Self-disorders in individuals with attenuated psychotic symptoms: Contribution of a dysfunction of autobiographical memory

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ABSTRACT

Patients with schizophrenia and people with subclinical psychotic symptoms have difficulties getting a clear and stable representation of their self. The cognitive mechanisms involved in this reduced clarity of self-concept remain poorly understood. The present study examined whether an altered way of thinking or reasoning about one's past may account for the reduced clarity of self-concept in individuals with attenuated psychotic symptoms (APS). An online study comprising 667 participants examined the capacity to give a meaning to past events and to scrutinize autobiographical memory to better understand him/herself. Our results showed that in this sample, individuals with APS ($n=49$) have a lower clarity of self-concept and a higher tendency to scrutinize autobiographical memory than controls subjects ($n=147$). A mediation analysis performed on the full sample revealed that the relation between APS and clarity of self-concept was mediated by a tendency to scrutinize autobiographical memory. Our results suggest that the weakness of self-concept, which increases with the intensity of psychotic symptoms, may be related to an altered function of autobiographical memory, so that examining past events may fail to sustain a stable and clear representation of the self when psychotic symptoms increase.

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1. Introduction

Disorders of the self are considered a core symptom of schizophrenia (Nelson et al., 2009; Parnas et al., 2005; Sass and Parnas, 2003) but have also been reported with emerging or subclinical psychotic symptoms (Evans et al., 2015; Møller and Husby, 2000; Torbet et al., 2015). For instance, individuals in the prodromal phase of psychosis (Fusar-Poli et al., 2013) experience some confusion about their identity (Møller and Husby, 2000; Nelson et al., 2014), and those with attenuated psychotic symptoms have a more vague representation of the kind of person they are (Evans et al., 2015; Preston, 2008). Also, some authors have hypothesized that a lack of integration of the self may represent a risk factor for the subsequent development of psychological problems (Bell and Wittkowski, 2009; Lutz and Ross, 2003).

The notion of self is however complex and multi-dimensional (Strawson, 1999), and disorders of self reported in psychosis include various manifestations such as a weakened sense of the most basic level of self, (the minimal self; Nelson et al., 2014, 2009; Parnas et al., 2005), which refers to the "consciousness of oneself as an immediate subject of experience" (Gallagher, 2000). For instance, a patient might feel as if he has lost contact to himself, or as if he is a vacuum. Disorders of self also include a weakness of

more elaborate aspects of the self, such as self-knowledge, that is, knowledge about conceptual self-attributes or representations of the self (Dimaggio et al., 2012; Klein et al., 2013; Lysaker and Lysaker, 2010). Despite this heterogeneity, these disorders point to the issue of how individuals with psychosis can maintain a coherent sense of self as well as a sufficient clarity about the person they are. In that view, (Campbell et al., 1996) have introduced the notion of "clarity of self-concept" that describes the degree to which "the contents of the self are clearly and confidently defined, internally consistent, and temporally stable" (p. 141). As an example, people with a low self-concept clarity spend much time wondering about the kind of person they are, frequently change their beliefs about themselves or feel that they are not really the person they appear to be.

1.1. Clarity of self-concept and autobiographical reasoning

Several factors may influence the way people develop a clear understanding and representation of themselves. One of these factors refers to how people look at their past to better understand who they are, that is how people examine their past in order to check whether the person they were in the past, their values or beliefs have changed or remained stable over time. As an example, people with low self-concept clarity display an increased propensity to scrutinize their memory because reflecting on past events may contribute to enhance self-continuity (Bluck and Alea, 2011, 2009; Liao et al., 2015; Rasmussen and Habermas, 2011). Thus, autobiographical memory is not merely a cognitive function involved in the storing of past experiences but also serves particular functions for the self (Berntsen and Rubin, 2006; Bluck and Alea, 2011; Conway, 2005). Also, the self-continuity function of autobiographical memory concerns the use of autobiographical memories to maintain a sense of self over time (e.g., Conway, 2005; Habermas and Bluck, 2000). Another factor relates to how people can learn from important or challenging events that have had a critical impact on the person we are today as well as on the beliefs we have formed about ourselves. Singer and Salovey (1993) called these highly personally significant events that have influenced our self "self-defining events" and considered them as representing hallmarks for the self (Conway et al., 2004). These authors also highlighted that these events can particularly alter the self as soon as they are interpreted or linked to previous experience or previous self-knowledge, by means of reflective processes called "autobiographical reasoning" (Blagov and Singer, 2004; Habermas and Köber, 2015; McLean et al., 2007; Singer et al., 2013). Another critical aspect of autobiographical reasoning is the ability to find out positive lessons from challenging events, a notion referred to as "redemption" (McAdams et al. 2001). In fact, giving a meaning to experiences that challenge the current view of ourselves helps compensate the effects of disruptions on self-continuity (Habermas and Köber, 2015). Other studies have shown that a more coherent and meaningful understanding of personal experiences may contribute to improved mental health (Baerger and McAdams, 1999; Lysaker et al., 2014, 2005; Park, 2010).

