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Categorical versus dimensional models of early psychosis

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Abstract

Aim: Early psychosis is typically operationalized as a categorical construct by dividing people into one of three diagnostic statuses: low-risk, clinical high-risk, and first episode psychosis. We empirically assess whether an alternative dimensional approach focused on observed symptom severity may be more desirable for clinical and research purposes.

Methods: Participants were 152 help-seeking youths ages 12–22 years old. Structured interview for psychosis risk syndromes interviews were used to obtain dimensional psychosis symptom severity ratings, and to classify participants by categorical psychosis risk status. Twenty-five participants were classified as having a diagnosable psychotic disorder, 52 participants as clinical high-risk, and 75 participants as help-seeking controls. We assessed the relation between categorical and dimensional measurements of psychosis severity, and then compared categorical versus dimensional psychosis severity in their ability to predict social and role functioning.

Results: On average, dimensional psychosis symptom severity increased along with categorical risk status (help-seeking control < clinical high-risk < diagnosable psychotic disorder). There was, however, considerable overlap between categories, with people at clinical high-risk being particularly hard to distinguish from people with diagnosable psychotic disorders on the basis of symptom severity. Dimensional symptom severity was more predictive of functioning than categorical risk status.

Conclusions: Categorical risk status and psychosis symptom severity are related but not interchangeable, and dimensional models of psychosis may be more predictive of functional outcomes. Adopting a dimensional rather than categorical approach to the psychosis risk spectrum may facilitate better predictive models and a richer theoretical understanding of early psychosis.

KEYWORDS
clinical high-risk, psychosis, psychotic, schizophrenia, ultra-high risk

1 | INTRODUCTION

Early psychosis may be operationalized in different ways: categorically, by classifying people into discrete diagnostic groups (e.g., help-seeking individuals who are not considered to be on the psychosis spectrum, individuals at clinical high-risk [CHR] for psychosis, and those meeting criteria for psychotic disorders); or dimensionally, using continuous ratings of symptom severity. When working with people who experience psychosis, researchers and clinicians are often faced with choices between categorical and dimensional models.

The CHR conceptualization of early psychosis has generally approached early psychosis as a categorical outcome, with people

classified as either high or low risk, and then studied and treated accordingly (Bora & Murray, 2014; Pruessner et al., 2017). The arbitrary nature of any given "cut point" for psychosis has been acknowledged and mostly advocated for on the basis of convenience (Yung et al., 2010). Some researchers have expressed scepticism, however, that the actual underlying construct of psychosis proneness is categorical (Van Os & Guloksuz, 2017; Schiffman & Carpenter, 2015).

There may be clinical and scientific advantages to embracing a dimensional (as opposed to categorical) approach to psychosis. Clinical decisions may be better facilitated by relying on the dimensional presentation of symptoms. For example, evidence-based treatments such as cognitive-behaviour therapy for psychosis (Beck et al., 2009), hallucinations-focused integrative therapy (Jenner, 2015), and neurological interventions like transcranial magnetic stimulation (Slotema et al., 2014) typically target symptom dimensions rather than diagnostic categories. Such therapies can be indicated when a person presents with positive symptoms of psychosis irrespective of whether these occur in the context of a primary psychotic disorder or other mental health diagnoses such as post-traumatic stress disorder (PTSD) or borderline personality disorder that also often feature concomitant psychotic symptoms (Kelleher & DeVylder, 2017). Treatment selection may accordingly be facilitated in many cases by attention to dimensional psychosis symptom severity rather than categorical psychotic disorder diagnoses.

