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Behind the opaque curtain: A 20-year longitudinal study of dissociative and first-rank symptoms in schizophrenia-spectrum psychoses, other psychoses and non-psychotic disorders

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Abstract

Background: Depersonalization and derealization are currently considered diagnostically distinct from first-rank symptoms (FRS) seen in schizophrenia-spectrum psychoses. Nevertheless, the lived experiences of these symptoms can be very similar phenomenologically.

Aims: To investigate the interrelationships between depersonalization, derealization and FRS in patients with different types of psychotic and non-psychotic diagnoses.

Methods: The Chicago Follow-up Study was a prospective longitudinal research programme designed to study psychopathology and recovery in psychiatric disorders consisting of 555 participants, who were recruited at index hospitalization and studied over six follow-up timepoints at approximately 2, 4.5, 7.5, 10, 15, and 20 years later. The primary clinical indices were depersonalization, derealization and Schneiderian FRS that were measured at index hospitalisation and at each subsequent follow-up.

Results: 62.8% of participants had at least four follow-ups. There were significant differences in the course and chronicity of depersonalization, derealization and first-rank symptoms across the three diagnostic groups. For the whole sample, derealization was significantly associated with FRS at 2-, 4.5- and 7.5-year follow-up timepoints whereas depersonalization was related to FRS from 10-year follow-up to 20-year follow-up. In patients with schizophrenia, overall depersonalization was more often associated with passivity phenomena whereas derealization was more often associated with overall delusions. There was also a significant effect of time on the associations between depersonalization, derealization and FRS across follow-ups.

Conclusions: Depersonalization and derealization should be viewed as transdiagnostic phenomena that are associated with FRS psychopathology along a continuum, although they are more closely associated with schizophrenia-spectrum psychoses.

Key words: Schizophrenia, psychosis, dissociation, depersonalization, derealization, first-rank symptoms.

1. Introduction

"It is '*as if*' the real me is taken out and put on a shelf or stored somewhere inside of me. Whatever makes me me is not there. It is like an opaque curtain…like going through the motions and having to exert discipline to keep the unit (Simeon, Knutelska, Nelson, & Guralnik, 2003)."

Depersonalization has been described as an experience in which the person feels an inner void or distance and detachment from their internal perceptual/sensory experiences and the environment, '*as if*' they are once removed; whereas derealization has been described as an experience where the immediate environment seems strange, unreal or fundamentally changed. The discrete cluster of symptoms of depersonalization and derealization include feelings of detachment or alienation from self, and environment, emotional numbing, and alterations in perceptual/sensory experiences and in the experience of time (Brauer, Harrow, & Tucker, 1970; Sierra, Mauricio, Baker, Medford, & David, 2005; Simeon et al., 2008; Tucker, Harrow, & Quinlan, 1973). The main experiential difference between the two phenomena is that in depersonalization, the locus of detachment is from one's self and in derealisation, the locus of detachment is centered around one's environment and surroundings. Depersonalization and derealization are fascinating transdiagnostic phenomena that exist along a continuum that can be experienced as transient or persistent phenomena that have been reported in non-clinical and clinical populations and can be experienced as a distinct, separate and unique experience and/or as a complex and entangled constellation of sensory-somatic alterations (Bernstein & Putnam, 1986; Cattell & Cattell, 1974; Simeon et al., 2003).

The psychiatric comorbidity of depersonalization and derealization is often reported with symptoms of anxiety, depression, post-traumatic stress disorder (PTSD), substance abuse, schizotypal personality disorders, and within psychotic disorders, particularly schizophrenia (Baker et al., 2003; Stanghellini, 2011; Torgersen et al., 2002). A recent systematic review reported a strong overlap in symptoms that are present in schizophrenia spectrum disorders and in dissociative disorders, supporting a dimensional model of psychopathology (Renard et al., 2017). Epidemiological data report a prevalence rate of depersonalization-derealization ranging from 1% to as high as 23% in the general population and up to 36% in the clinical population experiencing psychosis and up to 66% specifically in persons with schizophrenia (Aderibigbe, Bloch, & Walker, 2001; Gonzalez-Torres et al., 2010; Michal et al., 2009; Sun et al., 2019). During the prodromal phase of schizophrenia,

depersonalization and derealization have been considered as risk factors in predicting conversion to frank psychosis in high risk populations (Ackner, 1954; Yung & McGorry, 1996).

