



Personal and environmental contextual factors as mediators between functional disability and quality of life in adults with serious mental illness: a cross-sectional analysis

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Abstract

Purpose To examine personal and environmental contextual factors as mediators of functional disability on quality of life (QOL) in a sample of individuals with serious mental illness (SMI).

Methods A cross-sectional analysis of 194 individuals with SMI (major depressive disorder = 38.1%; bipolar disorder = 35.6%; schizophrenia spectrum disorder = 25.8%) recruited from four psychosocial rehabilitation clubhouses was undertaken to test a multiple regression model assuming that personal (i.e., resilience, social competence, and disability acceptance) contextual factors and environmental (i.e., family support, support from friends, and support from significant others) contextual factors would mediate the relationship of functional disability on QOL. The bootstrap test for multiple mediators was then used to test for the significance of the indirect effects functional disability on QOL through the mediators.

Results In the simple regression model, functional disability had a strong relationship with QOL; however, after introducing the potential mediators, its effect was significantly reduced indicating partial mediation effects. The final regression model yielded a large effect, accounting for 44% of the variance in QOL. Controlling for all other potential mediating factors, social competence, disability acceptance, family support, and support from friends were found to partially mediate the relationship between functional disability and QOL. Bias-corrected bootstrap procedure results further supported the mediation model.

Conclusions The findings from the study provide good support for the inclusion of person–environment contextual factors in conceptualizing the relationship between functional disability and QOL for individuals with SMI.

Keywords Serious mental illness · Person–environment contextual factors · Social competence · Disability acceptance · Social support

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Individuals with serious mental illness (SMI) often face numerous barriers to quality of life (QOL). SMI has been defined as both a mental illness and a functional disability—the long-term limitations resulting from a health condition [1]. Functioning is impacted by the interaction between the individual with a health condition (e.g., SMI) and personal and environmental (P×E) contextual factors [2]. Mental disorders meeting criteria for SMI include major depressive, bipolar, and schizophrenia spectrum disorders [3]. Functional limitations resulting from disability can adversely affect the QOL of individuals with SMI [4–6]. Researchers have found that inability to complete functional life tasks, such as activities of daily living (ADLs; e.g., bathing, dressing) and instrumental activities of daily living (IADLs; e.g., driving, budgeting), is associated with lower QOL [5–8]. These results provide support that one's level of functioning directly impacts their QOL.

Although functional disability can have adverse effects on QOL, some personal contextual factors have been found to buffer these effects. For example, resilience, or the ability overcome a setback in life, has been found to be directly related to one's QOL [9, 10]. Social competence, or appropriate social skills, is often lacking or deficient in individuals with SMI; however, it has been found to be directly related to QOL [6, 11]. Similarly, acceptance of, or psychosocial adaptation to, one's disability has been found to have a positive relationship with QOL [5, 12].

Just as personal contextual factors have been found to mediate the adverse effects of functional disability on QOL, some environmental contextual factors (e.g., social support) [13] have also been found to buffer such effects. Paramount to assisting individuals with SMI overcome functional limitations is receipt of social support. Natural support is often derived from family [14], friends [15], and significant others [16]. The literature is abundant with support for the direct relationship between adequate social support and QOL for individuals with SMI [5, 6, 17–24].

As stated above, the QOL of individuals with SMI can be impacted by functional disability. In addition, personal (e.g., resilience) and environmental (e.g., social support) contextual factors can also impact QOL. As a result of the evidence linking functional disability, personal contextual factors, and environmental contextual factors to QOL, researchers interested in improving the QOL of individuals with SMI should thoroughly understand the factors that influence QOL and their underlying relationships. To date, no study has examined the potential mediators of functional disability on QOL among individuals with SMI. Consequently, the purpose of the current study was to examine P×E contextual factors as mediators of functional disability on QOL in a sample of individuals with SMI.

Methods

Participants

A total of 194 individuals with SMI voluntarily participated in the study. Participants were recruited from four psychosocial rehabilitation clubhouses in the Southern and Midwestern regions of the United States. Inclusion criteria were self-reported: (a) age of 18 years or older; (b) primary diagnosis of SMI (e.g., major depressive disorder, bipolar disorder, schizophrenia spectrum disorder); and (c) ability to read at a 6th grade level or above. Although diagnosis was provided via self-report, all participants were clubhouse members of which having a documented SMI is a requirement. More than half of the participants identified as female (53.1%) and the majority identified as White/Caucasian (60.3%). See Table 1 for complete demographic details.

Measures

In order to measure the functional disability, personal contextual factors, environmental contextual factors, and

Table 1 Participant demographic and disability characteristics ($N=194$)

Demographic covariates	<i>n</i>	(%)
Age		
18–25	29	(14.9)
26–37	50	(25.8)
38–49	48	(24.7)
50–64	60	(30.9)
65+	6	(3.1)
Gender		
Male	89	(45.9)
Female	103	(53.1)
Transgender	1	(0.5)
Race		
Caucasian/White	117	(60.3)
African American/Black	38	(19.6)
Native American/Alaska Native	3	(1.5)
Asian/Pacific Islander	2	(1.0)
Bi-racial/multi-racial	5	(2.6)
Ethnicity		
Hispanic/Latino	46	(23.7)
SMI diagnosis		
Major depressive disorder	74	(38.1)
Bipolar disorder	69	(35.6)
Schizophrenia spectrum disorder	50	(25.8)

QOL constructs, we selected self-report instruments with well-documented reliability and validity among persons with SMI.

