



## Family functioning moderates the impact of psychosis-risk symptoms on social and role functioning

Elizabeth Thompson<sup>a,\*</sup>, Pamela Rakhshan<sup>a</sup>, Steven C. Pitts<sup>a</sup>, Caroline Demro<sup>a,2</sup>, Zachary B. Millman<sup>a</sup>, Kristin Bussell<sup>b</sup>, Jordan DeVlyder<sup>c</sup>, Emily Kline<sup>a,2</sup>, Gloria M. Reeves<sup>b</sup>, Jason Schiffman<sup>a</sup>

<sup>a</sup> Human Services Psychology Department, University of Maryland Baltimore County, 1000 Hilltop Circle, Baltimore, MD 21250, United States of America

<sup>b</sup> Division of Child and Adolescent Psychiatry, University of Maryland, School of Medicine, 700 West Pratt St., Baltimore, MD 21201, United States of America

<sup>c</sup> Graduate School of Social Service, Fordham University, 113 W 60th St, New York, NY 10023, United States of America

### ARTICLE INFO

#### Article history:

Received 20 February 2018

Received in revised form 14 June 2018

Accepted 27 August 2018

Available online 8 September 2018

#### Keywords:

Attenuated psychosis

Clinical high risk

Family support

Functioning

### ABSTRACT

**Background:** Youth at clinical high-risk (CHR) for psychosis often experience difficulties in social and role functioning. Given evidence that family stress and support can impact psychosis-risk symptoms, as well as an individual's ability to fulfill social and role functions, family dynamics are hypothesized to moderate the effect of psychosis-risk symptoms on functioning.

**Methods:** Participants at CHR ( $N = 52$ ) completed the clinician-administered Structured Interview for Psychosis-risk Syndromes (SIPS) and the Family Assessment Device (FAD) General Functioning Scale, a self-report measure of family functioning including cohesion and support. Interviewers rated participants' current social and role functioning using the Global Functioning: Social and Role Scales.

**Results:** Regression results indicated that positive symptoms, but not ratings of family functioning, statistically predicted social and role functioning. Perceived family functioning, however, moderated the effect of symptoms on social/role functioning. For individuals who perceived lower levels of family functioning, symptoms were moderately associated with social and role functioning ( $f^2 = 0.17$  and  $f^2 = 0.23$ , respectively). In contrast, psychosis-risk symptoms were not significantly associated with social/role functioning for individuals with higher levels of perceived family functioning. Notably, positive symptoms and perceived family functioning were not associated with one another, suggesting that perceived family functioning did not directly impact symptom severity, or vice versa.

**Conclusions:** Findings support the notion that family functioning may be a clinically meaningful factor for individuals at CHR. Although this cross-sectional data limits our discussion of potential mechanisms underlying the pattern of findings, results suggest that familial support may be beneficial for individuals at risk for psychosis.

© 2018 Published by Elsevier B.V.

## 1. Introduction

Individuals at clinical high-risk (CHR) for psychosis often experience significant emotional distress and marked deficits in multiple areas of functioning, including social integration and role fulfillment (Addington et al., 2008; Cornblatt et al., 2012; Fusar-Poli et al., 2015; Olvet et al., 2015). Although temporal precedence regarding psychosis-risk symptoms and functional difficulties is not well understood, literature suggests a bidirectional influence such that the experience of positive symptoms may impair functioning, and social and role deficits may contribute to more stress and greater symptomatology

(O'Brien et al., 2009). Both symptom exacerbation and functional deterioration have been associated with conversion to psychosis (Cannon et al., 2008). Thus, research exploring factors that may impact the experience of symptoms and/or functioning may facilitate better understanding of this relation and inform targets for early intervention.

Family characteristics are especially important for many individuals at CHR, given that psychosis-risk symptoms typically emerge during adolescence and young adulthood when youth are heavily impacted by family interactions. Evidence suggests that for youth at CHR, parent warmth, positive remarks, and involvement predict reductions in disorganized and negative symptoms and improved social functioning (O'Brien et al., 2006). In contrast, youth at CHR living in less cohesive and less supportive family environments show greater increases in symptomatology, more functional impairment, and increased risk of symptom relapse (Koutra et al., 2015; Schlosser et al., 2010). Related, among caregivers of youth at CHR, higher levels of criticism and emotional over-involvement correlate with caregiver anxiety and

\* Corresponding author.

E-mail address: [ethomps1@umbc.edu](mailto:ethomps1@umbc.edu) (E. Thompson).

<sup>1</sup> Present affiliation: Department of Psychiatry and Human Behavior, Alpert Medical School of Brown University.

<sup>2</sup> Present affiliation: Department of Psychiatry, Harvard Medical School.

depression, which likely has an adverse impact on family functioning (Domínguez-Martínez, Medina-Pradas, Kwapil, and Barrantes-Vidal, 2017). Furthermore, caregiver distress has been linked to increased criticism and blame towards those at risk (Domínguez-Martínez et al., 2017). Criticism, blame, and over-involvement are all defining characteristics of expressed emotion (EE), and high EE within families is a robust and meaningful predictor of negative outcomes such as relapse and deterioration among individuals with schizophrenia (Butzlaff & Hooley, 1998; Weintraub et al., 2017). Some evidence suggests that high EE has a negative impact on clinical outcomes in the very early stages of psychosis (Meneghelli et al., 2011; Schlosser et al., 2010), and further research is needed to explore how these family characteristics impact emerging illness. Collectively, findings suggest that individuals at CHR and their caregivers are impacted by family dynamics, including communication styles and attitudes towards one another, in clinically meaningful ways that warrant further exploration.

