cortex (PFC), lateral and medial temporal lobes (MTL, hippocampus, parahippocampus), ventral parietal cortex and posterior cingulated cortex (Cabeza & St Jacques, 2007).

Studies assessing autobiographical memory in Parkinson's disease are scarce. In fact, to the best of our knowledge, only two studies have been published on this topic (Sagar, Cohen, Sullivan, Corkin, & Growdon, 1988; Smith et al., 2010). In their inaugural study, Sagar et al. (1988) measured memory for personal events in PD using a modified version of the paradigm proposed by Crovitz and Schiffman (1974). Parkinson's patients with and without dementia were presented with ten cues such as bird, car, boy and were asked to generate personally experienced events from any lifetime period. Results showed that the PD group recalled fewer memories than control participants and also suggested that recall of personally experienced events in PD was characterized by overgenerality. Overgenerality of autobiographical memory (Williams & Broadbent, 1986) is defined as the tendency to recall repeated events or events lasting more than one day rather than specific events. The findings from Sagar et al. (1988) showed that PD patients were less likely to recall time-specific events and prone to generalize across similar episodes. In a more recent experiment, we explored whether or not autobiographical memory in PD was indeed characterized by overgenerality, in other words a lack of specificity (Smith et al., 2010).

The novelty of this study was to assess autobiographical memory in PD by referring to recent AM models (Conway&Pleydell-Pearce, 2000) and to measure two forms of AMs: personal facts and personal events. To do so, a modified version of the autobiographical fluency task proposed by Dritschel, Williams, Baddeley, and Nimmosmith (1992) was used. Participants were presented with five different lifetime periods (0–18 years, 19–30 years, 31–last 5 years, last 5 years, last 12 months; Piolino, Belliard, Desgranges, Perron, & Eustache, 2003) and were given 2 min to generate personal events and then another 2 min to generate personal facts (names). Results showed that the PD group recalled fewer personal events, especially for the last two lifetime periods, but were able to recall as many names as controls.Whenasked to give personal events, participants were instructed to give short descriptions of specific memories lasting no longer than 1 day. To assess overgenerality, the personal events generated were then classified as either general (e.g., narrative lasting more than 24 hrs or events fused together) or specific.

Supporting Sagar's first findings, our results showed a lack of specificity in autobiographical memory in Parkinson's disease as participants recalled fewer specific memories. In line with Sagar et al. (1988) suggestion, we proposed that overgeneral memories in PD are due to a failure to retrieve the information. Many findings support to the idea that retrieval deficits could lead to fewer personal memories and in particular fewer personal specific memories being retrieved in Parkinson's disease. The idea of retrieval deficits in PD is not novel. Indeed, many neuropsychological explorations of episodic memory in PD have demonstrated that deficits arise when patients are given a free recall task, whilst memory performance is relatively spared in recognition and cued-recall tasks (Flowers, Pearce, & Pearce, 1984; Ivory, Knight, Longmore, & Caradoc-Davies, 1999; Lees & Smith, 1983; Taylor, Saint-Cyr, & Lang, 1986). A similar pattern of results was found in studies exploring remote memory for public events that is deficits

in the recall of public events in PD when a recall task was used as opposed to a recognition task (Sagar et al., 1988;Venneri et al., 1997). These findings lead Sagar et al. (1988) to suggest that the deficits in remote memory for public events in PD were attributable to a retrieval failure.

Models of AM distinguish between two forms of memory retrieval. Direct (Conway & Pleydell-Pearce, 200) or associated (Moscovitch, 1992) retrieval arises from the presentation of a highly specific and personally relevant cue which activates autobiographical knowledge and initiates a memory into consciousness (e.g., the smell of baking reminding you of cooking with your grandmother in her kitchen in Dorset). Generative (Conway & Pleydell-Pearce, 2000) or strategic (Moscovitch, 1992) retrieval occurs when generic cues (such a holiday from childhood) are used to probe memory retrieval. If participants are required to retrieve a specific memory and only generic cues are provided, participants need to engage in a memory search to gain access the memory in question. They will engage in an iterative search process whereby cues will be used to access specific memory records. If the wrong information is returned the search will be elaborated (search-elaboration process). For example, thinking where I went to the seaside with my Grandmother when I was young I remember she lived in Lancashire and we once went on a day out. Through process of search elaboration I then retrieve event specific details such as what we did and with whom (e.g., going on a horse and carriage ride). Our previous study showed that in PD retrieval of personal events lacked specificity, and we proposed that overgenerality of AM in PD was due to a failure of generative retrieval processes. Indeed, according to Conway and Pleydell-Pearce (2000) a dysfunction of the generative retrieval process leads people to abort the search process and this impacts on the specificity of the memories retrieved.

