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Self-reference recollection effect and its relation to theory of mind: An investigation in healthy controls and schizophrenia

Laurie Compère [a,b,1], Célia Mam-Lam-Fook [a,b,c,1], Isabelle Amado [c,d,e,f,1], Marion Nys [a,b,1], Jennifer Lalanne [a,b,1], Marie-Laure Grillon [a,b,1], Narjes Bendjemaa [c,d,1], Marie-Odile Krebs [c,d,e,f,1], Pascale Piolino [a,b,f,g,*]

[a] Paris Descartes University, Sorbonne Paris Cité, Institute of Psychology, Memory and Cognition Laboratory, Boulogne Billancourt, Paris, France
[b] INSERM S894, Center of Psychiatry and Neurosciences, Paris, France
[c] Sainte-Anne Hospital, Service Hospitalo-Universitaire, Paris, France
[d] INSERM U894, Laboratory Pathophysiology of Psychiatric Diseases, Center of Psychiatry and Neurosciences, Paris, France
[e] University Paris Descartes, Faculty of Medicine Paris Descartes, Paris, France
[f] Institut de Psychiatrie – GDR 3557 CNRS, France
[g] Institut Universitaire de France (IUF), France

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ABSTRACT

This study explores the links between the Self-Reference Effect (SRE) and Theory of Mind (ToM) in typical adults and patients with schizophrenia. Participants were assessed with a self-referential memory paradigm investigating the mnemonic effect of both semantic and episodic self-reference with a recognition task associated with the Remember/Know/Guess paradigm. They also completed a self-descriptive scale and shortened versions of the attribution of intention task and the reading the mind in the eyes test as measures of cognitive and affective ToM respectively. Unlike typical adults, the patients showed no semantic SRRE (correct recognition associated with remembering), and there was no episodic SRRE and no SRE (on the number of correct recognitions) in either group. Semantic SRRE was correlated with the affective ToM in patients and with the positivity of the self-concept in the healthy group. We discuss that patients and typical adults use different strategies during self and other-reflection.

1. Introduction

The integration and the basis of mental representations of ourselves cannot be accomplished without the mobilization of high-level cognitive abilities that allow us to make inferences about what other people think of ourselves. Yet in the literature, the general knowledge that we have of ourselves is traditionally designated by the unitary concept of self while understanding others is often summarized in social cognition under the term of Theory of Mind (ToM), i.e. the attribution of mental states both to others and to oneself (Premack & Woodruff, 1978) and requires conscious understanding of others (Frith & Frith, 2007). From a cognitive perspective, general mental representations or perceptions that we have of ourselves form the "self-concept", i.e. the knowledge that the subject has of himself, his personality, his history, and his autobiography

* Corresponding author at: 2 Ter rue d'Alésia, Centre de Psychiatrie et Neurosciences, 75014 Paris, France.
E-mail address: pascale.piolino@parisdescartes.fr (P. Piolino).
[1] Address: 2 Ter rue d'Alésia, Centre de Psychiatrie et Neurosciences, Hôpital Sainte Anne, 75014 Paris, France.

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(Conway & Pleydell-Pearce, 2000; Markus, 1977; Martinelli, Sperduti, & Piolino, 2013). The self-concept includes abstract knowledge about our personality traits and temperament that are constitutive of our personal and social identity (Conway, 2005; Klein, Cosmides, Tooby, & Chance, 2002; Klein, Loftus, & Kihlstrom, 1996).

Moreover, the self-concept is not only a higher elaborate structure in memory but is also known to be an active process which facilitates the memorization of information (Conway, 2005; Markus, 1977) by acting as a filter or a prism, selecting the stimuli that are relevant to oneself during self-reference processing (Liao, Audi, Magritte, Meyer-Bahlburg, & Quigley, 2012). Indeed, findings in healthy adults suggest that information about oneself is typically better remembered than other information. This phenomenon is named the Self-Reference Effect (SRE) (Rogers, Kuiper, & Kirker, 1977) and reflects a deeper encoding of information related to a cognitively rich mental representation of the self (Henderson et al., 2009). It can be processed based on different kinds of representations of the self: either self-related semantic processing that requires participants to decide if a personality trait describes them, or self-related episodic processing of searching for a specific personal memory in connection with a personality trait (Klein, Loftus, & Burton, 1989). The SRE applies not only to the quantitative properties of memories (i.e., correct recalls and recognitions) but also to the qualitative properties (i.e., subjective sense of remembering). This Self-Reference Recollection Effect (SRRE) (Conway & Dewhurst, 1995) improves the correct recognitions associated with recollective experience (Remember responses in the Remember/Know/Guess paradigm, Gardiner, 2001) whereby participants consciously recollect specific details of an item presented earlier such as sensory aspects of the original item or associated thoughts and feelings.