Family involvement in treatment may be a particularly important intervention component for youth at CHR, as caregivers are often the first to notice early psychosis-spectrum symptoms (Judge, Perkins, Nieri, and Penn, 2005) and observe functional decline. More specifically, positive family environment (rather than mere family involvement) is strongly linked to the initiation of effective treatment and shortened duration of untreated psychosis for individuals in the early stages of psychosis (Compton et al., 2008). Although several treatment modalities, including family therapy, have been linked to positive outcomes for individuals at CHR (Okuzawa et al., 2014; Thompson et al., 2015), more nuanced research is needed to elucidate what types of early intervention targets (e.g., family interactions, cognitive patterns, emotion regulation) may be associated with particular outcomes of interest (e.g., symptom improvement or remission, reduced distress, functional recovery, reductions in comorbid concerns).

Although evidence indicates that family functioning plays a significant role in outcomes for those at CHR, it is less clear how family functioning is related to illness factors such as positive symptoms, social connectedness, and role fulfillment. For instance, it is not known whether positive family functioning is linearly associated with reduced symptomatology and/or better functioning (i.e., positive family functioning is a protective factor, promoting resiliency). Alternatively, or perhaps in parallel, family functioning may moderate the impact of positive symptoms on functioning (i.e., positive family functioning buffers the impact of symptoms when they emerge and/or progress). The current study assessed family characteristics of individuals at CHR and examined the relation between CHR symptoms, family functioning, and social and role functioning. We hypothesized that more severe positive symptoms and lower levels of perceived family functioning among those at CHR would be associated with greater impairment in social and role functioning. Furthermore, we hypothesized that the strength of the relation between psychosis-risk symptoms and functional impairment will vary across levels of family functioning, with individuals who indicate lower levels of family functioning experiencing greater social and role impairment in response to symptom presence.

## 2. Materials and methods

### 2.1. Participants

The study included 52 youth and young adults classified as being at CHR based on meeting criteria for a high-risk syndrome according to the Structured Interview for Psychosis Risk Symptoms (SIPS; Miller et al., 2003). Participants were 12–22 years old, with a mean age of 15.39 ( $SD = 2.43$ ), and 70.4% ( $n = 38$ ) of the sample was female. The racial breakdown of the sample was as follows: 44.2% African American, 36.5% Caucasian, 17.3% multiracial, and 1.9% American Indian/Alaska Native. Forty-seven (90.4%) youth reported living with their parents or caregivers (two of these individuals were living on a college campus and reported living with caregivers when not at school), and 5 youth did

not report with whom they were living at the time of evaluation. The median household income for the sample was \$20,000–\$39,999, and 50% ( $n = 26$ ) reported a family income below \$40,000.

This sample included individuals consented since 2011 in an ongoing project of CHR identification and research. Data presented in this paper was collected between 2011 and 2017, during which 163 individuals completed baseline assessments. Of those, 52 participants were categorized as being at CHR at the time of their baseline assessments and completed the measures included in this study. Previous iterations of this sample have been used in prior publications with distinct research hypotheses, measures, and findings.

### 2.2. Procedure

The current study was approved by the Institutional Review Boards at the University of Maryland School of Medicine and Baltimore County campuses. Potential participants were recruited through hospital and community clinics, local schools, and outreach to mental health providers throughout Maryland. Recruitment activities targeted clinicians and care providers within these settings, and referrals were made by providers seeking general diagnostic assessment/consultation, or specifically for evaluation of suspected psychosis-spectrum symptoms. All referrals were contacted by study staff housed within a psychosis-risk specialty clinic to verify eligibility. Participation criteria required that all participants were between the ages of 12 and 25, able to participate with a consenting parent or legal guardian if under the age of 18, and receiving mental health services at the time of participation. At the study visit, participants (and guardians, for participants under 18) provided written informed consent, and youth under 18 were required to provide written assent in addition to caregiver consent. Participants then completed a self-report questionnaire probing family functioning, followed by a diagnostic interview including an evaluation of psychosis-risk symptoms and social and role functioning.

### 2.3. Measures

The McMaster Family Assessment Device (FAD; Epstein, Baldwin, and Bishop, 1983) is a self-report measure designed to assess perceived family functioning in adolescents and adults. The general functioning scale consists of 12-items measuring communication, cohesion, problem solving, and support. Individuals are asked to answer how much they agree with statements about their family, such as “In times of crisis we can turn to each other for support”. The FAD items are rated on a five-point Likert scale (strongly disagree, disagree, neutral, agree, strongly agree). This scoring method was adapted from the original FAD, which uses a four-point Likert scale with no “neutral” response choice. Half of the FAD items are negatively worded (e.g., “There are lots of bad feelings in the family”) and thus, those items were reverse-scored to align with the scoring of positively worded items (e.g., “individuals are accepted for who they are”). Higher scores represent better family functioning.