Historically, depersonalization was first coined by Ludovic Dugas (Dugas, 1898) in association with false memories and symptoms of hysteria. The term depersonalization was derived from the personal diary of H.F Amiel in which he described the phenomenon as "Everything is strange to me, I can be outside of my body, of me as an individual, I am *depersonalized*, detached, away" (Amiel & Jaloux, 1927). Early theories of self-experience in depersonalization and derealization have been attributed to Pierre Janet and Sigmund Freud (Allen, 1993; Sierra, M. & Berrios, 1997; Sierra, Mauricio et al., 2005). Janet primarily understood the phenomena in relation to experiences of 'incompleteness' in perceptual, physical, emotional, and internal connectedness whereas Freud understood the phenomena in association with internal conflict as represented in repression and defence mechanisms and described the combination of depersonalization and derealization as a para-praxic symptom experienced as estrangement and similar to a dream-like state (Freud & Strachey, 1959; Howell, 2013; Janet, 1920). From a phenomenological perspective, Mayer-Gross contributed to the theoretical development by further delineating the experience attributing to depersonalization as being associated with the experience of alienation in relation to self and derealization in relation to alienation to the environment and that these two constructs of the disturbance affected different mental functions which can contribute to the formation of delusional symptoms (Mayer-Gross, 1935).

In relation to depersonalization, derealization, schizophrenia and theories of self-experience, Karl Jaspers and Kurt Schneider subsumed these phenomena under "disorders of the self" (Jaspers, 1997; Schneider, 1949). In the basic symptom model, depersonalization and derealization are considered as intermediate phenomena that exist within a continuum in relation to uncharacteristic subjective experiences that can lead to the development of first-rank symptoms (FRS) which are known to occur more often in schizophrenia, although also present in other psychotic diagnostic groups (Huber & Gross, 1989a; Klosterkötter, 1992; Rosen, Grossman, Harrow, Bonner-Jackson, & Faull, 2011). The alterations in one's sense of self, others, and the environment are considered fundamental elements in pre-psychotic experiences, the initial prodromal phase of first-episode psychosis, and the endpoint being more characteristic with the core elements of FRS (Langfeldt, 1960; Møller & Husby, 2000; Raballo et al., 2016; Sass, Louis, Pienkos, Nelson, & Medford, 2013).

There are some controversies in the definition of self-disturbances in schizophrenia: when Gruhle and the Early Heidelberg School of Psychiatrists first conceptualised self-disturbances these disturbances were considered psychotic symptoms (Mishara, Aaron L. & Schwartz, 2013), whereas the later ipseity model (Nelson, Parnas, & Sass, 2014; Sass, Louis A. & Parnas, 2003) views self-disturbances or self-disorders as non-psychotic phenomena. Self-disturbances are anomalous experiences that are perceived as happening to the self yet without the self's participation; this differs from Huber's basic symptoms concept where they are experienced as arising from the self (Mishara, A. et al., 2016). Sense of self or *self-presence* and "mineness" of thoughts and body can be fundamentally altered in the schizophrenia spectrum experiences yet have also been described in the experience of depersonalization and derealization (Pienkos et al., 2019). However, as mentioned above these experiences most likely form a continual yet fundamental shift in one's structure of self-consciousness rather than acting as atomistic and isolated mental events. Although the precise intermediate processes between early signs of subtle perceptual and cognitive anomalies such as the perceptualisation of thought (thoughts 'becoming sensory') and frank FRS are yet to be elucidated, depersonalization and derealization are promising candidates given their similarities with FRS and the observation that without the *'as if'* qualifier, many experiences of depersonalization and derealization would indeed appear identical to those of FRS, especially regarding the kinds of solipsistic and existential delusions considered characteristic of schizophrenia.