1.2. Clarity of self-concept, autobiographical memory and autobiographical reasoning in psychosis

Few studies have investigated the clarity of self-concept in the psychotic continuum. They demonstrated that people with APS have a lower level of self-concept clarity (Cicero et al., 2013; Evans et al., 2015; Preston, 2008) and raised the issue that a low clarity of self-concept may account for APS (Cicero et al., 2013). Other studies on schizophrenia have reported that patients have less stable and more passive representations of themselves (Bennouna-Greene et al., 2012; Boulanger et al., 2013; Klein et al., 2013) and

that patients with a higher self-concept clarity had better psychological adjustment (Bigler et al., 2001) and quality of life (Weinberg et al., 2012) as well as higher level of recovery (Hasson-Ohayon et al., 2014). With the exception of one study that showed that the higher the intensity of past traumatic experiences the lower the self-concept clarity in individuals with APS (Evans et al., 2015), no other studies have examined the factors that may account for the difficulty for individuals with APS to get a clear representation of their self.

Considering that autobiographical memory represents a critical support for the self (Berntsen and Rubin, 2006; Conway, 2005), the autobiographical memory deficits reported in schizophrenia (Berna et al., 2016; Potheegadoo et al., 2014, 2013; Ricarte et al., 2014) may have a negative impact on the clarity of self-concept in patients (Bennouna-Greene et al., 2012). Patients have difficulty accessing detailed memories of their past and to consciously relive past personal events (e.g., Cuervo-Lombard et al., 2007; Danion et al., 2005). Moreover, patients have an impaired ability to give a meaning to self-defining memories (Berna et al., 2011a, 2011b; Raffard et al., 2010, 2009) and to create a coherent narrative of their life (Allé et al., 2015; Lysaker et al., 2005). These results have been interpreted as a possible mechanism accounting for the disorder of self in patients (Allé et al., 2015; Berna et al., 2011a; Dimaggio et al., 2012). However, as none of these studies included direct measures of clarity of self-concept, the relationship between autobiographical reasoning capacities and characteristics of the self was speculative.

1.3. Aim and hypotheses of the present study

The aim of the present study was to examine the contribution of different aspects of autobiographical reasoning in the reduced clarity of self-concept of individuals with APS as a better understanding of the implication of these factors in this population considered at risk for schizophrenia may help approach mechanisms at play in patients clinically diagnosed with schizophrenia (Barrantes-Vidal et al., 2015). We were particularly interested in the way people give a meaning to past events and scrutinize their autobiographical memory. For that purpose, we first compared the characteristics of these factors (self-concept clarity, meaning making and self-function of autobiographical memory) in two populations of participants with high versus low levels of APS. Second, we analyzed the relationships among these factors in both groups separately. Finally, a mediation analysis was performed on the full sample in order to verify our hypothesis about these relationships on the psychotic continuum including people with low to high levels of APS. Based on previous research findings we have reviewed above, we predicted that individuals with APS would have a reduced clarity of self-concept related to abnormal self-continuity function of autobiographical memory. We also hypothesized that they would exhibit a reduced capacity to give a meaning to self-defining past events insofar as this population might be prone to symptoms of schizophrenia. We finally predicted that the influence of psychotic symptoms on the clarity of self-concept will be mediated by an abnormal self-function of autobiographical memory.

2. Methods

The study was conducted over the internet. Participants were recruited via WISO-Panel, a participant pool with German-speaking members who had registered to be invited to participate in online studies. All participants gave their informed consent at the time they joined WISO-Panel and the study was carried out in accordance with the latest version of the Declaration of Helsinki.

In total, 12,134 people from all walks of life received the link of the study, and responses were collected within one week. After a short description of the purpose of the study ("In the present study we are interested in investigating several aspects and functions of your autobiographical memory. We would like to understand better how and why you are thinking back to your past."). Participants were first asked to answer question relating to their age, gender and the existence of known psychiatric diagnosis, psychiatric or psychotherapeutic treatment and use of current medication.

