat to individuals with mental disorders and undermine their feelings of social inclusion and security [29], which can adversely affect their sleep [19].

To our best knowledge, no study to date has examined the impact of discrimination on sleep in individuals with mental disorders. However, studies have examined discrimination as a risk factor for poor sleep among other stigmatized groups, with findings suggesting that everyday experiences of unfair treatment may contribute to various sleep impairments, including poorer sleep quality, shorter sleep duration, and increased daytime fatigue [19, 30–43]. Importantly, a recent review found that experienced discrimination was consistently associated with poorer sleep outcomes among stigmatized individuals [20]. Given that research on stigma and sleep is only emerging and existing findings show harmful effects of discrimination on sleep, it is important to examine whether such effects are present among individuals with mental disorders. Further, it is crucial to understand the mechanisms underlying such effects in order to inform the development of effective interventions.

One potential mechanism linking societal stigma to individual sleep is through the internalization of stigma [44]. Theories posit that public stigma may affect individuals with mental disorders via self-stigmatization [21]. Facing constant condemnation from the public, individuals with mental disorders may start to endorse and internalize the external criticism as self-stigma [45, 46]. Self-stigma refers to stigmatized individuals' identification with societal negative evaluations and assimilation of such views into their own self-perceptions [47]. Individuals with self-stigma may devalue and denigrate themselves, perceive themselves as incapable and inferior to others, and engage in social withdrawal in order to hide their stigmatized status [29, 48, 49]. As self-stigma encompasses the internalization of public stigma toward the self and the development of negative self-beliefs, self-stigma may destroy self-esteem and self-efficacy and have a more damaging impact on individual functioning and well-being than public stigma and discrimination [48–52].

Individuals with mental disorders may differ in not only the extent to which they endorse their self-stigmatizing thoughts, referred to as self-stigma "content," but also the extent to which they think about their self-stigmatizing thoughts repetitively and habitually, referred to as self-stigma "process" [29, 48, 53]. Previous studies have shown that both the content and process of self-stigma adversely affect individuals with mental disorders [29, 48, 53]. Specifically, individuals who internalize self-stigmatizing thoughts to a greater extent and think about these thoughts more frequently may suffer a lower sense of self-worth [53]. Consequently, they may perceive less meaning in life and experience elevated distress [29, 48], which can further lead to physiological changes (e.g., hyper-activation of sympathetic nervous system) that undermine sleep quality and efficiency [20]. If sleep deprivation or sleep interruption continues, a range of adverse health outcomes, including decreased levels of physical and mental functioning and well-being, will occur [6–10].

Previous research has documented negative associations of public and internalized stigma with physical and mental HRQoL among individuals with mental disorders [52]. However, to our best knowledge, no study has examined the potential mediating role of sleep disturbance in the links between stigma and HRQoL. The goal of the present study was to test a mediation model of stigma, sleep, and HRQoL among individuals with mental disorders from Hong Kong, China. Given that Chinese culture places great emphasis on social identities and face concern [54], many Chinese people with mental disorders may have a heightened sensitivity to public stigma [55]. Once they are discriminated by others, they may internalize the stigma easily and suffer the adverse health outcomes [55]. In this study, we sought to examine whether public stigma (as indicated by experienced

discrimination) and internalized stigma (as indicated by self-stigma content and process) would affect sleep quality and, in turn, physical and mental HRQoL. We hypothesized that experienced discrimination would be positively associated with self-stigma content and process, which would, in turn, be associated with greater sleep disturbance and consequently poorer physical and mental HRQoL. Given previous research showing that demographic and clinical factors, such as age, household income, and illness duration, may affect the mediating and dependent variables in our analytic model [56–61], we controlled for these factors in the analyses.

Method

Participants and procedures

Participants were individuals with mental disorders recruited from seven community mental health service centers in Hong Kong, China. These service centers provided various rehabilitation services, including residential care, day training, and vocational rehabilitation, to psychiatric outpatients living in the community. Individuals with mental disorders were first introduced to the study through leaflets, posters, and announcements at the service centers. Individuals interested in joining the study contacted our research assistants, who further explained the study to them and ascertained their eligibility. Inclusion criteria were (a) being capable of reading and writing in Chinese and (b) having been diagnosed with at least one DSM-IV-TR Axis I disorder by a licensed psychiatrist. Exclusion criteria were (a) having received a DSM-IV-TR diagnosis of intellectual disability or dementia from a licensed psychiatrist and (b) being clinically unstable (i.e., having been hospitalized in the previous month). Eligible individuals were asked to sign written consent forms and complete self-administered questionnaires at the service centers. Of the 306 individuals screened, 282 met the study criteria, provided written informed consent, and eventually participated. Each participant received a monetary honorarium of HK$200 (or about US$26).