Several cross-sectional studies in both clinical populations and healthy volunteers have pointed towards significant associations between depersonalization, derealization and psychotic symptoms such as auditory-verbal hallucinations (Pilton, Varese, Berry, & Bucci, 2015). A very recent meta-analysis of 93 studies conducted in both clinical and nonclinical populations (Longden et al., 2020) found significant summary effects for hallucinations ($r = 0.461$, 95% confidence interval $0.386 - 0.531$) and delusions ($r = 0.418$, 95% confidence interval $0.370 - 0.464$) associated with dissociation. However, no previous research has investigated the specific relationships between these dissociative phenomena with FRS in a longitudinal manner over multiple follow-up timepoints. Given the transdiagnostic prevalence of depersonalization and derealization and their relation to psychosis and FRS, this study sought to examine the following questions:

1.) What are the course and chronicity of depersonalization, derealization and FRS in different diagnostic categories?

2.) What is the relationship between depersonalization, derealization and FRS at 6 follow-up points in different diagnostic categories?

3.) What are the relationships between depersonalization, derealization and positive psychotic symptoms (hallucination and delusions) in participants within the schizophrenia-spectrum?

4.) What are the longitudinal effects of time on depersonalization and derealization in relation to FRS in participants within the schizophrenia-spectrum?

It must be borne in mind that dissociation is by no means a unitary concept and has several subtypes (compartmentalisation, detachment and absorption) which have been found to be differentially related to psychotic experiences even in a general population sample (Humpston et al., 2016). Here we exclusively focus on the detachment subtype of dissociation – namely, depersonalization and derealization. It is also worth pointing out that in this study we investigated depersonalization and derealization *symptoms* only, rather than any kind of diagnostic entity (i.e. depersonalization-derealization disorder). Other disorders of the compartmentalisation subtype (i.e. dissociative identity disorder) are not within the remit of the current study.

2. Materials and Methods

2.1. Participants and measures

This study reports findings examining depersonalization and derealization and the relation to FRS in persons with schizophrenia, other psychosis, and non-psychotic disorders over 20 years. The Chicago Follow-up Study is a prospective longitudinal research programme designed to study psychopathology and recovery in psychiatric disorders (Harrow, Grossman, Jobe, & Herbener, 2005; Harrow & Jobe, 2005; Strauss, Harrow, Grossman, & Rosen, 2010) The study was approved by the University of Illinois at Chicago Institutional Review Board (IRB# 1997-0053). All participants signed informed consent prior to the initiation of study procedures and at each subsequent follow-up. The sample consisted of 555 participants, who were recruited at index hospitalization and studied over six follow-ups at approximately 2, 4.5, 7.5, 10, 15, and 20 years later.

Diagnosis was derived using the Diagnostic and Statistical Manual Version III criteria (American Psychiatric Association, 1980) and structured clinical interviews such as the Schedule for Affective Disorders and Schizophrenia (SADS;(Endicott & Spitzer, 1978) and

the Schizophrenia State Inventory (Grinker Sr, Roy Richard Ed & Harrow, 1987) and collateral information from hospital medical records, clinical staff and family members when available.

2.2. Primary clinical indices

The primary clinical indices used in this study included depersonalization, derealization and Schneiderian first rank symptoms that were measured at index hospitalization and at each subsequent follow-up utilizing the SADS (Endicott & Spitzer, 1978). Specific questions associated with depersonalization and derealization asked *"have you felt 'as if' you were outside of your own body, or 'as if' a part does not belong to you, or that you are physically cut off from people, or floating, or like you were in a dream?"* and *"Have things seemed unreal? Have you felt that people change their appearance in some strange way?."* Items were rated on a scale from 1 (not at all) to 8 (definite delusion).

Schneiderian first rank symptoms such as auditory hallucinations, voices arguing or commenting on action, somatic passivity, thought withdrawal, thought insertion, thought broadcasting, "made" feelings, impulses or volition acts and delusional perception were also evaluated at index hospitalization and at subsequent follow-ups. Each symptom was given a rating of either 1 absence of symptoms, 2 uncertain, but probable presence of symptoms or 3 the presence of symptoms.

