Intervention effectiveness for executive function in the Japanese population: A review

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日本における遂行機能障害への介入方法とその効果に関する文献レビュー

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要約

遂行機能の障害は、日常生活や社会生活に大きな影響を及ぼし目標に向けた行動の不適切さなどを引き起こす。日本においては、頭部外傷後の 67.8 %、脳血管疾患後の 24.7 % において遂行機能障害を合併する。遂行機能障害に対する介入には、1990 年代より問題解決訓練、自己教示法などの訓練方法が示され実施されているものの、本邦で実施され日本語で書かれた研究結果を系統的に整理した研究は見出せず、この現状を世界に発信する意義は大きい。本研究の目的は、本邦で頭部外傷と脳血管疾患を対象として実施された遂行機能障害に対する介入研究について、研究デザイン、対象疾患、評価指標、介入方法とアウトカムを分析することである。医学中央雑誌及び CiNii を用いて検索し、適格論文を抽出した結果、当該基準を満たした文献は 354 編中 17 編であった。研究デザインは、ランダム化比較試験（RCT: Randomized Controlled Trial）0 件、前後比較研究 2 件、事例研究が 15 件であった。対象年齢は 45.30±14.99、対象疾患は、脳血管疾患 17 名、脳外傷 20 名であった。評価指標は BADS（Behavioural Assessment of the Dysexecutive Syndrome）の他、WCST（Wisconsin Card Sorting Test）、Stroop 検査など複数の神経心理学的検査の他行動指標を組み合わせて用いられていた。介入方法は、問題解決法が 7 編と最も多く、次に、自己教示法 5 編の他、環境調整や机上課題、ADL、IADL、就労場面での介入と続き、全ての症例に神経心理学的所見や行動指標で改善が見られていた。各事例に対して体系化された介入ストラテジーを応用し、効果ある介入が実施されていたことから、今後、本邦における遂行機能障害に対するリハビリテーションにおいては、推奨されているストラテジーを普及していくと共に、RCT を用いた研究デザインを用いたエビデンスの構築が必要であることが示唆された。

Key words

executive function, intervention, rehabilitation, assessment, review

1. Introduction

Executive function was defined by Lezak (Lezak, 1982) as the mental capacity needed to set goals, make plans to achieve them, and effectively execute those plans. Executive function is today described as a complex comprehensive concept that includes working memory, inhibitory control, cognitive flexibility, planning, reasoning, and problem-solving (Cicerone, Dahlberg, Kalmar, Langenbahn, Malec, Bergquist, Felicetti, Giacino, Harley, Harrington, Herzog, Kneipp, Laatsch, & Morse, 2000).

The executive system manages and controls other cognitive abilities, such as attention and memory functions (Linden, Meulemans, Marczewski, & Collette, 2000). It then enables adaptation to novel and complex daily life situations (Collette, Hogge, Salmon, & Linden, M., 2006). Therefore, deficits in executive function have a dramatic impact on daily and social life, leading to reduced goal-directed behaviour and impaired social functioning (Hanks, Rapport, Millis, & Deshpande, 1999).

In Japan, patients with executive dysfunction accounted for 29.4 % of the total, of which 67.8 % suffered from traumatic brain injury (TBI) and 24.7 % from a stroke (Tokyo, 2008; Watanabe, 2016). Executive dysfunction, which is often associated with TBI, is common among young people and affects their

ability to go back to school and to work (Langlois, Rutland-Brown, & Wald, 2006).

Interventions for executive dysfunction have been systematically developed (Cicerone, Goldin, Ganci, Rosenbaum, Wethe, Langenbahn, Malec, Bergquist Kingsley, Nagele, Trexler, Fraas, Bogdanova, & Harley, 2019), such as Metacognitive Strategy Training (MST) (Goverover, Johnston, Toglia, & DeLuca, 2007), self-instructional training (Cicerone & Wood, 1987), problem-solving procedure (Cramon, Cramon, & Mai, 1991), and environmental adjustment (Sohlberg, Sprunk, Metzelaar, & Kristin, 1988).

The results of studies using these systematic training methods are reviewed by Cicerone et al. However, Japanese language articles are excluded from the review, and therefore, there are no systematic studies of intervention effectiveness that have been conducted and verified in Japan.

