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Parkinson's patients' executive profile and goals they set for improvement: Why is cognitive rehabilitation not common practice?

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Impairments in executive functions (EF) are the core cognitive impairment in patients with Parkinson's disease (PD). Surprisingly, cognitive rehabilitation is not routinely offered to patients with PD. However, in patients with acquired brain injury (ABI), cognitive rehabilitation, in particular strategic executive training, is common practice and has been shown to be effective. In this study, we determined whether PD patients have different needs and aims with regard to strategic executive training than ABI patients, and whether possible differences might be a reason for not offering this kind of cognitive rehabilitation programme to patients with PD. Patients' needs and aims were operationalised by individually set goals, which were classified into domains of EF and daily life. In addition, patients with PD and ABI were compared

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on their cognitive, in particular EF, profile. Overall, PD patients' goals and cognitive profile were similar to those of patients with ABI. Therefore, based on the findings of this study, there is no reason to assume that strategic executive training cannot be part of standard therapy in PD. However, when strategic executive training is applied in clinical practice, disease-specific characteristics need to be taken into account.

Keywords: Neuropsychological rehabilitation; Parkinson's disease; Acquired brain injury; Goal setting; Executive functions.

INTRODUCTION

Cognitive impairments are frequently documented in patients with Parkinson's disease (PD). In particular impairments of executive functions (EF) are already present in mild to moderate stages of PD and can even be observed in newly diagnosed patients. Executive dysfunctions are therefore considered a core feature of cognitive impairment in PD (Kudlicka, Clare, & Hindle, 2011; McKinlay, Grace, Dalrymple-Alford, & Roger, 2010; Muslimovic, Post, Speelman, & Schmand, 2005). EF are those capacities that enable individuals to adapt to new situations and to develop and pursue life goals in a constructive and productive way (Burgess & Simons, 2005). Impairments in EF can thus lead to a decreased independence in daily life functioning.

Pharmacological treatment, in particular dopaminergic medication, is the standard therapy in patients with PD. The literature, however, shows inconsistent results regarding whether pharmacological treatment enhances or impairs executive functioning (Cools, Barker, Sahakian, & Robbins, 2001, 2003; Vale, 2008). Nevertheless, it is obvious that patients with PD on dopaminergic medication still suffer from impairments of EF which they also experience in daily life (Koerts et al., 2011, 2012). However, in clinical practice, admittance to neuropsychological rehabilitation programmes is not yet part of standard therapy for patients with PD, despite the fact that these programmes have been shown to be effective in other patient groups with executive impairments (e.g., in patients with acquired brain injury) (Cicerone et al., 2011; Wilson, 2008). This is even more surprising given the fact that over the past few years several studies have been conducted that aimed to show the effectiveness of cognitive rehabilitation programmes in patients with PD (Edwards et al., 2013; Hindle, Petrelli, Clare, & Kalbe, 2013; Mohlman et al., 2010; Mohlman, Chazin, & Georgescu, 2011; Naismith, Mowszowski, Diamond, & Lewis, 2013; Nombela et al., 2011; Paris et al., 2011; Reuter, Mehnert, Sammer, Oechsner, & Engelhardt, 2012; Sammer, Reuter, Hullmann, Kaps, & Vaitl, 2006; Sinforiani, Banchieri, Zucchella, Pacchetti, & Sandrini, 2004). Overall, the results of these studies lead to the conclusion that cognitive

rehabilitation is also a feasible and effective treatment option for patients with PD. Especially with regard to impairments of EF, one study (Reuter et al., 2012) demonstrated that a multifaceted rehabilitation programme consisting of strategy training alongside function and skill training, resulted in improvements in daily life functioning and quality of life of patients with PD.

Strategy training of EF aims to teach patients a top-down approach that can be adapted flexibly and applies to various executive problems that patients encounter in daily life situations, and therefore focuses on improving daily life functioning and quality of life of patients with PD (Spikman & Fasotti, 2012). Cicerone et al. (2011) concluded in their review that cognitive rehabilitation programmes involving strategy training have been proven to be the most effective approaches for improving EF impairments in patients with ABI, in whom impairments of EF are frequently found (Bouwens, van Heugten, & Verhey, 2009; Ertzgaard, Ward, Wissel, & Borg, 2011; Evans, 2012). For example, Spikman et al. (2010) showed that patients with ABI who received executive strategy training resumed their previous roles in daily life and accomplished their individual goals significantly better than patients who received computer training. Also, patients with ABI who received executive strategy training showed more improvement with regard to setting realistic goals, planning, initiative and regulation compared to patients who received computer training.