Moreover, although diagnoses have sociological implications (e.g., diagnoses can cause [Firmin et al., 2019] or alleviate [Warman et al., 2015] stigma, determine health insurance coverage, etc.), it is the symptoms themselves—rather than the conventional diagnostic and statistical manual of mental disorders (DSM) diagnoses—which may be conducive to biogenetic explanations (Beck et al., 2009; Green & Glausier, 2016; Jones, 2010; Kurian et al., 2011). While particular dimensions (e.g., auditory verbal hallucinations) may correspond to identifiable biological processes, categorical diagnoses are often conceptually crude, encompassing a range of loosely overlapping symptom sets that may not always even be present (Kotov et al., 2017). For example, a person may meet criteria for schizophrenia on the basis of a significant past experience of hallucinations and delusions even if they are no longer experiencing symptoms and never relapse again. The lack of a necessary correspondence between a diagnosis and any specific underlying state or trait renders research based on that diagnosis vulnerable. In the case of psychiatric disorders, the degree of disconnect between symptoms and diagnosis *ipso facto* reduces confidence that people meeting criteria for the diagnosis truly share any underlying characteristics. In the case of early psychosis, if it is true that there is a substantial discrepancy between categorical diagnostic status and dimensional psychosis symptom severity, studies that report findings dimensionally rather than categorically are likely to be more useful to scientists who are attempting to generate causal scientific models of mental health syndromes.

A significant discrepancy between diagnostic status and dimensional psychosis symptom severity suggests the possibility that symptom severity might track important variables and outcomes more closely than diagnostic profiles, making them more scientifically and clinically relevant and perhaps more prognostically valid. There are various symptom dimensions that may be considered when studying psychotic disorders—positive, negative, and cognitive—each of which are weakly (though positively) correlated and show differing relations with clinical outcomes (Berman et al., 1997). In this study, we empirically examine the discrepancy between categorical and dimensional approaches to early psychosis by focusing on the distribution of positive symptom severity across psychosis risk groups in a sample of young people who were seeking help for various mental health concerns. Our sample included individuals meeting full criteria for a psychotic disorder, those at CHR, and help-seeking controls (HSCs), allowing for more confident inferences about the full spectrum of psychosis (Millman et al., 2019). We first estimate the relation between dimensional symptom severity and categorical psychosis risk status, thereby obtaining an empirical measure of the degree to which psychosis risk categories track (or fail to track) dimensional psychosis symptom severity. Provided there is such a discrepancy, we then assess whether dimensional psychosis symptoms are more closely related to functioning than categorical psychosis risk status. In order to test the hypothesis that dimensional psychosis symptoms are better prognosticators of functioning, we additionally test whether dimensional psychosis or categorical psychosis risk status at baseline are more closely related to functioning approximately 6 months later.

2 | METHOD

2.1 | Procedures

One hundred and fifty-two help-seeking individuals were recruited through the YouthFIRST research program at the University of Maryland, Baltimore County (UMBC) in collaboration with the University of Maryland School of Medicine, Division of Child and Adolescent Psychiatry (UMB). Participant referrals were made by mental health providers at community and university clinics, local schools, and paediatric inpatient units. Although anyone between the ages of 12 and 25 who was currently seeking mental health services was eligible for the study, we had initially capped enrollment at age 22 before extending the upper limit to 25 to cohere with SAMHSA guidelines (Substance Abuse and Mental Health Services Administration, 2018); therefore our age distribution skews somewhat young. Additionally, referrals were in some cases influenced by our clinic's reputation as specializing in psychosis risk during early adulthood, which likely skewed referrals toward lower age ranges and toward people suspected of some degree of psychotic-like symptoms. Referrals for clients who have already been diagnosed with a psychotic disorder are not accepted—in many cases, however, clients are referred for psychosis-risk assessment but upon evaluation are determined to meet criteria for a psychotic disorder. Although most of our participants who meet criteria for a psychotic disorder diagnosis are experiencing their first episode (given the referral pathways described), in a few cases the symptoms are recurrent (e.g., in the case of an individual whose initial episode resolved without treatment and

then was referred to us at the second episode). At the first study visit, written consent was obtained from adult participants, and written assent (as well as the consent of parents) if the child was under the age of 18. For participants with guardians, the Kiddie Schedule for Affective Disorders and Schizophrenia, Present and Lifetime Version (K-SADS-PL) was administered to guardians first following the standard procedure (in order to obtain a more complete diagnostic picture of the child), and then the child.

Participants were asked to return for follow-up approximately 6 months after the initial interview to be reassessed with the Structured interview for prodromal symptoms (SIPS), allowing for repeat assessment of functioning at follow-up. Seventy-nine participants (52%) returned for assessment.

