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Effectiveness of occupational therapy intervention in overcoming cognitive deficits to enhance quality of life in subjects with gliomas.

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Abstract

Background: Quality of life plays an important role that telling us the success of treatment of patients with brain tumors with all survival and live free from the disease. It is seen that the quality of life was less in patients with meningioma and neuromas. Cognitive decline may be the indicator of the progression of the disease and Quality of life is one of the parameters that characterize the success of brain tumor treatments, along with overall survival and a disease-free life.

Objectives: This study assesses the effectiveness of occupational therapy intervention in overcoming cognitive deficits to enhance quality of life in subjects with gliomas.

Study Design: This study was a Quasi experimental pre-post study.

Methods: Qualitative studies were included based on the objectives of the current review inclusion and exclusion criteria were prepared and based on that various database were used in selection of the study.

Results: The review study included 250 potentially relevant articles out of which 200 studies were excluded as duplicate, 25 studies were excluded as they didn't meet inclusion and exclusion criteria, 15 articles didn't mention the intervention and 10 studies were included for review.

Conclusion: studies showed that there are many interventions related to cognition and its improvement but there are no specific studies on gliomas so that's why there is a need to do further research.

Keywords: Brain Tumor; Cognition; Occupational Therapy; Quality of Life; Gliomas; Cognitive retraining, Memory; Attention; Judgement; Orientation; Memory; Problem Solving.

1. Introduction

1.1. Rationale

Gliomas are tumors that originate from glial cells in the central nervous system. They can be divided into two main groups: diffuse gliomas, which infiltrate their surroundings, and those with a more circumscribed growth pattern [1]. These are also known as World Health Organization grade I to IV glial cell brain tumors, are among the most devastating cancer diseases affecting humans [2]. These tumors are typically associated with a dismal prognosis and poor quality of life [3]. It is said that adult patients that have been diagnosed with the primary tumors of the brain showed a group of patients based on tumors that are both primary and malignant that are linked with side effects of treatment and can be

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harmful to life. The size and the location of tumors can lead to side effects that can be psychological, behavioral, and neurocognitive [4].

Patients with brain tumors are prone to facing problems related to their emotions that consist of depression, stress, and anxiety that may hamper their quality of life and overall comfort [5]. A recent review reveals that the ten most prevalent symptoms in glioma patients are: seizures (37%), cognitive deficits (36%), drowsiness (35%), dysphagia (30%), headache (27%), confusion (27%), aphasia (24%), motor deficits (21%), fatigue (20%) and dyspnea (20%) [6]. High grade gliomas cause alterations in cognitive domains such as language, attention, memory, empathy and executive functions and generate greater cognitive alterations than low grade gliomas, and slower brain plasticity processes [7]. Bilateral thalamic gliomas are one of the rarest types of brain tumor. Primary thalamic gliomas account for about 1%–1.5% of all intracranial tumors, and BTGs are even rarer. This occurs in adults, with only 25% of such tumors found in patients younger than 15 years [8]. Glioma's brain tumor is a tumor that grows fast having undifferentiated morphology and microscopic finger- like projections that invade the surrounding areas of the brain. Depending upon the grade, areas of the brain affected, and length of the disease the symptoms will occur like depression and sleeping problems and many patients with glioma brain tumor also face a decline in cognitive functioning [9]. Neuro-cognitive function is a very important determinant of Quality of life. Psychological reaction such as anxiety, depression, and uncertainty about the future, and a combination of these factors is likely to contribute to cognitive impairment [10]. Cognitive impairment is one of the most common neurological disorders in brain patients and exerts a deep negative impact on Quality of life interfering with family social and career-related activities. For example, anemia and fatigue, common symptoms in patients with glioblastoma, might affect cognitive function [11]. Quality of life plays an important role that telling us the success of treatment of patients with brain tumors with all survival and live free from the disease. It is seen that the quality of life was less in patients with meningioma and neuromas [12].