Since impairments of EF are common in PD and strategy training has proven effective in other patient groups with EF impairments, this raised the question why it is not yet common practice to offer strategy training to patients with PD. One of the reasons might be that therapists do not consider this as an appropriate treatment option because they believe that disease-specific characteristics, such as motor impairments, fatigue and the progressive, neurodegenerative nature of the disease, might hamper patients with PD from profiting from these rehabilitation programmes. Another possibility is that, despite the fact that executive impairments are common in patients with PD, it might be that these patients want to accomplish different goals and show a substantially different cognitive, in particular EF, profile than patients with ABI who are admitted to rehabilitation programmes. This might lead therapists to believe that cognitive rehabilitation is not a suitable option for patients with PD.

To increase insight into whether this latter possibility is legitimate, it was determined whether patients with PD have different individual needs and aims for cognitive rehabilitation than a heterogeneous group of patients with ABI, e.g., traumatic brain injury (TBI), stroke and other neurological conditions, who successfully completed a strategy training. If we find that there are no substantial differences between these two groups regarding these aspects, this might lower the threshold for offering strategy training to patients with PD. Patients' needs and aims were operationalised by individual goals that patients specified within the context of executive strategy

training. In addition, to what extent patients with PD show a different cognitive, in particular EF, profile than patients with ABI was also examined. The heterogeneous group of patients with ABI was chosen as a control group since (1) impairments of EF belong to the core cognitive impairments in all these subgroups of patients with ABI and (2) because strategic executive training has already been shown to be effective in this mixed group of patients with ABI (Spikman et al., 2010).

METHODS

Ethics statement

This study was approved by the medical ethical committee of the University Medical Centre Groningen, The Netherlands. All patients voluntarily agreed to participate by means of written informed consent and were treated according to the declaration of Helsinki.

Patients

Original descriptions of rehabilitation goals were available for 73 patients with ABI who participated in the study of Spikman et al. (2010). These 73 patients with ABI (31 with TBI, 31 with stroke, and 11 with other neurological conditions, such as cerebral tumours and encephalitis) were included in order to re-analyse their data for the purpose of the current study. All patients had been treated in an outpatient rehabilitation centre. For a more detailed description of the ABI patients, please see Spikman et al. (2010).

In addition, 26 idiopathic patients with PD were included. These patients were either recruited in The Netherlands from the departments of neurology of the University Medical Centre Groningen, Maastricht Medical University, or the hospital Nij Smellinghe in Drachten. Patients were diagnosed according to the UK Parkinson's Disease Brain Bank Criteria and were assessed while on regular dopaminergic medication. A levodopa equivalent daily dose (LEDD) was calculated for all patients with PD (Esselink et al., 2004). The severity of the motor symptoms of patients with PD was examined using the Unified Parkinson's Disease Rating Scale part three (Fahn & Elton, 1987) and the Hoehn and Yahr (H&Y) scale (Hoehn & Yahr, 1967). Patients in H&Y stage 4 (severe disability, still able to walk or stand unassisted) and stage 5 (wheelchair bound or bedridden unless aided) were not included. Patients with PD were significantly older than patients with ABI ($t = -8.30$, $p < .001$). Groups did not differ with regard to gender ($\chi^2 = 0.07$, $p = .796$) or level of education (Mann-Whitney $U = 796.50$, $p = .208$). Table 1 shows descriptive variables and disease characteristics of both patient groups.