All procedures were approved by Institutional Review Boards at each site (UMBC and UMB). Clinical research data are not shared.

2.2 | Measures

Kiddie-Schedule for Affective Disorders and Schizophrenia (K-SADS-PL). The K-SADS-PL is a clinician administered semi-structured interview used for diagnosing common disorders found in the DSM (Kaufman et al., 2016). For youth with guardians, parents and children were interviewed separately. Clinicians were trained in administration by experienced clinicians and principal investigators (PI). Reliability training included observing and co-rating K-SADS-PL interviews conducted by independent experienced staff and at least one PI, followed by independent administrations observed by staff, with clinicians considered reliable after reaching perfect agreement on at least three interviews during the co-rating process and obtaining approval from PIs. Team clinical review and consultation were also conducted after each K-SADS interview to ensure agreement across clinicians and the PI.

SIPS. The SIPS is a commonly used semi-structured clinical interview for classifying people into low risk, CHR for psychosis, and psychotic disordered groups. We follow other studies using similar samples by including individuals meeting schizotypal personality disorder as CHR (Rakhshan Rouhakhtar et al., 2019; Walker et al., 2013). The SIPS includes five dimensional "SOPS" subscales which we use as measures of positive symptom severity: P1 (unusual thought content/delusional ideas), P2 (suspiciousness/persecutory ideas), P3 (grandiose ideas), P4 (perceptual abnormalities/hallucinations), and P5 (disorganized communication). These five components are scored by clinicians on scales ranging from 0 to 6 and are often added together to yield a positive symptoms total scale that we refer to as "PSUM," representing positive symptom severity. Three CHR syndromes (attenuated psychosis syndrome, brief intermittent psychosis syndrome, and genetic risk syndrome) are determined from the SIPS interview based on scores on symptom ratings in combination with other factors (e.g., frequency, functional impact, family history, etc.). Per the guidelines of the SIPS authors, we scored positive symptoms on a continuum following the "rate the behaviours" model taught by the lead SIPS trainer (Dr. Barbara Walsh). The SIPS provides a "better explained by" box such that symptoms can be rated at levels above the risk threshold, but better accounted for by other conditions. Such a convention affords the possibility of individuals receiving symptom severity scores above SIPS risk threshold, but not receiving a CHR diagnosis. Clinicians administering the SIPS were trained and certified through an extensive training process within the lab or by an official seminar conducted by a Yale-certified SIPS trainer, and obtained good inter-rater reliability scores (ICC > .8 for positive symptoms and for total symptoms).

Global functioning: social and role scales (GF-S and GF-R). The GF-S and GF-R (Cornblatt et al., 2007) are clinician-rated measures of instrumental role fulfilment (e.g., working or attending school) and social integration/engagement (e.g., having friends). Each scale is rated from 1 to 10, with high scores indicating better functioning. The measure was designed specifically for people aged 12–29 years and includes ratings based on developmentally appropriate activities and common difficulties that may emerge in early stages of psychosis. The measures have been used in large studies of people at CHR of psychosis and demonstrates strong discriminant and convergent validity (Carrión et al., 2019; Cornblatt et al., 2007).

2.3 | Analysis

We constructed ROC curves to investigate the extent to which positive symptom severity can distinguish HSCs from people at CHR, and distinguish people at CHR from people with diagnosable psychotic disorder. We then used regression to assess the strength of the relation between psychosis symptom severity at baseline and social/role functioning at baseline and 6-month follow-up, and performed the same analyses using categorical risk status in order to compare the relative strengths of each association. Though all reported tests were two-tailed, our hypothesis was that psychosis symptom severity would have a stronger relation with social and role functioning than categorical psychosis risk status.