A study suggested that Physical and occupational therapy are modalities frequently used in rehabilitation settings, as they help patients to optimize functioning to regain an independent and meaningful life and came with a conclusion that the intervention's impact on health-related quality of life also has the potential to increase patients' resources to manage their situation[13] Preliminary research suggests that rehabilitation can reduce disability in glioma patients, by improving both functional abilities and cognitive functioning compared to standard care. A recent meta-analysis indicates that patients with glioma receiving rehabilitation have better outcomes on neurological function and quality of life [14].

At present, rehabilitation treatment is not popular in glioma patients. There is a lack of definite evidence to prove the benefits of rehabilitation therapy for glioma patients so more attention should be paid to the therapeutic value of rehabilitation for glioma patients in the future [15]. So, there is a need of study as the cognition plays a very important role in daily life and in above studies the patient is treated as whole in terms of both physical and mental areas that's why there are not much good results in improvement of cognition and health related quality of life but by doing this study one can focus only on cognition domain rather than focusing on everything. And the above-mentioned studies showed that there are many interventions related to cognition and its improvement but there are no specific studies on gliomas so that's why there is a need to do further research.

Objective

Objective of this systematic review is to evaluate the impact of cognitive retraining in improving quality of life in subjects with gliomas and their neurological recovery.

2. Methods

2.1. Eligibility criteria

The studies included in this review are:

- Studies published with patients with any neurological disorder
- Randomized controlled trails
- Peer reviewed studies
- Studies publish in English
- Studies published with complete texts.

The studies excluded in this review are:

- Review papers including systematic reviews, narrative review and meta-analysis
- Single patient case reports
- Experimental studies
- Studies with incomplete texts
- Studies other than English

2.2. Information Sources

The specific databases, registers, websites, organizations, reference lists, and other sources that are searched or consulted to identify studies for the systematic review on the effectiveness of occupational therapy intervention in overcoming cognitive deficits to enhance quality of life in subjects with gliomas may include:

2.2.1. Databases

- PubMed
- Embase
- CINAHL (Cumulative Index to Nursing and Allied Health Literature)
- Cochrane Library (including Cochrane Central Register of Controlled Trials)
- Scopus
- Web of Science
- PsycINFO
- Allied and Complementary Medicine Database (AMED)
- Health Technology Assessment (HTA) Database
- ClinicalTrials.gov

2.2.2. Registers

- ClinicalTrials.gov
- International Standard Randomized Controlled Trial Number (ISRCTN) registry
- World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP)

2.2.3. Websites

- National Institute for Health and Care Excellence (NICE)
- Agency for Healthcare Research and Quality (AHRQ)
- European Medicines Agency (EMA)

2.2.4. Organizations and Research Institutions

- World Health Organization (WHO)
- Centers for Disease Control and Prevention (CDC)
- American Medical Association (AMA)
- National Institutes of Health (NIH)
- American Association of Critical-Care Nurses (AACN)

2.3. Search strategy

Search strategy was used and implemented whereas the search terms that used to retrieve articles included Gliomas, brain tumor, memory, cognition, attention, Quality of life, occupational therapy, cognitive retraining, cognitive rehabilitation; full list of keywords used.

2.4. Selection process

Read the full text online thoroughly and then make it assessed by some other reviewer and did comparison to see whether the study is meeting inclusion criteria and if it meets the criteria it is selected for the review.

2.5. Data collection process

Firstly, the literature search was done on PubMed, google scholar and research gate with the keywords Gliomas, brain tumor, memory, cognition, attention, Quality of life, occupational therapy, cognitive retraining, cognitive rehabilitation.

Secondly searching the literature, and going through the full text and checked the inclusion criteria of the study to see if it is fulfilling the criteria for my study.

Out of the 8 studies included in the review, all the review was the qualitative and quantitative studies. Majority of the studies were conducted in the hospital settings. These studies were published between 2009 to 2023.