The purpose of this study was to analyze the study design, target disorders, evaluation indices, intervention methods, and outcomes of intervention studies for executive function disorders conducted in Japan for TBI and a stroke.

2. Methods

"Ichushi-Web" and CiNii (Scholarly and Academic Information Navigator) were used to search the articles for a comprehensive review of the content of interventions for executive dysfunction in Japan. All articles published up to November 2021 were included. "Ichushi-Web" is a medical article database that enables the most comprehensive review of biomedical articles in Japan (Japan Medical Abstracts Society, 2022). The following keywords were used in this search: "executive function" "intervention research," "rehabilitation," "physical therapy," and "occupational therapy. The search formula in "Ichushi-Web" is as follows: "(((("executive function (conscious process) / TH or executive function / AL)) and (PT = original paper) and ((intervention research / TH or intervention research / AL) or (rehabilitation / TH or rehabilitation / AL) or (Physical Therapy / TH or Physical Therapy / AL) or (Occupational Therapy / TH or Occupational Therapy / AL) and (Intervention Studies / TH or Intervention Studies / AL))))." CiNii is a database service that enables searches for academic information such as articles, books, journals, and doctoral dissertations (National Institute of Informatics, 2022). The search formula in CiNii was set as follows: executive function AND intervention AND (rehabilitation or physical therapy or occupational therapy). Three researchers (occupational therapists with more than 20 years of clinical experience) discussed and decided on the search formula to ensure the validity of the search formula.

The articles were reviewed by two members, and abstracts were prepared according to the following criteria after filling out the Study Review Form: (1) subject characteristics (age, gender, characteristics of injury, time since injury), (2) evaluation measures (ratings indicating executive dysfunction, pre-, and post-intervention testing), and (3) intervention characteristics (intervention setting, targeted functions, duration of intervention, intervention effects).

The abstracts or complete articles were reviewed according to the following eligibility criteria: (1) subjects were patients with executive dysfunction associated with a stroke or traumatic brain injury, (2) evaluation methods for executive dysfunction described, (3) intervention methods and intervention effects demonstrated, (4) interventions conducted and verified in Japan, (5) original papers, and (6) no inclusion period. The exclusion criteria were as follows: (1) qualitative studies, (2) observational studies, (3) academic journals, (4) conference proceedings, (5) review articles, (6) articles without adequate description of the intervention, (7) articles that did not include participants with a primary diagnosis of TBI or a stroke, and (8) articles with complications other than executive dysfunction such as children, mental illness, or dementia.

In the primary screening, we determined from the article title and abstract whether or not the article satisfied the eligibility criteria, and we accepted references that could not be determined explicitly.

The search resulted in the detection of 356 articles. Based upon the initial review of abstracts or full articles, we eliminated 297 reviews (97 studies of participants with other neurologic diagnoses, 221 with no description of the evaluation method, 59 experimental manipulations of subjects without neurologic deficit, 17 pediatric subjects, and 2 conference proceedings). As a result, 59 papers were accepted in the primary screening. An additional 42 articles were excluded after a complete review (24 studies of participants with other neurologic diagnoses, 26 with no description of the evaluation method, and 5 with no description of intervention methods). The 17 articles satisfied the eligibility criteria (Figure 1).

The 17 articles that satisfied the eligibility criteria were analyzed for the following items: study design, target diseases, endpoints, and intervention methods.

The authors have no conflicts of interest directly relevant to the content of this article.

3. Result

We fully reviewed and evaluated 17 studies (Table 1). The mean age of the subjects was 45.3 ± 14.99, and the diseases covered were a stroke in 17 subjects and TBI in 20 subjects. The years of publication of articles were 2 from 1990 to 2000, 9 from 2001 to 2005, 2 from 2006 to 2010, 3 from 2011 to 2015, and 1 from 2016 to 2020 (Figure 2). Intervention duration ranged from 6 to 40 weeks, and intervention frequency ranged from daily to once a month. The intervention sites were 8 hospitals, 8 outpatient/day services, and 2 real workplaces.