3 | RESULTS

Table 1 gives demographics for the full sample. When comparing the three groups of interest (CHR, HSC, and psychotic disorder), there were no statistically significant differences in race (X^2 = 5.3, df = 8, p = .72), gender (i.e., percent male, X^2 = 5.2, df = 2, p = .07), or household income (X^2 = 8.3, df = 10, p = .59). Among those individuals classified as low risk/HSC, primary DSM-5 diagnoses for HSCs as determined by the K-SADS-PL were attention deficit hyperactivity disorder (ADHD; n = 16), adjustment disorder (n = 3), anxiety disorder (n = 3), bipolar disorder (n = 7), major depressive disorder (MDD; n = 35), oppositional-defiant disorder (n = 4), PTSD (n = 4), as well as three participants who did not meet criteria for a DSM-5 mental health condition despite being help-seeking (n = 3). Co-morbid DSM-5 diagnoses for those individuals classified as CHR were ADHD (n = 6), anxiety disorder (n = 3), bipolar disorder (n = 1), MDD (n = 35), and

TABLE 1 Sample characteristics

			Positive symptom severity (PSUM)	
	N	%	Mean	SD
Gender				
Female	94	62	9	5.7
Male	57	38	10.4	6.3
Other	1	1	Censored	
Race				
Black	65	43	9.6	6.4
White	53	35	9	5.9
Multiracial	21	14	10.5	4
Asian	2	1	Censored	
Did not endorse	11	7	11.3	6.4
Household income				
<20 000	37	24	10.8	6.5
200 000-39 999	20	20	9.8	5.8
40 000-59 999	13	9	6.9	3.4
60 000-79 999	14	9	5	4.6
80 000-99 999	9	6	8	6.5
≥100 000	6	21	11.1	6.3
Declined to answer or did not know	17	11	9.7	6
Diagnosis				
MDD	70	46	9	5.2
Psychotic disorder	25	16	17	4.5
ADHD	22	14	6.9	4.2
PTSD	11	7	10.3	3.9
Bipolar	8	5	7.6	6.1
Anxiety	6	4	7.8	5
Oppositional	4	3	5.8	4.6
Adjustment	3	2	1	1.7
No diagnosable disorder	3	2	2.3	2.1
Age				
Median (SD)	15 (2.9)			

Abbreviations: ADHD, attention deficit hyperactivity disorder; MDD, major depressive disorder; PTSD, post-traumatic stress disorder.

PTSD (n = 7). See Data S1 for average psychosis symptom severity for each diagnosis.

Figure 1 shows the descriptive overlap between dimensional psychosis symptom severity and categorical risk status. People at CHR tended to have more positive symptom severity (PSUM M = 12.6, SD = 3.9) than the HSC group (PSUM M = 5.1, SD = 3.3) and people with psychotic disorder tended to have more symptoms (PSUM M = 17, SD = 4.5) than people at CHR. There was, however, noticeable overlap between the distributions. 51% of controls had higher total positive symptom scores ("PSUM") than at least one person with a diagnosable psychotic disorder, and 12% of people at CHR scored higher than the *average* person with diagnosable psychotic disorder.

We then assessed the relation between dimensional positive symptoms scores and categorical psychosis risk status using ROC curves (Figure 2). Dimensional positive symptom severity distinguished HSC from people at CHR fairly well with an area under the curve (AUC) of .92. Using the best available cut point of 9.5, 11% of HSC would be incorrectly classified as CHR, and 19% of CHR would be incorrectly classified as HSC. In contrast, people at CHR were less distinguishable from people with diagnosable psychotic disorders on the basis of positive symptoms severity (AUC = .79, with the difference from the aforementioned AUC statistically significant at $p < .05$). The best available cut-point PSUM score of 14.5 misclassified 31% of people at CHR as having diagnosable psychotic disorder, and misclassified 20% of people with diagnosable psychotic disorder as being at CHR. Using the best available cut-points established by both ROC curves, 25.7% of the full sample of 152 would be misclassified into diagnostic