2.1. Participants

A total of 2,624 participants followed the invitation to participate in the study, but some attrition was observed during the study so that 1,698 participants completed all questionnaires until the SCCS (see Section 2.2.6). After having completed the SCCS, participants were randomly assigned to complete the CAPE, which assesses (subclinical) psychotic symptoms (see Section 2.2.7) or another questionnaire (these data are not reported in the present paper). A total of 858 participants completed the CAPE. Next, we excluded participants older than 60 years ($n=155$) to avoid possible confounds related to memory loss in older age and those more generally relating to psychotic like symptoms. Finally, we excluded 36 participants scoring high on the psychopathological lie scale (i.e., people achieving more than 8 out of 16 points on the psychosis lie scale; see Section 2.2.7). Application of these exclusion criteria reduced the baseline sample to 667 participants who completed all necessary questions.

As commonly done in schizotypy research (e.g., Cicero et al., 2013), individuals were considered as having APS if they scored 1.5 SD above the mean of the CAPE total score (i.e. 2.12/4). The control group was composed of people with a CAPE total score below 0.5 SD and who disclosed no lifetime diagnosis of schizophrenia or bipolar disorder and no current intake of antipsychotic medication. For each participants of the APS group, three control individuals were selected based on their age, gender and level of education. The control group was thus composed of 147 individuals.

The mean age of our participants in both groups was 41.9 years ($SD=11.3$), and both groups comprised 36.7% of men (see Table 1). Among APS individuals, 33 (67.3%) disclosed having ever received a psychiatric diagnosis in contrast to 25 control participants (17.0%, $\chi^2 < 0.001$). Diagnoses reported included mostly depression and anxiety disorders (see Table 1). Twenty-three APS individuals (46.9%) disclosed taking current psychotropic medication in contrast to 38 control participants (25.9%, $\chi^2 < 0.001$). Antidepressants drugs were the most frequently reported drugs.

Among APS individuals, one disclosed having received a diagnosis of schizophrenia and being treated with antipsychotics, one disclosed a diagnosis of schizophrenia but was not taking psychotropic drugs, one disclosed a diagnosis of bipolar disorder and two disclosed taking antipsychotics for depression and anxiety disorders. Considering that psychiatric diagnoses were not confirmed by trained clinicians and remained purely declarative, and as people with high APS may have also received a diagnosis of psychotic disorder, we decided to keep these five subjects in the APS group. We also performed secondary analyses after excluding these participants in order to control if results remained unchanged.

2.2. Procedure

2.2.1. Self-defining memories

Participants were first asked to retrieve 3 self-defining memories, that is, memories that best corresponded to the following

Table 1

Demographic characteristics of individuals with Attenuated Psychotic Symptoms (APS) and controls participants.

	Individuals with APS ($n=49$)		Controls ($n=147$)		
	M	SD, %	M	SD, %	t, χ^2
age (years)	41.9	(11.3)	42.0	(11.2)	0.05
sex (male)	18	(36.7%)	54	(36.7%)	0.00
Level of education					0.87
9 years of school	8	(16.3%)	17	(11.6%)	
O-Levels	17	(34.7%)	58	(39.5%)	
A-Levels	14	(28.6%)	42	(28.6%)	
university	10	(20.4%)	30	(20.4%)	
Employment status					9.98
working	22	(44.9%)	93	(63.3%)	
pupil/student	9	(18.4%)	28	(19.0%)	
retired	5	(10.2%)	8	(5.4%)	
unemployed	8	(16.3%)	8	(5.4%)	
parental leave	1	(2.0%)	4	(2.7%)	
other	4	(8.2%)	6	(4.1%)	
Reported lifetime diagnoses					
no psychiatric diagnosis	16	(32.7%)	122	(83.0%)	44.7***
schizophrenia	2	(4.1%)	0	(0.0%)	
bipolar disorder	1	(2.0%)	0	(0.0%)	
depression	28	(57.1%)	15	(10.2%)	
anxiety disorder	15	(30.6%)	6	(4.1%)	
OCD	5	(10.2%)	0	(0.0%)	
PTSD	9	(18.4%)	9	(6.1%)	
personality disorder	8	(16.3%)	2	(1.4%)	
eating disorder	6	(12.2%)	4	(2.7%)	
substance/alcohol use disorder	1	(2.0%)	1	(0.7%)	
Reported current psychotherapy					
no psychotherapy	25	(51.0%)	139	(94.6%)	51.0***
ambulatory	11	(22.4%)	2	(1.4%)	
certified psychotherapist	13	(26.5%)	2	(1.4%)	
Reported current medication					
no medication	26	(53.1%)	109	(74.1%)	7.6**
antidepressants	19	(38.8%)	3	(2.0%)	
tranquilizers	4	(8.2%)	1	(0.7%)	
hypnotics	3	(6.1%)	1	(0.7%)	
antipsychotics	3	(6.1%)	0	(0.0%)	
stimulants	0	(0.0%)	0	(0.0%)	