TABLE 1
Means (SDs) of descriptive and disease characteristics of ABI (*n* = 73) and PD (*n* = 26) patients

	<i>Patients with ABI</i>	<i>Patients with PD</i>
	<i>M (SD) Range</i>	<i>M (SD) Range</i>
Age in years	42.7 (13.9) 17–65	62.0 (8.6) 48–79
Education	5.0 (1.1) 2–7	5.3 (1.3) 2–7
Sex m/f (%)	47/26 (64.4/35.6)	16/10 (61.5/38.5)
UPDRS, part III	–	24.8 (11.4) 10–59
H&Y	–	2.4 (0.4) 1.5–3
LEDD	–	771.0 (400.8) 160–1670

Educational level was classified based on a 7-point scale; 1 ≤ 6 years primary school and 7 = university degree. Severity of motor symptoms in PD was measured by the UPDRS motor part; range 0–108 max. H&Y = Hoehn and Yahr scale (range 0–5). LEDD = levodopa equivalent daily dose. UPDRS = Unified Parkinson’s Disease Rating Scale. Please see Spikman et al. (2010) for a more detailed description of patients with ABI.

Study design and procedure

Both patient groups were assessed within randomised controlled trials (RCT). In the study of Spikman et al. (2010), patients with ABI were included if they (1) had a minimal post-onset time of 3 months, (2) were aged between 17 and 70 years, (3) lived at home, (4) had a history of daily life problems related to impairments in EF reported by themselves or their proxies, (5) experienced these impairments as burdensome, and (6) were motivated to participate in a cognitive rehabilitation programme. Consistent with these criteria, patients with PD or their proxies had to complain about problems related to executive dysfunctioning in daily life, had to experience these problems as burdensome, and had to be motivated to take part in a cognitive rehabilitation programme. Neurological and severe psychiatric comorbidity were exclusion criteria in both groups. In addition, severe cognitive comorbidity (including screening for dementia) was an exclusion criterion in both groups. The other inclusion and exclusion criteria were checked during a semi-structured interview with the patient and his or her proxy and on the basis of patients’ medical files.

Patients with ABI and PD who met the abovementioned criteria underwent an extensive neuropsychological assessment, which consisted of several neuropsychological tests and a questionnaire. Additional inclusion criteria were a standard age score on the Behavioural Assessment of the Dysexecutive Syndrome (BADS; Wilson, Alderman, Burgess, Emslie, & Evans, 1996) categorised as “low average” or lower, or a discrepancy between this standard age score and premorbid IQ measured by the Dutch Groninger Intelligence Test–short version (Luteijn & van der Ploeg, 1983) of 15 points, and standard

scores of 2 or lower on the BADS Six Elements Test or Zoo Map subtests. A total score of at least 18 points on the Dysexecutive Questionnaire (DEX; Wilson et al., 1996) was a final inclusion criterion (Spikman et al., 2010). There is a more detailed description of these tests and questionnaire below. If patients showed impairments on these subjective and/or objective measures of EF, they were randomly assigned to the experimental or control rehabilitation group.

In both conditions, patients were asked to set three individual rehabilitation goals. The current study only focuses on these rehabilitation goals.

Goal descriptions of patients with ABI were retrieved from original patient files. Of the patients with ABI, four had only two written goal descriptions in the original files and one had five goal descriptions all of which were included for analysis. All patients with PD specified three goals, which were also retrieved from their files.

Neuropsychological measures of executive and general cognitive functions

The following neuropsychological tests and questionnaire were administered in order to describe the cognitive and EF profile of patients with ABI and PD.

Executive functions. All subtests of the BADS (Wilson et al., 1996) were administered. The sum of profile scores resulted in a standard age score and a related clinical classification. Results of the subtests Zoo Map (total score part 1) and Six Elements were further analysed in order to study planning behaviour. The ratio B/A in the Trail Making Test (Reitan, 1958) was used to measure cognitive flexibility. Patients' ability to inhibit responses was measured by means of the ratio Color-Word card/Word card of the Stroop Color Word Test (Stroop, 1935).

The total score of the DEX questionnaire (Wilson et al., 1996) was used to measure subjective complaints related to problems with executive functioning in daily life. This questionnaire was completed by patients and their proxies. The difference of scores (patient total score–proxy total score) was used as a measure of self-awareness (Spikman et al., 2013). In the case of three patients with ABI, a therapist instead of a partner or family member completed the proxy version of the DEX.