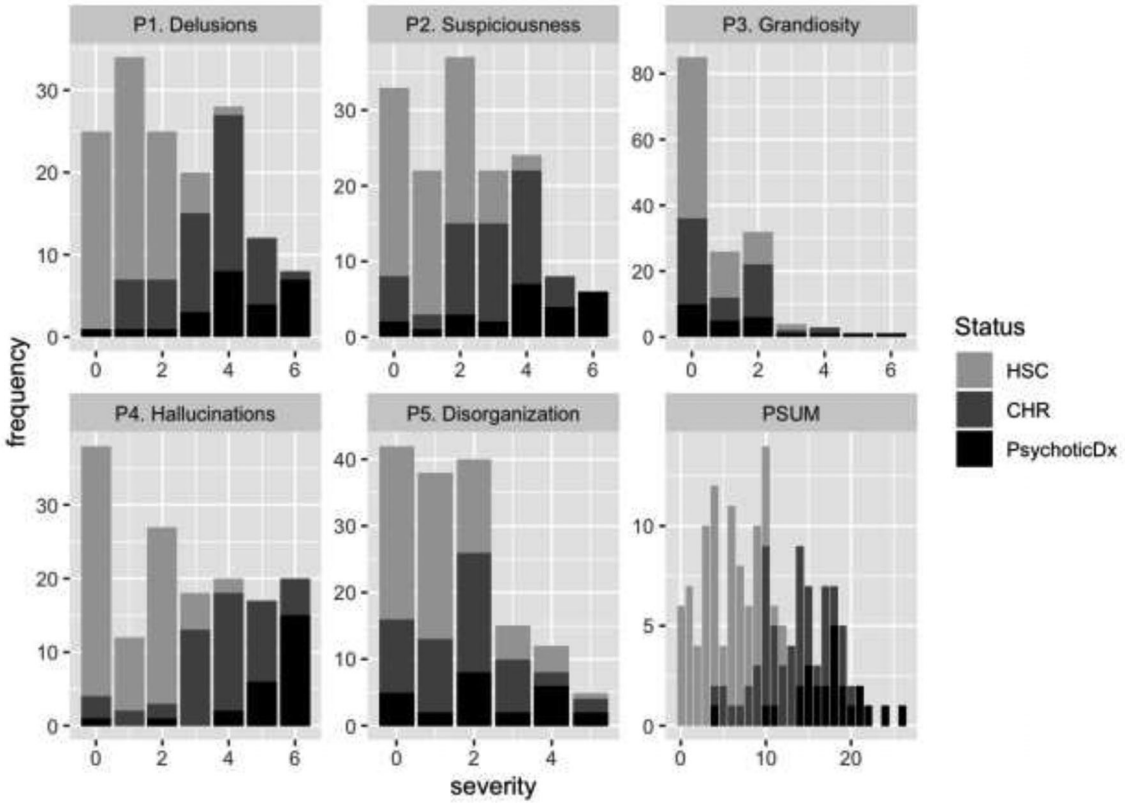

FIGURE 1 Stacked bar chart showing the distribution in dimensional symptom severity by categorical psychosis risk status (help-seeking controls [HSC], clinical high risk [CHR], and psychotic disorder). "PSUM" is the sum of P1 through P5