Functional disability

Functional disability was measured using the *World Health Organization Disability Assessment Schedule 2.0* (WHODAS-2) [25], a 36-item scale that measures an individual's level of functioning in six major life domains: communication, mobility, self-care, interpersonal interactions and relationships, life activities, and participation. Following Sánchez's [26] recommendation, only 19 items were used for this study; items that were specific to physical disability and the participation subscale were omitted. All items begin with the phrase "In the past 30 days, how much difficulty did you have in:" followed by specific questions (e.g., "Analyzing and finding solutions to problems in day-to-day life?"). Items are rated on a 5-point Likert-type scale (1 = *none* to 5 = *extreme or cannot do*); higher scores indicate greater difficulty with completing tasks. The WHODAS-2 has good internal consistency reliability for the total scale ($\alpha = .96$) as well as for the individual subscales ($\alpha = .79-.98$) [25]. The internal consistency estimate found in the current study was excellent (Cronbach's $\alpha = .92$).

Personal contextual factors

Personal contextual factors were measured using the *Brief Resilience Scale* (BRS) [27], the *Perceived Social Self-Efficacy* scale (PSSE) [28], and the *Adaptation to Disability Scale-Revised-23* (ADS-R-23) [29]. The BRS is a 6-item scale that assesses a person's ability to bounce back from stressful situations. A typical item is "I tend to bounce back quickly after hard times." Items are rated on a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*), with higher scores indicating greater resilience. It has good internal consistency reliability, ranging from .80 to .91 [27, 30]. The Cronbach's alpha of the BRS for the current study was computed to be .85. The PSSE is a 5-item scale that assesses social competence. All items begin with the phrase "How well can you" followed by specific questions (e.g., "help someone new become part of a group to which you belong?"). Items are rated on a 5-point Likert-type scale (1 = *not well at all* to 5 = *very well*); higher scores indicate greater social competence. The PSSE has satisfactory internal consistency reliability estimates ranging from .66 to .88 [28, 31, 32]. The Cronbach's alpha of the PSSE for the current study was computed to be .88.

The original *Acceptance of Disability Scale* (ADS) [33] consisted of 50 items and was criticized for lack of adequate psychometric evaluation. The ADS-R [34], a revised and abbreviated version of the ADS, is a 32-item scale that

assesses the value change process a person experiences upon the onset of disability. For this study, an abbreviated and modified version of the ADS-R, the ADS-R-23 [29], which consists of only 23 items (i.e., items that were specific to physical disability were omitted), was used. In the ADS-R-23, the referent "disability" was changed to "mental health problems" in order to better align with current utilized and accepted terminology among individuals with SMI. A sample item is "Mental health problems or not, I am going to make good in life." Items are rated on a 4-point Likert-type scale (1 = *strongly disagree* to 4 = *strongly agree*), with higher scores indicating greater acceptance of a mental illness. The original and revised scales have excellent internal consistency reliability estimates ($\alpha = .92-.93$) [29, 33, 34]. The internal consistency estimate found in the current study was excellent (Cronbach's $\alpha = .92$).

Environmental contextual factors

Environmental contextual factors were measured using the *Multidimensional Scale of Perceived Social Support* (MSPSS) [35]. The MSPSS is a 12-item scale that measures social support from family, friends, and significant others. Sample items from the subscales include "My family really tries to help me." (family), "I can talk about my problems with my friends." (friends), and "There is a special person who is around when I am in need." (significant others). The items are rated on a 7-point Likert-type scale (1 = *very strongly disagree* to 7 = *very strongly agree*). The MSPSS has good internal consistency reliability for the total scale ($\alpha = .88-.92$) as well as for the individual family ($\alpha = .87-.93$), friends ($\alpha = .85-.91$), and significant others ($\alpha = .88-.91$) subscales [35, 36]. The Cronbach's alpha of the MSPSS for the current study was computed to be .88 for the total scale and .95 for the family, .92 for the friends, and .95 for the significant others subscales.

Quality of life

The *Satisfaction with Life Domains Scale* (SLDS) [37] is a 15-item scale that measures QOL in various domains. The 14-item version [9] was used for this study. All items begin with the phrase "Which face comes closest to expressing how you feel about" followed by specific questions (e.g., "the way you spend your spare time?"). Items are rated on a 7-point Likert-type scale depicting faces with varying affect (1 = *terrible* to 7 = *delighted*); higher scores indicate greater QOL. The SLDS has good internal consistency reliability ($\alpha = .84-.92$) [9, 37]. The internal consistency estimate found in the current study was excellent (Cronbach's $\alpha = .90$).

Utilizing both objective (e.g., records) and subjective (e.g., self-report) data, Baker and Intagliata [37] examined

the relationships between biological, psychological, and social factors and QOL, and found their results aligned with those in the QOL literature. The SLDS has convergent and divergent validity as reflected by its correlations with other related measures [e.g., *Bradburn Affect Balance Scale* ($r = .64$), *Global Assessment Scale* ($r = .29$), *Alienation Measure* ($r = -.28$), *Brief Symptom Inventory* ($r = -.28$), *Personal and Social Network Adjustment Scale* ($r = .28$), *Rosenberg Self-Esteem Scale* ($r = .33$)], supporting its validity to assess QOL [9, 37]. Use of a single instrument to measure QOL among individuals with SMI [38–40], specifically using the SLDS [6, 17, 19, 41, 42] has been shown to be successful. The SLDS was selected for its ability to assess QOL in numerous life domains as well as its focus on the person–environment interaction to predict QOL.