The average age of participants was 43.38 years ($SD = 11.10$ years), and 48.6% of them were female. Most participants were not married (80%) and had received secondary education or more (90.4%). On a monthly basis, 51.3% of participants earned less than or equal to HK$5000 (or about US$637), 29.6% earned HK$5001–10000 (or about US$637–1274), and 19.1% earned HK$10000 (or about US$1274) or above. The median monthly household income of participants was HK$4001–5000 (or about US$510–637), much lower than the median monthly household income of the larger population in Hong Kong (HK$25000, or about US$3186) [62]. Most participants had one psychiatric diagnosis (87.7%). Among participants who had multiple psychiatric diagnoses (12.3%), the average number of diagnoses was 2.38 ($SD = 0.78$). Their primary diagnoses included schizophrenia spectrum and other psychotic disorders (81.7%), depressive disorders (9.2%), bipolar disorders (7.7%), anxiety disorders (1.1%), and others (0.4%). Most participants were on psychotropic medications (98.2%). The average duration of illness was 17.06 years ($SD = 11.21$ years).

Measures

Experienced discrimination

Experienced discrimination was measured with the experienced discrimination subscale of the Internalized Stigma of Mental Illness Scale (ISMI) [63]. This subscale contained five items measuring respondents' perceived mistreatments, such as being ignored, disrespected, patronized, or undervalued, due to the biases of others. Sample items were "People ignore me or take me less seriously just because I have a mental illness" and "Others think that I can't achieve much in life because I have a mental illness." Participants rated each item on a four-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Item ratings were averaged, with higher scores indicating higher levels of experienced discrimination and scores > 2.50 representing moderate-to-severe experienced discrimination [64]. Brohan and colleagues [65] noted in a review of stigma measures that this subscale of the ISMI had been used to indicate experienced discrimination among individuals with mental disorders. In previous studies, its validity was demonstrated by its significant correlations with theoretically related constructs (e.g., self-esteem and distressed mood) [66, 67], and its reliability was evidenced by its high internal consistency (for a review, see [68]). In the present study, it had good internal consistency reliability, with a Cronbach's alpha of 0.81.

Self-stigma content

Self-stigma content was measured with the stereotype endorsement, alienation, and social withdrawal subscales of the ISMI [63]. These subscales contained a total of 19 items measuring the extent to which respondents endorsed negative stereotypes about mental disorders (seven items), perceived themselves as inferior to others (six items), and engaged in secrecy and social withdrawal in order to hide their stigmatized status (six items). Sample items were "I can't contribute anything to society because I have a mental illness," "Having a mental illness has spoiled my life," and "I stay away from social situations in order to protect my family or friends from embarrassment." Participants rated each item on a four-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Item ratings were averaged,

with higher scores indicating more negatively valenced content of self-stigmatizing thoughts and scores > 2.50 representing moderate-to-severe self-stigma content [64]. Brohan and colleagues [65] noted in a review of stigma measures that these subscales of the ISMI had been used to indicate self-stigma content among individuals with mental disorders. In previous studies, their validity was demonstrated by their significant correlations with theoretically related constructs (e.g., self-esteem and quality of life) [69, 70], and their reliability was evidenced by their high internal consistency (for a review, see [68]). In the present study, they had good internal consistency reliability, with Cronbach's alphas of 0.78 (stereotype endorsement), 0.83 (alienation), and 0.83 (social withdrawal).