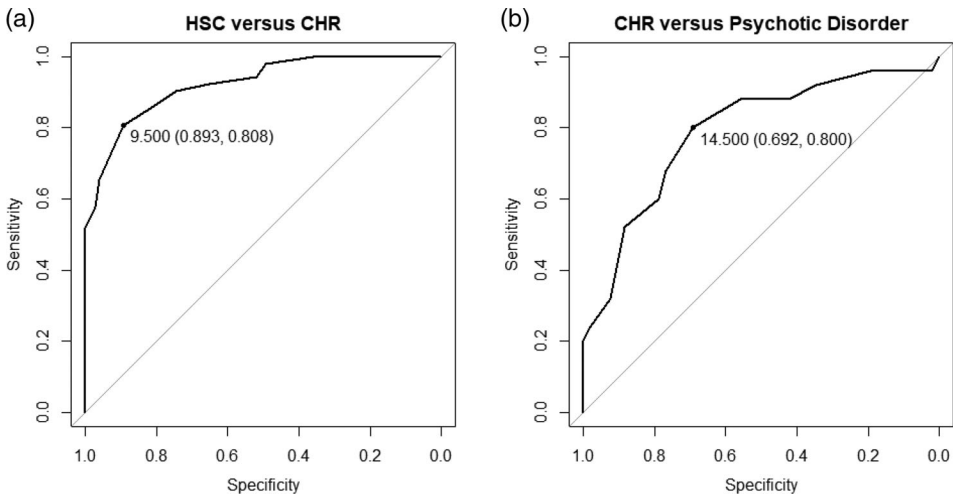

FIGURE 2 Receiver operating characteristic (ROC) curves showing the ability of dimensional psychosis symptom severity (PSUM) to distinguish help seeking controls (HSC) from people at clinical higher risk (CHR), and people at CHR from people with diagnosable psychotic disorders. The point on each curve with the highest sensitivity + specificity is marked. A PSUM score of >9 best distinguishes HSC from CHR, and a score of 15+ best distinguishes people with diagnosable psychotic disorder from CHR

risk categories on the basis of dimensional psychosis symptom severity alone, suggesting that dimensional positive symptom severity and categorical psychosis status are related, yet quantitatively fairly distinct, constructs.

Finally, we compared the strength of the relation between functioning and dimensional versus categorical psychosis status using regression and the cox test for non-nested models (Table 2; Zeileis & Hothorn, 2002). Baseline dimensional psychosis symptom severity consistently outperformed categorical risk status in predicting concurrent social and role functioning at baseline. Baseline dimensional psychosis symptom severity also outperformed categorical risk status (*p*s < .001) in predicting social functioning at 6-month follow-up, suggesting better prognostic value. Baseline dimensional psychosis symptom severity outperformed categorical risk status at predicting social functioning in people at CHR versus psychotic disorder at follow-up ($p < .001$), but did not statistically significantly outperform categorical risk status in predicting social functioning in people at CHR versus HSC ($p > .05$).

TABLE 2 Cox test results showing the relation between baseline categorical versus dimensional psychosis and concurrent and follow-up social/role functioning ratings

Outcome	Predictor	R^2	*p* value (reference: PSUM model)
Social functioning at time 1	CHR (vs. HSC)	.08*	<.001
	PsychoticDx (vs. CHR)	.04	<.001
	PSUM	.23*	NA
Role functioning at time 1	CHR (vs. HSC)	.004	<.001
	PsychoticDx (vs. CHR)	.05	<.001
	PSUM	.08*	NA
Social functioning at time 2	CHR (vs. HSC)	.04	<.001
	PsychoticDx (vs. CHR)	.06	<.001
	PSUM	.13*	NA
Role functioning at time 2	CHR (vs. HSC)	.006	>.1
	PsychoticDx (vs. CHR)	.02	<.001
	PSUM	.01	NA

Note: The R^2 for positive symptom ratings (PSUM) provided in this table is for the full study sample (help-seeking control [HSC], clinical high-risk [CHR], and psychotic disorder), but for the purposes of significance testing the sample was restricted to the relevant subset (e.g., when comparing PSUM to CHR status in predicting social functioning, the sample was restricted to HSC and people at CHR). In all cases, the model favoured PSUM over the corresponding category, except in comparing CHR (vs. HSC) to PSUM in predicting role functioning at time 2, where the difference was non-significant. Asterisks in the R^2 column indicate a statistically significant relation with the outcome.

4 | DISCUSSION

Clinical research on early psychosis has typically operationalized psychosis categorically, and although we see the value of this model across a range of contexts, our findings suggest the additional value of a dimensional approach. We found that dimensional positive symptom severity generally increased as expected across groups on average (HSC < CHR < psychotic disorder), yet there was substantial variation in psychotic symptoms such that a full quarter of the sample would be misclassified if judged on the basis of positive symptom severity ratings alone. Many HSCs had more severe symptoms than people at CHR or with diagnosable psychotic disorder; people who were at CHR or who met criteria for psychotic disorder sometimes had few symptoms; and it was not uncommon for people with diagnosable psychotic disorder to have less severe symptoms than people with CHR or even HSCs (see Figure 1). In general, findings suggest that continuous and categorical approaches to psychosis are related, but not interchangeable and sort a substantial minority of people differently.