The FAD was developed and normed in both clinical and non-clinical individuals and families, and it has been re-tested in contemporary community samples (Epstein, Baldwin, and Bishop, 1983; Mansfield, Keitner, and Dealy, 2015). The FAD general functioning subscale has been shown to have high reliability and high inter-correlation with the full FAD measure (Byles, Byrne, Boyle, and Offord, 1988), a well-validated and widely used measure of family functioning. The general functioning subscale has also demonstrated good concurrent and construct validity when compared to other assessments of family functioning (Aarons et al., 2007; Leibach & Everhart, 2017; Shek, 2001). Within the current sample, internal consistency was strong (Cronbach's alpha = 0.91).

The Structured Interview for Psychosis-risk Syndromes (SIPS; Miller et al., 2003) is a clinician-administered interview that assesses sub-threshold positive symptoms to determine risk. The SIPS is the most widely used psychosis-risk assessment in North America. All

participants met criteria for a SIPS-defined risk syndrome: attenuated psychosis syndrome ( $n = 42$ ), brief intermittent psychosis syndrome ( $n = 4$ ), genetic risk and deterioration ( $n = 2$ ), or schizotypal personality disorder ( $n = 4$ ). SIPS symptoms include unusual thoughts, suspiciousness, grandiosity, perceptual abnormalities, and disorganized communication. The sum of positive symptom scores was used to measure symptom severity in the current study. This is an imperfect measure of symptom severity given that individuals with milder symptoms may have higher total scores compared to individuals with one or two more severe symptoms. However, consistent with prior work (Addington et al., 2011; Miklowitz et al., 2014; Miller et al., 1999), we believe this scale is a reasonable proxy for overall CHR severity, especially given that this is a sample of exclusively high-risk individuals (as determined by SIPS diagnostic criteria).

For the current study, raters (doctoral graduate students) completed an intensive training and certification process including a didactic training led by a SIPS creator (Barbara Walsh) or an individual certified by the Yale PRIME Clinic (Jason Schiffman). Additionally, post training, all interviewers rated to reliability criterion ( $ICC > 0.80$ ) for audio-recorded cases ( $n = 3$ ), while co-rating in-vivo interviews ( $n = 3$ ), and while leading interviews co-rated by an experienced evaluator ( $n = 3$ ). All study cases were presented within team case conferences or via individual supervision with study PIs. Ongoing reliability training and practice across 10 interviews yielded high rates of reliability ( $ICC = 0.82$ ) and perfect diagnostic consensus ( $kappa = 1$ ).

The Global Functioning Social and Role Scales (GF-S and GF-R; Cornblatt et al., 2007) are clinician-rated measures of instrumental role fulfillment and social integration/engagement. Each scale is rated from 1 to 10, with high scores indicating better functioning. The measure was designed for individuals aged 12–29 years, the age range of highest risk for psychosis, and includes ratings based on developmentally appropriate activities and common difficulties that may emerge in early stages of psychosis. Creators of the GF-S and GF-R scales report adequate psychometric properties, with inter-rater reliability ranging from 0.78 to 0.93 and convergent validity estimates (i.e. correlations with established functioning scales) ranging from 0.49 to 0.70 (Cornblatt et al., 2007). In a study including a substantial proportion of the current sample (Wilson et al., 2016), the GF scales were compared to similar unitary global functioning scales and moderate to strong correlations were reported between the measures (correlations ranged from 0.61 to 0.74). Furthermore, results suggested that the GF scales may successfully discriminate functioning from psychiatric symptom severity.

### 3. Results

#### 3.1. Analyses

Basic descriptive statistics indicated that all variables of interest were within acceptable limits of normality based on standards defined by West, Finch, and Curran, (1995; Table 1). Given the small sample size, we elected to interpret all effects that were statistically significant based on traditional null hypothesis testing ( $p < .05$ ) or had a small-to-moderate effect size ( $f^2 > 0.05$ ). Linear regressions estimated the effects

**Table 1**  
Descriptive statistics for positive symptoms, perceived family functioning, and social and role functioning scores.

Score	Mean	SD	Minimum	Maximum	Skewness	Kurtosis
SIPS positive symptom total	12.50	4.10	4	23	0.19	−0.16
Perceived family functioning	41.35	10.46	21	60	−0.07	−0.94
Role functioning	6.60	1.68	3	9	−0.33	−0.56
Social functioning	6.02	1.32	4	9	0.34	−0.22

Note.  $N = 52$ .

of SIPS positive symptom total, perceived family functioning, and an interaction term (positive symptom total x family functioning) on social functioning, and independently on role functioning. Examination of the relation between SIPS positive symptoms and perceived family functioning ( $r [50] = -0.11, p = .437$ ) suggest no issues of collinearity in the predictors. Given the presence of significant interactions, the effects of SIPS positive symptom total on social functioning and role functioning were probed at low, moderate, and high levels of perceived family functioning.

#### 3.2. Full regression models

Regression results indicated that SIPS positive symptom total significantly predicted social and role functioning scores (Table 2). Perceived family functioning did not have direct effects on social functioning but was positively related to role functioning. More importantly, the interaction between perceived family functioning and SIPS positive score was present for the prediction of both role functioning ( $t[48] = 2.70, p = .01, f^2 = 0.15$ ) and social functioning ( $t[48] = 2.01, p = .051, f^2 = 0.08$ ). The presence of an interaction suggests that the effect of SIPS positive symptoms on role and social functioning depends on the degree of family functioning.

