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Physical and Cognitive Training to Enhance Intensive Care Unit Survivors' Cognition: A Mapping Review

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Abstract

Purpose: The aim of this study was to examine current literature regarding effects of physical or cognitive training and simultaneous (dual-task) physical and cognitive training on cognition in adults surviving an intensive care unit (ICU) stay.

Design: Systematic mapping.

Methods: A literature search was conducted to examine effects of physical and/or cognitive training on cognitive processes.

Results: Few studies have targeted adults surviving ICU. Independently, physical and cognitive interventions improved cognition in healthy older adults with and without cognitive impairment. Simultaneous interventions may improve executive function. Small sample size and heterogeneity of interventions limited the ability to make inferences.

Conclusion: Literature supports positive effects of single- and dual-task training on recovering cognition in adults. This training could benefit ICU survivors who need to regain cognitive function and prevent future decline.

Relevance to Practice: With the growing number of ICU survivors experiencing cognitive deficits, it is essential to develop and test interventions that restore cognitive function in this understudied population.

Keywords: Cognition; cognitive impairment; intensive care survivors; physical activity; systematic mapping.

Advances in medical treatments have increased the number of adults surviving their intensive care unit (ICU) stay (Geense et al., 2017), leading to a heightened need for specialized and effective treatments for ICU-related sequelae. Intensive care is associated with new and worsening physical, psychological, and cognitive impairments that can persist for years following the critical illness (Needham et al., 2012; Proffitt & Menzies, 2019), especially if survivors experience an episode of delirium.

McKegney (1966) was the first to describe "intensive care syndrome," a condition attributed to factors such as severity of illness, treatment setting, and life-saving procedures. Complications post-ICU include chronic pain, fatigue, inability to perform activities of daily living, and ICU-acquired weakness (ICUAW; Geense et al., 2017; Proffitt & Menzies, 2019; Rengel et al., 2019). It is estimated that, after hospital discharge, one third of ICU survivors will experience ICUAW (Proffitt & Menzies, 2019). Accompanying ICUAW, symptoms such as depression, anxiety, posttraumatic stress, sleep disturbances (Geense et al., 2017; Hopkins et al., 2017; Proffitt & Menzies, 2019), and cognitive impairment are frequently reported.

Studies of physical or cognitive training have reported some success in recovering and improving cognition with growing evidence that, in healthy adults, simultaneous cognitive and physical exercise interventions may produce an additive effect (Joubert & Chainay, 2018; Tait et al., 2017). Examples of some of the physical training activities tested in these studies were tai chi and stretching/range of motion exercises, dance, and walking. Cognitive training activities tested included computerized games, whistling a tune, recalling a list, counting backward, and exergaming. Noticeably, these physical and cognitive interventions varied widely across study populations and in the studies of ICU survivors. Understanding the independent and combined intervention effects of physical and cognitive training demonstrates promise for improving cognitive recovery for

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Cite this article as:
Lasiter, S., Chrisman, M., Snodgrass, B., Thompson, M., & Harmon, K. (2021). Physical and cognitive training to enhance intensive care unit survivors' cognition: A mapping review. *Rehabilitation Nursing*, *46*(6), 323–332. doi: 10.1097/RNJ.0000000000000325

ICU survivors and further implications for social and economic factors in population health (Stanmore et al., 2017). The purpose of this mapping review was to present a critical examination of current knowledge of physical training, cognitive training, and the combination of both on cognition in adults and ICU survivors who experienced cognitive impairments.

Methods

Unlike systematic reviews where high-level primary studies are synthesized to answer a specific research question, systematic mapping is used when the availability of high-level evidence is not available and existing evidence is broad and less focused. These articles vary widely in study design, recruited population, interventions tested, and findings (James et al., 2016). This in-depth search returned articles that were gathered, reviewed, organized, and cataloged with the purpose of identifying existing practice and research gaps rather than synthesizing information to support practice. Thus, a systematic mapping method (Grant & Booth, 2009; James et al., 2016) was used to answer the question: What are the gaps in published literature reporting independent and combined physical and cognitive training on recovering cognition in adult ICU survivors?