3.1 Study design

In terms of intervention design, there were 0 RCTs, 2 pre-

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┌─────────────────────────────────┐
│ Articles identified through      │
│ database searching               │
│ (n = 356)                        │
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                │
                ▼
┌─────────────────────────────────┐         ┌──────────────────────────────────────────┐
│ Articles screened (n = 356)      │         │ Articles excluded n = 297                  │
└─────────────────────────────────┘         │ Participants with other neurologic         │
                │          ┌──────────────┐  │   diagnoses (n = 97)                        │
                ├─────────▶│ Articles     │─▶│ No description of the evaluation method     │
                │          │ excluded     │  │   (n = 221)                                 │
                │          │ (n = 297)    │  │ Experimental manipulations of subjects      │
                │          └──────────────┘  │   without neurologic deficit (n = 59)       │
                ▼                             │ Pediatric subjects (n = 17)                 │
┌─────────────────────────────────┐          │ Conference proceedings (n = 2)              │
│ Full-text articles assessed for  │          │ Note:There are duplicates.                  │
│ eligibility (n = 59)             │          └──────────────────────────────────────────┘
└─────────────────────────────────┘
                │          ┌──────────────┐  ┌──────────────────────────────────────────┐
                ├─────────▶│ Articles     │─▶│ Full-textarticles excluded n = 42          │
                │          │ excluded     │  │ Participants with other neurologic         │
                │          │ (n = 42)     │  │   diagnoses (n = 24)                        │
                │          └──────────────┘  │ No description of the evaluation method      │
                ▼                             │   (n = 26)                                  │
┌─────────────────────────────────┐          │ No description of intervention methods      │
│ 17 articles                      │          │   (n = 5)                                   │
└─────────────────────────────────┘          │ Note: There is a duplication.               │
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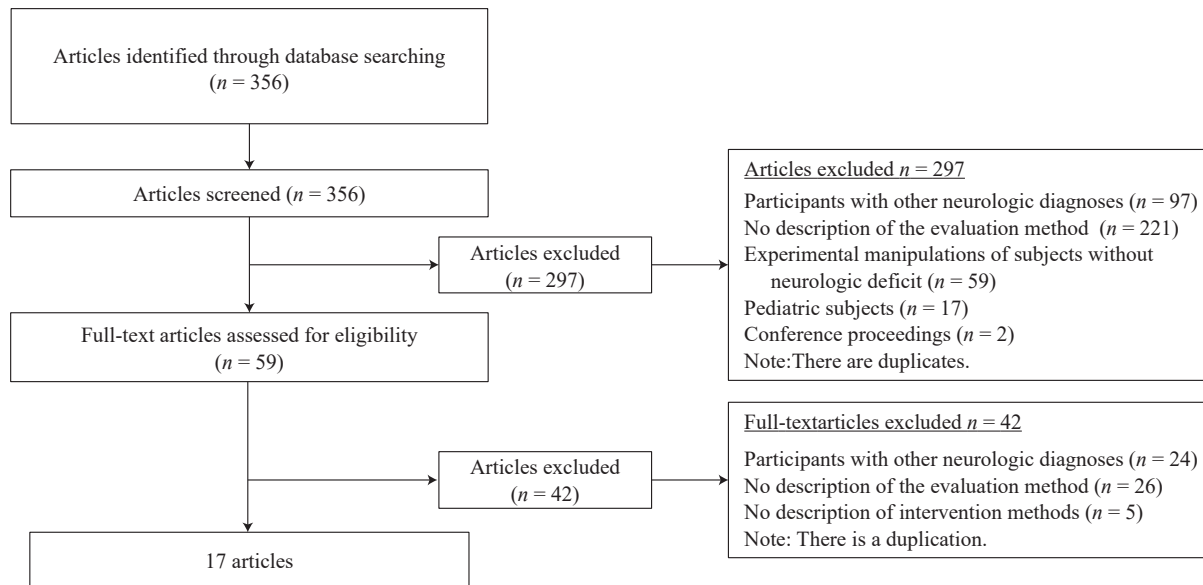
Figure 1: Identified articles from the literature search and screening process

post comparison studies, and 15 case reports.

3.2 Assessment tools

The assessment instruments included 10 Wisconsin Card Sorting Test (WCST), 8 Behavioural Assessment of the Dysexecutive Syndrome (BADS), 7 Paced Auditory Serial Additions Task Clinical Assessment for Attention (PASAT), 5 Tinkertoy Test, 2 Word fluency, 2 Stroop Test, 1 FAB, and 1 Tower of Hanoi as tests of executive function. Wechsler Adult Intelligence Scale-Revised (WAIS-R) or Wechsler Adult Intelligence Scale-Third Edition (WAIS-III) was used for intelligence tests in ten of the articles. Wechsler Memory Scale-Revised (WMS-R) 7 Wechsler Memory Scale-Revised,1 Rey-Osterrieth Complex Figure Test (ROCFT) (1 item), 1 RBMT (1 item) was used for memory impairment. As an attention test, 9 Trail Making Test (TMT) and 1 Clinical Assessment for Attention (CAT). Kohs block-design test was used as a component disorder in two of the articles.