#### 3.3. Probing the interactions between positive symptoms and family functioning

To help elucidate the interactions, we followed guidelines suggested by Aiken and West (1991) and defined moderate, low, and high family functioning as the mean and one SD below and above the mean, respectively. In these models, the effect of SIPS positive symptom total is correctly thought of as the simple effect (conditional effect) of psychosis on functioning at those levels. Results indicated that at both low and mean perceived family functioning, SIPS positive symptom total was negatively related to both role and social functioning. The relation was not present for families reporting high perceived family functioning. See Table 3 and Figs. 1 and 2 for effects.

### 4. Discussion

Results from this study indicate that psychosis-spectrum symptoms were conditionally related to impairment in social and role functioning among our sample of individuals at CHR. Notably, family functioning (as perceived by youth at CHR) did not have direct effects on social functioning, and effects on role functioning were small. There was, however, a significant interaction between positive symptoms and perceived family functioning, such that higher levels of perceived family functioning could be thought of as a buffer of the deleterious effects of psychosis-spectrum symptoms on both role and social functioning. Specifically, at low and mean perceived family functioning, attenuated psychosis was

**Table 2**  
Predicting role and social functioning from positive symptom total and perceived family functioning.

	$\beta$	$t$	$p$	Cohen's $f^2$
Predictors of role functioning				
SIPS positive symptom total	−0.30	−2.31	0.025	0.11
Perceived family functioning	0.22	1.70	0.097	0.06
Perceived family functioning x positive symptom total	0.35	2.70	0.010	0.15
Predictors of social functioning				
SIPS positive symptom total	−0.32	−2.37	0.022	0.12
Perceived family functioning	0.17	1.27	0.212	0.03
Perceived family functioning x positive symptom total	0.27	2.01	0.051	0.08

Note:  $f^2 = 0.02, 0.15, \text{ and } 0.35$  correspond to small, moderate, and large effect sizes (Cohen, 1988).

**Table 3**  
Regressions predicting social and role functioning from positive symptom total at different levels of perceived family functioning.

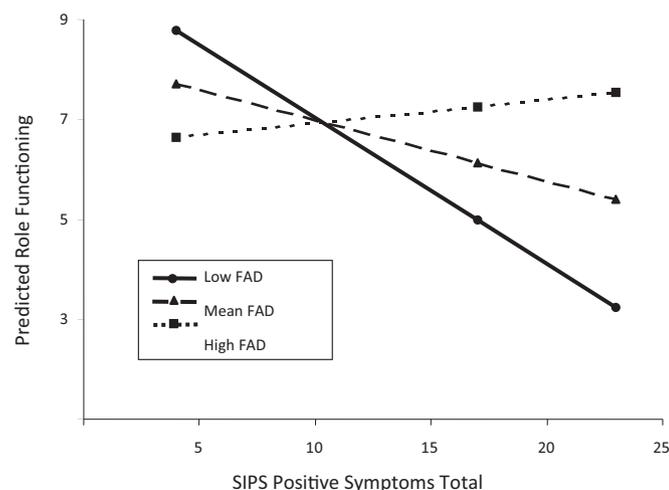
	$\beta$	$t$	$p$	Cohen's $f^2$
Effect of positive symptoms on role functioning at				
Low perceived family functioning	−0.71	−3.33	0.002	0.23
Moderate perceived family functioning	−0.30	−2.31	0.025	0.11
High perceived family functioning	0.12	0.63	0.530	0.01
Effect of positive symptoms on social functioning at				
Low perceived family functioning	−0.63	−2.87	0.006	0.17
Moderate perceived family functioning	−0.32	−2.37	0.022	0.12
High perceived family functioning	0.00	0.02	0.986	0.00

Note:  $f^2 = 0.02, 0.15,$  and  $0.35$  correspond to small, moderate, and large effect sizes (Cohen, 1988).

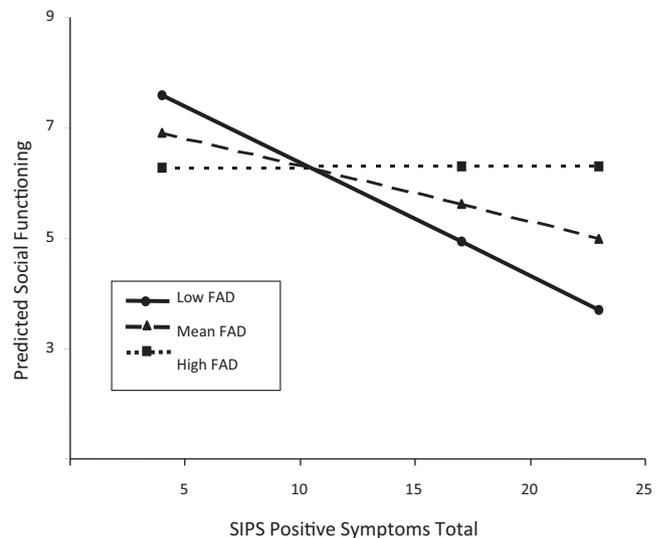
related to functional impairment, with stronger effects (moderate) at the low level of perceived family functioning. This effect was not present in families reporting higher levels of family functioning. Findings demonstrate a staged process, with the effect sizes diminishing with greater perceived family functioning, particularly in relation to role functioning. Although causality cannot be determined given our methodology, findings suggest that the relation between attenuated psychosis and impaired functioning is less pronounced with more adaptive family functioning.