Note: APS=Attenuated Psychotic Symptoms; OCD=Obsessive Compulsive Disorder; PTSD=Post-Traumatic Stress Disorder.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

instructions (Singer and Moffitt, 1991): (a) It is at least one year old; (b) It is a memory from your life that you remember very clearly and that still feels important to you; (c) It is a memory that helps you to understand who you are as an individual and might be a memory you would tell someone else if you wanted that person to understand you in a basic way; (d) It may be a memory that is positive or negative, or both, in how it makes you feel now. The only important aspect is that it leads to strong feelings; and (e) It is a memory that you have thought about many times. It should be familiar to you like a picture you have studied or a song you have learnt by heart. Participants were invited to give a short title to their memories. This title was later used to display the event for the ratings of the memory characteristics that subsequently appeared on three pages for each memory. A detailed description of the events themselves was not required.

2.2.2. Characteristics of the memories

On the second page, participants were asked to give their age at the time of the event and to rate the vividness of the memory, the emotional valence and intensity at the time of remembering, and the strength of their memory of the event using 7-point scales (Johnson et al., 1988).

2.2.3. Scale to assess meaning making (SMM)

On the third page, participants were asked to complete a scale that measured meaning making associated with self-defining memories (6 items on 5-point Likert-type scale with 1=totally disagree and 5=totally agree; Wood and Conway, 2006) (see items in Appendix). This scale has high reliability at Cronbach's α=.86 (Wood and Conway, 2006), whereby α ranged from .75 to .86 across the three self-defining memories in our study.

2.2.4. Centrality of events scale (CES)

The short version (7 items on 5-point Likert-type scale with 1=totally disagree and 5=totally agree) of the CES (Berntsen and Rubin, 2006), assessed the extent to which the events had become a reference point for personal identity (see items in Appendix). Cronbach's α was .92 in the original publication (Berntsen and Rubin 2006), and ranged from .84 to .91 across the three self-defining memories.

2.2.5. Thinking about life experiences (TALE) scale

Next, participants completed the short form of the Thinking About Life Experiences (TALE) scale (15 items on 5-point Likert-type scale, with 1=almost never and 5=very frequently) (Bluck and Alea, 2011; Rasmussen and Habermas, 2011). This scale assesses how often people think about or talk about past experiences of their life and the three main functions of autobiographical memory (self, social, directive) that are supported by the acts of thinking or talking about the past (Alea and Bluck, 2003; Pillemer, 2003). TALE comprises three subscales of 5 items each that all begin with the following statement: "I think back over or talk about my life or certain periods of my life…". For instance, the self-continuity function is assessed with the following statement: "…when I want to feel that I am the same person that I was before". The directive function involves the use of autobiographical memories in problem solving and guiding present and future thinking and behaviour (Pillemer, 2003) (e.g., "… when I believe that thinking about the past can help guide my future."). The social function concerns the way people use their past to initiate or maintain social bonds, elicit empathy or intimacy, or inform (Alea and Bluck, 2003; Pillemer, 2003) (e.g., "… when I want to maintain a friendship by sharing memories with friends."). Cronbach's α ranged from .74 to .83 in the original publication (Bluck and Alea, 2011) and from .81 to .85 in our study.

2.2.6. The self-concept clarity scale (SCCS)

This scale (Campbell et al., 1996) assesses the extent to which the contents of an individual's self-concept are clearly and confidently defined, internally consistent, and temporally stable. SCCS consists of 12 items on a 5-point Likert-type scale (with 1=strongly disagree and 5=strongly agree) (e.g., "I spend a lot of time wondering about what kind of person I really am" or "My beliefs about myself seem to change very frequently"). SCCS has good internal consistency (α=.86) and test-retest reliability (r=.79), with a single general factor (Campbell et al., 2003). In our study Cronbach's α was .91.

2.2.7. Community assessment of psychic experiences (CAPE)

Finally, respondents completed the CAPE (Stefanis et al., 2002) that assesses attenuated psychotic symptoms. The CAPE is comprised of 42 items that are marked on a 4-point Likert scale (with

1=ever, 2=sometimes, 3=often, 4=nearly always) and that are derived from clinical rating scales but are worded in a manner comprehensible to both healthy and clinical populations. CAPE taps three syndromes: positive (e.g., "Do you ever feel as if you are being persecuted in some way?"), negative (e.g., "Do you ever feel that you experience few or no emotions at important events?") and depressive (e.g., "Do you ever feel pessimistic about everything?"). In the present study, Cronbach's α ranged from .87 to .95 for the total and subscale scores. Importantly, CAPE contains no item taping symptoms related to clarity of self-concept.