Table: Characteristics of included studies

S.N	Study/ Author	Year of publication	Research design	Number of participants	Sample character	Outcomes	Result
1.	Mario Lozano et.al	2023	RCT	80	Cancer	Trail making test, Wechsler adult intelligence scale (WAIS), Hospital anxiety and depression scale (HADS), Brief pain inventory (BPI), Piper fatigue scale (PFS), 6 min walk test (6MWT).	multimodal intervention improved cognitive, psychological, and functional performance in women after breast cancer more than mHealth alone. Occupational therapy has a role to play in breast cancer rehabilitation.
2.	Jantine Geertruida Röttgering et.al	2022	RCT	Glioma	100	Checklist Individual Strength (CIS) and the Beck Depression Inventory Primary Care (BDI-PC)	GRIP on fatigue trial will provide information on the efficacy of BCBT compared to a WLC 2in reducing severe fatigue in patients with diffuse glioma.
3.	Sophie D et.al	2021	RCT	Brain Tumor	62	primary outcome is change in performance-based outcomes. Secondary outcomes were changes in patient-reported outcomes (PROs) and tertiary outcomes were enrolment and attrition, adherence and patient satisfaction.	All participants found a tablet-app suitable for delivery of cognitive rehabilitation and 90% rated the program as “good” or “excellent”.
4.	Anders Hansen et.al	2020	RCT	Glioma and undergoing active cancer treatment	64	(I)The primary outcome was the between-group difference in the overall QoL from baseline to the 6-week follow-up. (ii) secondary outcome measures consisted of objective functional performance, including	Compared with the control group, the intervention group had consistently better results on self-rated secondary

						aerobic power, muscle strength, walking ability, and postural balance	outcomes, including cognitive functioning
5.	Anders Hansen et.al	2014	RCT	Primary Gliomas	56	The tests battery includes two questionnaires: The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire C30 (EORTC-QLQ-C30) and the EORTC brain cancer module (EORTC QLQ-BN20).	According to AMPS, a higher score indicates an increased level of independence, increased safety in the community and increased efficiency of performance.
6.	Karin Gehring et.al	2009	RCT	Glioma	140	(i)An extensive battery of NP tests was administered to objectively assess attention, verbal memory, and executive function. (ii)Two self-report questionnaires were used to assess subjective cognitive symptoms and functioning: the MOS CFS. (iii) e Cognitive Failure Questionnaire (CFQ), mental component summary score (MCS) of the Short-Form 36 (SF-36) Health Survey and the three subscales of the Community Integration Questionnaire.	CRP group performed significantly better than the control group on NP tests of attention and verbal memory and reported less mental fatigue.
7.	Karin Gehring et.al	2018	Pilot RCT	Glioma	34	(i)Adherence was then calculated as the percentage of the physical exercise sessions completed out of prescribed sessions in the period in which a patient participated in the programme. (ii)Average intensity was indicated by the average heart rate of all training sessions as a percentage of the maximum heart rate as measured during the first exercise test	Compared to the control group, the exercise group showed larger improvements in absolute VO2 peak.
8.	Teresa Liu-Ambrose et.al	2022	RCT	Stroke	120	(i)Primary outcome: The Alzheimer Disease Assessment Scale-Cognitive-Plus (ADAS-Cog-Plus).	The control group reported significantly higher physical activity participation

						(ii)Secondary outcome: computerized version of the Stroop task, self-report Lawton and Brody Instrumental Activities of Daily Living (IADL) Scale, Short Physical Performance Battery (SPPB), 4-meter gait speed, and 6-Minute Walk Test (6MWT).	compared with the exercise group.

Thirdly the full text was reviewed by the two reviewers and the data was obtained and finally the reviewers extracted the data from the included studies through discussion.

2.6. Data Items

- **Level of cognition**: Mini mental status examination (MMSE) scale was used as an outcome measure for cognition and for the screening tool Montreal cognitive Assessment (MOCA) was also used to measure cognition.
- **Quality of life**: RAND SF 36- Item Health Survey (Version 1.0) was used.
- **Cognitive functions**: outcome may include measures of cognitive abilities such as memory, attention, executive functioning and other cognitive domains.
- **Behavioural functions:** Outcome may assess changes in behavioural responses including responsiveness to various cognitive activities, motor abilities and communication abilities.
- **Clinical outcome:** This outcome may include measure of mortality, length of stay in neurosurgery ward, functional outcomes and other clinical indicators. Data would be collected for each specific clinical measures, time patient and analysis reported in the inclusion studies.