General cognitive functions. The Rey Auditory Verbal Learning Test (Dutch version; RAVLT; Deelman, Brouwer, van Zomeren, & Saan, 1980) was administered to study the immediate and delayed recall of unrelated verbal information. The total score of the Digit Span forward and backward of the Wechsler Adult Intelligence Scale (WAIS; Wechsler, 1987) was used to evaluate short-term verbal memory. Psychomotor speed was

measured with the Trail Making Test (TMT; Reitan, 1958) part A and the Word card of the Stroop Color Word Test (Stroop, 1935).

Goal classifications

In order to compare patients’ aims and needs, we classified rehabilitation goals of patients with PD and ABI twice: first into domains of EF and subsequently into domains of daily life activities. The classification of EF was based on Ylvisaker’s (1998) definition and contained the following EF domains; (1) Planning, (2) Regulation, (3) Time management, (4) Initiative, (5) Self-awareness, (6) Other EF (i.e., a goal which was related to EF but could not be classified into one of the other domains), and (7) Other (i.e., a goal that was not related to EF at all). Regulation included self-monitoring, inhibiting irrelevant behaviours, and cognitive flexibility. The category “Time management” was added to the original definition of Ylvisaker, based on literature supporting the idea that a conscious awareness or sense of time is required for goal-directed behaviour and is therefore a legitimate aspect of EF (Barkley, 2011). Table 2 presents a detailed description of the classification.

The World Health Organization’s (2002) International Classification of Functioning, Disability, and Health was used for defining a classification of basic functioning and daily life domains (Heerkens, Hirs, de Kleijn-de Vrankrijker, van Ravenberg, & ten Napel, 2002). This led to a classification consisting of the following domains: (1) Cognitive functioning (non-EF), (2) Executive functioning, (3) Physical functioning, (4) Mental functioning and

TABLE 2
Classification of domains of executive functions

<i>Domains of EF</i>	<i>Definition</i>
(1) Planning	Goals that are related to mental processes preceding the execution of a task.
(2) Regulation	Goals that apply to the actual process of execution of a task.
(3) Time management	Goals that are explicitly related to deficits in estimating time.
(4) Initiative	Goals that apply to motivating oneself to actually start activities and/or goals that are aiming for a positive change compared to the current level of activities, such as implementing more different activities or accomplishing certain activities more often.
(5) Self-awareness	Goals that are related to a lack of awareness associated with disease-specific deficits.
(6) General EF	Goals that contain two or more domains of EF. However, if it is explicitly stated which domain has most priority, than the goal can be classified into one of the former categories.
(7) Other	Goals that are not related to EF.

emotion regulation, (5) Self-care, (6) Occupation and education, (7) House-keeping and gardening, (8) Finances and administration, (9) Leisure and community life, (10) Mobility, (11) Social relations, and (12) Communication. Table 3 shows this classification system in more detail.

The classification systems were developed in several steps. Three independent raters (T.T.V., J.M.S. and J.K.) classified all rehabilitation goals into domains of EF and subsequently into domains of basic functioning and daily life during a first classification round. Since the inter-rater reliability was not sufficient, adjustments were made to the definition of domains in both classifications, leading to the classification systems as shown in Tables 2 and 3. Subsequently, all goals were classified again, a process that resulted in reliable ratings. These final classification systems were used by a fourth independent rater (H.T.D.) to classify all rehabilitation goals again. The ratings of H.T.D. were reliable when compared to the ratings of T.T.V. (see below for information about the inter-rater reliability). The ratings of T.T.V. were eventually used for further analyses.

Statistical analyses

In order to assess the quality of the goal classifications, the inter-rater agreement of both classifications (EF and daily life domains) was calculated by using Cohen's Kappa. Furthermore, Chi-square tests were performed to compare distributions of EF goals and daily life goals between patient groups. Because all statistical assumptions were met, the cognitive and EF

TABLE 3
Classification of domains of basic functioning, daily life activities and participation