Four items served as "lie" items (highly implausible positive symptoms) to check the truth of the responses (Moritz et al., 2013). These items tap broadly publicized but in fact rather rare or pseudo-psychotic symptoms such as seeing tiny objects like white mice; incidences of alien abduction; being a famous personality; experience of lapses during which one becomes another person.

2.3. Statistical analyses

The mean rating scores of the three self-defining memories was used for statistical analyses. Separate Student t-tests were used to compare memory ratings, scores of the SCSS, CES and TALE scales and subscales. Pearson's correlation coefficients (r) were calculated in both groups separately between SCCS, SMM, CES, CAPE and TALE scores and subscores.

A sample size calculation was performed with G*POWER (v.3.1.) based on the assumption of a medium effect size for between groups comparisons on self-concept clarity, correlation and mediation analyses (α=0.05; 1-β=0.8). This indicated that a minimum of 172 participants (both groups together) was needed to detect medium effects.

3. Results

3.1. Ratings

Individuals with APS had significantly lower scores of self-concept clarity than controls (d=1.70), and higher scores of TALE scale and subscales (ds > 0.38), with the exception of TALE social function. Memory ratings of vividness and emotional intensity did not differ significantly between groups, but individuals with APS had significantly lower scores of memory strength (d=0.37) and less positive self-defining memories than controls (d=0.42). The degree of meaning making associated with the self-defining memories did not differ significantly between groups, but individuals with APS felt their self-defining memories as more central to their self than control participants (d=0.44) (see Table 2).

3.2. Correlation analyses

Correlation analyses after Bonferroni correction (see Table 3) showed a significant negative correlation between self-concept clarity and both TALE global scale and self-continuity function subscale, and a positive correlation between self-concept clarity and age of participants in the control group only. Contrary to our hypothesis, no significant correlation was found between meaning making and self-concept clarity. The CAPE negative subscore was negatively correlated with self-concept clarity and with TALE total score in the APS group. These correlations remained significant when the influence of depressive symptoms was entered as a covariate. Group differences and correlation analyses remained essentially unchanged when the five people disclosing diagnosis of schizophrenia, bipolar disorder or taking antipsychotics were excluded from the analyses.

Table 2
Ratings of individuals with attenuated psychotic symptoms (APS) and controls participants.

	Individuals with APS (n=49)		Controls (n=147)			
	M	SD	M	SD	t (194)	d
CAPE						
total score	2.34	(0.17)	1.46	(0.20)	27.2***	4.32
positive subscore	1.87	(0.36)	1.27	(0.16)	16.17***	3.74
negative subscore	2.76	(0.42)	1.65	(0.33)	19.08***	3.41
depressive subscore	2.76	(0.45)	1.63	(0.34)	18.32***	3.28
SCCS	32.33	(9.95)	46.56	(8.36)	−9.83***	1.70
CES	4.03	(0.53)	3.75	(0.63)	2.80**	0.44
SMM	4.07	(0.46)	4.03	(0.54)	0.51	0.08
TALE						
total score	47.78	(8.62)	43.97	(10.0)	2.38*	0.38
self-continuity function	15.10	(3.52)	13.52	(4.08)	2.43*	0.39
social function	15.80	(3.59)	15.18	(3.78)	1.00	0.16
directive function	16.88	(3.87)	15.27	(3.72)	2.60**	0.43
Ratings of self-defining memories						
age	25.84	(11.91)	27.58	(10.53)	−0.97	0.17
memory strength	5.80	(1.11)	6.08	(0.74)	−1.98*	0.37
memory vividness	5.96	(1.14)	6.09	(0.78)	−0.89	0.17
emotional intensity	5.59	(1.25)	5.47	(1.11)	0.62	0.11
emotional valence	3.76	(1.73)	4.49	(1.73)	−2.54*	0.42

Note: APS=Attenuated Psychotic Symptoms; CAPE=Community Assessment of Psychic Experiences, SCCS=Self-Concept Clarity Scale, CES=Centrality of Events Scale, SMM=Scale to assess Meaning Making, TALE=Thinking About Life Experiences scale.