The action of the self as a cognitive filter extends to social cognition by acting as a prism through which others are seen using our self-concept and personal memories to make inferences about others (Corcoran & Frith, 2003). The view that we engage in similar processes during our own understanding and understanding of others is supported by brain imaging data that evidence a common brain network in self and other reference processing (Legrand & Ruby, 2009). The study of some pathologies such as autism (Henderson et al., 2009) and alexithymia (Moriguchi et al., 2006) also highlighted strong connections between self and social skills disruptions. Therefore, self-reference processing is considered crucial for adaptive functioning in social environments since a clear understanding of one's own traits is critical in assessing one's role in a social context (van der Meer, Costafreda, Aleman, & David, 2010) and since the ability to understand others' mental states requires self-reflection as a basis for interpreting their experience (Carruthers, 2009). Many authors distinguish between two ToM (e.g., Duval, Piolino, Bejanin, Eustache, & Desgranges, 2011): cognitive ToM and affective ToM. Cognitive ToM concerns the cognitive status, beliefs, thoughts or intentions of others, while affective ToM concerns the affective states, emotions and feelings of others.

In addition to growing evidence of links between the processing and representations of others and of oneself (e.g., Centelles, Assaiante, Nazarian, Anton, & Schmitz, 2011; Corcoran & Frith, 2003; Duval, Desgranges, Eustache, & Piolino, 2009), one of these links seems to be their dependence on metacognitive and executive functions, i.e., the capacity to engage in mental activity on one's own mental processes, i.e., to "think on one's own thoughts" (Perner & Lang, 2000). On the one hand, the self is a higher-level construct (e.g., a working self, Conway, 2005) that through executive processes such as selection and inhibition, guides and modulates different cognitive systems, such as memory encoding and retrieval, affects and behaviors. It plays a crucial role in motivation, subjective self-evaluations and the management of self-goals in an individual's life, allowing the construction of a coherent and positive self-image (Conway, 2005; Klein et al., 1989). Many studies have reported strong links between executive functions and self-related processes, such as autobiographical memory retrieval, especially in neurological or psychiatric diseases (Baddeley & Wilson, 1988; Fivush & Nelson, 2004; Matuszewski et al., 2006; Piolino et al., 2010; Winthorpe & Rabbitt, 1988). On the other hand, understanding the mental states of others rests on the ability to inhibit our own perspective and integrate the various contextual elements that determine the behavior of others. This relationship between ToM skills and executive functioning has already been largely highlighted in studies of participants with typical (Carlson, Moses, & Breton, 2002) and atypical development such as autism (Pellicano, 2010). Moreover, many authors including Duval et al. (2011) showed that the cognitive component of ToM is particularly based on the operation of executive functions.

Schizophrenia (SCZ) is a particularly interesting model to study the interplay between self-reference processes and ToM, since SCZ is linked to particularities of subjective experience (e.g., the feeling of not being quite like oneself, and disintegration of self-consciousness, Lalova et al., 2013; Sass & Parnas, 2003). In fact, symptoms in SCZ such as delusions of control or thought insertion typically refer to the dysfunction of the self in the social world (Corcoran & Frith, 2003) and appear to stem from a failure to recognize one's own actions and thoughts (Morgan et al., 2011). Moreover, the literature on SCZ reports a set of cognitive impairments including memory (Palmer, Dawes, & Heaton, 2009), social skills (Bazin et al., 2009), and executive functions (Braff et al., 1991), that are considered as central elements in SCZ and that contribute to the severe handicap observed in patients' daily life.

Harvey, Lee, Horan, Ochsner, and Green (2011) were among the first to investigate the SRE in SCZ with an incident memory task of personality traits encoded in three conditions: structural processing ("Are the letters of the word uppercase or lowercase?"), social desirability ("Is the trait socially desirable for other people in general?") and semantic self-reference ("Does this personality trait describe you?"). Their results supported the growing literature highlighting the lack of SRE in SCZ (Bedford & David, 2014; Pauly, Kircher, Weber, Schneider, & Habel, 2011). Patients, unlike controls, failed to show an improved recognition of adjectives encoded in the self-reference condition in comparison with alternative encodings (e.g., adjectives encoded in a social desirability condition). However, this study did not investigate SRRE and the two possible routes to SRE (semantic and episodic) as evidenced by Klein et al. (1989). Moreover, it did not investigate the links with