<i>Domains</i>	<i>Examples</i>
(1) Cognitive functioning (non EF)	Memory, reaction speed, visual perception, information processing.
(2) Executive functioning	Planning, regulation, initiative, attention.
(3) Physical functioning	Fatigue, fitness, energy, motor functions.
(4) Mental functioning and emotion regulation	Self-esteem, self-confidence, nervousness, specific emotions.
(5) Self-care	Bathing, shaving, getting dressed, eating and drinking.
(6) Occupation and education	Work-day planning, homework, teaching, organising files.
(7) Housekeeping and gardening	Cleaning, cooking, mowing, repairs.
(8) Finances and administration	Payments, overview income and expenses, use of ATM machine, sorting bills.
(9) Leisure & community life	Hobbies, holiday, politics, religion
(10) Mobility	Driving, public transport, taxi, biking.
(11) Social relations	Friends/acquaintances, family, partner/children, colleagues.
(12) Communication	Conversations, phoning, reading, e-mailing.

profiles of patients with PD and ABI were compared using ANCOVAs. As patient groups differed significantly with regard to age, this variable was used as a covariate in the model. The alpha level of .05 was adjusted for multiple comparisons using the Bonferroni correction, resulting in an alpha level of .004. Furthermore, Cohen's d was calculated for all neuropsychological tests and questionnaire comparisons between patients with PD and ABI. An effect size of $< .2$ was labelled as marginal, .2 as small, .5 as medium, and .8 as large (Cohen, 1992). Paired samples t -tests were used to compare ratings of patients with PD and ABI to ratings of their proxies on the DEX questionnaire. Since the ABI group consisted of TBI patients, stroke patients, and patients with other neurological conditions, ratings of patients and proxies on the DEX questionnaire were also analysed for each subgroup independently with paired samples t -tests. Results of neuropsychological tests were also analysed from a clinical perspective. Therefore, test results of the RAVLT, Digit Span, and Trail Making Test were compared to normative data. Performances that fell within the lowest 10% of the normative samples were considered to be *impaired* (Lezak, Howieson, Loring, Hannay, & Fischer, 2004). The BADS total score was transformed in a standardised scaled age score, which can be interpreted as a clinical score ranging from impaired, borderline, low-average, average, above average, high to very high. These descriptive data are reported and compared between groups by means of percentages.

RESULTS

Classifications: Inter-rater reliability

The classification of goals into domains of EF resulted in a Cohen's Kappa of .71. The agreement between raters regarding the classification of goals in domains of daily life functioning was .86. According to the classification proposed by Landis and Koch (1977), the inter-rater reliability or agreement between ratings ranged from substantial to almost perfect.

Classifications of EF and daily life domains: Comparisons between patients with PD and ABI

The group of 73 patients with ABI formulated 217 goals and the group of 26 patients with PD specified a total of 78 goals. Figure 1 shows the classification of goals into domains of EF for both patient groups. The percentage of goals that were set on "Time management" was significantly higher in patients with PD than in patients with ABI ($\chi^2 = 15.57, p < .001$), whereas patients with ABI set a significantly higher percentage of goals on cognitive domains that were not related to EF when compared to patients with PD ($\chi^2 = 6.13, p = .013$). Furthermore, in both groups the majority of goals were set on the

Figure 1. Rehabilitation goals of patients with PD and ABI classified into domains of EF (percentage of total number of goals set within patient groups). Chi-square test: * $p < .05$, ** $p < .01$.

“Regulation” domain, including goals related to self-monitoring, inhibition of irrelevant behaviours and cognitive flexibility. Patients with ABI came up with only two goals in the domain of “Self-awareness”, whereas patients with PD set no goals at all in this domain. For patients with ABI, the top three domains of EF in which most goals were set, were, respectively, “Regulation”, “Initiative” and “Planning”. For patients with PD the top three were “Regulation”, “Planning” and “Initiative”.

When goals were classified into domains of daily life, a significant difference was found between our patient groups for “Housekeeping and gardening” ($\chi^2 = 12.95$, $p < .001$). Figure 2 shows that patients with PD set a considerable higher percentage of goals within this domain than did patients with ABI. There were no significant differences found between groups with regard to the other domains. The majority of goals of both patients with PD and ABI were classified in the domain of “Executive functions”, indicating that these goals were not focused on specific daily life domains. Remarkably, none of patients with PD formulated goals that fell into the domain of “Physical functioning”, whereas in patients with ABI the lowest number of goals was set on “Self-care”. Patients with ABI set most goals within the following three domains: “Executive functioning”, “Leisure and community life”, “Social relations” and “Cognitive functioning” (in the latter two domains the same number of goals was formulated). For patients with PD, the top

Figure 2. Rehabilitation goals of patients with PD and ABI classified into domains of basic cognitive functions and daily life activities and participation (percentage of total number of goals set within patient groups). Chi-square test: $**p < .01$.

three were as follows: “Executive functioning”, “Housekeeping and gardening” and “Communication”.