An electronic literature search was conducted in February 2019 by a medical librarian (M. T.) using PubMed, CINAHL, and Cochrane Database of Systematic Reviews. Search terms included "ICU survivors," "ICU syndrome," "PICU syndrome," "ICU psychosis," "critical illness," "cognitive dysfunction," "cognitive deficit," "cognitive boost," "stimulation," "training," and/or "exercise." The population of interest was ICU survivors. Because of limited data specifically about ICU survivors, we also included articles examining adults with and without mild and moderate cognitive impairments and articles with broad differences in intervention duration or time. Articles were excluded if they were not in English and if subjects had preexisting dementia, brain/neurological injury or disease, stroke with severe cognitive or physical residual deficits, cardiac surgery, or cancer, as these diagnoses are known to reduce cognition to the extent that the participants may not be able to complete physical activity and cognitive study protocols. Articles that focused on behavioral impact of physical and cognitive training on cognition and functional and structural effects on the brain comprised the sample. The articles are summarized below.

Results

Of 297 articles reviewed for eligibility, 17 were included (see Figure 1). Three authors (S. L., M. C., and B. S.) independently appraised each of the 17 articles for agreement with inclusion criteria, and consensus was reached. Researchers conducting the 17 studies used various research designs, including seven randomized controlled trials, one controlled trial, one nonrandomized controlled trial, one quasi-experimental study, five systematic reviews, and two systematic reviews with meta-analysis. The authors (S. L. and M. C.) applied AMSTAR (A Measurement Tool to Assess Systematic Reviews) to assess quality of the systematic reviews (Shea et al., 2007) and assessed bias in randomized controlled trials using the Cochrane Collaboration risk of bias tool (Higgins et al., 2011). Discrepancies were discussed until consensus. Of eight controlled trials, two were assessed as having low risk of bias, two were assessed as having fair risk, and four were assessed as having high risk; among the seven reviews, three were assessed as high quality, three were assessed as medium quality, and one was assessed as low quality (see Table 1). Findings and discussion are organized below by physical and cognitive training effect on brain structure followed by intervention type.

Long-Term Cognitive Impairment

Up to 80% of ICU survivors experience long-term cognitive impairment (LTCI), with most studies reporting deficits in at least 50% of patients (Hopkins et al., 2017; Sakusic et al., 2018). Patients who received treatment in an ICU, especially after an episode of delirium, are at higher risk of LTCI regardless of age or preexisting conditions (Pandharipande et al., 2013). This LTCI results in considerable cost to patients, caregivers, families, and society (Pandharipande et al., 2013), including decreased quality of life for patients and caregivers, difficult independent living, mental health concerns, and unemployment (Elliott et al., 2019; Hopkins et al., 2012; Kamdar et al., 2017; Nedergaard et al., 2017; Wolters et al., 2013). Unemployment can persist 12 months following critical illness, and up to 29% of ICU survivors remain unemployed for health reasons, including cognitive impairment (Hodgson et al., 2018).

Executive functioning, the domain responsible for planning, problem solving, initiating, shifting, sequencing, monitoring, and inhibition, is most adversely affected by ICU-acquired cognitive impairment (Jackson et al., 2012), followed by memory and attention (Hopkins et al., 2012). Combined, these deficits act to prevent ICU survivors from independent living and employment (Wolters et al., 2013). Longitudinally, Nedergaard et al. (2017) reported approximately 70% of study ICU survivors had cognitive impairment at discharge and at 12 months, with cognitive impairment persisting in 25% of the study participants at 6 years. Global cognition scores were similar to Alzheimer-type