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

3.3. Mediation analysis

Secondary analyses were performed in order to examine further whether and how the TALE self-function subscore mediated the relationship between attenuated psychotic symptoms (CAPE total score) and self-concept clarity (SCCS). An ordinary least squares path analysis using a bootstrapping approach (Hayes, 2009) was conducted on the full sample (N=667) in order to examine the psychosis continuum. Mediation was investigated by directly testing significance of the indirect effect of the independent variables (CAPE) on the dependent variable (SCCS) through the mediator (TALE self-function subscore). This indirect effect was quantified as the product of the effects of the independent variable (IV) on the mediator (a) and of the mediator on the dependent variable (DV) (b), controlling for the direct effect of the IV (c'). Bootstrapping estimated indirect point effects and associated 95% confidence intervals (CI) derived from the mean of 10.000 bootstrap samples. A bias corrected boot-strapping procedure was chosen as this is considered the most powerful approach to detecting statistical mediation (Fritz and MacKinnon, 2007). Indirect effects were deemed statistically significant when the bias corrected CI did not include zero (Preacher and Hayes, 2008). Statistical analyses were completed using the SPSS software (v.22) and an additional macro, named *process* (Preacher and Hayes, 2008). All variables were entered into the mediation analyses simultaneously.

The mediation analysis showed that the number of APS (CAPE) indirectly influenced self-concept clarity through their effect on TALE self-function. As can be seen in Fig. 1, the number of APS was associated to a higher tendency to scrutinize one's past ($a=2.13$), and the tendency to scrutinize one's past associated to a lower clarity of self-concept ($b=-0.57$). The bias corrected bootstrap confidence interval for the indirect effect ($a \times b = -1.22$) was above zero (from -1.95 to -0.65). Thus, there was evidence that APS influenced the clarity of self-concept independent of their effect on TALE self-function ($c'=-16.31$), however the mediator significantly increased this negative effect ($c=-17.53$). Given that CAPE positive and negative subscores were correlated with TALE self-function in opposite directions and in order to disentangle the role of both positive and negative APS on SCCS, subsequent mediation analyses were performed by using the CAPE positive and CAPE negative subscales successively. Results showed that although both CAPE positive and CAPE negative subscores were negatively associated with SCCS, the relation between CAPE positive and SCCS was mediated by the TALE self-function and no that between CAPE negative and SCCS.

Finally, the results remained unchanged when people reporting having ever received a diagnosis of schizophrenia (n=5) or bipolar disorder (n=7), and people disclosing taking antipsychotics (n=8) were excluded.

4. Discussion

The present study examined the contribution of different aspects of autobiographical reasoning to the clarity of self-concept

Table 3
Bivariate correlations (controls in upper-right square, n=147; participants with attenuated psychotic symptoms (APS) in lower-left square, n=49).

		1	2	3	4	5	6	7	8	9	10	11	12
1	Self-Concept Clarity		−.36***	−.26***	−.31***	−.36***	.11	.07	−.22**	−.05	−.24***	−.25***	.30***
2	TALE total score	.05		.85***	.85***	.90***	.10	.15	.08	.18*	.01	.02	−.26***
3	TALE self-continuity function	−.09	.78***		.53***	.67***	.06	.20**	−.001	.17*	−.09	−.05	−.05
4	TALE social function	.03	.71***	.26		.68***	.02	−.01	.03	.03	.05	−.02	−.39***
5	TALE directive function	.16	.86***	.59***	.41***		.18*	.20*	.19*	.27***	.08	.13	−.24***
6	SMM	−.02	.06	−.04	.10	.07		.66***	.15	.25***	.00	.17*	.14
7	CES	−.01	.21	.15	.09	.26	.66***		.11	.24***	−.04	.14	.23***
8	CAPE total score	−.18	−.07	−.08	−.07	−.02	−.11	.02		.67***	.88***	.84***	−.14
9	CAPE positive	.26	.40***	.27	.21	.45***	−.20	−.13	.41***		.31***	.39***	−.08
10	CAPE negative	−.44***	−.46***	−.30*	−.29*	−.49***	−.10	−.08	.49***	−.59***		.68***	−.15
11	CAPE depression	−.14	−.18	−.21	−.21	−.14	.35*	.43***	.53***	−.22	.29*		−.07
12	Age	.06	−.22	−.20	−.20	−.26	.05	.16	−.07	−.18	.10	.05	