2.3. Statistical analyses

All available data were included in the analyses, which were all carried out using the statistical programming language R (Version 3.6.2 in a Microsoft Windows environment) using the following packages: car, dplyr, stats, gmodels, psych and geepack. First, we divided the sample into three groups (schizophrenia-spectrum psychoses, other psychosis and non-psychosis) and calculated their numbers and basic demographics data at baseline. We also measured the presence of various baseline psychotic symptoms at baseline. Depersonalization, derealization and FRS were measured at baseline and each of the follow-up points up until follow-up 6 (20-year follow-up). We also measured the trajectories of depersonalization, derealization and FRS over the whole 20-year period. Linear regression analyses were carried out between dissociative symptoms (i.e. depersonalization and derealization) and FRS at each follow-up. We used the generalised estimation equation (GEE; see (Hubbard et al., 2010)

package in R to analyse the binary logistic repeated-measures FRS and dissociation data at each follow-up in participants with schizophrenia-spectrum psychoses only, as this group would by definition experience the most significant levels of FRS. We chose the autoregressive within-subject covariance structure ('working covariance') AR(1) for the GEE analyses, by which correlation between each timepoint decreases as a power of how many timepoints apart two observations are.

Lastly, we performed linear regression analyses between depersonalization, derealization and overall delusions, overall hallucinations, overall psychosis, passivity phenomena and auditory hallucinations independently.

3. Results

3.1. Participant characteristics

Demographic and descriptive information of the sample are reported in Table 1. 62.8% of participants had at least four follow-ups. In the psychosis categories (schizophrenia-spectrum and other psychoses) the participants were predominantly male [$X^2(2) = 23.89$, $p < 0.0001$], tended to be of white ethnicity [$X^2(4) = 11.70$, $p = 0.020$] and often never married [$X^2(4) = 6.48$, $p = 0.166$], however in the non-psychosis category there were more females than males. In all three categories there was no significant difference between age at index hospitalisation [$F(1) = 0.148$, $p = 0.701$], years of education [$F(1) = 3.729$, $p = 0.054$] or socioeconomic status [$F(1) = 0.136$, $p = 0.712$]. Non-psychosis group however had significantly fewer hospitalizations [$F(1) = 6.67$, $p = 0.010$]. As can be expected, participants in the psychosis categories rated much higher than participants in the non-psychosis category on all the baseline psychotic symptom measures. Participants in the schizophrenia-spectrum psychosis category also rated significantly higher on depersonalization and derealization at almost all the follow-up points compared with those in the other psychosis and non-psychosis categories, as well as FRS (which by definition are a part of the schizophrenia syndrome). Curiously some participants in the non-psychotic category also endorsed at least one FRS item upon each follow-up, however at a much lower scale than those in the psychosis categories.

Insert Table 1 about here

3.2. Course and chronicity of depersonalization, derealization and FRS in different diagnostic categories

Figure 1 (Panel A) shows the trajectory of depersonalization symptoms from baseline across 6 follow-ups stratified by diagnostic category. The difference between diagnoses at baseline [$X^2(5) = 2.110$, $p = 0.834$] and the first (2-year) follow-up timepoint [$X^2(10) = 13.38$, $p = 0.203$] was not significant, however from the second (4.5-year) follow-up [$X^2(10) = 15.16$, $p = 0.126$] onwards, participants within the schizophrenia spectrum displayed significantly higher levels of depersonalization symptoms with an increasing trend, whereas participants with other psychoses and non-psychotic disorders demonstrated a decreasing trend as well as much lower levels of depersonalization.

For derealization (Figure 1, Panel B), participants with schizophrenia-spectrum psychoses consistently showed significantly higher levels of derealization from the first to the last follow-up timepoints. It was only at baseline that the groups did not differ significantly in their levels of derealization symptoms [$X^2(5) = 3.054$, $p = 0.692$]. Extremely few derealization symptoms were reported from the 7.5-year follow-up timepoint onwards in the non-psychosis group.

Participants diagnosed with a schizophrenia-spectrum psychosis again consistently displayed much higher levels of FRS from baseline through to all follow-up time-points (all ps < 0.0001) compared with participants with other psychotic and non-psychotic disorders. However, approximately 20% of participants in the latter groups still reported FRS throughout the follow-up timepoints.

