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Evaluating Lumosity's Role In Neurorehabilitation: A Brief Review

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Background: Neurological rehabilitation aims to enhance functional abilities and well-being in individuals with nervous system disorders.The Lumosity brain training program is one example of Computerized Cognitive Training (CCT), which has become a potential technique for improving cognitive function in a variety of neurological diseases.

Objective: This review evaluates the efficacy of Lumosity-based CCT in improving cognitive function in patients with neurological disorders by analyzing recent randomized controlled trials (RCTs).

Methods: A comprehensive literature search was conducted using databases including PubMed, Google Scholar, ResearchGate, ScienceDirect, and Cochrane Library. Inclusion criteria were randomized controlled trials (RCTs) that are written in english, published within the last five years, and involve game-based interventions. Exclusion criteria were if they are abstract-only, have been published less than five years ago, lack complete text availability, or are not written in english.

sResults: Ten RCTs were reviewed involving diverse populations including stroke survivors,multiple sclerosis, brain injury, and patients with Alzheimer's disease. Most studies demonstrated improvements in cognitive domains such as memory, attention, processing speed, and executive functions. Enhanced outcomes were noted when CCT was combined with physical therapies (e.g., aerobic or vestibular training). However, several studies reported no significant differences between experimental and control groups, suggesting context-dependent efficacy. Limitations included small sample sizes, lack of long-term follow-up, limited generalizability, and concerns about real-world applicability.

Conclusion: Lumosity brain training shows potential in cognitive rehabilitation, with positive effects on specific cognitive functions. The integration of CCT with physical interventions yield enhanced outcomes.

Despite encouraging findings, further large-scale, long-term RCTs are needed to validate its efficacy and determine its advantages over traditional cognitive therapies.

INTRODUCTION

Neurological rehabilitation is a physician-supervised program for individuals with nervous system disorders to improve function, reduce severity and enhance a patient's well-being.[1] Lumosity is the most effective online tool for cognitive enhancement that offers brain training exercises that target brain areas such as memory, attention and processing speed to make the individual smarter and better fit mentally irrespective of age . Lumos lab was founded in the year 2005 by David Drescher, Michael Scanion and Kunal Sarkar. Its website is http://www.lumosity.com[2.] The five principles of Lumosity are targetting, adaptivity, novelty, engagement and completeness.Targetting is an effective training task must be carefully targeted to train brain functions that will lead to the maximum benefit for the user in daily life. Adaptivity is the ability of individual to bring his or her own unique set of strengths and weaknesses to any new task. Novelty is the process of experiencing something different by engaging with new tasks and challenges .Engagements are critical components of making brain games effective and encouraging people to do them. Completeness refers to development of many brain training programs previously available which were developed in the context of a single, narrow academic framework, targeting a neural system with highly specialized training.[3] The two theories on which Lumosity based are on theory of neuroplasticity and theory of cognitive reserve.Theory of Neuroplasticity is the process of the brain modifying its pathways as it learns new things.Originally, scientists thought that this process only occurred in childhood, but adults learning also develops a new task, long term physical changes in their brain's composition.The theory of cognitive reserve goes hand-in-hand with neuroplasticity. This theory proposes that life experiences, cognitive activities, and unique skill sets can allow your brain to compensate for the structural changes that come with aging and dementia by building new pathways. Cognitive reserve is the "use it or lose it" theory – the more you use your brain, the more pathways it build through neuroplasticity, and the longer it will take for you to show symptoms of cognitive decline or dementia.[4] The key component of the Lumosity cognitive training program is a suite of 52 games. Each game is a 2D puzzle-type game, designed to improve cognitive skills. Although the major game action involves only pointing and clicking, pattern recognition, attend to multiple objects simultaneously, associate and memorize visual and verbal information. The challenge level of a game is usually decided by the presence and amount of distraction, the time limit or complexity of the pattern or rule to be recognized, and hence the amount of cognitive effort and skill required. To play Lumosity, one logs into the Lumosity website and follows a personalized training program or sequence to play the games. The particular sequence is classified under each cognitive skill category (e.g., memory, attention, processing speed, mental flexibility). Each individualized training session consists of five games, and each game lasts around 5 to 6 min.[5]The Mobile Application Rating Scale (MARS) is a widely used Health app quality assessment tool that includes a multidimensional measure of engagement, functionality, aesthetics, information, as well as app subjective quality.There are four cognitive domains: memory, attention, executive function, and visuospatial function. Memory is defined as the ability to store, recall, utilize, and manipulate specific information.