General cognitive and EF profile of patients with PD and ABI

Patients with PD and ABI showed only a minor difference in performance on tests of memory, which did not reach significance (see Table 4). It was found that 42.3% of patients with PD and 43.8% of patients with ABI showed an impaired performance on the immediate recall of the RAVLT. The performance on the delayed recall of the RAVLT was labelled as clinically impaired in 3.9% of patients with PD in contrast to 13.7% of the ABI group. With regard to short-term verbal memory a higher percentage of patients with ABI were impaired when compared to patients with PD (respectively 26.4 and 11.5%). No differences were found between patient groups on measures of psychomotor speed (see Table 4), even though 26.9% of patients with PD were considered to be clinically impaired in psychomotor speed compared to more than half of patients with ABI (50.7%).

Likewise, no significant differences were found between patients with PD and ABI on several measures of EF, such as cognitive flexibility, inhibition and planning (see Table 4), which is consistent with the marginal to

TABLE 4
Performance of ABI and patients with PD on neuropsychological measures of general
cognitive, executive functions and the DEX questionnaire

	<i>ABI</i> (n = 73)	<i>PD</i> (n = 26)	<i>ANCOVA</i>		<i>Effect size</i>
	<i>M</i> (SD)	<i>M</i> (SD)	<i>F</i>	p	d
<i>Memory</i>					
RAVLT IR	39.72 (10.61)	35.00 (10.08)	0.20	.657	0.45
RAVLT DR	8.00 (3.37)	7.65 (2.83)	0.19	.662	0.11
Digit Span total score	13.26 (3.65)	14.65 (3.11)	3.61	.060	0.40
<i>Psychomotor speed</i>					
TMT A	47.65 (22.59)	46.81 (15.76)	0.38	.537	0.04
Stroop Word card	57.88 (17.55)	60.27 (28.62)	0.55	.459	0.11
<i>Executive Functions</i>					
TMT B/A ratio	2.19 (0.86)	2.54 (0.88)	0.82	.367	0.40
Stroop ratio	1.62 (0.30)	2.09 (2.47)	2.53	.115	0.37
BADS Zoo Map total score	0.86 (3.96)	−0.42 (4.40)	0.04	.950	0.31
BADS Six Elements	5.05 (1.35)	5.40 (1.08)	0.42	.516	0.27
BADS Standardised age score	89.21 (13.64)	94.00 (15.45)	0.67	.417	0.34
DEX Self	31.37 (13.00)	25.46 (9.88)	1.64	.203	0.48
DEX Proxy	32.11 (14.66)	23.35 (11.73)	1.82	.181	0.63
DEX Δ	−0.74 (12.90)	2.12 (11.91)	0.05	.819	0.23

ANCOVA = univariate analysis of covariance; BADS = Behavioural Assessment of the Dysexecutive Syndrome; DEX = Dysexecutive Questionnaire. Zoo map total score part 1; DR = delayed recall score; RAVLT IR = Rey Auditory Verbal Learning Test immediate recall score; TMT = Trail Making Test.

Significance $p < .004$, Bonferroni corrected alpha.

medium effect sizes. On the TMT ratio 28.0% of patients with PD and 21.9% of patients with ABI were impaired. Also, the standardised age score of the BADS was labelled as “low average” or “impaired” in 30.8% of patients with PD compared to 42.5% of patients with ABI. No significant differences were found between patients with PD and ABI regarding the number of problems with executive functioning in daily life as reported on the DEX questionnaire. Moreover, there was no significant difference between proxies of patients with PD and ABI with respect to the reported number of problems on the DEX questionnaire. When ratings for both groups of patients were compared to ratings of their proxies, no significant differences were found (paired samples t -test ABI: $t = 0.49$, $p = .626$; PD: $t = 0.91$, $p = .374$). The same was true when these ratings were independently compared for each subgroup of patients with ABI (TBI: $t = -1.07$, $p = .294$; stroke: $t = 0.56$, $p = .580$; other: $t = -1.05$, $p = .317$). Furthermore, there was no significant difference between patient groups when difference scores (DEX self-DEX proxy) of the DEX questionnaire were compared (see Table 4).