Procedures

Approval was received from the University of Wisconsin–Madison’s Education and Social/Behavioral Science Institutional Review Board (IRB). The first author disseminated the study information to four psychosocial rehabilitation clubhouses in two U.S. regions (South and Midwest), was present at each agency, and distributed all surveys to interested participants. All participants provided informed consent, completed the self-report surveys in approximately 45 min (on average), and received a minimal compensation for their time spent on the study.

Data analysis

Problems of missing data were minimal, as most of the measures in this study had < 5% missing values. For individual items missing on scale scores, a simple imputation method using regression was selected for handling missing data. In simple imputation, computation estimates are based on the values of other related items in the same scale in order to replace missing data. Simple imputation is preferred over case deletion, since it will not decrease the sample size (i.e., no statistical power loss) or affect the representativeness of the sample. Simple imputation will yield similar results when the missing data are < 5% [43].

To test the analysis that the association between functional disability and QOL is mediated by P×E contextual factors, several simple and a multiple regression analysis (MRA) were conducted along with the bootstrap test for multiple mediators [44]. In order to determine the sample size for a mediation analysis, we conducted an a priori power analysis using G*Power [45, 46], a software tool for general power analysis. The analysis was based on the multiple linear regression that will be used for this study, as it is the most involved analysis in the study. With a medium effect size (f^2) of .15 [47], an alpha of .05, a standard power

level of .80, and a total of seven predictors, the results of the power analysis showed that a minimum of 103 participants would be needed to achieve an appropriate power level for this study. Our sample of 194 is more than adequate for this study. MRA was used to test the hypothesis that the association between functional disability [independent variable (IV)] and QOL [dependent variable (DV)] is mediated by resilience [mediator 1 (M_1)], social competence (M_2), disability acceptance (M_3), family support (M_4), support from friends (M_5), and support from significant others (M_6). In addition, the bootstrap method was used to test the significance of the indirect effects of the IV (functional disability) on the DV (QOL) through the mediators. The Statistical Package for the Social Sciences (SPSS, version 25.0 for Windows) was used to perform the computations and the significance was set at .05.

Mediator analysis

Baron and Kenny’s [48] three-step approach to mediation using multiple regression was applied:

1. Regress the M onto the IV to show that it is possible that the two variables can be causally linked.
2. Regress the DV onto the IV to show a causal relation is also possible.
3. Regress the DV simultaneously onto the IV and the M to show that the M is significantly related to the DV, even when the IV is statistically controlled.

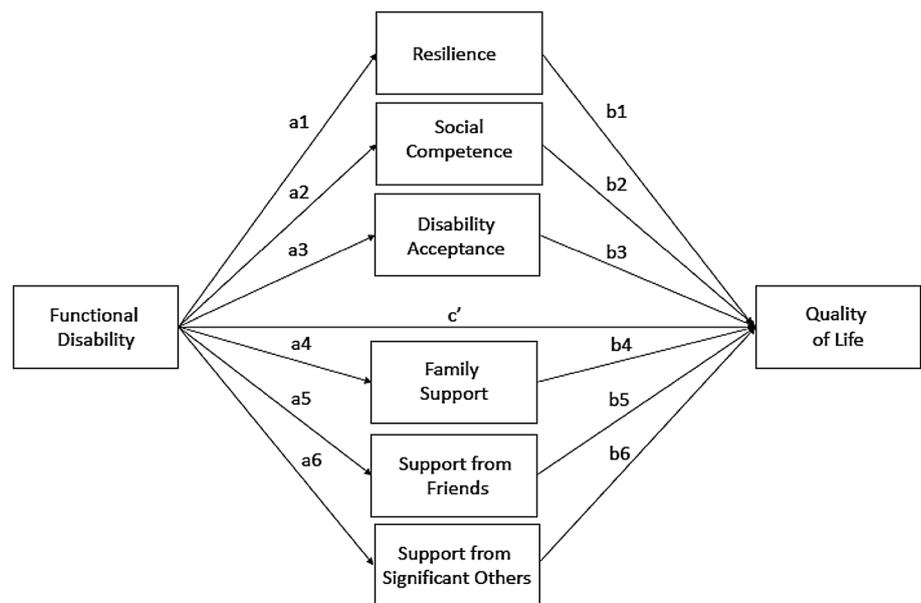
A mediator hypothesis is supported if the regression coefficients for Steps 1 and 2 are significant, and the partial regression coefficient for predicting the DV from the mediator is significant in the third step [48]. In this study, a mediational hypothesis of the relationship between functional disability and QOL was tested.

The relevant analysis was a simultaneous regression of QOL onto functional disability, and the P×E contextual factors. The motive for including all six mediators and the IV in the regression equation is based on the hypothesized path model presented in Fig. 1, which implies that each mediator is uniquely related to QOL (DV) controlling for the other mediators (M_1 – M_6) and functional disability (IV). It was hypothesized that the association between functional disability and QOL is mediated by resilience, social competence, disability acceptance, family support, support from friends, and support from significant others.