2.7. Study risk of bias assessment

The methods used to assess the risk of bias in the included studies for a systematic review on the Effectiveness of occupational therapy intervention in overcoming cognitive deficits to enhance quality of life in subjects with gliomas: A Systematic Review. we used tools include the Cochrane Collaboration's Risk of Bias Tool for assessing the bias Multiple reviewers independently assess the risk of bias in each included study. This typically involves two or more reviewers evaluating the same study separately. Working independently minimizes the potential for bias and allows for a more robust evaluation. After the independent assessments, the reviewers compare their assessments and discuss any discrepancies in their evaluations. Disagreements are resolved through consensus, discussion, or by involving a third reviewer or the principal investigator. Transparent documentation of the resolution process should be maintained. During the assessment, reviewers evaluate various aspects of the included studies that contribute to the risk of bias, such as random sequence generation, allocation concealment, blinding of participants and assessors, completeness of outcome data, selective outcome reporting, and other relevant criteria depending on the selected tool.

2.8. Data Synthesis

We conducted a qualitative synthesis of the findings of the included studies. The synthesis was divided according to the domain assessed. The data synthesis was performed by one author and reviewed by a second author and third author.

3. Results

3.1. Included Studies

3.1.1. Study 1

Mario Lozano et.al evaluated 80 patients after cancer; IA group (n=40) and CG (n=38) for this the author used Beneca mobile health app, trail making test, Wechsler adult intelligence scale (WAIS), Hospital anxiety and depression scale (HADS), Brief pain inventory (BPI), Piper fatigue scale (PFS), 6 min walk test (6MWT) and came with a result that Selective attention (TMT) was significantly higher in the IA group, with a moderate to large effect size for TMT A (T2: d=1.1; T 3: d=1.2), working memory and processing speed (WAIS), anxiety and general HADS score (d=1.6), and functional capacity at 8 weeks and 6 months (d=1.5). Fatigue perception (mean difference, -0.6; 95% CI -1.4 to 0.04;

p=0.009) and pain (intensity level p<0.001) interference level interference (p=0.002) were also significantly more improved in the IA group [16].