Overall, findings support the notion that perceived family functioning may be an important buffer and/or protective factor for functioning among individuals at CHR. Notably, within this sample, risk symptomatology (as measured by the SIPS) was not associated with perceived family functioning. Thus, it can be inferred that intensity of risk symptomatology did not directly influence perceived family functioning. Further, it can also be inferred that characteristics (of the individuals or their environments) other than positive symptoms must be influencing the level of social/role functioning among youth at CHR.

Although our design is cross-sectional using measured variables, results are consistent with findings that more cohesive families are better able to manage positive symptoms, demonstrate and facilitate greater support, and consequently, promote higher levels of functioning outside of the home (e.g., at school or work; Compton et al., 2008; O'Brien et al., 2006). It is possible that at-risk individuals in families with higher functioning may be receiving more support and/or effective services which translate to better functioning in social and role contexts (Haine-Schlagel and Walsh, 2015; Marshall et al., 2005; Rickwood, Mazzer, and Telford, 2015; Tang et al., 2014). It may also be that individuals at



**Fig. 1.** The effect of SIPS positive symptom total on role functioning at high, moderate, and low levels of perceived family functioning.



**Fig. 2.** The effect of SIPS positive symptom total on social functioning at high, moderate, and low levels of perceived family functioning.

CHR in higher functioning families may be better able to cope with their symptoms, perhaps due to resiliency characteristics promoted over time. Factors such as higher self-esteem, greater social support, and more active coping may be protective against psychosis symptomatology (Pruessner, Iyer, Faridi, Joober, and Malla, 2011). Thus, if protective characteristics such as these are supported in families with more positive functioning, psychosis-risk symptoms may not have as great of an impact on functioning in family, role, and social contexts.

Despite questions related to the direction of effect across variables, results support the importance of perceived family functioning for individuals at CHR. Evidence that higher levels of perceived family cohesion and support may be linked to better social/role functioning corroborates previous research describing baseline benefits (including less impairing symptomatology and functioning) of positive family environments for individuals at CHR (Compton et al., 2008; O'Brien et al., 2006). Furthermore, limitations regarding causality notwithstanding, the current findings suggest the possibility that psychosocial therapy aimed at bolstering familial cohesion and support among individuals at CHR may be helpful for supporting functional goals.

#### 4.1. Clinical implications

Family-focused therapy specifically aimed at increasing family functioning (e.g., emphasizing psychoeducation and supportive familial interactions) has been shown to be effective in decreasing attenuated psychosis and related (negative, disorganized, and general) symptomatology (O'Brien et al. 2015; Miklowitz et al., 2014), bolstering functioning, and improving family communication (McFarlane et al., 2015; Miklowitz et al., 2014; O'Brien et al., 2014) within CHR/early psychosis samples. Findings from the current study support prior evidence that family functioning, a characteristic shown to be amenable to change within treatment contexts, remains a worthwhile target of intervention for individuals at CHR. Our findings suggest that this treatment target may be particularly important if affected individuals perceive their family functioning to be unsupportive, maladaptive, or strained. Tools like the FAD may be useful for identifying individuals at CHR who may benefit from family-oriented intervention (i.e., those with lower levels of perceived family functioning who have family members who can be engaged in treatment) and those who may be better served by alternate approaches to treatment (i.e., those who already have positive family relations and would potentially benefit from interventions targeting other areas of concern).

Measures with high face validity (such as the FAD) may be appealing in the context of treatment, as areas of family strengths and weaknesses can be easily identified, monitored, and targeted throughout care. As a caution, it is important that discussion of family dynamics be approached sensitively, to minimize feelings of guilt and/or blame. Family functioning measures that are linked to clinically relevant outcomes are needed to establish treatment goals and track progress. Results demonstrate that the FAD measures elements of family functioning that are linked to clinically-meaningful outcomes, namely social integration and role functioning, thought to be important markers of illness and long-term disability.

As CHR researchers and clinicians continue to embrace flexible and individually tailored interventions for those at risk, research focused on evaluating tools that may be useful for weighing treatment priorities and choosing intervention modalities will contribute to the field in clinically meaningful ways. The current study lends support to evaluating and monitoring perceived family functioning throughout treatment in the CHR population, and further research into the clinical application of the FAD and similar tools is warranted for this purpose.

#### 4.2. Limitations and future directions

The current study was limited in its ability to objectively measure family functioning, as the FAD was only completed via self-report questionnaire by individuals at CHR. Ratings from other family members and/or observational data could be used to gain a better understanding of family functioning from multiple perspectives.

We were not able to consider all variables of interest that may influence the inter-relation of positive symptoms, family, and social and role functioning. For example, some research suggests that as the duration of psychosis-risk symptom persistence increases, parental warmth towards those at CHR decreases, and mothers' expressions of rejection, fusion, and protectiveness increase (McFarlane & Cook, 2007). Additionally, given findings from a classic Finnish adoptive family study of schizophrenia where individuals at genetic high-risk appeared to be particularly sensitive to family environment with respect to future mental health outcomes, exploring the possible influence of genetic risk on inter-relations and outcomes may provide further insight into the role of families (Tienari et al., 1985; Tienari et al., 1994). Other variables of interest that may impact the relation between positive symptoms, family functioning, social integration, and role-fulfillment include cognitive abilities, co-morbidities, and other family characteristics related to family size, mental health status, and socioeconomic status.