Attention is defined as the ability to pay attention to external objects instantaneously, maintain attention for a long time, or move attention from one place to another. The executive function is defined as the ability to control, regulate, and manage various cognitive processes.It consists of problem planning, implementation, inhibition of behavior, and flexibility of thinking. The visuospatial function is defined as the ability to interpret and organize visual perception data[6]. Lumosity provides a variety of games that claim to improve memory, speed, or problem-solving skills. The goal of Lumosity is to improve proficiency in cognitive and memory skills. Each individual program generate tasks that challenge the mind with a series of tests and training exercises intended for self-affirmation regardless of the effectiveness of these games.[7]

Rationale

Lumosity is a brain training program that has gained popularity in the field of neurorehabilitation. A comprehensive review of the literature on this topic is crucial for several reasons:

1. To evaluate the current evidence: A well-structured literature review can analyze existing research on Lumosity's effectiveness in neurorehabilitation. This will help to determine if the program has a positive impact on cognitive functions like memory, attention, and processing speed in patients with neurological conditions like stroke, brain injury, or dementia.
2. To identify research gaps: The review can identify areas where research on Lumosity and neurorehabilitation is lacking. This could include specific patient populations, types of cognitive functions targeted, or the program's long-term effects.
3. To embrace in rehabilitation plan: By synthesizing the available evidence, the review can provide valuable insights for clinicians working in neurorehabilitation. This can help them decide whether to recommend Lumosity as part of a patient's rehabilitation plan.
4. To guide future research: The review can identify limitations in current research methodologies and suggest directions for future studies on Lumosity and neurorehabilitation. This will help researchers design more robust studies to definitively determine the program's efficacy.

Overall, a review of the literature on Lumosity in neurorehabilitation is essential to critically analyze the existing evidence, identify areas for further research, and inform clinical practice decisions. By comprehensively examining the current research landscape, the review can play a significant role in advancing our understanding of this specific intervention in neurorehabilitation.

Methodology

Studies were searched from the following engines PubMed, Google Scholar, Research gate, Science direct and Cochrane Library using keywords Neurorehabilitation and Lumosity Brain Training to review the article. This review includes only randomized controlled trials (RCTs) that are written in english, published within the last five years, and involve game-based interventions. Studies are excluded if they are abstract-only, have been published less than five years ago, lack complete text availability, or are not written in english.