Test of indirect effect

To complement the approach outlined by Baron and Kenny [48], the bootstrap test for multiple mediators developed by Preacher and Hayes [44] was used to test

Fig. 1 Proposed P×E mediation model of functional disability on QOL



the significance of the indirect effects of the IV (functional disability) on the DV (QOL) through the mediators. Numerically, this indirect effect is equal to the product of the two path coefficients that compose the indirect path from the predictor (*X*) to the outcome variable (*Y*). There have been some valid concerns regarding the assumption that the sampling distribution of the product of the path coefficients used to calculate indirect effects are normal distributions; therefore, several alternative tests have been proposed [49], and a consensus is emerging that the bootstrap test offers one statistically strong approach to addressing this bias [50]. The PROCESS macro for SPSS (version 2.16) for conducting multiple mediation sessions was downloaded from Andrew Hayes’ website (<http://www.afhayes.com/>) to test the mediation model’s indirect effects [51].

Results

Bivariate correlations

Bivariate correlations among the different variables were performed. Table 2 presents the correlation matrix values, means, and standard deviations for the study variables. Save for support from significant others, all variables were significantly correlated with one another. Correlations ranged from small ($r = .14$ for social competence and support from significant others) to large ($r = .77$ for family support and support from friends).

Mediational analysis

The association between the IV (functional disability) and each of the mediators (Step 1) was assessed. Functional

Table 2 Correlations, means, and standard deviations for variables used in multiple regression and mediation analyses ($N = 194$)

Variables	1	2	3	4	5	6	7	8
1. Functional disability	–							
2. Resilience	-.472*	–						
3. Social competence	-.348*	.412*	–					
4. Disability acceptance	-.507*	.472*	.428*	–				
5. Family support	-.166*	.216*	.205*	.180*	–			
6. Support from friends	-.327*	.390*	.301*	.311*	.766*	–		
7. Support from significant others	-.056	-.104	-.144*	.099	.091	.182*	–	
8. Quality of life	-.456*	.401*	.396*	.447*	.465*	.539*	.244*	–
Mean	44.02	18.97	18.48	62.04	18.85	19.81	16.82	66.87
SD	15.33	6.14	4.91	13.06	7.91	6.46	8.59	16.13

* $p < 0.05$

disability was significantly related to resilience (M_1), social competence (M_2), disability acceptance (M_3), family support (M_4), and support from friends (M_5): β [95% CIs] = -0.47 [$-0.60, -0.35$], -0.35 [$-0.48, -0.22$], -0.51 [$-0.63, -0.39$], -0.17 [$-0.31, -0.03$], and -0.33 [$-0.46, -0.19$], respectively. These 95% confidence intervals do not include zero, demonstrating that the relationships are significant ($p < 0.05$) for each of the mediators. However, functional disability was not significantly related to support from significant others (M_6): β [95% CI] = -0.06 [$-0.19, 0.08$]. In addition, the association between functional disability and QOL (Step 2) was significant: β [95% CI] = -0.46 [$-0.58, -0.33$]. In the final regression model, four of the five remaining mediators were found to be significantly associated with QOL, while controlling for functional disability (Step 3); β [95% CIs] = 0.13 [$0.01, 0.26$] for social competence, 0.16 [$0.03, 0.30$] for disability acceptance, 0.21 [$0.04, 0.38$] for family support, and 0.20 [$0.05, 0.91$] for support from friends. Finally, the association between functional disability and QOL in the final regression equation was significantly reduced

($\beta = -0.20$) after controlling for the effect of the mediators. The final model accounted for 44% of the variance in QOL, $R = .67$, $R^2 = 0.44$, $F(6, 187) = 24.90$, $p < 0.001$, which is considered a large effect size according to Cohen's standards for the behavioral sciences research [47]. Table 3 presents a summary of the mediation analysis. In summary, all three steps detailed by Baron and Kenney [48] were found to be significant for five of the hypothesized mediators (M_1 – M_5). However, the findings only support four of the mediators (M_2 – M_5). Specifically, the findings conform to the predictions in the model that functional disability is associated with QOL through its association with social competence, disability acceptance, family support, and support from friends, each of which is a unique contributor to QOL.

Indirect effects

The relationship between functional disability and QOL was reduced after controlling for the mediating variables social

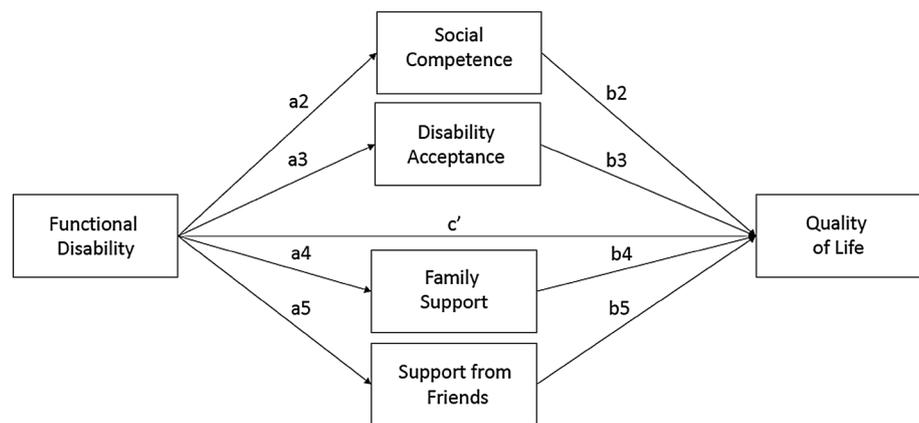
Table 3 Steps in testing personal (resilience, social competence, and disability acceptance) and environmental (social support from family, friends, and significant others) contextual factors as mediators between functional disability and QOL