Note: *$p < 0.05$; **$p < 0.01$; ***$p < 0.005$ Coefficients in bold are significant after Bonferroni correction ($p < 0.002$).
TALE=Thinking About Life Experiences scale, CAPE=Community Assessment of Psychic Experiences, SMM=Scale to assess Meaning Making, CES=Centrality of Event Scale.
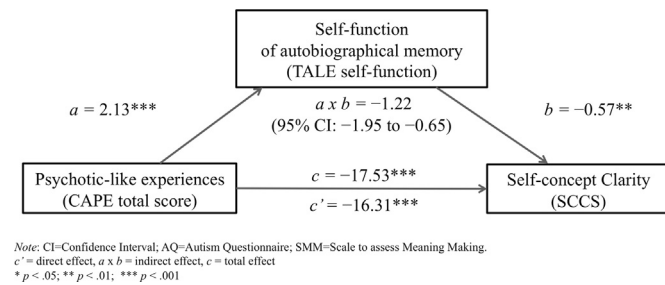
Note: CI=Confidence Interval; AQ=Autism Questionnaire; SMM=Scale to assess Meaning Making.
c' = direct effect, $a \times b$ = indirect effect, c = total effect
* $p < .05$; ** $p < .01$; *** $p < .001$

Fig. 1. Results of the mediation analysis.

of individuals with attenuated psychotic symptoms (APS). As predicted, the clarity of self-concept was significantly lower in individuals with APS than in control participants. Moreover, individuals with APS displayed a similar degree of meaning-making associated with their self-defining memories and even experienced these events as more central to their self in comparison to controls. However, APS individuals also exhibited a higher tendency to scrutinize autobiographical memory to better understand oneself (as assessed by TALE self-continuity scale) and contrary to controls, this tendency was not correlated with self-concept clarity. Analyses on the full sample revealed that psychotic symptoms increased the propensity to reflect upon one's past in a way that reduces (instead of increases) the clarity of self-concept; that is, the negative impact of psychotic symptoms on self-concept clarity was enhanced through their influence on the propensity to reflect upon one's past. Altogether, our results suggest that the weakness of self-concept, which increases together with the intensity of APS, is related to an altered self-continuity function of autobiographical memory, so that examining past events may fail to sustain a stable and clear representation of the self when APS increase.

4.1. Self-function of autobiographical memory and clarity of self-concept in psychosis

The negative association between self-concept clarity and the tendency to reflect upon past events to better understand oneself has been reported in several studies (Bluck and Alea, 2009; Rasmussen and Habermas, 2011). These results support the idea that autobiographical memory serves a function for the self so that people with low self-concept clarity are more driven to look at their past as a way to improve self-concept clarity (see for discussion, Bluck and Alea, 2009). Our study provided confirmatory evidence in our control group, but this association was not found in individuals with APS. In keeping with the fact that these people had a significantly lower clarity of self-concept but a higher propensity to reflect about their past, our results suggest that the way these people look at their past may be dysfunctional and may fail to ensure stability to their self. This interpretation fits with previous study results showing that self-reflection may in some cases have a deleterious impact on self-concept clarity in particular in participants with low self-concept clarity (Csank and Conway, 2004). Further support for this idea is provided by the results of our mediation analysis, which examined the full sample of 667 individuals and showed that the tendency to scrutinize one's past increased together with the number of APS (in particular positive APS) and enhanced the negative impact of APS on clarity of self-concept. It is worth mentioning here that individuals with APS also exhibited a higher propensity to examine their past in order to guide present and future thinking and behaviour. This self-directive function of autobiographical memory is also essential to maintain a sense of continuity of self (Pillemer, 2003) and was

significantly correlated to self-concept clarity in controls but not in individuals with APS.

Previous studies in schizophrenia have exhibited more frequent dysfunctional repetitive thinking in patients compared to controls (Ricarte et al., 2014) and showed that it was associated with both positive and negative symptoms such as hallucinations and social withdrawal (Badcock et al., 2011; Halari et al., 2009; Jones and Fernyhough, 2009). Our correlation analyses restricted to the APS group provided confirmatory evidence by showing distinct influences of positive and negative APS on the tendency to reflect upon one's past. In fact, positive symptoms increased this tendency, whereas negative symptoms reduced this tendency. However, another interpretation of our results is that abnormalities of self-concept in individuals with APS may reside in their difficulty recognizing mental states and articulating different facets of their self in a flexible way (Dimaggio et al., 2012; Lysaker et al., 2014; Lysaker and Lysaker, 2002). This difficulty that points to a deficiency of the dialogical self have been extensively reported in schizophrenia and associated with both positive, negative and disorganization symptoms of the illness (Lysaker and Lysaker, 2002).