Characteristics of included studies

Sr	Author and year	Sample Size	Study Location	Groups	Outcome Measures	Intervention	Results
1.	Ho H.Y. et al in 2020	39 patients	Taiwan	GI intervention group (n=19) G2 control group (n=20)	Cognitive function tests and the Stroke Impact Scale	Both the groups were trained for 20 min, twice a week, for 12 weeks. The intervention group receiving CCT with Lumosity software and the control group receiving conventional cognitive training).	The CCT group exhibited sig improvement in global co function evaluated using the MM MCA and specific cognitive do verbal working memory (backwa span test), processing speed (Digit Modalities Test
2.	Corti C, Uregesi C. Borgatti R, Bardoni A. et al in 2020	33 patients	Italy	19 subjects were allocated to the Training-first Group (G1) 14 to the Waiting-first Group (G2).	Cognitive flexibility: the computerized version of Wisconsin Card Sorting Test (WCST) Problem-solving abilities: an age-appropriate problem-solving task	(Training-first Group) started the CCT immediately, whereas the other group (Waiting-first Group) started the CCT after a comparable time of waiting list. CCT sessions per week for eight weeks (40 sessions).	Both groups improved in visual working memory more after the t than after the waiting-list perio Training-first group improved arithmetic calculation speed.
3.	Abou Shady NA, Omara T, Soliman KM. et al in 2023	42 patients	Egypt	G1 study group (n=21) G2 control group (n=21)	Addenbrooke's Cognitive Examination Revised (ACE-R) test Montreal Cognitive Assessment (MoCA) Stroke specific quality of life scale (SS-QoL)	The Study group received mobile application-based brain training program (Lumosity training application) as well as aerobic training on a bicycle ergometer, and the control group received only the aerobic training on a bicycle ergometer for 18 sessions every other day for 6 weeks, 3 sessions/week, each session for 60 minutes	The study group reported enhan in the cognitive functions as wel quality of life more than the group
4.	Abelmann AC , Kessels RP et al in 2023	60 participants	Netherlands	G1 Active control group n=30 G2 Experimental group n=30	Mental Slowness Questionnaire (MSQ) Time Active Pressure Questionnaire Dutch Multifactor Fatigue Scale DMFS) Goal Attainment Scaling (GAS) Virtual Meeting Task (VMT)	Active control group (CogniPlus training: an 8-week computerised cognitive function training). Experimental group (Karman Line — Tempo module: an 8-week game-supported cognitive strategy training)8-week	This study showed the treatm slowed IPS in cognitive rehabi and, more generally, improv insight into implementing platforms in cognitive training.
5.	Kumari P, Deepa S, Vijayalakshmi B. et al in 2024	22 patients	Chennai	Two groups. Each group has 11 children.	Digit span forward Digit span backward Spatial memory test Stroop test	One group received a brain gym intervention with six Super space movements (Brain Buttons, Space Buttons, Earth Buttons, Thinking Cap, Cross Crawl and Hook-Ups) for 5 minutes on daily basis for 4 weeks. Another group received a web-based cognitive training for 5 minutes on daily basis for 4 weeks duration.	There was a significant increm visual attention span and w memory for the intervention The study finding also showed th gym intervention successfully en the participants working memo the cognitive training interventio

6.	Goswami A et al in 2024	36 patients	India	G1 VT+ CT group G2 CT alone group G3 Control group (VT= Vestibular therapy) CT = Control group)	ERP-P300 Digit Symbol Substitution Test (DSST), Stroop Color Word Test (SCWT) Trail Making Test.	VT+ CT group: Vestibular therapy was administered using Cawthrone and Cooksey's vestibular rehabilitation exercises and, Cognitive therapy was given with a com- puterized brain program game for 45-60 minutes a day, 3 days a week for a total of 8 weeks CT alone group: This group of participants only received computerized cognitive therapy procured from Lumosity Inc. for (30-45) minutes a day, 3 days a week for a total of 8 weeks. Control group: This group of participants was instructed to continue with their usual care activities and were given targeted therapy after the conclusion of this study	This study showed VT+CT resu greater improvement in measu cognition including ERP-P300 ($p < 0.03$) and its amplitude ($p <$ DSST ($p < 0.00$), and TMT-B (p as compared to CT alone, and control group.
7.	Darr AJ et al.in 2024	65 patients	USA	G1 Traditional CR group (n=37) G2 CCT group (n = 28)	The Paced Auditory Serial Addition Test (PASAT) The Symbol Digit Modalities Test (SDMT) Key Behaviors Change Inventory (KBCI)	The traditional CR group received a clinician-directed intervention that provided manualized, traditional clinician-directed CR for 6 weeks, 10 hours per week, for a total of 60 hours CCT group trained for 1 hour, playing at least 3 Lumosity games from each of 5 cognitive domains and using the UCR Brain Games..	This study showed that both programs led to sig improvements and there is significant improvement within time effects on all outcome measu
8.	Sharma D . et al in 2025	32 participants	India	Group 1-. Aerobic training Group 2.- Mobile application based cognitive training Lumosity	Addenbrooke's Cognitive Examination – III (ACE-III) Six Minute Walk Test (6MWT) The Quality of Life in Alzheimer's Disease (QoL-AD) Neuro Cognitive Performance Test (NCPT)	Group one was given moderate intensity aerobic training for 30 minutes, five days/week, for eight weeks. Group two was given cognitive training through mobile application for eight weeks.	All outcomes showed sig improvement within each However, between the groups aerobic capacity showed a sig difference ($p < 0.01$), while cogn = 0.42) and quality of life ($p = 0.$ not differ significantly.
9.	Corti C et al	84 children	Italy	G1Training-first Group G2 Waiting-first Group	Corsi Block Tapping Test Computerized Wisconsin Card Sorting Test (WCST) AC-MT battery Child Behavior Checklist (CBCL 6–18)	Two groups of patients were engaged in five CCT sessions per week for eight weeks (40 sessions). n, one group (Training-frst Group) started the CCT immediately, whereas the other group (Waiting-frst Group) started the CCT after a comparable time of waiting list.	Strong improvement after train Training-first Group and M improvement after training in W first Group