This study used an estimate for overall psychosis-risk symptom severity, namely the total sum of positive symptom ratings on the SIPS. Although this appears to be a reasonable estimate of severity that has been used in prior work (Addington et al., 2011; Miklowitz et al., 2014; Miller et al., 1999), there may be cases where higher total scores are a function of numerous relatively mild positive symptoms (e.g., scores of 3 across all five positive symptoms) and other cases where total score is influenced by one or two severe positive ratings (e.g., scores of 5 on two of the five symptoms), thus creating risk for within-group heterogeneity. Future studies could look at individual symptom scores to explore more nuanced relations between specific symptoms and functioning variables.

The cross-sectional nature of the design prohibits inferences of causality. Although this limits speculation related to mechanisms driving the relations noted, this limitation does not detract from the main finding that perceived family functioning is an important factor that moderates the association between positive symptoms and functional outcomes, regardless of what influences family functioning.

#### 4.3. Conclusions

For individuals at CHR who perceive low to moderate family functioning (e.g., support and cohesion), greater psychosis-spectrum

symptomatology seems to be associated with lower levels of social integration and role fulfillment. In contrast, for those at CHR who perceive more positive characteristics of family functioning in their home environments, symptom severity may not be associated with social and role functioning. These results suggest that perceived family functioning is meaningfully linked to functional outcomes in youth at CHR, and thus, family characteristics may be an important treatment target to support social and role functioning within this population.

#### Conflict of interest

The authors do not have of any potential conflict of interest, real or perceived.

#### Contributors

Emily Kline and Gloria Reeves contributed to study design and protocol development. Elizabeth Thompson, Pamela Rakhshan, Caroline Demro, Zachary Millman, and Kristin Bussell oversaw protocol implementation and data management. Elizabeth Thompson performed data analysis and led manuscript development (literature search, planning, and writing of the first draft). Jordan DeVlyder assisted in manuscript development and editing. Steven Pitts assisted in the design of the study and served as a statistical consultant. Jason Schiffman was Principal Investigator for this project and assisted with all stages of design, implementation, analysis, writing, and editing. All authors contributed to and have approved the final manuscript.

#### Funding source declaration

This work was supported by the National Institute of Mental Health (grant R01MH112612 to J.S.) and the United States, State of Maryland Department of Health and Mental Hygiene, Behavioral Health Administration through the Center for Excellence on Early Intervention for Serious Mental Illness (OPASS# 14-13717G/M00B4400241 to J.S.).

#### References

- Aarons, G.A., McDonald, E.J., Connelly, C.D., Newton, R.R., 2007. Assessment of family functioning in Caucasian and Hispanic Americans: reliability, validity, and factor structure of the family assessment device. *Fam. Process* 46 (4), 557–569.
- Addington, J., Penn, D., Woods, S.W., Addington, D., Perkins, D.O., 2008. Social functioning in individuals at clinical high risk for psychosis. *Schizophr. Res.* <https://doi.org/10.1016/j.schres.2007.10.001> [https://doi.org/S0920-9964\(07\)00454-9](https://doi.org/S0920-9964(07)00454-9) [pii].
- Addington, J., Epstein, I., Liu, L., French, P., Boydell, K.M., Zipursky, R.B., 2011. A randomized controlled trial of cognitive behavioral therapy for individuals at clinical high risk of psychosis. *Schizophr. Res.* 125 (1), 54–61.
- Aiken, L.S., West, S.G., 1991. *Multiple Regression: Testing and Interpreting Interactions*. SAGE Publications, Inc., Thousand Oaks, CA, USA.
- Butzlaff, R.L., Hooley, J.M., 1998. Expressed emotion and psychiatric relapse: a meta-analysis. *Arch. Gen. Psychiatry* 55 (6), 547–552.
- Byles, J., Byrne, C., Boyle, M.H., Offord, D.R., 1988. Ontario child health study: reliability and validity of the general functioning subscale of the McMaster family assessment device. *Fam. Process* 27 (1), 97–104.
- Cannon, T.D., Cadenhead, K., Cornblatt, B., Woods, S.W., Addington, J., Walker, E., Seidman, L.J., Perkins, D., Tsuang, M., McGlashan, T., Heinsen, R., 2008. Prediction of psychosis in youth at high clinical risk. *Arch. Gen. Psychiatry* <https://doi.org/10.1001/archgenpsychiatry.2007.3>.
- Cohen, 1988. *Statistical Power Analysis for the Behavioral Sciences*. Lawrence Erlbaum Associates, Hillsdale, NJ, USA <https://doi.org/10.2307/2286629>.
- Compton, M.T., Chien, V.H., Leiner, A.S., Goulding, S.M., Weiss, P.S., 2008. Mode of onset of psychosis and family involvement in help-seeking as determinants of duration of untreated psychosis. *Soc. Psychiatry Psychiatr. Epidemiol.* 43 (12), 975.
- Cornblatt, B.A., Auther, A.M., Niendam, T., Smith, C.W., Zinberg, J., Bearden, C.E., Cannon, T.D., 2007. Preliminary findings for two new measures of social and role functioning in the prodromal phase of schizophrenia. *Schizophr. Bull.* <https://doi.org/10.1093/schbul/sbm029>.
- Cornblatt, B.A., Carrión, R.E., Addington, J., Seidman, L., Walker, E.F., Cannon, T.D., Cadenhead, K.S., McGlashan, T.H., Perkins, D.O., Tsuang, M.T., Woods, S.W., Heinsen, R., Lencz, T., 2012. Risk factors for psychosis: impaired social and role functioning. *Schizophr. Bull.* <https://doi.org/10.1093/schbul/sbr136>.
- Dominguez-Martínez, T., Medina-Pradas, C., Kwapił, T.R., Barrantes-Vidal, N., 2017. Relatives' expressed emotion, distress and attributions in clinical high-risk and recent onset of psychosis. *Psychiatry Res.* <https://doi.org/10.1016/j.psychres.2016.11.048>.
- Epstein, N.B., Baldwin, L.M., Bishop, D.S., 1983. The McMaster family assessment device \* previous first next. *J. Marital. Fam. Ther.* <https://doi.org/10.1111/j.1752-0606.1983.tb01497.x>.
- Fusar-Poli, P., Rocchetti, M., Sardella, A., Avila, A., Brandizzi, M., Caverzasi, E., Politi, P., Ruhrmann, S., McGuire, P., 2015. Disorder, not just state of risk: meta-analysis of functioning and quality of life in people at high risk of psychosis. *Br. J. Psychiatry* <https://doi.org/10.1192/bjp.bp.114.157115>.
- Haine-Schlagel, R., Walsh, N.E., 2015. A review of parent participation engagement in child and family mental health treatment. *Clin. Child. Fam. Psychol. Rev.* <https://doi.org/10.1007/s10567-015-0182-x>.
- Judge, A.M., Perkins, D.O., Nieri, J., Penn, D.L., 2005. Pathways to care in first episode psychosis: a pilot study on help-seeking precipitants and barriers to care. *J. Ment. Health* <https://doi.org/10.1080/09638230500271089>.