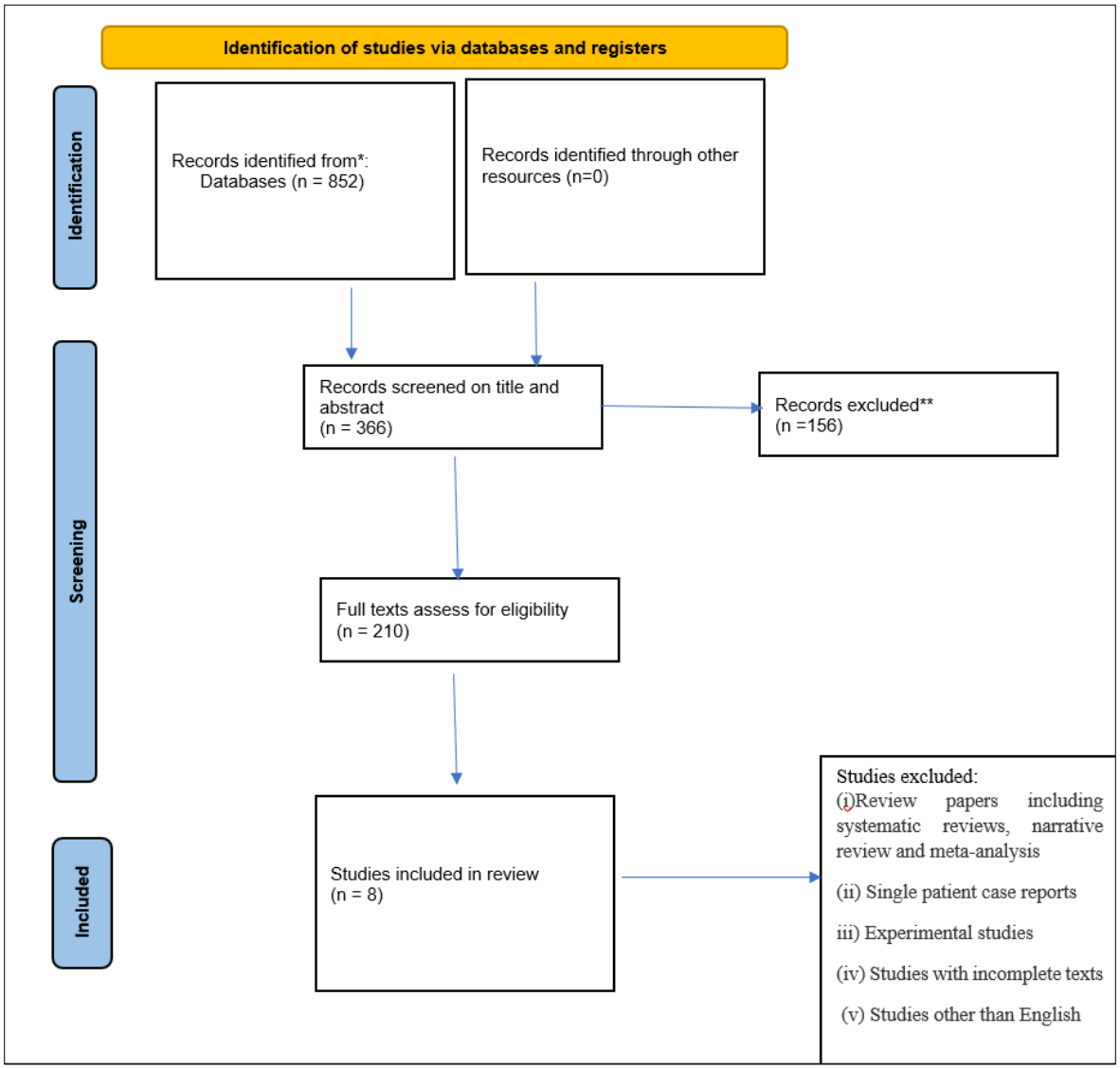

Figure 1 Prisma Flow Chart shows the study selection procedure

3.1.2. Study 2

Jantine Geertruida Röttgering et.al evaluated 100 patients with gliomas and go through three trial assessments which is a baseline assessment after randomization and before the start of the intervention, a second assessment 14 weeks after baseline, and a follow-up assessment 24 weeks after baseline. The baseline and second assessments consist of web-based questionnaires, which are completed at home, and several measurements in the hospital. Grip on fatigue intervention was given which is a multimodal Dutch intervention with therapist sessions and online modules with therapist feedback. BCBT for CRF in patients with a brain tumor is directed at the beliefs and behavior of the patient that contribute to the persistence of fatigue the intervention lasts 12 weeks. The information and assignments are based on several evidence-based CBT interventions in different populations targeting fatigue by our research group. Neurocognitive functioning is tested using a standardized clinical test battery that is normally used for clinical care to evaluate preoperative and postoperative cognitive status and came with the result that Cognitive behavioral interventions seem promising in reducing fatigue severity based on their effectiveness in cancer survivors and palliative cancer patients [17]

3.1.3. Study 3

Sophie D et.al evaluated 62 patients with brain tumor neuropsychological assessments were blinded. Neuropsychological follow-up assessments were conducted immediately after the intervention (6 months' post-surgery) and one-year post-surgery. Participants in the waiting-list control group were offered the opportunity to follow the cognitive rehabilitation program, with guidance from the researcher, after the last study assessment. Intervention used is the tablet-based cognitive rehabilitation program Re Mind includes psychoeducation, strategy training and an attention retraining game were used and came with result that all participants found a tablet-app suitable for delivery of cognitive rehabilitation and 90% rated the program as "good" or "excellent" [18]