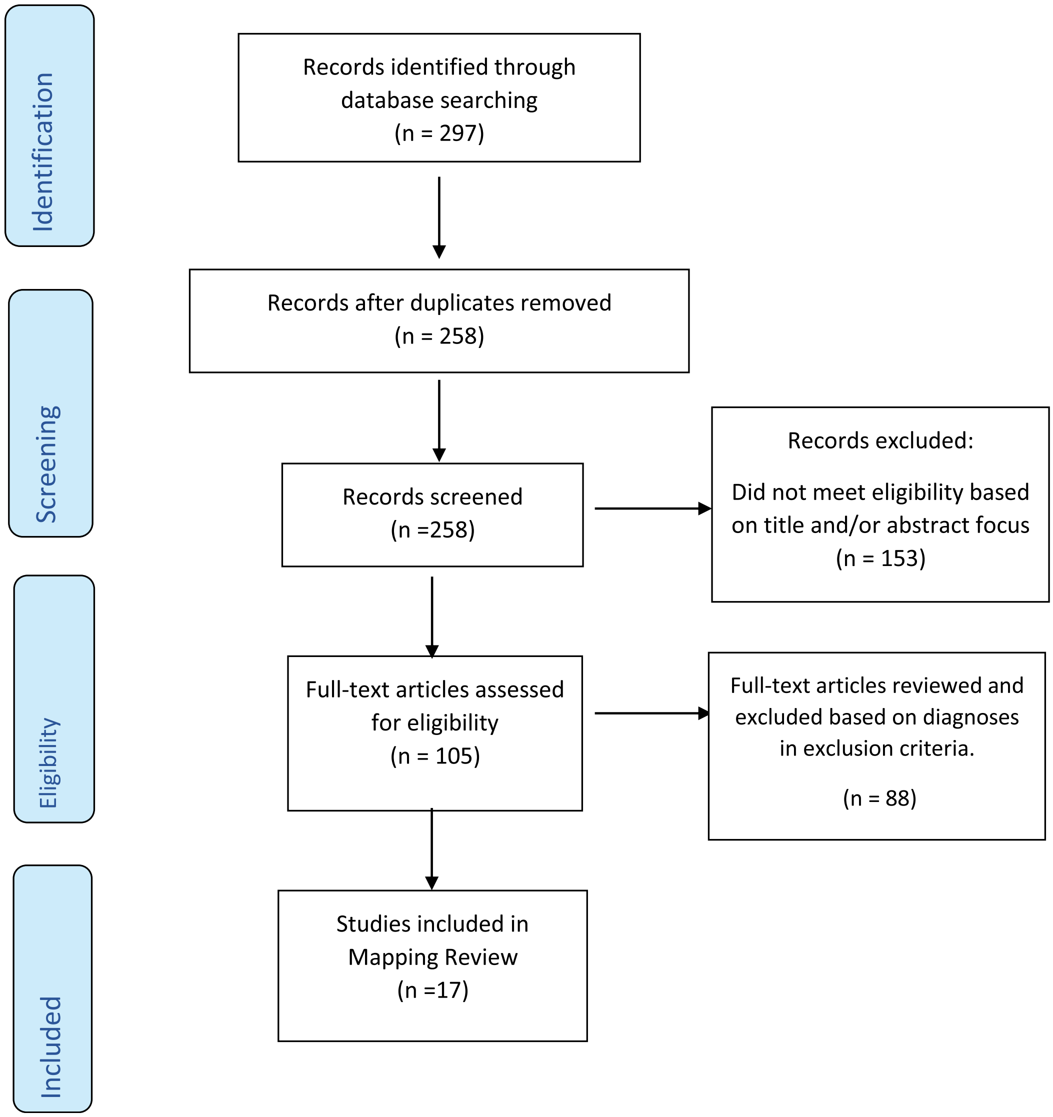

Figure 1. PRISMA flow diagram.

dementia at 3 months postdischarge, showing no significant improvement after 1 year (Estrup et al., 2018; Pandharipande et al., 2013).

Physical Exercise and Cognition

Physical exercise increases brain neurotrophic factors (Rengel et al., 2019), which protects existing neurons and increases neuroplasticity (Dhami et al., 2015). Imaging has shown increased gray matter volume and activity in frontal, parietal, and hippocampus areas in response to physical exercise (Curlik & Shors, 2013; Dhami et al., 2015). These areas of the brain are responsible for executive functioning, planning, divided attention, and response inhibition (Anderson-Hanley et al., 2012).

Physical activity also enhances learning and memory by stimulating dopaminergic activity in the basal ganglia, increasing blood concentrations of biomarkers (e.g., norepinephrine, lactate) and stimulating neurogenesis (Hopkins et al., 2012; Lauenroth et al., 2016). In addition, physical exercise increases cerebral blood flow providing oxygen, neurotrophic factors, and glucose to the brain stimulating angiogenesis (Dhami et al., 2015; Wang et al., 2018). Angiogenesis boosts oxygen and glucose delivery to new and old neurons (Dhami et al., 2015; Hopkins et al., 2012) sparking neurogenesis, increased cell proliferation in the hippocampus, and decreased proinflammatory markers (Gleeson et al., 2011; Hopkins et al., 2012). Physical exercise also mitigates the harmful effects of chronic inflammation. Thus, by increasing neuroplasticity, angiogenesis, and neurogenesis, physical exercise is crucial for recovery of long-term cognitive function in ICU survivors (Hopkins et al., 2012).