- Koutra, K., Triliva, S., Roumeliotaki, T., Basta, M., Simos, P., Lionis, C., Vgontzas, A.N., 2015. Impaired family functioning in psychosis and its relevance to relapse: a two-year follow-up study. *Compr. Psychiatry* <https://doi.org/10.1016/j.comppsy.2015.06.006>.
- Leibach, G.G., Everhart, R.S., 2017. Family assessment device: real-world validity in urban families of children with asthma. *J. Fam. Psychol.* **31** (5), 642.
- Mansfield, A.K., Keitner, G.I., Dealy, J., 2015. The family assessment device: an update. *Fam. Process* **54** (1), 82–93.
- Marshall, M., Lewis, S., Lockwood, A., Drake, R., Jones, P., Croudace, T., 2005. Association between duration of untreated psychosis and in cohorts of first-episode outcome patients: a systematic review. *Arch. Gen. Psychiatry* **62** (9), 975–983.
- McFarlane, W.R., Cook, W.L., 2007. Family expressed emotion prior to onset of psychosis. *Fam. Process* <https://doi.org/10.1111/j.1545-5300.2007.00203.x>.
- McFarlane, W.R., Levin, B., Travis, L., Lucas, F., Lynch, S., Verdi, M., Williams, D., Adelsheim, S., Calkins, R., Carter, C.S., Cornblatt, B., Taylor, S.F., Auther, A.M., McFarland, B., Melton, R., Migliorati, M., Niendam, T., Ragland, J., Sale, T., Salvador, M., Spring, E., 2015. "Clinical and functional outcomes after 2 years in the early detection and intervention for the prevention of psychosis multisite effectiveness trial": erratum. *Schizophr. Bull.* <https://doi.org/10.1093/schbul/sbu219>.
- Meneghelli, A., Alpi, A., Pafumi, N., Patelli, G., Preti, A., Cocchi, A., 2011. Expressed emotion in first-episode schizophrenia and in ultra high-risk patients: results from the Programma2000 (Milan, Italy). *Psychiatry Res.* **189** (3), 331–338.
- Miklowitz, D.J., O'Brien, M.P., Schlosser, D.A., Addington, J., Candan, K.A., Marshall, C., Domingues, I., Walsh, B.C., Zinberg, J.L., De Silva, S.D., Friedman-Yakoobian, M., Cannon, T.D., 2014. Family-focused treatment for adolescents and young adults at high risk for psychosis: results of a randomized trial. *J. Am. Acad. Child Adolesc. Psychiatry* <https://doi.org/10.1016/j.jaac.2014.04.020>.
- Miller, T.J., McGlashan, T.H., Woods, S.W., Stein, K., Driesen, N., Corcoran, C.M., Hoffman, R., Davidson, L., 1999. Symptom assessment in schizophrenic prodromal states. *Psychiatry Q.* **70** (4), 273–287.
- Miller, T.J., McGlashan, T.H., Rosen, J.L., Cadenhead, K., Ventura, J., McFarlane, W., Perkins, D.O., Pearlson, G.D., Woods, S.W., 2003. Prodromal assessment with the structured interview for prodromal syndromes and the scale of prodromal symptoms: predictive validity, interrater reliability, and training to reliability. *Schizophr. Bull.* <https://doi.org/10.1093/oxfordjournals.schbul.a007040>.
- O'Brien, M.P., Gordon, J.L., Bearden, C.E., Lopez, S.R., Kopelowicz, A., Cannon, T.D., 2006. Positive family environment predicts improvement in symptoms and social functioning among adolescents at imminent risk for onset of psychosis. *Schizophr. Res.* <https://doi.org/10.1016/j.schres.2005.10.005>.
- O'Brien, M.P., Zinberg, J.L., Ho, L., Rudd, A., Kopelowicz, A., Daley, M., Bearden, C.E., Cannon, T.D., 2009. Family problem solving interactions and 6-month symptomatic and functional outcomes in youth at ultra-high risk for psychosis and with recent onset psychotic symptoms: a longitudinal study. *Schizophr. Res.* <https://doi.org/10.1016/j.schres.2008.10.008>.
- O'Brien, M.P., Miklowitz, D.J., Candan, K.A., Marshall, C., Domingues, I., Walsh, B.C., Zinberg, J.L., De Silva, S.D., Woodberry, K.A., Cannon, T.D., 2014. A randomized trial of family focused therapy with populations at clinical high risk for psychosis: effects on interactional behavior. *J. Consult. Clin. Psychol.* <https://doi.org/10.1037/a0034667>.