3.1.4. Study 4

Anders Hansen et.al evaluated 64 patients with Glioma and undergoing active cancer treatment. objective functional performance, including aerobic power, muscle strength, walking ability, and postural balance were assessed and the the rehabilitation intervention included 6 weeks of physical therapy with a strong emphasis on exercise (cardiovascular training, resistance training, and interventions individually designed to address participants' deficits or impairments) and testing for the self-perception of performance in everyday living. If a participant identified difficulties, a client-centered occupational therapy intervention (individual and goal orientated) was included as a part of the rehabilitation intervention was given and came with the result after doing the comparison that the control group, the intervention group had consistently better results on self-rated secondary outcomes, including cognitive functioning [19]

3.1.5. Study 5

Anders Hansen et.al evaluated 56 patients with primary glioma and for assessments the tests battery includes two questionnaires: The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire C30 (EORTC-QLQ-C30) and the EORTC brain cancer module (EORTC QLQ-BN20). The intervention consists of 6 weeks intensive physiotherapy as groups exercise in conjunction with 0–6 weeks of individual occupational therapy if a need is present and came with the result according to AMPS, that a higher score indicates an increased level of independence, increased safety in the community and increased efficiency of performance[20]

3.1.6. Study 6

Karin Gehring et.al evaluated 140 patients with gliomas for assessment an extensive battery of NP tests was administered to objectively assess attention, verbal memory, and executive function. Two self-report questionnaires were used to assess subjective cognitive symptoms and functioning: the MOS CFS. e Cognitive Failure Questionnaire (CFQ), mental component summary score (MCS) of the Short-Form 36 (SF-36) Health Survey and the three subscales of the Community Integration Questionnaire were used.

For the intervention the CRP consisted of six weekly, individual sessions of 2 hours each which is carried out by one of seven neuropsychologists, incorporated both cognitive retraining and compensation training. The waiting-list control group received usual care (i.e., regular medical follow-up; no cognitive interventions) and came with the result that CRP group performed significantly better than the control group on NP tests of attention and verbal memory and reported less mental fatigue [21]

3.1.7. Study 7

Karin Gehring et.al evaluated 34 participants with glioma and all individual eligible patients provided informed consent, and for assessment they underwent neuropsychological testing and completed self-report questionnaires on cognitive symptoms, fatigue, sleep, mood and quality life at home. Subsequently, they were invited to undergo a maximal cardiopulmonary exercise test in a sports medical Centre.

The exercise group received three home-based aerobic training sessions per week, for a duration of six months whereas patients in the waiting-list control group were advised to maintain an active lifestyle, in accordance with Dutch public health guidelines [22]

3.1.8. Study 8

Teresa Liu-Ambrose et.al evaluated 12o participants with stroke and for the assessments various tests were used which includes the Alzheimer Disease Assessment Scale-Cognitive-Plus (ADAS-Cog-Plus) and computerized version of the Stroop task, self-report Lawton and Brody Instrumental Activities of Daily Living (IADL) Scale, Short Physical Performance Battery (SPPB), 4-meter gait speed, and 6-Minute Walk Test (6MWT) for the intervention the EX program included strength, aerobic, agility, and balance training exercises. The cognitive and social enrichment program included

computerized cognitive training and social, cognitive enrichment activities and some activities used apps, and others which were based on improvisation and mental activities from the Perk Activities program whereas he BAT program consisted of stretches, deep breathing and relaxation exercises, general posture education, grip strength and dexterity exercises, and light isometric toning exercises after giving this they came with the result that The control group reported significantly higher physical activity participation compared with the exercise group[23].