Insert Figure 1 about here

3.3. Relationships between depersonalization, derealization and FRS at 6 follow-up points

For the whole sample, depersonalization was not significantly associated with FRS at 2-, 4.5-, 7.5-year follow-up timepoints whereas derealization was highly significantly associated with FRS (Table 2). This pattern is reversed from 10-year to 20-year follow-up timepoints, where

depersonalization was found to be highly significantly associated with FRS but derealization was not.

Insert Table 2 about here

3.4. Relationships between depersonalization, derealization and positive psychotic symptoms in participants within the schizophrenia-spectrum

We carried out linear regression analyses at baseline between depersonalization, derealization and variables measuring overall delusion, overall hallucination, both delusion and hallucination, bizarre delusion and auditory hallucination in participants diagnosed within the schizophrenia-spectrum. Derealization was significantly associated with overall delusion (β = 0.774, p = 0.006, odds ratio 2.16 with 95% confidence interval 1.25 – 3.76) but not with bizarre delusions specifically, having both delusions and hallucinations, or with any kind of hallucination including auditory hallucinations. Derealization on the other hand was marginally significantly associated with having both delusions and hallucinations (β = 0.388, p = 0.040, odds ratio 1.47 with 95% confidence interval 1.02 – 2.14).

For the six follow-up timepoints we performed the same analyses between depersonalization, derealization and variables measuring overall delusion, overall hallucination, auditory hallucination and passivity phenomena instead of bizarre delusion as the latter was only measured at baseline. As reported in Table 3, there was a significant association between depersonalization and derealization in all constructs at the 2-year follow-up. However, only derealization was statistically significant with all constructs at the 4.5-year follow-up and only depersonalization was statistically significant with all constructs at the 10-year follow-up. At the 7.5-year follow-up, there was a significant association between depersonalization and derealization and most constructs, albeit depersonalization and auditory hallucinations. At the 15-year follow-up depersonalization and derealization were significantly associated with overall delusions and overall psychosis, whereas depersonalization was uniquely associated with the passivity phenomena and derealization was significantly associated with auditory and overall hallucinations. Lastly, at the 20-year follow-up depersonalization and derealization were both significantly associated with overall psychosis whereas depersonalization was also associated with hallucinations and the passivity

phenomena and derealization was uniquely associated with overall delusions. Interestingly, with the exception of the 4.5-year follow-up depersonalization was associated with overall psychosis and the passivity phenomena; and with the exception of the 10-year follow-up, derealization was associated with overall psychosis and overall delusions.

Insert Table 3 about here

3.5. Longitudinal effects of time on depersonalization, derealization in relation to FRS in participants within the schizophrenia-spectrum

GEE analyses found that in participants diagnosed with schizophrenia-spectrum psychoses, there was a consistently significant effect of time on FRS as outcome when depersonalization was entered into the equation as a predictor variable. This significant effect was apparent and consistent at the first follow-up [$X^2(1) = 19.70, p < 0.0001$], the second follow-up [$X^2(1) = 31.80, p < 0.0001$], the third follow-up [$X^2(1) = 30.10, p < 0.0001$], the fourth follow-up [$X^2(1) = 9.96, p = 0.0016$], the fifth follow-up [$X^2(1) = 8.70, p = 0.0032$] and the sixth follow-up [$X^2(1) = 27.40, p < 0.0001$]. Another set of GEE analyses found that in the same group of participants, there was also a significant effect of time on FRS as outcome when derealization was entered into the equation as a predictor variable. This significant effect was apparent and consistent at the first follow-up [$X^2(1) = 35.00, p < 0.0001$], the second follow-up [$X^2(1) = 45.00, p < 0.0001$], the third follow-up [$X^2(1) = 34.20, p < 0.0001$], the fourth follow-up [$X^2(1) = 7.88, p = 0.005$], the fifth follow-up [$X^2(1) = 5.63, p = 0.018$] and the sixth follow-up [$X^2(1) = 22.20, p < 0.0001$].