This non-trivial difference between continuous (symptom severity) and categorical (CHR status and psychotic disorder) operationalizations of psychosis has consequences for clinical research. Our findings are in line with other studies reporting that psychosis is not exclusive to people with primary psychotic disorders (Kelleher & DeVylder, 2017; van Os et al., 2009), and that people who have been diagnosed with psychotic disorders are not always (or even usually) experiencing symptoms of psychosis (Singh et al., 2004). Conversely, a substantial minority of people who experience a full psychotic episode have never exhibited previous signs or symptoms consistent with a CHR state (Shah et al., 2017). The present study additionally shows that help-seeking people who are not classified as CHR often have subthreshold psychotic symptoms (in some cases more severe than people who are classified as high-risk or with diagnosable psychotic disorders). Therefore, our findings contribute to the growing recognition that mental health symptoms cut across diagnoses (Insel et al., 2010; Kotov et al., 2017), highlighting the importance of considering the transdiagnostic expression of psychosis in clinical research (van Os & Reininghaus, 2016). This and related findings have the potential to impact decisions about clinical staging: the fact that the progression of a psychotic disorder diagnosis is not equivalent to a linear worsening of psychotic symptoms suggests that services that aim to best serve clients at a particular point in the continuum of the course of "psychotic disorder" will need to be flexible enough to account for widely varying symptom presentations, including a lack of psychosis-specific symptoms (Hartmann et al., 2019).

The SIPS clinical interview convention of "better explained by" another condition allows clinicians to make a judgement as to whether some other psychopathology (e.g., trauma, substance use) is the underlying cause of psychosis risk symptoms, which may account for some of this overlap (specifically, it may account for some portion of the 11% [n = 8] of instances where someone was designated as HSC but had positive symptom severity scores above the ROC-determined cutoff for HSC). Nonetheless, the present findings suggest that instruments designed to identify a psychotic disorder or risk of a psychotic disorder may often fail to sensitively track psychotic symptoms themselves, and tools that do a relatively good job tracking psychosis severity can perform relatively poorly in distinguishing help-seeking individuals with low risk for psychosis from people at CHR or with a psychotic disorder (consider the effects of sleep deprivation on thought disorder and hallucinations among healthy individuals; Petrovsky et al., 2014). Even if it is true that the average person who

meets criteria for psychotic disorder has psychotic symptoms, whereas the average person without psychotic disorder has none, any representative sample of the psychotic spectrum will show a blur of observed symptom severities between the categories and numerous counterexamples to those averages (with 26% in our sample sorted into the "wrong" diagnostic group on the basis of symptom severity). Although valuable and suggestive, empirical findings that hold for psychotic diagnoses may in many instances fail to hold for psychotic symptoms, and vice versa.

The present study provides evidence that dimensional psychosis symptom severity in the early phases of psychosis may be more predictive of social and role functioning than categorical psychosis risk status both concurrently and prognostically. While diagnostic categories have their own functional impacts, including in the form of higher stigma (Firmin et al., 2019; Warman et al., 2015), current dimensional symptoms may have more direct consequences on functioning which make them particularly relevant to treatment. Assessment tools and markers for psychosis may provide distinct clinical value beyond diagnosis if they can provide an understanding of active symptomatology with its corresponding impact on specific and current functional concerns. This may be particularly true in the context of low rates of "conversion" to psychotic disorder among those at CHR despite persistent impairment in social and role functioning (Addington et al., 2011). Available data suggests that approximately 80% of young people at CHR may not convert to a psychotic disorder (Raballo et al., in press), and for most clinicians in community settings, these categorically high-risk individuals form a small minority of their total client volume (Ising et al., 2012; Zhang et al., 2014). Risk prediction for categorical conversion to a psychotic disorder per se is not likely to be a primary concern for the majority of clinicians given such low base rates, but concurrent and future social or occupational impairment likely is. Assessments and screening instruments that track dimensional symptom severity may provide tangible clinical value for monitoring purposes even if clients never meet full criteria for a psychotic disorder (Kline et al., 2016). Among clinicians working with clients who already meet criteria for a psychotic disorder, assessment tools can be useful for monitoring or predicting fluctuations into and out of active psychosis.