Self-stigma process

Self-stigma process was measured with the Self-stigmatizing Thinking's Automaticity and Repetition Scale (STARS) [53]. This scale contained eight items measuring the extent to which respondents thought about their self-stigmatizing ideas habitually. Sample items were "Thinking negatively about my identity as a person with mental illness is something I do every day" and "Thinking negatively about my identity as a person with mental illness is something I do every moment." Participants rated each item on a five-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Item ratings were averaged, with higher scores indicating more habitual emergence of self-stigmatizing thoughts and scores > 3 representing moderate-to-severe self-stigma process [71]. This measure had been used to indicate self-stigma process among individuals with mental disorders [29, 48]. In previous studies, its validity was demonstrated by its significant correlations with theoretically related constructs (e.g., self-esteem and personal recovery), and its reliability was evidenced by its high internal consistency [29, 48]. In the present study, it had excellent internal consistency reliability, with a Cronbach's alpha of 0.94.

Sleep disturbance

Sleep disturbance was measured using the Pittsburgh Sleep Quality Index (PSQI) [72]. This scale contained 19 items capturing respondents' sleep patterns and problems. Sample items were "During the past month, how often have you had trouble sleeping because you cannot get to sleep within 30 min?" and "During the past month, how often have you had trouble sleeping because you wake up in the middle of the night or early morning?" A standardized algorithm was used to calculate seven subscale scores, namely subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleeping medication, and daytime dysfunction. Possible scores for each subscale ranged from 0 to 3. The composite scores were summed, with higher scores indicating higher levels of sleep disturbance and scores ≥ 5 representing clinically significant sleep disturbance [72]. This measure had been used to indicate sleep disturbance among individuals with mental disorders [9, 73]. In previous studies, its validity was demonstrated by its significant correlations with theoretically related constructs (e.g., quality of life [9, 73]), and its reliability was evidenced by its high internal consistency [74, 75]. In the present study, it had satisfactory internal consistency reliability, with a Cronbach's alpha of 0.74.

Physical and mental HRQoL

Physical and mental HRQoL were measured using the SF-12 Health Survey Version 2 (SF-12v2) [76]. This scale contained 12 items measuring respondents' functioning and well-being in physical and mental dimensions of health. Sample items were "During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?" and "How much of the time during the past 4 weeks have you felt calm and peaceful?" Following Ware and colleagues [77], a standardized algorithm, based on factor score coefficients obtained from principal component analysis with orthogonal rotation, was used to calculate two composite scores, namely physical component summary (PCS) and mental component summary (MCS). The composite scores were transformed to norm-based scores with a mean of 50 and a standard deviation of 10. Higher scores indicated higher levels of physical and mental HRQoL. Scores < 40 represented moderate-to-severe impairments in physical and mental HRQoL [78]. These measures had been used to indicate physical and mental HRQoL among individuals with mental disorders [79]. In previous studies, their validity was evidenced by their significant correlations with theoretically related constructs (e.g., life satisfaction and social functioning) [80, 81], and their reliability was evidenced by their high internal consistency [82, 83]. In the present study, they had good internal consistency reliability, with Cronbach's alphas of 0.77 (PCS) and 0.82 (MCS).

Data analyses

Descriptive statistics were computed for all variables to characterize the sample. Then, Pearson correlations were calculated to examine the relations among the variables of interest. Finally, structural equation modeling (SEM) was performed to test the hypothesized model. Manifest variables were physical and mental HRQoL, which were indicated by the PCS and MCS scores, respectively. Latent variables were experienced discrimination, self-stigma content and process, and sleep disturbance, each of which

was indicated by three parcels of items created based on the factorial algorithm suggested by Rogers and Schmitt [84]. A measurement model was constructed to assess whether the factor structures of the latent variables fit the data. A structural model was also developed to examine the relations among the latent variables. Model fit was assessed using comparative fit index (CFI), Tucker–Lewis Index (TLI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA). CFI and TLI values ≥ 0.90 and SRMR and RMSEA values ≤ 0.08 suggested a good model fit [85]. Following Shrout and Bolger's recommendations [86], indirect effects in the structural model were evaluated with the bootstrapping procedures. Bias-corrected confidence intervals were engendered based on 1000 bootstrapped samples from the data. The exclusion of zero in the 95% confidence interval suggested a significant indirect effect. All analyses were conducted using Mplus Version 7.4.

Results

Table 1 presents the results of descriptive and Pearson correlation analyses. Descriptive analyses showed that 36.5% of participants had moderate-to-severe experienced discrimination. Participants varied in stereotype endorsement (16% moderate-to-severe), alienation (35.1% moderate-to-severe), and social withdrawal (28% moderate-to-severe). While 30.9% of participants had moderate-to-severe self-stigma content, 41.1% had moderate-to-severe self-stigma process. Also, 71.3% of participants had clinically significant sleep disturbance. Furthermore, 42.6% of participants had PCS scores below 40 and 32.3% had MCS scores below 40, indicating moderate-to-severe impairments in physical and mental HRQoL.