4. Discussion

In this novel naturalistic study, we prospectively examined diagnostic differences in the course and chronicity of, and relationships between, depersonalization, derealization and FRS at index hospitalization and throughout the subsequent 20 years at multiple timepoints. To the best of our knowledge, no previous research has longitudinally studied the interrelationships between these symptoms with a final follow-up period as long as 20 years, neither has there been any systematic investigation of dissociation and FRS where depersonalization and derealization are treated as separate yet conceptually correlated dissociative phenomena.

It has been hypothesized that the chronological sequences in the transformation of basic symptoms to FRS includes an intermediary phenomenon where individuals can experience depersonalization and/or derealization (Klosterkötter, 1992). Basic symptoms have been described as "early symptoms" that involve subtle subjective sensory and perceptual alterations, however, basic symptoms can also appear throughout the course (Gross, 1989; Huber & Gross, 1989b). The sequence of transition during the intermediary phase of depersonalization and derealization this fragmentation in the arc of internal sense of self continues to progress to FRS, the *'as if'* becomes the *'it is'* with certainty and often delusional elaborations, a process known as "psychotic re-personalisation" (Sierra, Mauricio et al., 2005). Indeed, many of the thought interference symptoms in FRS would be phenomenologically identical to the kind of detachment from one's own mental processes often experienced by participants with depersonalization and derealization, had there not been any delusional meaning and conviction attached to the former.

An issue here concerns whether the delusional meaning and conviction are merely attached to pre-existing thought interference symptoms; or whether the thought interference symptoms require a degree of delusional meaning to become thought interference symptoms in the schizophrenic sense – even where 'partial insight' occurs. For example, to become a delusional thought, the experience of thought insertion requires a delusional attribution of agentive insertion; it is not merely an attenuation of the normal sense of agency or ownership of a thought. The attribution of external agency produces a qualitatively distinct phenomenon. Delusional attributions may also intensify depersonalization and derealization due to the nature of the delusions. This cautions against a view which regards FRS as the mere addition of delusional interpretation to thoughts accompanied by depersonalization or derealization.

This process plays a key etiological role in the production of positive symptoms; yet, as outlined earlier, the self-disturbance models are not without dispute. The Early Heidelberg School of Psychiatry argues that damaged minimal self arises from a kind of unconscious processing (Giersch & Mishara, 2017), which may be linked to how dissociative symptoms first occur (for example, due to intense anxiety or distress) and in some individuals give rise to a persistent sense of ego-fragmentation over time. By contrast, the later ipseity models propose a heightened self-awareness (hyper-reflexivity) which can also lead to feelings of detachment via extreme introspection. Sass, Pienkos, Nelson & Medford (2013) investigated the affinities and discrepancies between depersonalization-derealization *disorder* and schizophrenia-spectrum psychoses. Not surprisingly, the authors found significant parallels

between the two, despite the former condition manifests without delusional elaboration or frank hallucinations in the FRS sense. The major discrepancy that differentiated the two conditions was that in schizophrenia the self-experience or the first-person perspective is not only detached but also *dislocated*. The boundaries between self and world/other are not only disrupted but may in fact be *dissolved* altogether, leading to the most severe and fundamental types of psychopathology. This could involve automatic, unconscious processes of ego-fragmentation not dissimilar to those first proposed by the Early Heidelberg School; however, it could also be the result of intense hyper-reflexivity and diminished self-affection as put forward in the ipseity model. As such, the exact pathogenetic pathway from basic self-disturbances to depersonalization and derealization to FRS psychopathology remains the subject of much debate.

4.1. Course and chronicity of depersonalization, derealization, and FRS in different diagnostic categories

The main findings from this study on the diagnostic differences in course and chronicity of depersonalization, derealization and first rank symptoms show that depersonalization, derealization and FRS are heterogenous and transdiagnostic symptoms. However, depersonalization, derealization and FRS are more prevalent and persistent in the schizophrenia group over the 20-year trajectory compared to other psychosis and the non-psychotic control group. Regardless of diagnosis, depersonalization and derealization are more severe at baseline when compared to the 20-year follow-up. These findings are consistent with other findings showing that depersonalization, derealization and FRS are transdiagnostic, exist along a continuum and can have an episodic or a chronic course (Lyssenko et al., 2018; Rosen, C., Grossman, Harrow, Bonner-Jackson, & Faull, 2011; Simeon et al., 2003). Factors that can contribute to an episodic course in depersonalization or derealization may be associated with stress and/or trauma (Aderibigbe et al., 2001). It has been shown that approximately 25% of a clinical sample will report some degree of dissociative symptomatology, regardless of diagnostic category (Putnam et al. 1996). However, other studies did not find significant differences in depersonalization and derealization between diagnostic groups (Brunner, Parzer, Schmitt, & Resch, 2004). Other studies have shown that within a specific diagnostic group, person who also experience

depersonalization or derealization have a poorer outcome (Hwu, Chen, Tsuang, & Tseng, 1981; Michal et al., 2016).