Table 1 Combined Cognitive and Physical Training and Cognition in Adults with and without Cognitive Impairment

Study	Study Design and Quality	Participants	*N*	Intervention(s) and Timing	Outcome(s)
Bruderer-Hofstetter et al. (2018)	Systematic review, meta-analysis; high quality	Older adults (≥55 years) NC or MCI Age: mean = 71, range 65–81	*N* = 1758 (1,088 MCI, 670 NC)	DTI	Five of 17 studies found DTI superior to cognitive or physical training alone in improving physical and/ or cognitive function; no improvement in IADL; DTIs are best for improving global cognition, learning and memory, complex attention, and language domains in participants with MCI; DTIs performed separately improved physical and/or cognitive outcomes more than simultaneous interventions.
Coelho et al. (2013)	Controlled trial; high risk of bias	Older adults with mild–moderate Alzheimer's disease Age: IG: 78 ± 7.3; CG: 77 ± 7.4	*N* = 27 (IG: 14; CG: 13)	IG: Physical training with simultaneous cognitive tasks (generating names or whistling specified song) that increased in difficulty over time CG: No intervention	Frontal cognition improved significantly in the DTI group compared to the CG; the CG had worse scores in the Clock Drawing Test and more counting errors in a follow-up assessmen.t
Eggenberger et al. (2015)	RCT; fair risk of bias	Adults age >70 independent or assisted living facility without CI Mean age: IG1: 77 IG2: 78 IG3: 80	*N* = 89	IG1: Virtual reality video dance game IG2: Simultaneous treadmill walking with verbal memory training IG3: Treadmill walking Intervention delivered to nonhospitalized, community residing adults	Video game dancing and simultaneous walking with memory training groups improved in switching attention and working memory compared to the treadmill only group; improvements in executive functioning, long-term visual memory, and processing speed were maintained until 1-year follow-up.
Evans et al. (2009)	RCT; high risk of bias	Adults with CI secondary to neurological injury or illness Mean age: IG: 44; CG: 45 Age range: 28–60	*N* = 19 (10 IG, 9 CG)	IG: Walking with cognitive task that increased in complexity with time CG: No intervention	Improvement in the DTI group was noted for walking and talking, but no changes in cognitive–motor, cognitive–cognitive, or motor–motor task combinations.
Lauenroth et al. (2016)	Systematic review; medium quality	Adults with NC and CI Age range: 44–82	*N* = 1,461	Combined cognitive and physical training interventions.	Simultaneous and subsequent DTI had greater significant positive changes in cognitive outcomes when compared to cognitive or physical therapy interventions alone.
Law et al. (2014)	Systematic review; medium quality	Older adults (≥60 years) with normal cognition or cognitive impairments	*N* = 802 (480 NC, 32 CI)	DTI	DTI had significant positive effects in cognitive function, memory, executive function, attention, and functional status in participants with cognitive impairment, no comparison with a CG

(continues)

Table 1. Combined Cognitive and Physical Training and Cognition in Adults with and without Cognitive Impairment, Continued