3.3 Intervention methods
3.3.1 Pre-post comparison studies

We reviewed two pre-post comparison studies (Nakajima, Honda, & Sakatsume, 2001; Sakatsume & Honda, 2004). In a pre-post comparative study, patients with chronic frontal lobe disorder who had been injured for more than 8 months were treated over 6 weeks with three main types of intervention: self-instructional procedure (Cicerone & Wood, 1987), problem-solving therapy (Cramon et al., 1991) and physical-set changing (Furukawa et al., 1996). Both self-instructional procedure (Cicerone & Wood, 1987) and problem-solving therapy (Cramon et al., 1991) were conducted as outpatient individual rehabilitation sessions of one hour each twice a week. Physical-set changing (Furukawa, Honda, Hihara, & Murakami, 1996) consisted of 20-minute exercises performed twice a day, morning and evening, at the patient's home with the help of a video.

In the self-instructional procedure (Cicerone & Wood, 1987), the Toronto Tower Task was used to progress step by step from external language control to internal language control of the solution procedure. In the problem-solving therapy (Cramon et al., 1991) task, the Raven's Standard Progressive Matrices Test was used to provide interventions to improve the ability to analyze problems, reason, and check and correct results. In the physical-set changing (Furukawa et al., 1996) task, a video of Parkinson's exercises by Furukawa et al. was used to improve cognitive flexibility through imitation of movements. After 6 weeks of the above intervention, improvements were observed in the WAIS-R, WCST, Tinkertoy Test, and behavioral assessment before and after the intervention.

3.3.2 Case reports

We reviewed case reports for 15 papers. Six were conducted in outpatient settings, eight in hospital admissions, and two in real work settings (with duplicates). The duration of intervention ranged from 6 to 40 weeks, and the frequency of intervention ranged from daily to once a week. As with the pre-post comparative studies, problem-solving procedures (Cramon et al., 1991) were used in five studies (Kubota, Hamada, Iwase, Arikawa, Uehigashi, & Uehigashi, 2006; Kubota, Ariue, Ogawa, Hiyoshi, & Yamashita, 2014; Murayama, Hara, & Ozeki, 2003; Nakajima, Honda, & Sakatsume, 2001; Sakatsume & Honda, 2004) and self-instructional training (Cicerone & Wood, 1987) in three studies (Murayama et al., 2003; K. Nakajima & Honda, 1999; Sakatsume & Honda, 2004). In addition, planning and skills training with ADLs and IADLs was used in 3 studies (Fukumoto, Tosaka, Hasegawa, Matsunaga, Awata, & Toikawa, 2005; Miyamae, Harada, & Sengoku, 2003; Yokota, Sakai,