DISCUSSION

The results suggest that strategic executive training might be applied as a standard therapy for patients with PD, since their goals for cognitive rehabilitation of EF impairments, reflecting their needs and aims, as well as their EF profile are comparable to those of a mixed group of patients with ABI for whom strategic executive training has already been shown to be effective.

When patients' goals were classified into domains of EF, it was found that patients with PD and ABI set a comparable number of goals for the majority of EF domains (i.e., planning, regulation, initiative, self-awareness and general EF). Patients with PD did, however, set significantly more goals in the domain of "Time management" than patients with ABI. Since cognitive slowness is common in both patient groups (Broeders et al., 2013; Dikmen et al., 2009; Muslimovic et al., 2005; Rasquin et al., 2004; Spikman, van Zomeren, & Deelman, 1996), it is more likely that this finding is due to slowness of movement (bradykinesia), the single most important diagnostic criterion of PD (Bloem et al., 2010). Patients with PD indeed frequently reported that they do not take their motor problems sufficiently into account and therefore need more time for activities than expected. From a neuro-anatomical perspective the fronto-striatal network plays a dominant role in time estimation. Evidence suggests that difficulties in time estimation in patients with PD are related to dysfunctions of this dopaminergic fronto-striatal network (Perbal-Hatif, 2012).

Patients with ABI set a significantly higher percentage of goals that was not related to EF at all than patients with PD. When analysing these goals in more detail, it was found that they were mainly related to problems in the regulation of social behaviour, including emotion perception, and to problems with regard to lowered self-esteem, memory, visuo-perception, and fatigue. However, since impairments in social cognition, memory, visuo-perception, and fatigue are also reported in patients with PD, the finding that patients with ABI set more goals related to these aspects than patients with PD is difficult to explain (Goldman, Weis, Stebbins, Bernard, & Goetz, 2012; Herrera, Cuetos, & Rodríguez-Ferreiro, 2011; McDonald, 2013; Millis et al., 2001; Ponsford et al., 2012; Solla et al., 2013; Spikman et al., 2013). Possibly, patients with ABI experience deficits in these domains as more restricting in daily life than do patients with PD.

Both patient groups set the smallest number of goals on "Self-awareness" and the largest number within the domain of "Regulation". This indicates that patients experience most problems when executing daily activities. Again, these findings underline the similarity between patients with PD and ABI concerning specific impairments of EF experienced as most restricting in daily life.

Patients' goals were also classified into the domains of basic functioning, daily life activities, and participation. The most important finding here is that

in almost all domains (11 out of 12), no significant differences between patients with PD and ABI were found. Both groups are thus highly comparable with regard to problems experienced in these three domains. Patients with PD only set a significantly higher number of goals within the domain of "Housekeeping and gardening" compared to patients with ABI, indicating that patients with PD experience more problems with EF when preparing and executing tasks around the house. A possible explanation for this finding is the fact that patients with PD were significantly older than patients with ABI and therefore a higher number of them had retired. This usually means that people spend more time at home. However, other explanations are also possible. By far, most goals of patients with PD and ABI were classified in the domain of "Executive functioning", which was defined as one of the basic functioning domains. This might indicate that problems with EF do not hinder patients in specific daily life domains, but have an impact on daily life functioning in general. This is in line with previous studies stating that impairments in EF exert a negative influence on everyday life and lead to an overall reduced level of participation (Erez, Rothschild, Katz, Tuchner, & Hartman-Maier, 2009; Perna, Loughan, & Talka, 2012).

It is worth noting that even though PD is characterised by motor symptoms, patients with PD did not set goals to improve their "Physical functioning". This is in line with the idea that patients with PD find cognitive impairments in daily life more restricting than motor impairments (Cahn et al., 1998; Klepac, Trkulja, Relja, & Babic, 2008).