4. Discussion

The aim of this review was to d aims to assess how cognitive retraining has its impact on abstract thinking and higher mental functions. Seven interventions were identified, of which most employed some cognitive rehabilitation programs. While few interventions demonstrated statistically significant improvements, it is important to acknowledge that all the studies were randomized controlled trials and the findings point towards important opportunities for future research. As there were some limitations in the studies that were included in this review and are explained as follows:

Limitations

Study one given by Mario Lozano et.al stated that the IA group received far more health-professional attention compared to the m-Health group, which may be a limitation of the work. Applications specifically designed to address all these variables would be necessary to draw firm conclusions about the comparison with the face-to-face intervention. Finally, the program in this study may not be sustainable due to the time required by staff.

Study two given by Jantine Geertruida Röttgering et.al stated that Potential limitations of the current study design are the inability to blind participants and researchers for the given intervention and the lack of a true placebo condition in the WLC group. These are issues that in general arise in all psychotherapy trials. In this study, patients randomized to the WLC group can be treated for fatigue after the follow-up measurements. However, not including a waiting list condition in research in this population is questionable, since patients suffer from severe fatigue with currently no other effective treatment available. Considering this, a WLC seems to be appropriate for this group of vulnerable patients.

Study three given by Sophie D et.al stated that the recruitment of participants was difficult, which resulted in underpowered statistical analyses. Many patients (52%) were not eligible for inclusion, and additionally, a substantial part of patients declined participation. Unfortunately, the small sample size hampered subgroup analyses on differences in outcomes for meningioma vs. glioma, adherent vs. non-adherent participants and those who involved informal caregivers vs. patients who did not.

Study four given by Anders Hansen et.al stated that the number of participants and duration of follow-up were inadequate to determine if the intervention was superior to the current usual rehabilitation care.

Study five given by Anders Hansen et.al stated that the potential limitation is the uncertainty and risk of side effects to the concomitant treatment, which enhances the risk of dropout.

Study six given by Karin Gehring et.al stated that: Firstly, the study included a relatively large number of outcome measures. Secondly, the study results can only be generalized to glioma patients who both reports having cognitive symptoms and score below a predetermined cutoff on objective NP tests. Also, the results may apply only to patients with relatively mild deficits, similar to the group studied, who have sufficient cognitive resources and motivation to follow the rehabilitation program. Finally, the study could not tease out the relative effectiveness of cognitive retraining versus the use of compensatory strategies.

Study 7 given by Karin Gehring et.al stated that an important limitation of our study is its small sample size. predominantly due to patients' lack of time or motivation to participate in the trial and/or training program. This suggests that the intervention, in its current form, may be of interest to a smaller subset of the target population. Furthermore, all patients were tested on a cycle ergometer because group allocation and preferred training modality were not known until after baseline exercise testing. However, not everyone trained on a bicycle, and consequently both the baseline and follow-up tests lacked exercise specificity. This could have led to an underestimation of changes in aerobic fitness in patients who chose running or swimming as training modality.

Study 8 given by Teresa Liu-Ambrose et.al stated that firstly, in terms of lesion type and location, this study sample of adults with chronic stroke is a heterogeneous sample and this may have limited our ability to detect between-group differences. Secondly, the study sample included chronic stroke survivors with mild to moderate motor impairment and thus, limits the generalizability of results to those with more severe stroke-related motor impairments. Thirdly, due to

the diverse content of the cognitive and social enrichment intervention, there may have been insufficient dose and specificity of training for the cognitive domains of memory, attention, and executive functions measured by the ADAS-Cog-Plus.

5. Conclusion

Cognitive retraining was used as an intervention protocol on the patients with gliomas to enhance quality of life and the outcome measures that were used to assess the patients were MMSE, MOCA and RAND SF 36- Item Health Survey (Version 1.0) the domains that were assessed by using these outcome measures were attention, judgement, orientation, Attention and concentration, Problem solving and memory. Also the above mentioned studies showed that there are many interventions related to cognition and its improvement but there are no specific studies on gliomas so that's why there is a need to do further research. From going through studies there is a need of study as the cognition plays a very important role in daily life and in above studies the patient is treated as whole in terms of both physical and mental areas that's why there are not much good results in improvement of cognition and health related quality of life but by doing this study one can focus only on cognition domain rather than focusing on everything.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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