Pearson correlation analyses showed that experienced discrimination, self-stigma content, self-stigma process, and sleep disturbance were positively correlated with one another ($p < 0.001$). Physical HRQoL was negatively correlated with experienced discrimination ($p = 0.006$), self-stigma content ($p = 0.002$), self-stigma process ($p < 0.001$), and sleep disturbance ($p < 0.001$). Mental HRQoL was also negatively correlated with experienced discrimination ($p < 0.001$), self-stigma content ($p < 0.001$), self-stigma process ($p < 0.001$), and sleep disturbance ($p < 0.001$).

Table 2 presents the results of SEM. In the measurement model, standardized factor loadings, ranging between 0.67 ($p < 0.001$) and 0.96 ($p < 0.001$), were all statistically significant. The measurement model resulted in a good fit to the data: CFI = 0.98, TLI = 0.97, RMSEA = 0.06, SRMR = 0.06. In the structural model, standardized path coefficients,

Table 2 Standardized parameter estimates for the measurement and structural models

			Standardized β
Measurement model			
Experienced discrimination	→	ED1	0.83***
Experienced discrimination	→	ED2	0.81***
Experienced discrimination	→	ED3	0.78***
Self-stigma content	→	SSC1	0.78***
Self-stigma content	→	SSC2	0.75***
Self-stigma content	→	SSC3	0.67***
Self-stigma process	→	SSP1	0.96***
Self-stigma process	→	SSP2	0.92***
Self-stigma process	→	SSP3	0.90***
Sleep disturbance	→	SD1	0.76***
Sleep disturbance	→	SD2	0.69***
Sleep disturbance	→	SD3	0.69***
Structural model			
Experienced discrimination	→	Self-stigma content	0.74***
Experienced discrimination	→	Self-stigma process	0.52***
Self-stigma content	→	Sleep disturbance	0.23*
Self-stigma process	→	Sleep disturbance	0.49***
Sleep disturbance	→	Physical HRQoL	−0.41***
Sleep disturbance	→	Mental HRQoL	−0.60***

ED1–ED3 item parcels of experienced discrimination, *SSC1–SSC3* item parcels of self-stigma content, *SSP1–SSP3* item parcels of self-stigma process, *SD1–SD3* item parcels of sleep disturbance

*$p < 0.05$; ***$p < 0.001$

Table 1 Descriptive statistics of and Pearson correlations among variables

	M	*SD*	2	3	4	5	6
1. Experienced discrimination	2.33	0.74	0.58***	0.46***	0.24***	−0.16**	−0.39***
2. Self-stigma content	2.26	0.59		0.58***	0.35***	−0.19**	−0.41***
3. Self-stigma process	2.85	1.00			0.42***	−0.22***	−0.56***
4. Sleep disturbance	7.41	4.42				−0.33***	−0.43***
5. Physical HRQoL	42.11	9.42					−0.01
6. Mental HRQoL	45.81	12.46					

**$p < 0.01$; ***$p < 0.001$

ranging between −0.60 ($p < 0.001$) and 0.74 ($p < 0.001$), were, again, all statistically significant. The structural model resulted in a good fit to the data: CFI = 0.96, TLI = 0.94, RMSEA = 0.06, SRMR = 0.05.

Figure 1 shows the mediation model of stigma, sleep, and HRQoL. Controlling for demographic and clinical factors, experienced discrimination had significant direct effects on self-stigma content ($p < 0.001$) and self-stigma process ($p < 0.001$). Both the content ($p = 0.02$) and process ($p < 0.001$) of self-stigma had significant direct effects on sleep disturbance. Sleep disturbance had significant direct effects on both physical HRQoL ($p < 0.001$) and mental HRQoL ($p < 0.001$).