Furthermore, we suggested that AM difficulties in PD might be due to a reduction in connectivity in the brain network involved in AM (Addis, Wong, & Schacter, 2007) and maybe specifically to a dysfunction of the left lateral PFC highly involved in generative retrieval (Conway et al., 1999). The question is thus how to increase retrieval of specific autobiographical memories in PD. Of particular interest for the current exploration, studies have showed that providing external cues is an effective way to overcome memory problems in PD (Buytenhuijs et al., 1994; Weingartner, Burns, Diebel, & Lewitt, 1984). For example, Sagar et al. (1988) showed that giving cues at retrieval helped participants with PD to retrieve previously generated personally experienced events. Participants were first presented with ten cues (bird, car, boy) and asked to give personal events. The following day, participants were then presented with the cue words again and asked to recall the events generated the day before. Then, if participants failed to regain memories generated on Day 1 they were cued again with key words, chosen by the experimenter, from their Day 1 memories. Results showed that when cued with specific key words, PD participants regained their Day 1 performance thus supporting the retrieval hypothesis. These studies thus support the idea that providing people with PD with specific cues should increase their retrieval.

In the current follow-up study, employing the well-established autobiographical fluency task (Dritschel et al., 1992), in the first stage of the experiment, participants were asked to retrieve AMs from five lifetime periods (Smith et al., 2010; Piolino et al., 2003). Based on our previous findings we predicted that participants with PD would retrieve fewer

specific memories especially from the most recent lifetime periods (Smith et al., 2010). After a delay, we asked them to retrieve the memories produced in the first stage in three different retrieval conditions: free recall, generative recall where we gave the lifetime periods as cues, and finally specific recall where we gave participants cues corresponding to titles that they themselves gave to their AMs produced in the first stage of the experiment. Compared to Sagar et al.'s (1988), the novelty of this study was not only to use lifetime periods as cues but also in the second stage of the experiment to have a free recall phase where participants were not given any cues when asked to recall the information. Our prediction based on previous findings issued from the memory literature (Kliegel, Altgassen, Hering, & Rose, 2011; Price, 2010) and from Sagar et al.'s (1988), is that overall patients will benefit from being given cues. However, we also predict that PD participants will benefit more from specific cues than generic cues because retrieval processes involved when specific cues are available involve less strategic processes.

2. Method

3.

Participants

Sixteen participants with idiopathic Parkinson's disease (9 females) were recruited through the Leeds (UK) branch of the Parkinson's Society. The diagnosis of Parkinson's disease was established by a neurologist in accordance to the clinical criteria of the United Kingdom Parkinson's disease Society Bank (UK, PDSBB; Gibb & Lees, 1988). Sixteen age matched older adults controls (OAC, 11 females), free of neurological or psychiatric illness were recruited from the University of Leeds Adult pool. All were native English speakers and had received at least8 years of education. Demographic characteristics are reported in Table 1. Exclusion criteria for both groups included dementia (Mini-Mental State Exam score <26, MMSE, Folstein, Folstein, & McHugh, 1975), a history of traumatic brain injury or neurological disorder other than PD, medications known to affect cognitive function (e.g., anticholinergics, antidepressants, antipsychotics), a history or alcohol or drug abuse, or a psychiatric disorder.

Furthermore, given that depression itself leads to deficits in AM (Williams et al., 2007), only participants without severe depression (Geriatric Depression Scale score, Sheikh & Yesavage, 1986) were included. There were no significant differences between the two groups for age ($t(30) = 0.30$, $p = .77$) and MMSE score ($t(30) = 0.59$, $p = .56$). Participants also completed two standardized tests of executive function: the Trail Making Task and the Stroop task. The Stroop task (Stroop, 1935) required participants first to read words that pertain to different colours for example red, printed in black ink and then to read colour words written in incongruent colours for example the word RED written in blue ink. The outcome measure was the interference that is the time it took to complete the control conditions compared with the interference condition. The Trail Making Task (TMT; Reitan, 1958) comprises two parts: Part A in which the subject is asked to quickly draw lines on a page connecting 25 consecutive numbers and Part B in which the subject must draw the lines alternating between numbers and letters. The errors and the time to complete Part B minus Part A were recorded. There were no group differences on the Trail Making Task time scores (PD: M = 75.95, SD = 53.47; OAC: M = 46.31, SD = 38.02), or the TMT error scores (PD:M = 0.81, SD = 1.37; OAC: M = 0.44, SD = 1.50). There were