4.2. Relationships between depersonalization, derealization and FRS at 6 follow-up points

In all participants regardless of diagnostic category, we found significant associations between derealization and FRS at follow-up timepoints 2-, 4.5- and 7.5-years but this diminished after the 7.5-year follow-up. Instead, the pattern was reversed and significant associations were found between depersonalization and FRS from 10-year follow-up timepoint onwards. This is a very curious finding, which may be explained by the observation that rates of derealization were practically non-existent in the non-psychotic group after 7.5 years (follow-up point 3) and this also explains the massively inflated odds ratios at this point. Rates of depersonalization however were lower at the beginning of the follow-up period and increased after 4.5 years, at least in the schizophrenia and other psychosis groups.

When examining the relationship between depersonalization, derealization and aspects of psychosis in participants with schizophrenia our primary findings showed that overall depersonalization was more often associated with passivity phenomena whereas derealization was more often associated with overall delusions. This finding is consistent others who have who have hypothesised that in psychosis depersonalization crystallises into various delusional content (Fuentenebro & Berrios, 1995). Lastly, both depersonalization and derealization were generally significantly associated with overall psychosis.

The observation that facets of depersonalization and derealization may map onto different aspects of psychosis is clearly a new contribution to the study of the intricate relationships between these symptoms. It is also interesting that, in contrast to previous studies, we did not find a consistent association between depersonalization and auditory-verbal hallucinations specifically apart from at the very first follow-up. Rather, the strongest association was with passivity phenomena. Given that this is the first study where depersonalization and derealization were separated instead of using a homogenous dissociation variable as far as we are aware, it can be difficult to speculate the reasons behind such findings. However, dissociation is by no means a unitary concept and has several subtypes (compartmentalisation, detachment and absorption) which have been found to be

differentially related to psychotic experiences even in a general population sample (Humpston et al., 2016).

By viewing depersonalization and derealization separately, we can further look into the nuances of these alterations of self-experience. For example, depersonalization often involves a sense of detachment from one's own thoughts, feelings and behaviours whereas derealization is more related to the sense of detachment from external environments and the world around the affected individual. As such, the locus of detachment is different (internal/external, respectively) and this may partly explain why passivity phenomena, i.e. the feeling of loss of authority or control over one's own volition, is more closely related to depersonalization. On the other hand, delusional ideation often takes an externalising locus, which may mean that the external world would appear threatening or alien – just like the feeling of unfamiliarity in derealization.

Another potential reason why we did not find a specific association between depersonalization and auditory-verbal hallucinations in individuals within the schizophrenia-spectrum might be that the latter is often more heterogeneous and transdiagnostic than passivity phenomena, which are considered more characteristic of schizophrenia. Consequently, the association with passivity would be stronger in this particular group of participants.

4.3. Longitudinal effects of time on depersonalization, derealization in relation to FRS in participants within the schizophrenia-spectrum

Our analyses found a significant effect of time on FRS as outcome with both depersonalization and derealization in participants with schizophrenia, suggesting a potentially continual disintegration of self-experience over time. We purposefully chose the autoregressive model of the 1st order (AR1) as the correlation structure, which is particularly useful for regularly repeated measurements on the same subject (Pekár & Brabec, 2018). These results are very likely to be the closest estimation to the true effects and they indicate that throughout the six follow-up timepoints, depersonalization and derealization persist alongside FRS in patients with schizophrenia. This pattern of results is consistent with those displayed in Figure 1, where the persistence of dissociative and first-rank symptoms over 20 years is seen only in patients with schizophrenia in comparison to those with other psychosis or even less in those without any kind of psychotic disorder. It would be interesting to