Variable	β	95% CI for β	R^2	F
Step 1				
Regression 1 (path a1): functional disability predicting resilience				
Functional disability	-.472*	[-0.597, -0.347]	0.22	54.958
Regression 2 (path a2): functional disability predicting social competence				
Functional disability	-.348*	[-0.482, -0.216]	0.12	26.399
Regression 3 (path a3): functional disability predicting disability acceptance				
Functional disability	-.507*	[-0.630, -0.385]	0.26	66.564
Regression 4 (path a4): functional disability predicting family support				
Functional disability	-.166*	[-0.305, -0.025]	0.03	5.426
Regression 5 (path a5): functional disability predicting support from friends				
Functional disability	-.327*	[-0.462, -0.192]	0.11	23.055
Regression 6 (path a6): functional disability predicting support from significant others				
Functional disability	-.056	[-0.194, 0.084]	0.00	0.610
Step 2				
Regression 7 (path c): functional disability predicting quality of life				
Functional disability	-.456*	[-0.584, -0.329]	0.21	50.304
Step 3				
Regression 8 (paths b1, b2, b3, b4, b5, and c'): functional disability predicting quality of life controlling for resilience, social competence, disability acceptance, family support, and support from friends				
Resilience	.050	[-0.085, 0.185]	0.44	24.899
Social competence	.132*	[0.007, 0.257]		
Disability acceptance	.163*	[0.028, 0.298]		
Family support	.210*	[0.040, 0.380]		
Support from friends	.202*	[0.046, 0.912]		
Functional disability	-.202*	[-0.335, -0.069]		

CI confidence interval

* $p < 0.05$

Fig. 2 Final P×E mediation model of functional disability on QOL



competence, disability acceptance, family support, and support from friends, which is indicative of significant indirect effects through one or more mediators and a case of partial mediation. Bias-corrected bootstrap procedure results further supported the mediation model. The standardized indirect effects (products ‘*ab*’) and 95% confidence intervals were $-0.05 [-0.13, -0.01]$, $-0.09 [-0.18, -0.03]$, $-0.04 [-0.10, -0.01]$, and $-0.07 [-0.18, -0.01]$ for functional disability’s indirect paths through social competence, disability acceptance, family support, and support from friends, respectively. The 95% confidence intervals do not include zero, demonstrating that the indirect effects (paths *a* and *b*) are significant ($p < 0.05$) for the four significant mediators (M_2 – M_5). See Fig. 2 for the revised model.

Discussion

QOL is the ultimate life goal for everyone, including people with SMI. In the current study, we investigated the intermediary role of P×E contextual factors in reducing the negative effect of functional disability on QOL for people with SMI. The full model accounted for 44% of the variance in levels of QOL and provided strong support for social competence, disability acceptance, family support, and support from friends as mediators between functional disability and QOL. In fact, when these mediators were included in the model, functional disability’s effect on QOL was significantly reduced from -0.46 (Step 2) to -0.20 (Step 3), indicating partial mediation [48].

The environmental contextual factors of family support followed by support from friends were the most significant mediators between functional disability and QOL. Family support [21, 52] and support from friends [53] have consistently been associated with QOL in the literature. However, individuals with SMI may have few, if any, family or friends whom they can trust or rely on [54, 55], which could negatively impact their QOL. Conversely, positive relationships

have been found to be the most important aspect of happiness, well-being, and QOL [5, 27, 28, 56–58]. However, positive relationships are influenced by effectiveness in social communication and interpersonal interactions, which individuals with SMI often have difficulty. Helping individuals with SMI build positive relationships may reduce social isolation and improve QOL.

Social competence, a personal contextual factor, was also an influential mediator in the model. Social competence was a positive predictor of QOL, which is consistent with findings in the literature [6, 9]. However, individuals with SMI who reported lower levels of social competence also reported lower levels of social functioning, social support, and QOL. Thus, social support, social competence, and ultimately having skills and capacity to build positive relationships are some of the very important factors of QOL of individuals with SMI. Therefore, helping people with SMI develop social competence could help them develop positive relationships and perceive higher levels of support from such relationships (e.g., friends), which would also increase their QOL. In addition, social skills and empathic self-efficacy training may improve interpersonal skills to expand social networks that can help individuals with SMI have positive relationships [59].

Another personal contextual factor that significantly mediated the effect between functional disability and QOL was disability acceptance. Disability acceptance has been found to be a positive predictor of QOL [6, 11]. Additionally, disability acceptance has been shown to be associated with various factors of QOL, including functional independence [60], employment [34], and self-esteem [11]. In fact, disability acceptance has even been shown to be a significant predictor of social competence in adults with SMI [61]. Thus, incorporating disability acceptance factors into case conceptualization, treatment planning, and clinical practice for individuals with SMI could serve to increase their QOL. Research has shown Acceptance and Commitment Therapy (ACT) [62] to be successful in aiding individuals with SMI

accept their disability, cope with their accompanying mental health problems, and even decrease hospitalizations.