10	Tramontano M. et al in 2024	38 patients	India	G1 Cognitive-Motor group (CMg) G2 Cognitive Therapy group (CTg)	Cognitive Impairment Index (CII) The Multiple Sclerosis Quality of Life Questionnaire MSQOL-54 The Stroop Color Word Interference Test (SCWT).	30 min of conventional neuromotor therapy, in addition to which the CMg received 20 min of cognitive–motor therapy and the CTg received computer-based cognitive therapy three training sessions per week for four weeks, each lasting 50 min	Participants in the CMg group significant improvements in co function, as measured by the Co Impairment Index (CII), acros time points: baseline (T0), intervention (T1), and two month intervention (T2) ($\chi^2(2) = 14.55$ .001). Additionally, the CMg experienced notable enhancem health-related quality of life (HR particularly in the emotional wel and health distress subscales MSQOL-54.

Discussion

The findings from various studies suggest that Lumosity brain training (LBT) holds promise as a supportive tool in the rehabilitation of individuals with neurological conditions. Its application in stroke, multiple sclerosis, ADHD, and Alzheimer's disease has demonstrated improvements in cognitive functions such as memory, attention, visuospatial skills, and executive functioning. These improvements contribute to better daily functioning and quality of life for patients. Additionally, LBT plays a role in achieving therapeutic goals, including enhancing patience, problem-solving abilities, and self-worth. Despite these promising outcomes, there are notable limitations that must be addressed. The lack of diversity in game content restrict its effectiveness across different types and severities of disabilities. Most studies involved small, homogeneous populations within rehabilitation centers, limiting the generalizability of results. Furthermore, the short duration and limited follow-up of many studies hinder the ability to assess long-term benefits. There is also ongoing debate about whether the gains from brain-training games transfer to real-world tasks, with some arguing that time spent on such games could be more productively used on activities like physical exercise or learning new skills. Given these concerns, while LBT appears beneficial as a supplementary intervention, further large-scale, diverse, and long-term studies are necessary to validate its effectiveness and integration into standard neurological rehabilitation practices.

Conclusion

This review highlights the growing body of evidence supporting the efficacy of Computerized Cognitive Training (CCT), particularly programs such as Lumosity, in enhancing cognitive functions in individuals with neurological conditions. Most studies reviewed demonstrate significant improvements in global cognition and specific domains such as working memory, attention, and processing speed following CCT interventions. Furthermore, the integration of CCT with physical therapies (e.g., aerobic or vestibular training) appears to improve cognitive and functional outcomes, suggesting a synergistic effect. While within-group improvements are consistently observed, between-group differences are sometimes less pronounced, indicating that while CCT is beneficial, its advantages over traditional methods vary depending on context and implementation. Overall, CCT emerges as a promising, accessible, and scalable approach to cognitive rehabilitation. However, further large-scale, long-term randomized controlled trials are warranted to establish its sustained efficacy, optimize intervention protocols, and determine its comparative benefits over conventional cognitive therapies.