Table 1: List of literature that met the conformance criteria for this study

ID	Author	Research design	Numbers	Diagnosis	Outcome measures of executive function disorders	Intervention Method
1	Asuka Nakajima et al. (2017)	Case reports	4	TBI ($n = 4$)	WAIS-III, WMS-R, RBMT, TMT, KWCST, BADS	Awareness-facilitating Therapy (AFT) self-monitoring and self-regulation
2	Masatomo Kubota et al. (2014)	Case reports	1	Stroke	WAIS-III, HDS-R, CAT, PASAT, BADS	Computer-assisted Attention Training Problem Solving Training (Von Cramon, 1990) Cognitive Behavioral Therapy counseling
3	Masako Matsuba (2013)	Case reports	4	TBI	TEA (Test of Everiday Attention), BADS	The workbook for cognitive rehabilitation: attention, memory and executive function (Fujii, 2004), Feedback on homework (workbook)
4	Yuki Yokota et al. (2012)	Case reports	1	TBI	MMSE, CAT, FAB, TMT, WMS-R, WAIS-III, BADS	Planning practice for IADL (e.g., getting shopping and cooking done by the time the husband gets home, preparing breakfast for the family by 7:00 a.m.) Practice in performing tasks such as cooking and laundry
5	Yuri Kudo et al. (2006)	Case reports	1	TBI	WAIS-R, WMS-R, ROCFT, TMT, PASAT, BADS, Word fluency, Towe of Hanoi	The workbook for cognitive rehabilitation (Fujii, 2004), diary
6	Masatomo Kubota et al. (2006)	Case reports	1	TBI	Raven's, HDS-R, TMT, Span, Kohs	Attention Process Training (Sholberg, 1987), problem-solving therapy (Von Cramon, 1990) (e.g., Travel planning, Cooking menu planning and cooking procedure planning, Bookcase creation plan) Sentence summarization, Word recall, Japanese word-chain game
7	Sachiko Anamizu et al. (2005)	Case reports	1	Stroke	WAIS-R, WMS-R, WCST, PASAT, BADS, Word fluency, Towe of Hanoi, Visual cancellation	Tinkertoy (Lezak, 1995), Tower of Hanoi (Goel, 1995)
8	Noriyuki Fukumoto et al. (2005)	Case reports	1	TBI	Raven's, HDS-R, WMS-R, Kohs, TMT, Rey, PASAT, BADS, Word fluency, Tower of Hanoi	Environmental adjustment method by auditory stimulation, Scheduling, planning and execution of cooking and shopping (IADL)
9	Kazuyuki Sakatsume et al. (2004)	Case reports	1	TBI	WAIS-III, WMS-R, PASAT, TMT, WCST, BADS, Tinkertoy Test, Stroop Test Athletic ability, Work-place environment, Ability to work in the field, Data Creation Ability, Communication skills	Visual structuring of information by computer, (idea processor) Externalization of the thinking process Assessment of job performance in the workplace
10	Kazuyuki Sakatsume et al. (2004)	Case reports	1	TBI	TMT, WAIS-R, MMSE, PASAT, Reven, WCST, Tinkertoy Test	Self-instructional training (Ciceron, 1987), problem-solving therapy (Von Cramon, 1990), physical-set changing (Furukawa 1996)
11	Kazuyuki Sakatsume et al. (2003)	Pre-post comparison	10	TBI ($n = 3$), Stroke ($n = 6$), Brain Tumor ($n = 1$)	WCST, Tinkertoy Test, Behavioral Assesment(Sholberg, 1989)	Self-instructional training (Ciceron, 1987), problem-solving therapy (Von Cramon, 1990), physical-set changing (Furukawa 1996)
12	Yukiteru Murayama et al. (2003)	Case reports	1	TBI	WAIS-R, WMS-R, WCST, PASAT, TMT	Self-instructional training (Ciceron, 1987), overt verbal mediation, problem-solving therapy (Von Cramon, 1990)
13	Chihiro Miyamae et al. (2003)	Case reports	1	Stroke	WCST, Stroop Test	Notice his symptoms, sequenced learning (ADL training and a craft activity), communication with the patient
14	Keiko Nakajima et al. (2001)	Pre-post comparison	10	Strok ($n = 7$), TBI ($n = 2$), Brain Tumor ($n = 1$)	WCST, Tinkertoy Test, Behavioral Assessment (Sholberg, 1989)	Self-instructional training (Ciceron, 1987), problem-solving therapy (Von Cramon, 1990), physical-set changing (Furukawa 1996)
15	Yasuyoshi Takeda et al. (2001)	Case reports	1	TBI	WAIS-R, WMS-R, KWCST, MMSE	The work trial program using familiar work (Office work and photography)
16	Keiko Nakajima et al. (1999)	Case reports	1	TBI	WAIS-R, span, WCST, Tinkertoy, Behavioral asessment	Self-instructional training (Ciceron, 1987), problem-solving therapy (Von Cramon, 1990), SST
17	Yoshihisa Nunotani (1995)	Case reports	1	stroke	span, TMT, WCST, Spontaneity-score	Assessment of job performance in the workplace Adaptation and gradation of work tasks, The work trial program using familiar work Environmental adjustment