Our findings further indicate that functional disability was a prominent factor negatively affecting QOL and could not be completely mediated by the P×E contextual factors. In our study, higher levels of functional disability were associated with lower levels of QOL; therefore, reducing functional disability is very important to increase QOL for individuals with SMI. Specifically, difficulties in communication and interpersonal interactions as well as impairments in ADLs and IADLs are associated with relatively lower levels of QOL [5, 7, 8]. The current and previous research findings stress the importance of interventions to help individuals with SMI reach optimal functioning, independence, and QOL, which will also positively contribute to treatment adherence such as medication compliance and treatment engagement [63, 64]. For example, cognitive remediation interventions to improve concentration, attention, and memory, and skills training to improve ADLs and IADLs could increase functioning of individuals with SMI, and possibly thereby improve their QOL.

Overall, the findings from this study support the P×E contextual factors as mediators of the relationship between functional disability and QOL for individuals with SMI. QOL interventions should focus on the complex interactions between disability-related factors and P×E contextual factors. Therefore, it is imperative to investigate the underlying mechanism for QOL of individuals with SMI by investigating how P×E contextual factors may interact with each other to affect QOL for individuals with SMI. The inclusion of the person–environment perspective is useful for making empirical research more comprehensive, as a person's functioning is highly associated with the person's personal qualities and surrounding environment [2]. Therefore, interventions focused on P×E contextual factors may help reduce the negative effects of functional disability on QOL for people with SMI.

Limitations

There are some limitations that should be considered when interpreting the results of the current study. First, the causality of the relationships between predictor and outcome variables could not be verified, as a descriptive, correlational, cross-sectional design was utilized in this study. Second, it is possible that there are feedback loops between the predictor (i.e., functional disability), outcome (i.e., QOL), and mediator (i.e., social competence, disability acceptance, family support, and support from friends) variables we investigated, which may affect the estimates in a cross-sectional study [65], such as this one. Third, generalizability of the findings is limited by the use of a nonrandom convenience sample

through psychosocial rehabilitation clubhouses. Finally, the use of self-report data, including SMI diagnosis, reading level, and selected measures may pose a challenge to interpretation of findings, as results from self-report measures are vulnerable to affective bias and recent life events; such response errors might have a negative impact on data quality [66]. However, self-report measures were found to be useful in predicting functional outcomes for individuals with SMI [67].

Conclusions

The findings from the study provide good support for the inclusions of the P×E contextual factors in conceptualizing the relationship between functional disability and QOL for individuals with SMI. The inclusion of such person–environment aspects provides a more holistic perspective in conceptualizing a construct of interest. QOL is a subjective human life experience. Individuals' experiences are impacted by biological, psychological, and social aspects, which underscores the crucial component of person–environment interactions.

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References

1. Barton, R. (1998). The rehabilitation-recovery paradigm: A statement of philosophy for a public mental health system. *Psychiatric Rehabilitation Skills*, 2, 171–187.
2. World Health Organization. (2001). *International classification of functioning, disability and health: ICF*. Geneva: Author.
3. Substance Abuse and Mental Health Services Administration. (2016). Behind the term: Serious mental illness. Retrieved from https://nrepp-learning.samhsa.gov/sites/default/files/documents/behind_the_term/pdf_07_26_2017/Behind_the_Term_SMI_7.2017.pdf.
4. Barnes, A. L., Murphy, M. E., Fowler, C. A., & Rempfer, M. V. (2012). Health-related quality of life and overall life satisfaction in people with serious mental illness. *Schizophrenia Research and Treatment*, 245103, 1–6.