References

1. Sagary R, Malim NH, Abdullah NL, Mohamad WN, Ahmad AL. Impact of Mobile Games-Aided Neurorehabilitation: A Systematic Literature Review. The Malaysian journal of medical sciences: MJMS. 2023 Dec;30(6):29.
2. Kpolovie PJ. Lumosity training and brain-boosting food effects on learning. International Research Journals. 2012 Jun;2(6):217-30
3. Hardy J, Scanlon M. The science behind lumosity. San Francisco, CA: Lumos Labs. 2009 Nov.
4. https://.wordprtbirehabilitationess.com/tag/lumosity
5. Shute VJ, Ventura M, Ke F. The power of play: The effects of Portal 2 and Lumosity on cognitive and noncognitive skills. Computers & education. 2015 Jan 1;80:58-67.
6. Bang M, Jang CW, Kim HS, Park JH, Cho HE. Mobile applications for cognitive training: Content analysis and quality review. Internet Interventions. 2023 Sep 1;33:100632
7. Heiman S. A study on the perception of brain games and their effect on memory and cognitive skills.
8. Ho HY, Chen MD, Tsai CC, Chen HM. Effects of computerized cognitive training on cognitive function, activity, and participation in individuals with stroke: a randomized controlled trial. NeuroRehabilitation. 2022 Jan 1;51(1):79-89.
9. Corti C, Urgesi C, Poggi G, Strazzer S, Borgatti R, Bardoni A. Home-based cognitive training in pediatric patients with acquired brain injury: preliminary results on efficacy of a randomized clinical trial. Scientific reports. 2020 Jan 29;10(1):1391.
10. Abou-Shady NA, Omara T, Soliman KM, Abdelhakiem NM. Influence of Mobile Application Based Brain Training Program on Cognitive Function and Quality of Life in Patients Post Stroke. Journal of Advanced Zoology. 2023 Sep 2;44.
11. Abelmann AC, Kessels RP, Brazil IA, Fasotti L, Bertens D. Game-supported cognitive strategy training for slowed information processing speed after acquired brain injury: study protocol for a randomised controlled trial. BMJ open. 2023 Sep 1;13(9):e067108.
12. Kumari P, Deepa S, Vijayalakshmi B. EFFECT OF BRAIN GYM AND WEB-BASED COGNITIVE TRAINING INTERVENTION ON VISUAL ATTENTION SPAN AND WORKING MEMORY IN CHILDREN WITH DYSLEXIA. Journal of Research Administration. 2024 Jan 4;6(1).
13. Goswami A, Sehgal CA, Noohu MM, Parveen S, Azharuddin M. Effect of vestibular therapy as an adjunct to cognitive therapy to improve cognition in elderly with mild cognitive impairment (MCI): A Randomized Controlled Trial. JOURNAL OF GERONTOLOGY AND GERIATRICS. 2024 Nov 15;72:173-84.
14. Darr AJ, Babakhanyan I, Caswell M, Alia Westphal B, Bailie JM. Efficacy of Computerized vs. Traditional Cognitive Interventions for the Treatment of Chronic mTBI Symptoms Among Service Members. Military Medicine. 2024 Sep;189(Supplement_3):530-8.
15. Sharma D, Sheth M, Dalal D. Aerobic training versus mobile application based cognitive training:

impact on cognition, aerobic capacity, and quality of life of older adults–An experimental study. JOURNAL OF GERONTOLOGY AND GERIATRICS. 2025 Apr 24;73:23-8.

16. Corti C, Oldrati V, Papini M, Strazzer S, Poggi G, Romaniello R, Borgatti R, Urgesi C, Bardoni A. Randomized clinical trial on the effects of a computerized cognitive training for pediatric patients with acquired brain injury or congenital malformation. Scientific Reports. 2023 Sep 4;13(1):14559.
17. Tramontano M, Argento O, Manocchio N, Piacentini C, Orejel Bustos AS, De Angelis S, Bossa M, Nocentini U. Dynamic Cognitive–Motor Training versus Cognitive Computer-Based Training in People with Multiple Sclerosis: A Preliminary Randomized Controlled Trial with 2-Month Follow-Up. Journal of Clinical Medicine. 2024 May 1;13(9):2664.