Notes: RCT: Randomized Controlled Trial; CVA: Cerebrovascular Accident; TBI: Traumatic Brain Injury; BT: Brain Tumor; MMSE: Mini-mental State Examination; WCST: Wisconsin Card Sorting Test; WAIS-III: Wechsler Adult Intelligence Scale-third Edition; WMS-R: Wechsler Memory Scale-revised; RBMT: Rivermead Behavioural Memory Test; TMT: Trail Making Test; PASAT: Paced Auditory Serial Addition Task.
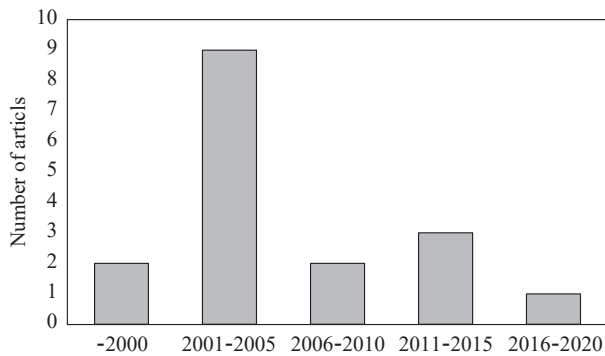
Figure 2: Article publication year

Hamanaka, Takahashi, & Kato, 2012). Two studies used training in an actual work environment (Sakatsume & Honda, 2004) (Nunotani, 1995), and one study used interventions in a setting similar to actual work (Yasuyoshi, T. S., Makino, N., Nukata, S., & Amakusa, 2001). Interventions using workbooks designed to train executive, attention, and memory functions were used in two studies (Kudo, Sato, & Imamura, 2006; Matsuba, 2013). Two studies used computer-based attention training (Kubota et al., 2014; Sakatsume & Honda, 2004), and two studies used counseling to facilitate metacognition (Kubota et al., 2014; Miyamae et al., 2003). One study used the evaluation instruments Tinkertoy (Lezak, 1982) and Tower of Hanoi (Goel & Grafman, 1995) as intervention tools (Anamizu, Kato, Saito, & Kashima, 2005). Awareness-facilitating Therapy (AFT) (Nakajima, Baba, Nakamura, Inaba, & Kawashima, 2017) was used in one study. All rehabilitation types were individual.

4. Discussion

Seventeen articles were extracted out of 356 in this study. In the process of selecting eligible articles, the most frequently excluded articles were: "225 no description of intervention methods," "221 no description of the evaluation method," and "97 studies of participants with other neurologic diagnoses." Of the 17 papers extracted, 15 were case studies, 2 were pre-post comparative studies, and 0 were RCTs. Most intervention studies of executive dysfunction in Japan were revealed to be case reports. These findings suggested that the difficulty in assessing executive dysfunction and the frequent complications, such as impaired consciousness and hemispatial neglect, make it difficult to establish a subject group with only executive dysfunction, which is essential when conducting an RCT. It is suggested that this may be one of the reasons for the lack of studies using an RCT design in contrast to the many case reports.

In 17 articles, the WCST, BADS, and PASAT were the most frequently used assessment tools for executive dysfunction. The BADS is one of a battery of neuropsychological tests with ecological validity developed by Wilson et al. (Wilson, 2013); the Japanese version was created and published by Kashima et al. in 2003.

BADS (Behavioural Assessment of the Dysexecutive Syndrome) is based on the working memory model of Baddeley et al. and Shallice's model of attentional control systems and consists of six subtests (Wilson, 2013). In addition, there is a questionnaire (Dysexecutive Questionnaire; DEX) consisting of 20 items in 4 domains (Wilson, 2013). Before 2003, several tools, such as the WCST and the Stroop Test, were used in combination to assess executive dysfunction. After 2003, the BADS was used in the evaluation of all articles. Therefore, the evaluation of executive dysfunction seems to have become easier. However, all the articles used a combination of intelligence, attention, and memory tests, suggesting that many neuropsychological tests are required to diagnose executive dysfunction.