investigate the effects of time in these other groups of patients, too, however the small (sometimes the symptom is not present at all) sample sizes of those with the symptoms across time might have prohibited us from drawing any meaningful conclusions. However, it is curious that FRS are found at all in other psychoses and even non-psychosis groups, which in our opinion may be interpreted in two ways. Either it casts further doubt on the diagnostic utility and specificity of FRS in the schizophrenia-spectrum, or that the distinct results for the schizophrenia group and their much higher prevalence of FRS could be taken as evidence that the schizophrenia group 'behaves' differently compared to the other groups, adding weight to the idea that the FRS construct is tracking something distinctive. In any case, further research is clearly warranted in this area.

4.4. Limitations

The limitations of this study can be attributed to attrition overtime resulting in a reduction in the sample size of the 20 years which could increase the risk of committing a Type 1 error in the data analysis. Additionally, the follow-up assessments did not include an evaluation of trauma which is known to be associated with depersonalization, derealization and FRS (Moskowitz, Schäfer, & Dorahy, 2008; Moskowitz, Heinimaa, & van der Hart, 2019; Rosen et al., 2017) Thus, we are not able to comment on the longitudinal effects of trauma and the associations to these symptoms. Lastly and along these lines, The Chicago Follow-up study was designed and initiated in the early 1970's, long before more detailed measures, such as the Cambridge Depersonalization Scale or the Dissociative Experiences Scale (DES) were available thus we are unable to expand our study into more specific nuances related to depersonalization and derealisation outside the symptoms measured in the SADS. However, it is also important to note that the SADS has long been considered a gold-standard semi-structured interview used to measure degree and severity of psychopathology.

5. Conclusions

The triangulation of depersonalization, derealisation and FRS converge at the foundation of self-disturbance in terms of self-identity, self-demarcation, internal self-consistency and self-presence. These alterations can also include changes in the 'mineness' or ownership of one's actions, thoughts and perception. We argue that the phenomenological subjective experience of depersonalization and derealization should be viewed as a transdiagnostic phenomenon

that are associated with psychopathology along a continuum from non-clinical to clinical populations ranging from transient to chronic and persistent symptom expression. Depersonalization and derealisation have long been considered intermediate phenomena along a continuum of sensory and perceptual alterations that are present leading to the development of psychosis, and as such could potentially serve as marker of conversion in high risk populations. The symptom domains of depersonalization and derealisation merit deep, nuanced, focused research and the development of targeted clinical interventions given the prevalence across time, degree of severity and the transdiagnostic nature of these symptoms. Lastly, disentangling the complex intermingling of depersonalization, derealisation and FRS by reporting diagnostic classification differences in addition to points of convergence and divergence over a 20-year period in individuals with schizophrenia provides a foundation and framework by which future research can further expand upon the conceptualization and distinctions.

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Data Availability

Data from the Chicago Longitudinal Study is not available for the data repository.

Author Vitae

Clara Humpston is a Research Fellow at the Institute for Mental Health, University of Birmingham. Her research experiences span from psychopharmacology to cognitive neuropsychiatry to phenomenology. She is a strong proponent of inter- and multidisciplinary approaches and values the importance of multiple lines of scientific inquiry in mental health research. Clara completed her PhD on the cognitive neuropsychiatry of schizotypy and first episode psychosis in Professor David Linden's lab from Cardiff University in 2017. She then began her first postdoctoral position at the Institute of Psychiatry, Psychology and Neuroscience, King's College London, before coming to Birmingham.

Martin Harrow is Director of the Chicago Follow-up Study, and has received several national awards for his research on thought disorder, psychosis, long-term adjustment, suicide, and recovery in schizophrenia. Recently his research has focused on longitudinal studies of the long-term effects of antipsychotic medications. His national awards include the Gralnick Award by the American Association of Suicidology, an NIMH MERIT Award, and the Zubin Award by the Society for Research in Psychopathology for lifetime contributions to the understanding of psychopathology. He also was awarded the Distinguished Faculty Award at the University of Illinois College of Medicine and is Professor Emeritus.

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