- O'Brien, M.P., Miklowitz, D.J., Cannon, T.D., 2015. Decreases in perceived maternal criticism predict improvement in subthreshold psychotic symptoms in a randomized trial of family-focused therapy for individuals at clinical high risk for psychosis. *J. Fam. Psychol.* <https://doi.org/10.1037/fam000123>.
- Okuzawa, N., Kline, E., Fuertes, J., Negi, S., Reeves, G., Himelhoch, S., Schiffman, J., 2014. Psychotherapy for adolescents and young adults at high risk for psychosis: a systematic review. *Early Interv. Psychiatry* <https://doi.org/10.1111/eip.12129>.
- Olivet, D.M., Carrión, R.E., Auther, A.M., Cornblatt, B.A., 2015. Self-awareness of functional impairment in individuals at clinical high-risk for psychosis. *Early Interv. Psychiatry* <https://doi.org/10.1111/eip.12086>.
- Pruessner, M., Iyer, S.N., Faridi, K., Joobar, R., Malla, A.K., 2011. Stress and protective factors in individuals at ultra-high risk for psychosis, first episode psychosis and healthy controls. *Schizophr. Res.* <https://doi.org/10.1016/j.schres.2011.03.022>.
- Rickwood, D.J., Mazzer, K.R., Telford, N.R., 2015. Social influences on seeking help from mental health services, in-person and online, during adolescence and young adulthood. *BMC Psychiatry* <https://doi.org/10.1186/s12888-015-0429-6>.
- Schlosser, D.A., Zinberg, J.L., Loewy, R.L., Casey-Cannon, S., O'Brien, M.P., Bearden, C.E., Vinogradov, S., Cannon, T.D., 2010. Predicting the longitudinal effects of the family environment on prodromal symptoms and functioning in patients at-risk for psychosis. *Schizophr. Res.* <https://doi.org/10.1016/j.schres.2010.01.017>.
- Shek, D.T., 2001. The general functioning scale of the family assessment device: does it work with Chinese adolescents? *J. Clin. Psychol.* **57** (12), 1503–1516.
- Tang, J.Y.M., Chang, W.C., Hui, C.L.M., Wong, G.H.Y., Chan, S.K.W., Lee, E.H.M., Yeung, W.S., Wong, C.K., Tang, W.N., Chan, W.F., Pang, E.P.F., Tso, S., Ng, R.M.K., Hung, S.F., Dunn, E.L.W., Sham, P.C., Chen, E.Y.H., 2014. Prospective relationship between duration of untreated psychosis and 13-year clinical outcome: a first-episode psychosis study. *Schizophr. Res.* <https://doi.org/10.1016/j.schres.2014.01.022>.
- Thompson, E., Millman, Z.B., Okuzawa, N., Mittal, V.A., Devylder, J., Skadberg, T., Buchanan, R.W., Reeves, G.M., Schiffman, J., 2015. Evidence-based early interventions for individuals at clinical high risk for psychosis. *J. Nerv. Ment. Dis.* <https://doi.org/10.1097/NMD.0000000000000287>.
- Tienari, P.E., Sorri, A.N., Lahti, I.L., Naarala, M., Wahlberg, K.E., Rönkkö, T., Pohjola, J., Moring, J., 1985. The Finnish adoptive family study of schizophrenia. *Yale J. Biol. Med.* **58** (3), 227.
- Tienari, P., Wynne, L.C., Moring, J., Lahti, I., et al., 1994. The Finnish adoptive family study of schizophrenia: implications for family research. *Br. J. Psychiatry* **164**, 20–26.
- Weintraub, M.J., Hall, D.L., Carbonella, J.Y., Weisman de Mamani, A., Hooley, J.M., 2017. Integrity of literature on expressed emotion and relapse in patients with schizophrenia verified by AP-curve analysis. *Fam. Process* **56** (2), 436–444.
- West, S.G., Finch, J.F., Curran, P.J., 1995. Structural Equation Models with Nonnormal Variables: Problems and Remedies.
- Wilson, C., Kline, E., Thompson, E., Demro, C., Pitts, S., Bussell, K., Reeves, G.M., Schiffman, J., 2016. Comparison of measures of functioning for use with treatment-seeking adolescents experiencing attenuated symptoms of psychosis. *Early Interv. Psychiatry* **10** (1), 81–87.