The assessment tool for executive dysfunction used in the 17 selected articles was a combination of multiple testing tools, such as the WCST and Stroop Test, in the articles before 2003. After the BADS was launched in Japan in 2003, all articles used the BADS, which seems to have facilitated the evaluation of executive dysfunction. However, all of the articles used a combination of intelligence, attention, and memory tests, indicating that many neuropsychological tests are required to diagnose executive dysfunction. In addition to the above neuropsychological tests, naturalistic environment tests such as the Assessment of Motor and Process Skills (Fisher, 1993), and Frontal Systems Behavior Scale (Chiaravalloti & DeLuca, 2003) are recommended (Cristofori et al., 2019). It is noted that executive dysfunction is more apparent in daily life and the workplace than in hospitals and rehabilitation units (Burgess et al., 1998). Therefore, the evaluation of executive dysfunction requires a multifaceted evaluation that combines not only neuropsychological testing but also occupational performance assessment and behavioral assessment. In this study, the interventions mainly used for executive dysfunction were: 7 problem-solving therapy (Cramon et al., 1991), and 5 self-instructional procedures (Cicerone & Wood, 1987). Many intervention studies of executive dysfunction in this study were conducted between 2001 and 2010. This suggests that these studies were conducted using these intervention strategies in this period. Recently, interventions focusing on goal-oriented attentional self-regulation using Goal Management Training (GMT) and Metacognitive Strategy Training (MST) using video and verbal feedback have been recommended (Cicerone et al., 2019). An RCT conducted for community residents compared Cognitive Orientation to Occupational Performance (CO-OP), which is an occupation-based training, with standard occupational therapy (SOT), and found improvements in executive function and activities of daily life (Skidmore, Dawson, Whyte, Butters, Dew, Grattan, Becker, & Holm, 2013). The studies using these strategies were conducted around 2012 and are recommended in the 2019 review by Cicerone et al. (Cicerone et al., 2019). The articles reviewed in this study were not published since 2003 for pre-post comparative studies, and the case reports were not published since 2017. The

interventions using these strategies were not included in the articles reviewed in this study.

However, in the articles we reviewed, the case reports by occupational therapists in Yokota et al. (Yokota et al., 2012) and Kubota et al. (Kubota et al., 2014) used interventions using elements of the MST and CO-OP strategies in IADL tasks.

In other case reports, therapists intervened by combining elements of each strategy according to each case. It is possible that as these strategies become more widely used in Japan, there will be more reports of interventions for executive dysfunction with a high level of evidence, such as RCTs and pre-post comparative studies.

5. Conclusion

In the present study, we investigated the current status of interventions for executive function associated with a stroke and traumatic brain injury in Japan. Of the 354 articles, 337 were excluded due to incomplete assessment of executive dysfunction or complications of other diseases, and 17 were selected. Of the 17 articles reviewed, 15 RCTs were not included, and 15 were case reports, except for 2 pre-post comparative studies. Although there were few studies using strategies that have been recommended in recent studies, therapists were practicing elements of MST and CO-OP strategies ingeniously. It was suggested that the dissemination of the recommended strategies is necessary for the intervention of executive dysfunction after a stroke or traumatic brain injury in Japan.

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Appendix

List of literature that met the conformance criteria for this study (Japanese)