5. Mas-Expósito, L., Amador-Campos, J. A., Gómez-Benito, J., & Lalucat-Jo, L. (2011). The World Health Organization Quality of Life Scale Brief Version: A validation study in patients with schizophrenia. *Quality of Life Research*, *20*, 1079–1089.
6. Sánchez, J., Rosenthal, D. A., Tansey, T. N., Frain, M. P., & Bezyak, J. L. (2016). Predicting quality of life in adults with severe mental illness: Extending the International Classification of Functioning, Disability, and Health. *Rehabilitation Psychology*, *61*, 19–31.
7. Anderson, R. L., & Lewis, D. A. (2000). Quality of life of persons with severe mental illness living in an intermediate care facility. *Journal of Clinical Psychology*, *56*, 575–581.
8. Norman, R. M. G., Malla, A. K., McLean, T., Voruganti, L. P. N., Cortese, L., McIntosh, E., et al. (2000). The relationship of symptoms and level of functioning in schizophrenia to general wellbeing and the Quality of Life Scale. *Acta Psychiatrica Scandinavica*, *102*, 303–309.
9. Calsyn, R. J., Morse, G. A., Tempelhoff, B., Smith, R., & Allen, G. (1995). Homeless mentally ill clients and the quality of life. *Evaluation and Program Planning*, *18*, 219–225.
10. Yu, N. X., Liu, C., & Yue, Z. (2017). Resilience mediated the association between acculturation and psychological growth in college students from Hong Kong to Guangzhou, China. *Journal of Mental Health*, *26*, 326–333.
11. Ferrin, J., Chan, F., Chronister, J., & Chiu, C.-Y. (2011). Psychometric validation of the Multidimensional Acceptance of Loss Scale. *Clinical Rehabilitation*, *25*, 166–174.
12. Trompenaars, F. J., Masthoff, E. D., van Heck, G. L., de Vries, J., & Hodiament, P. P. (2007). Relationships between social functioning and quality of life in a population of Dutch adult psychiatric patients. *International Journal of Social Psychiatry*, *53*, 36–47.
13. World Health Organization. (2002). *Towards a common language for functioning, disability, and health: ICF*. Geneva: Author.
14. Anthony, W. A., Cohen, M., & Farkas, M. (1990). *Psychiatric rehabilitation*. Boston: Boston University Centre for Psychiatric Rehabilitation.
15. Lam, J. A., & Rosenheck, R. (1999). Social support and service use among homeless persons with serious mental illness. *International Journal of Social Psychiatry*, *45*, 13–28.
16. Burns, D. D., Sayers, S. L., & Moras, K. (1994). Intimate relationships and depression: Is there a causal connection? *Journal of Consulting and Clinical Psychology*, *62*, 1033–1043.
17. Baker, F., Jodrey, D., & Intagliata, J. (1992). Social support and quality of life of community support clients. *Community Mental Health Journal*, *28*, 397–411.
18. Brunt, D., & Hansson, L. (2009). The social networks of persons with severe mental illness in in-patient settings and supported community settings. *Journal of Mental Health*, *11*, 611–621.
19. Caron, J., Tempier, R., Mercier, C., & Leouffre, P. (1998). Components of social support and quality of life in severely mentally ill, low income individuals and a general population group. *Community Mental Health Journal*, *34*, 459–475.
20. Eack, S. M., Newhill, C. E., Anderson, C. M., & Rotondi, A. J. (2007). Quality of life for persons living with schizophrenia: More than just symptoms. *Psychiatric Rehabilitation Journal*, *30*, 219–222.
21. Greenberg, J. S., Knudsen, K. J., & Aschbrenner, K. A. (2006). Prosocial family processes and the quality of life of persons with schizophrenia. *Psychiatric Services*, *57*, 1771–1777.
22. Hansson, L., Middelboe, T., Merinder, L., Bjarnason, O., Bengtsson-Tops, A., Nilsson, L., et al. (1999). Predictors of subjective quality of life in schizophrenic patients living in the community. A Nordic multicentre study. *International Journal of Social Psychiatry*, *45*, 247–258.
23. Helgeson, V. S. (2003). Social support and quality of life. *Quality of Life Research*, *12*(Suppl 1), 25–31.
24. Prince, P. N., & Gerber, G. J. (2005). Subjective well-being and community integration among clients of assertive community treatment. *Quality of Life Research*, *14*, 161–169.
25. Üstün, T. B., Kostanjsek, N., Chatterji, S., & Rehm, J. (2010). *Measuring health and disability: Manual for WHO Disability Assessment Schedule (WHODAS 2.0)*. Geneva: World Health Organization.
26. Sánchez, J. (2014). Using the World Health Organization's international classification of functioning, disability, and health (ICF) model as a framework to predict participation and quality of life (QOL) in adults with severe mental illness (Doctoral dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 3636073).
27. Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The Brief Resilience Scale: Assessing the ability to bounce back. *International Journal of Behavioral Medicine*, *15*, 194–200.
28. Di Giunta, L., Eisenberg, N., Kupfer, A., Steca, P., Tramontano, C., & Caprara, G. V. (2010). Assessing perceived empathic and social self-efficacy across countries. *European Journal of Psychological Assessment*, *26*(2), 77–86.
29. Sánchez, J., Umucu, E., Schoen, B., Barnes, E. F., Chan, F., & Bezyak, J. L. (2016). Measurement structure of an abbreviated and modified version of the Adaptation to Disability Scale-Revised for individuals with severe mental illness. *Journal of Applied Rehabilitation Counseling*, *47*(3), 41–49.
30. Tansey, T. N., Kaya, C., Moser, E., Eagle, D., Dutta, A., & Chan, F. (2016). Psychometric validation of the Brief Resilience Scale in a sample of vocational rehabilitation consumers. *Rehabilitation Counseling Bulletin*, *59*, 108–111.
31. Sánchez, J., Pfaller, J. S., Sung, C., Bezyak, J. L., Iwanaga, K., Chen, S.-M., et al. (2016). Factorial validity of the Perceived Empathic and Social Self-Efficacy Scale for adults with serious mental illness: A brief report. *Australian Journal of Rehabilitation Counselling*, *22*, 135–146.
32. Sánchez, J., Pfaller, J. S., Sung, C., Bezyak, J. L., Iwanaga, K., Chen, S.-M., et al. (2017). Factorial validity of the Perceived Empathic and Social Self-Efficacy Scale for adults with serious mental illness: A brief report - ERRATUM. *Australian Journal of Rehabilitation Counselling*, *23*, 112.
33. Linkowski, D. C. (1971). A scale to measure acceptance of disability. *Rehabilitation Counseling Bulletin*, *14*, 236–244.
34. Groomes, D. A. G., & Linkowski, D. C. (2007). Examining the structure of the Revised Acceptance Disability Scale. *Journal of Rehabilitation*, *73*(3), 3–9.
35. Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The Multidimensional Scale of Perceived Social Support. *Journal of Personality Assessment*, *52*, 30–41.
36. Cecil, H., Stanley, M. A., Carrion, P. G., & Swann, A. (1995). Psychometric properties of the MSPSS and NOS in psychiatric outpatients. *Journal of Clinical Psychology*, *51*, 593–602.
37. Baker, F., & Intagliata, J. (1982). Quality of life in the evaluation of community support systems. *Evaluation and Program Planning*, *5*, 69–79.
38. Sharir, D., Tanasescu, M., Turbow, D., & Maman, Y. (2007). Social support and quality of life among psychiatric patients in residential homes. *International Journal of Psychosocial Rehabilitation*, *11*(1), 81–91.
39. Yasien, S., Alvi, T., & Moghal, F. (2013). Does perceived social support predict quality of life in psychiatric patients? *Asian Journal of Social Sciences and Humanities*, *2*, 32–41.
40. Young, K. M. (2004). Factors predicting overall life satisfaction for people with long-term mental illness factors. *International Journal of Psychosocial Rehabilitation*, *9*, 23–35.