Table 3 presents the results of Bootstrap analyses. The total indirect effects of experienced discrimination on sleep disturbance ($p < 0.001$), physical HRQoL ($p < 0.001$), and mental HRQoL ($p < 0.001$) were significant. Specifically, experienced discrimination had significant indirect effects on sleep disturbance via self-stigma content ($p = 0.02$) and via self-stigma process ($p < 0.001$). Also, experienced discrimination had significant indirect effects on physical HRQoL via self-stigma content and sleep disturbance ($p = 0.03$) and via self-stigma process and sleep disturbance ($p < 0.001$). Moreover, experienced discrimination had significant indirect effects on mental HRQoL via self-stigma content and sleep disturbance ($p = 0.04$) and via self-stigma process and sleep disturbance ($p < 0.001$). The explained variances were 53.8, 26.5, 45.1, 18.9, and 37% for self-stigma content, self-stigma process, sleep disturbance, physical HRQoL, and mental HRQoL, respectively.

Discussion

Consistent with our hypotheses, experienced discrimination was positively related to self-stigma content and process, which were, in turn, linked to greater sleep disturbance and consequently poorer physical and mental HRQoL among individuals with mental disorders. These findings indicated that exposure to public stigma and discrimination (e.g., being ignored, disrespected, patronized, or undervalued by others) could potentially elicit feelings of marginalization and disempowerment, resulting in the development and recurrence of self-stigmatizing thoughts (e.g., ideas about self-devaluation, self-blame, self-shame, secrecy, or withdrawal). Further, such negative self-thoughts could adversely affect sleep quality, contributing to dysregulations of somatic and psychological health that impair quality of life among individuals with mental disorders.

The present study was one of the first to examine experienced discrimination as a risk factor for sleep disturbance among individuals with mental disorders. In support of theories that posit psychosocial stress as a predictor of poor sleep [19] and prior research linking social threats