ID	著者	論文名	発行年	研究デザイン	対象	評価指標	介入方法
1	中島ら	頭部外傷後の注意／遂行機能／記憶障害に対する Awareness-facilitating Therapy	2017	事例報告	脳外傷 n=4	WAIS-III, WMS-R, RBMT, TMT, KWCST, BADS	Awareness- facilitating Therapy (AFT) 気づきの改善と問題解決の般化
2	窪田ら	社会的行動障害を伴った脳出血患者の認知リハビリテーション 衝動性のコントロールを目指して	2014	事例報告	脳卒中 n=1	WAIS-III, HDS-R, CAT, PASAT, BADS	Computer-assisted Attention Training 問題解決訓練 (Von Cramon, 1990), 認知行動療法, カウンセリング
3	松葉ら	外傷性脳損傷後数年を経て開始した認知リハビリテーションの長期経過	2013	事例報告	脳外傷 n=4	TEA (Test of Everiday Attention), BADS	頭が働く練習帳：言葉の練習帳, 注意の練習帳, 記憶の練習帳, 遂行機能の練習帳 (藤井, 2004)
4	横田ら	両側前頭葉内側および外側面の損傷により自発性低下を呈した一症例に対する作業療法の試み	2012	事例報告	脳外傷 n=1	MMSE, CAT, FAB, TMT, WMS-R, WAIS-III, BADS	計画立案練習（夫の帰宅時間までに買い物から調理を済ませる, 7時までの家族の朝食を準備するなど）調理や洗濯などの作業遂行実践訓練
5	工藤ら	頭部外傷後の高次脳機能障害に対する認知リハビリテーションについて 交通外傷後の高次脳機能障害2症例からの考察	2006	事例報告	脳外傷 n=1	WAIS-R, WMS-R, ROCFT, TMT, PASAT, BADS, Word fluency, ハノイの塔	頭が働く練習帳 (藤井, 2004)
6	窪田ら	閉鎖性頭部外傷の前頭葉症候群に対する認知リハビリテーション 症例報告	2006	事例報告	脳外傷 n=1	Raven's, HDS-R, TMT, Span, コース立方体組み合わせテスト	Attention Process Training (Sholberg, 1987), 問題解決訓練 (Von Cramon, 1990) (e.g., 旅行計画, 調理の立案など) 論旨要約, しりとりなど
7	穴水ら	右前頭葉背外側損傷に対する遂行機能リハビリテーション	2005	事例報告	脳卒中 n=1	WAIS-R, WMS-R, WCST, PASAT, BADS, Word fluency, ハノイの塔, Visual cancellation	Tinkertoy (Lezak, 1995), ハノイの塔 (Goel, 1995)
8	福本ら	スケジュールに沿った自発的行動が可能となった遂行機能障害の1症例	2005	事例報告	脳外傷 n=1	Raven's, HDS-R, WMS-R, Kohs, TMT, Rey, PASAT, BADS, Word fluency, ハノイの塔	聴覚刺激入力による環境調整, スケジュール管理, 調理や買い物の計画立案 (IADL)
9	坂爪ら	高次脳機能障害の代償によって復職した脳外傷事例 アイディア・プロセッサによる遂行機能障害の代償	2004	事例報告	脳外傷 n=1	WAIS-III, WMS-R, PASAT, TMT, WCST, BADS, Tinkertoy Test, Stroop Test	パソコン（アイディアプロセッサ）を用いた情報の視覚的構造化, 思考過程の外在化
10	坂爪ら	遂行機能障害の認知リハビリテーション 制御障害への治療介入と改善機序の検討	2004	事例報告	脳外傷 n=1	TMT, WAIS-R, MMSE, PASAT, Reven, WCST, Tinkertoy Test	自己教示法 (Ciceron, 1987), 問題解決法 変換法 (古川, 1996)
11	坂爪ら	遂行機能障害の認知リハビリテーションの効果と脳損傷部位の検討	2003	前後比較研究	脳外傷 n=3 脳卒中 n=6 脳腫瘍 n=1	WCST, Tinkertoy Test, 行動評価 (Sholberg, 1989)	自己教示法 (Ciceron, 1987), 問題解決法 変換法 (古川, 1996)
12	村山ら	遂行機能障害例に対するリハビリテーションの試み	2003	事例報告	脳外傷 n=1	WAIS-R, WMS-R, WCST, PASAT, TMT	自己教示法 (Ciceron, 1987), 外言語化訓練, 問題解決法 (Von Cramon, 1990)
13	宮前ら	遂行機能障害を示した右被殻損傷例への作業療法	2003	事例報告	脳卒中 n=1	WCST, Stroop Test	障害理解の援助, 日常生活訓練, 手工芸を利用した手順遂行や自己抑制
14	中島ら	「遂行機能リハビリテーション訓練」における WAIS-R サブスケールの変化	2001	前後比較研究	脳卒中 n=7 脳外傷 n=2 脳腫瘍 n=1	WCST, Tinkertoy Test, 行動評価 (Sholberg, 1989)	自己教示法 (Ciceron, 1987), 問題解決法 変換法 (古川, 1996)
15	武田ら	頭部外傷者の評価と治療 復職を果たした一症例を通して	2001	事例報告	脳外傷 n=1	WAIS-R, WMS-R, KWCST, MMSE	馴染みのある活動を用いた職業訓練
16	中島ら	遂行機能障害への認知リハビリテーションの試み 若年改善例の報告	1999	事例報告	脳外傷 n=1	WAIS-R, span, WCST, Tinkertoy, 行動評価	自己教示法 (Ciceron, 1987), 問題解決法 (Von Cramon, 1990), ソーシャルスキルトレーニング
17	布谷ら	再就職を果たした遂行機能障害患者の1例	1995	事例報告	脳卒中 n=1	span, TMT, WCST, Spontaneity-score	職場の環境調整, 職業訓練