41. Barbato, A., Monzani, E., & Schiavi, T. (2004). Life satisfaction in a sample of outpatients with severe mental disorders: A survey in Northern Italy. *Quality of Life Research*, *13*, 969–973.
42. Middelboe, T., Mackeprang, T., Thalsgaard, A., & Christiansen, P. B. (1998). A housing support programme for the mentally ill: Need profile and satisfaction among users. *Acta Psychiatrica Scandinavica*, *98*, 321–327.
43. Fox-Wasylyshyn, S. M., & El-Masri, M. M. (2005). Focus on research methods: Handling missing data in self-report measures. *Research in Nursing and Health*, *28*, 488–495.
44. Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*, 879–891.
45. Faul, F., Erdfelder, E., Buchner, A. G., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*, 1149–1160.
46. Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175–191.
47. Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale: Erlbaum.
48. Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173–1182.
49. MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods*, *7*, 83–104.
50. Hoyt, W. T., Imel, Z. E., & Chan, F. (2008). Multiple regression and correlation techniques: Recent controversies and best practices. *Rehabilitation Psychology*, *53*, 321–339.
51. Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis*. New York: Guilford Press.
52. Smith, M. J., & Greenberg, J. S. (2007). *The influence of sibling relationships on the quality of life of adults with schizophrenia*. Paper presented at the 11th annual meeting of the Society for Social Work and Research (SSWR), San Francisco.
53. Panadero Herrero, S. (2011). Quality of life and psychosocial functioning in people with severe and chronic mental diseases. *Anuario de Psicología Clínica y de la Salud*, *7*, 51–59.
54. Hawkins, R., & Abrams, C. (2007). Disappearing acts: The social networks of formerly homeless individuals with co-occurring disorders. *Social Science & Medicine*, *65*, 2031–2042.
55. Padgett, D. K., Henwood, B., Abrams, C., & Drake, R. E. (2008). Social relationships among persons who have experienced serious mental illness, substance abuse, and homelessness: Implications for recovery. *American Journal of Orthopsychiatry*, *78*, 333–339.
56. Butler, J., & Kern, M. L. (2016). The PERMA-Profler: A brief multidimensional measure of flourishing. *International Journal of Wellbeing*, *6*(3), 1–48.
57. Diener, E., Oishi, S., & Lucas, R. (2009). Subjective well-being: The science of happiness and life satisfaction. In S. J. Lopez & C. R. Snyder (Eds.), *The Oxford handbook of positive psychology* (2nd ed.). Oxford: Oxford University Press.
58. Seligman, M. E. P. (2011). *Flourish*. New York: Free Press.
59. Hasson-Ohayon, I., Kravetz, S., Levy, I., & Roe, D. (2009). Metacognitive and interpersonal interventions for persons with severe mental illness: Theory and practice. *The Israel Journal of Psychiatry and Related Sciences*, *46*, 141–148.
60. Lin, C.-P., Wang, C.-C., Fujikawa, M., Brooks, J., Eastvold-Walton, L., Maxwell, K., & Chan, F. (2013). Psychometric validation of the Brief Adaptation to Disability Scale-Revised for persons with spinal cord injury in Taiwan. *Rehabilitation Research, Policy, and Education*, *27*, 223–231.
61. Sánchez, J., Sung, C., Phillips, B. N., Tschopp, M. K., Muller, V., Lee, H.-L., & Chan, F. (in press). Predictors of perceived social effectiveness of individuals with serious mental illness. *Psychiatric Rehabilitation Journal*. <https://doi.org/10.1037/prj0000321>.
62. Bach, P., & Hayes, S. C. (2002). The use of Acceptance and Commitment Therapy to prevent rehospitalization of psychotic patients: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *70*, 1129–1139.
63. Corrigan, P. W., Rao, D., & Lam, C. S. (2005). Psychiatric rehabilitation. In F. Chan, M. Leahy, & J. Saunders (Eds.), *Case management for rehabilitation health professionals* (Vol. 2, pp. 132–163). Osage Beach: Aspen Professional Services.
64. Tschopp, M. K., & Frain, M. (2009). Psychiatric rehabilitation. In F. Chan, E. D. Cardoso, & J. A. Chronister (Eds.), *Understanding psychosocial adjustment to chronic illness and disability: A handbook for evidence-based practitioners in rehabilitation* (pp. 371–398). New York: Springer.
65. Hayes, A. F., Preacher, K. J., & Myers, T. A. (2011). Mediation and the estimation of indirect effects in political communication research. In E. P. Bucy & R. L. Holbert (Eds.), *The sourcebook for political communication research: Methods, measures, and analytical techniques* (pp. 434–465). New York: Routledge.
66. Krumpal, I. (2013). Determinants of social desirability bias in sensitive surveys: A literature review. *Quality & Quantity*, *47*, 2025–2047.
67. Eisen, S. V., Bottonari, K. A., Glickman, M. E., Spiro, A. III, Schultz, M. R., Herz, L., et al. (2011). The incremental value of self-reported mental health measures in predicting functional outcomes of veterans. *The Journal of Behavioral Health Services and Research*, *38*, 170–190.