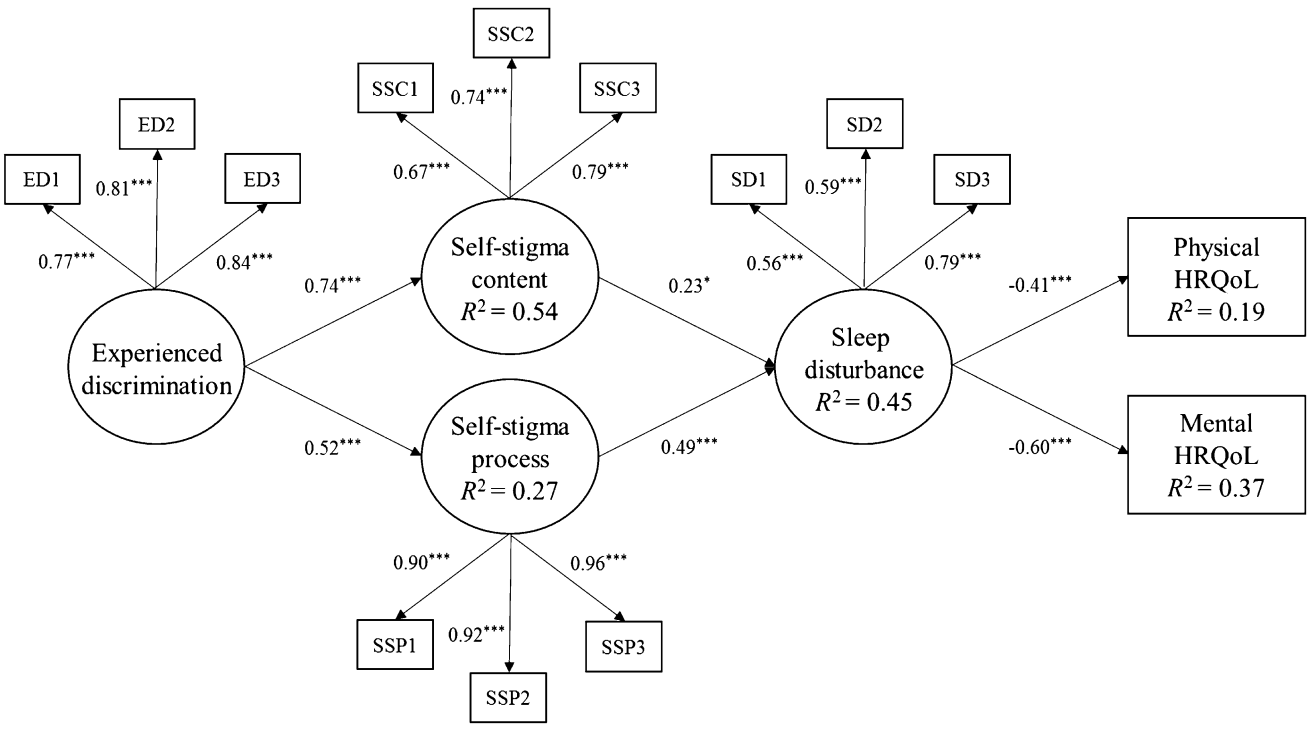

Fig. 1 Mediation model of stigma, sleep, and HRQoL. Standardized factor loadings and standardized path coefficients are shown. Measurement errors are not shown for clarity. *$p < 0.05$; ***$p < 0.001$

Table 3 Bootstrap analyses of indirect effects in the structural model

							Standardized indirect effect (95% CI)
Indirect effects of experienced discrimination on sleep disturbance							
Total indirect effects							
Experienced discrimination	→	Self-stigma content and process	→	Sleep disturbance			0.42*** [0.30, 0.55]
Specific indirect effects							
Experienced discrimination	→	Self-stigma content	→	Sleep disturbance			0.17* [0.03, 0.31]
Experienced discrimination	→	Self-stigma process	→	Sleep disturbance			0.25*** [0.14, 0.36]
Indirect effects of experienced discrimination on physical HRQoL							
Total indirect effects							
Experienced discrimination	→	Self-stigma content and process	→	Sleep disturbance	→	Physical HRQoL	−0.17*** [−0.25, -0.10]
Specific indirect effects							
Experienced discrimination	→	Self-stigma content	→	Sleep disturbance	→	Physical HRQoL	−0.07* [−0.13, −0.01]
Experienced discrimination	→	Self-stigma process	→	Sleep disturbance	→	Physical HRQoL	−0.10*** [−0.16, −0.05]
Indirect effects of experienced discrimination on mental HRQoL							
Total indirect effects							
Experienced discrimination	→	Self-stigma content and process	→	Sleep disturbance	→	Mental HRQoL	−0.25*** [−0.36, −0.14]
Specific indirect effects							
Experienced discrimination	→	Self-stigma content	→	Sleep disturbance	→	Mental HRQoL	−0.10* [−0.19, −0.01]
Experienced discrimination	→	Self-stigma process	→	Sleep disturbance	→	Mental HRQoL	−0.15*** [−0.23, −0.07]

*$p < 0.05$; ***$p < 0.001$

to sleep difficulties among other stigmatized groups [37], our study demonstrated that experiences of discrimination and maltreatment were associated with greater sleep disturbance among individuals with mental disorders. More generally, our findings highlighted the utility of a psychosocial approach to study the development and maintenance of sleep problems in individuals with mental disorders.

Past research has shown that self-stigma may mediate the damaging effects of public stigma on individuals with mental disorders [52]. Expanding on this work, our study pointed to the mediating roles of self-stigma content and process in the links between experienced discrimination and sleep disturbance among individuals with mental disorders. Specifically, our findings revealed that societal stigma may exert its influence on individual sleep through increasing negative self-thoughts and activating ruminative thought processes. These findings indicated the importance of building stigma resistance to mitigate self-stigmatizing thoughts, which, when left unattended, are likely to adversely affect sleep health.

In line with previous studies showing the roles of public and internalized stigma in shaping patterns of health disparities among stigmatized groups [87–89], our study found that experienced discrimination and associated self-stigma were linked to decreased levels of physical and mental HRQoL among individuals with mental disorders. Also, echoing some earlier work showing poor sleep as a mediating mechanism linking psychosocial stressors to health outcomes [41, 90], our findings showed that experienced discrimination, as well as self-stigma content and process, could affect physical and mental HRQoL through interfering with sleep. Given the pivotal role of poor sleep in translating stigma-related stress into adverse health consequences, future services for stigmatized individuals should consider including sleep interventions.