In addition to these comparisons, we performed a between group comparison of specified goals falling into the top three domains of basic functioning, daily life activities, and participation. Results of this comparison showed that patients with ABI set more goals in domains that are related to "Social relations", "Leisure and community" activities, and "Cognitive functioning" than patients with PD. On the other hand, patients with PD set more goals related to "Household activities" and "Communication". It thus seems that patients with PD aim at improving activities they undertake (around the house), whereas patients with ABI intend to improve their (social) activities. However, the finding that patients with PD set more "Communication" goals could possibly also be explained as a disease-specific characteristic. Some studies have found problems with production and comprehension of language to be common in PD and to be related to impairments in EF (Colman et al., 2009; Colman, Koerts, Stowe, Leenders, & Bastiaanse, 2011).

With regard to comparisons on neuropsychological measures, it was found that general cognitive and in particular EF profiles of patients with PD and ABI are comparable. No significant differences between groups were found concerning their performances on neuropsychological tests for memory, psychomotor speed and EF, and the number of problems with EF experienced in daily life. When results were interpreted from a clinical perspective, a large

number of patients with PD as well as patients with ABI showed a clinically impaired performance (ranging from at least 20 to 67% for most target measures) with respect to memory, psychomotor speed, and EF. This is in agreement with results of previously conducted studies (Elliott, 2003; Godefroy et al., 2010) and the fact that ABI and PD are characterised by a dysfunctioning of the (pre)frontal cortex due, respectively, to direct injury of brain tissue or a dopaminergic dysfunctioning of the fronto-striatal circuits. When comparing the ratings of patients and their proxies regarding the number of problems with EF in daily life, no significant difference was found between patients with ABI and their relatives. The same result was found in patients with PD and their relatives. The agreement between patients and their proxies can be interpreted as an indicator of intact self-awareness, since patients with impaired self-awareness tend to underestimate their impairments when compared to their proxies' perspective (Hart, Sherer, Whyte, Polansky, & Novack, 2004; Spikman & van der Naalt, 2010). In other words, EF impairments reported by patients with PD and ABI are reliable and must be taken seriously.

Even though results seem promising with regard to introducing strategic executive training as standard therapy, the study is also marked by a number of shortcomings. One limitation is that we were not able to retrieve information regarding the underlying pathology and severity of patients with ABI. This was because patients were recruited from an outpatient rehabilitation setting and that in the majority of cases their hospital files were not obtainable. A second limitation of this study was that the group of patients with PD was relatively small. The calculated effect sizes for the differences in performance on neuropsychological tests, however, ranged from small to medium, indicating that a larger sample size of patients with PD would not have resulted in different conclusions. Moreover, when analysing differences regarding goals and cognitive profiles between patients with ABI and PD, disease severity within the group of PD patients was not taken into account. This can be considered a limitation, since increasing disease severity possibly influences patients' goals and cognitive profiles. This would be an interesting question to answer in future studies. A final limitation of this study is the heterogeneity of the ABI group. Therefore a comparison between patients with PD and a group of patients with another neurodegenerative disease would have been desirable. However, according to our knowledge, strategic executive training is not offered to any other neurodegenerative patient group as standard therapy procedure. Moreover, in the context of the current study, this limitation can also be considered as a strength. Despite the great diversity of disease-specific characteristics within the group of patients with ABI, we still found that patients with PD were highly comparable to this group regarding their goals and the EF profile. This means that from a clinical perspective the heterogeneity of the

ABI group makes our conclusions even stronger than if we had only included a homogeneous TBI group.

In conclusion, based on our findings, we have no reason to assume that strategic executive training could not be offered as standard therapy to patients with PD. Results showed that patients with PD and ABI were not only comparable in terms of the rehabilitation goals they set, which reflect patients' needs and aims for cognitive rehabilitation, but were also comparable with regard to their cognitive and in particular EF profile. When considering the application of strategic executive training as standard therapy in patients with PD, neuropsychologists need to be aware, however, of disease-specific characteristics such as motor impairments and fatigue. In addition, for patients with PD the focus of strategic executive training should possibly be more on improving time management and functioning around the house. Future studies need to determine whether strategic executive training is actually effective in patients with PD, meaning that it results in improving patients' daily life functioning and quality of life. Furthermore, because of the neurodegenerative nature of PD, future studies should determine at which stage of the disease this treatment is suitable and for how long patients will benefit.

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