4.2. Meaning making and clarity of self-concept in psychosis

Previous studies on healthy participants have shown that the capacity to draw meaning from self-defining memories is generally associated with indicators of psychological well-being and capacity for growth (Pasupathi et al., 2001; Singer et al., 2013) such as more positive self-views (Debats et al., 1995), higher adjustment capacity (Blagov and Singer, 2004), greater identity status maturity (McLean and Pratt, 2006). This capacity might thus also contribute to better stability and clarity of self-concept (Blagov and Singer, 2004). However, our results did not support this hypothesis as meaning making was not correlated with self-concept clarity in both our groups. Moreover, individuals with APS exhibit similar capacities as controls to take distance and learn lessons from past significant events. This conclusion should be however made with caution given that evaluation of meaning making is usually based on the analyses of the content of memory narratives (Blagov and Singer, 2004), which was not the case in this study. Furthermore, previous studies in schizophrenia have shown that impairment of meaning making capacities as assessed by the experimenter on memory narratives were observed although patients' scoring on the meaning making scales did not differ significantly from that of controls (Berna et al., 2011a). This represents a limitation of our study due to the web-based format of our study. Moreover, some recent studies have questioned the idea that giving a meaning to past events may be linked to positive mental health and shown that university students with symptoms of post-traumatic stress disorder had higher meaning associated to past traumatic events but did not show better adjustment or well-being associated with their meaning (Waters et al., 2013). Further studies are therefore needed to examine in more depth the kind of meaning and the function of this meaning in people with APS.

4.3. Limitations

Some other limitations of our study need to be acknowledged. Our main focus was to examine the relationship between self-concept clarity and different measures of autobiographical reasoning but other factors such as social anxiety (Stopa et al., 2010) or history of trauma (Evans et al., 2015) may also influence self-concept clarity and were not assessed in our study. Moreover, other tendencies to adopt metacognition such as for instance the propensity to worry or ruminate were not investigated in this study (in order to limit the duration of the study). These

tendencies may also influence the more general tendency to scrutinize one's past to better understand oneself and in turn experience more symptoms and lose contact with self-experience. Further studies are therefore needed to disentangle the kind of metacognitive processes that support the self-function of autobiographical memory. As mentioned above, neither the topic of the self-defining memories nor their content were collected so further analyses on the categories of self-defining memories (Blagov and Singer, 2004) were not possible. For the same reason, external measures of meaning making and of the specificity of memories (that is whether the self-defining memories corresponded to unique or over-generalized events; Williams and Broadbent, 1986) were not possible either. This should be explored in future studies, as people with difficulty accessing specific and unique events of their life may be also more prone to over-reflect over their past and then lose contact with self-experience. The population approached by means of this web-based study may differ from people with APS recruited with other methods (Lenhart et al. 2003); this limitation also applies to studies conducted with undergraduate students. For the same reason, information reported on psychiatric diagnosis, psychotherapy and medications were only self-reported and could not be confirmed by additional external evaluations. Finally, substantial attrition was observed, but the vast majority of individuals stopped the study at the very beginning (809 out of 926, 87.4%) when they were asked to give a title to their three self-defining memories.

4.4. Conclusion

This study was one of the first attempts to examine aspects of autobiographical reasoning that may underlie the weakness of self-concept in people with attenuated psychotic symptoms. It shows that the self-continuity function of autobiographical memory may be abnormal in subjects with APS in that it fails to support a clear representation of the self in this population. Further studies with patients with schizophrenia are needed to confirm this hypothesis in a clinical sample. Clinical implications of our findings are twofold. On the one hand, they provide indirect support for the use of experience-based psychotherapy (such as mindfulness-based interventions) for people at risk for schizophrenia (Nelson et al., 2009). In fact, these methods aim to reduce or disengage from maladaptive reflections and hyper-reflectivity that characterizes psychosis (Nelson et al., 2014). On the other hand, they advocate for the use of more structured narrative therapy with those people, as these methods allow guiding the exploration of past events in order to improve self-understanding and have demonstrated some clinical efficacy in people diagnosed with schizophrenia (e.g., Roe et al. 2010; Smorti et al. 2010; Salvatore et al., 2012; Lysaker and Dimaggio, 2014).

Conflicts of interest

None.

Role of funding source

None.

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Appendix A

Items of the Scale to assess Meaning Making (Wood and Conway, 2006).

This past event has had a big impact on me.

I feel I have grown as a person since experiencing this past event.

Having had this experience, I have more insight into who I am and what is important to me.

Having had this experience, I have learned more about what life is all about.

Even when I think of the event now, I think about how it has affected me.

I have often spent time thinking about what this event means to me.

Items of the Centrality of Event Scale (Berntsen and Rubin, 2006).

I feel that this event has become part of my identity.

This event has become a reference point for the way I understand myself and the world.

I feel that this event has become a central part of my life story.

This event has colored the way I think and feel about other experiences.

This event permanently changed my life.

I often think about the effects this event will have on my future.

This event was a turning point in my life.

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