Our findings on the deleterious effects of experienced discrimination suggested a strong need to design effective community-based stigma reduction programs. In order to mitigate the public stigma of mental disorders, knowledge-based interventions, which focus on challenging inaccurate

and negative stereotypes about mental disorders and replacing them with factual information, should be provided to reduce stigmatizing attitudes in community members [91]. Also, contact-based interventions, which help facilitate positive social contacts and interactions between individuals with and without mental disorders, should be offered to improve the public's attitudes toward mental illness [91]. Furthermore, community-wide policies (e.g., the establishment of anti-discrimination laws) and events (e.g., advocacy campaigns) should be implemented to reduce discriminatory behaviors and enhance the awareness of human rights in society [92].

Since eliminating stigma at the societal level is a lengthy process, an important question from a short-term perspective is how we can instantly attenuate the adverse impact of experienced discrimination on individual sleep health. As indicated by the mediating role of self-stigma in the association between experienced discrimination and sleep disturbance, one way to reduce the sleep difficulties of individuals with mental disorders may be through diminishing the internalization of stigma. Given prior research showing that self-stigma can be reduced through psychological interventions [93], it may be a promising intervention target to address sleep and health disparities resulting from discriminatory experiences.

It is important to note that both the content and process of self-stigma significantly predicted sleep and health outcomes, meaning that, aside from the content of self-stigmatizing thoughts, the process through which individuals have these thoughts also affects their functioning and well-being. Given the independent effects of self-stigma content and process, anti-self-stigma strategies should be geared toward tackling self-stigma content as well as targeting self-stigma process. To reduce self-stigma content, practitioners may help these individuals build critical consciousness and develop cognitive restructuring skills that enable them to recognize the illegitimacy of discrimination and challenge their self-stigmatizing views [53]. Also, to alleviate self-stigma process, practitioners may empower these individuals to extend their self-characterizations beyond their stigmatized identities, which may help them think about their self-stigmatizing thoughts less often [53].

The present study validated a mediation model to elucidate how stigma may adversely affect sleep and HRQoL. It is noteworthy, however, that our model only explained moderate amounts of variance in the outcome measures. This may not be surprising, given previous research showing that sleep quality and health status may vary as a function of numerous personal and environmental factors, including socioeconomic status, thinking styles, emotional states, interpersonal processes, and physical settings [94–96]. Moreover, a handful of studies have found that stigma may influence sleep and HRQoL through different mechanisms, such as increases in stress and loneliness and decreases in social support and economic security [19, 31, 44, 97]. As researchers are just beginning to examine the impact of stigma on sleep health, additional research is needed to test a more comprehensive model capturing how stigma may affect sleep and health outcomes through multiple mechanisms.

Our study was not without limitations. First, our cross-sectional design did not allow us to examine the causal relations among variables. Future studies should use longitudinal panel designs to disentangle the temporal orders of the associations reported here. Second, all our measures were based on participants' self-reports, meaning that our results might be subject to common method biases. Future studies should collect data using multiple methods (e.g., ecological momentary assessments of discriminatory experiences, implicit association tests of self-stigma, actigraphy and polysomnography measures of sleep disturbance, and clinician ratings of functioning and well-being [7, 30, 53, 98]) to retest our hypotheses. Third, our study used a convenience sample consisting predominantly of individuals with psychotic disorders, which was not representative of all individuals with mental disorders. Future studies should use probabilistic sampling methods, with individuals with different mental disorders being sampled in a balanced manner, to retest our hypotheses. Finally, our study was based on a Chinese sample, which was not reflective of the ethnic and cultural diversity of individuals with mental disorders in the world, limiting the generalizability of our findings. In fact, although public and internalized stigma may be more salient in such collectivistic societies as China, it is likely to exist in other cultural settings as well [99, 100]. Future researchers should conduct cross-cultural validations of our conceptual model using samples of individuals with mental disorders from different cultural backgrounds.

Despite these limitations, the present study had important theoretical and practical implications. Theoretically, our findings highlighted the importance of considering the contributions of both public and internalized stigma, and differentiating between self-stigma content and process, when examining the sleep quality and health status of individuals with mental disorders. Practically, our findings pointed to the necessity of developing anti-stigma and anti-self-stigma interventions at societal and individual levels in order to reduce stigma-related stress and improve sleep and health outcomes among individuals with mental disorders. In addition to designing community-based stigma reduction initiatives that can dispel the public's misconceptions about mental disorders and eradicate their discriminatory behaviors, it is imperative to provide patient-oriented self-stigma reduction programs that help individuals with mental disorders develop stigma resistance and reduce stigma internalization.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethics approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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