Beyond its advantages in assessment and monitoring of psychosis severity, a dimensional approach to conceptualizing psychosis can inform treatment decisions and development. The distribution of symptom types in our study (e.g., suspiciousness, hallucinations) is consistent with prior work showing that there are many ways to meet criteria for a disorder along the psychosis spectrum (Addington et al., 2015). Which treatment option is optimally effective for a given individual likely depends on the specific presenting issues of concern. A focus on the assessment of dimensional symptom severity may allow clinicians to better track the client's actual presenting concerns *which may not include psychosis at all*, whereas a focus on assessing whether someone meets criteria for a psychotic diagnosis (which they can meet even when symptoms are absent, or fail to meet even when some symptoms are present) risks removing clinicians even further from the patient's actual experience. It is important to note here that neither dimensional nor categorical assessment of psychosis is sufficient in clinical contexts where psychosis is rarely the only issue of concern to clients and is most frequently not the issue of most concern even to individuals meeting full criteria for psychotic disorder (Bridges et al., 2013). Ultimately, clinicians can select treatment strategies according to the particular issues prioritized as of most concern to the client (Thompson et al., 2015).

The present study has strengths and limitations. Strengths included our use of a well-controlled sample consisting of help-seeking individuals across the full spectrum of early psychosis (Millman et al., 2019), as well as the use of multiple timepoints to assess the relation between psychosis and functioning over time. Limitations include the relatively small sample size and the fact that many participants were referred specifically due to suspicions of psychosis. We do not have reliable data on whether participants with diagnosable psychotic disorders were experiencing their first episode, which could have produced confounds such as treatment or medication effects. Another limitation is the focus solely on positive symptoms. The approach we describe in this paper could easily be applied to other symptom dimensions such as cognitive and negative symptoms, however, we decided to restrict our analyses to positive symptoms to limit the scope of the paper, as these three symptom dimensions are weakly correlated and show differing relations with clinical outcomes (Berman et al., 1997). Another limitation is the age cap of 25 years old. We chose this cap to cohere with SAMHSA guidelines for early psychosis (Substance Abuse and Mental Health Services Administration, 2018), but other groups have argued convincingly that such arbitrary cutoffs may have limited clinical and scientific utility (Greenfield et al., 2018). Finally, while not strictly a limitation, it is important to note that even granting all the above points about the benefits of a dimensional approach, there can still be important uses for categorization and categorical decision-making. For example, categorical approaches can sometimes facilitate communication and create a shared understanding of the overarching considerations and concerns confronting a client. Additionally, admission to treatment programs or access to certain benefits may require a binary determination about a patient's condition. The findings from the present paper concerning the relatively close correspondence between symptoms and functioning suggest the possibility that such a determination may be better made on the basis of symptom severity than diagnosis, but this does not in any way imply that processes of categorization are generally or inherently counterproductive. These considerations notwithstanding, our results suggest a rationale for pursuing dimensional approaches to psychosis risk and early psychosis assessment that may complement traditional approaches by affording advantages otherwise missing from the more common categorical alternative.

5 | CONCLUSION

The present study explored the distribution of psychosis symptom severity between individuals categorized as HSCs, clinical high-risk, or as meeting full criteria for psychotic disorder. Although there was

an association between categorical psychosis risk diagnoses and dimensional psychosis symptom severity, we documented substantial overlap in symptom severity between all three groups, suggesting that categorical and dimensional approaches to the construct of early psychosis were not interchangeable. Further, we found that dimensional psychosis symptom severity tracked functioning significantly better than categorical psychosis risk status. We suggest that dimensional approaches to early psychosis may have better scientific and clinical value than categorical psychosis risk designations. Fine-grained characterizations of the experience of early psychosis should be explored and/or capitalized upon in future work, and research should attempt to pursue dimensional approaches to early psychosis rather than categorical approaches where possible. Additionally, the properties of multidimensional approaches should be explored—for example, further breaking down the positive symptom dimension into its components (see Figure 1), considering multiple symptom dimensions associated with psychosis at once (positive, negative, cognitive), as well as other dimensions such as quality of life and happiness—as these may have even greater incremental scientific and clinical value than the unidimensional approach considered in the present article.

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DATA AVAILABILITY STATEMENT

Clinical research data are not shared.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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