Study	Study Design and Quality	Participants	*N*	Intervention(s) and Timing	Outcome(s)
Joubert & Chainay (2018)	Systematic review; medium quality	Adults with no CI Age range: 22–80	*N* = 12,494	DTI	DTI can have positive outcomes for brain structure and function, cognitive functioning, emotional status, and physical functioning in healthy older adults. Greatest positive effects in long-term maintenance of intervention effects were seen in DTI groups.
Sacco et al. (2016)	Nonrandomized controlled trial (experimental design)	Older adults ≥50 years with MCI Mean age: 72 Age range: 70–76	*N* = 8	Each participant was own control and participated in both experimental treatments with 3-month pause: cycling alone or cycling with cognitive training (cognitive exercises delivered on a tablet).	Participants had greater improvement in inhibition tasks in DTI; no effect was noted for single reaction time in either cycling alone or DTI.
Tait et al. (2017)	Systematic review; low quality	Older adults with CI	*N* = 29 RCTs	DTI	Seventeen of 19 simultaneous DTI studies noted improvement in ≥1 cognitive domain whereas 6 of 10 sequential DTI studies noted significant changes.
Vaportzis et al. (2019)	Systematic review, meta-analysis; high quality	Healthy adults ≥60 years	*N* = 2826 (2,065 physical, 423 cognitive, 232 DTI, 106 other)	DTI	Five of 6 studies that evaluated DTI found significant improvement in ≥1 cognitive domain compared to CG; meta-analyses found no significant change in cognitive outcomes for DTI.
Zhu et al. (2016)	Systematic review; high quality	Older adults with no CI Age range: 65–81.9	*N* = 2,667 (1,085 combined intervention, 249 cognitive intervention, 333 physical intervention, 1,000 controls)	DTI, cognitive therapy, physical therapy	No significant difference between DTI and cognitive intervention alone. DTI had significant improvements on memory, executive function, attention, global cognition, and visuospatial ability compared to control group. Greater improvement in DTI for global cognition and visuospatial ability compared to the physical exercise group.

Note. NC = normal cognition; MCI = mild cognitive impairment; DTI = dual-task intervention; IADL = instrumental activities of daily living; IG = intervention group; CG = control group; RCT = randomized controlled trial; NC = normal cognition; CI = cognitive impairment.

Cognitive Training and Cognition

Cognitive training (brain exercise) promotes neuroplasticity through directed and repeated activities that target specific cognitive functions such as memory, attention, and executive function (Lauenroth et al., 2016). Cognitive training is unique in that it utilizes repeated problem-based activities and standardized tasks and targets specific cognitive domains (Gates et al., 2011). Exercises targeting specific areas of the brain have the greatest efficacy in improving cognitive performance in patients with mild cognitive impairment (MCI; Gates et al., 2011). Furthermore, interventions with cognitive exercise lasting at least 12 weeks have yielded the greatest cognitive benefits (Gates et al., 2011).

Combined Cognitive and Physical Training and Cognition

Two types of combined cognitive and physical interventions have been tested; subsequent training interventions, characterized by cognitive and physical interventions completed at different times, and dual-task interventions (DTIs) where cognitive and physical interventions are administered simultaneously (Lauenroth et al., 2016). Given the different actions that cognitive and physical training each has on the brain (Dhami et al., 2015; Lauenroth et al., 2016; Maillot et al., 2012), the combined intervention is hypothesized to provide greater benefits in cognition (Joubert & Chainay, 2018).

Compared to subsequent training interventions, DTI in healthy adults has increased positive effects on cognitive functioning in healthy adults (Lauenroth et al., 2016). A meta-analysis evaluating the effects of combined cognitive and physical interventions on cognitive outcomes in healthy older adults (Zhu et al., 2016) demonstrated improved memory, executive function, global cognition, and visuospatial abilities, but not processing speed. Combined interventions increased positive effects compared to physical intervention only, but no significant difference when compared to cognitive intervention alone. High-frequency interventions had approximately one third of the effect size compared to lower frequency ones (Zhu et al. 2016). In a systematic review, Lauenroth et al. (2016) concluded that length, frequency, and duration of the program increased effectiveness, as did progressive cardiovascular and strength training combined with attention, executive function, or working memory practice.

Joubert and Chainay (2018) examined effects of cognitive and physical training alone and combined on cognition in healthy older adults. They found that DTIs improved brain structure and function and demonstrated long-term maintenance of cognitive benefits. They also concluded that combined cognitive and physical training interventions helped slow cognitive decline in older adults.

Overall, dual-task cognitive and physical exercises lead to better cognitive performance than interventions with independent and subsequent training; however, results are not conclusive. Further research is needed to better understand the additive benefits of combined therapy.

Combined Interventions in Adults With Cognitive Impairment

Evaluation of DTI in patients with cognitive impairment has shown positive effects on cognitive performance (Coelho et al., 2013; Evans et al., 2009). Using a DTI that required healthy adult participants to complete a cognitive task while completing a motor task showed significant improvements in frontal cognitive functions, including abstraction, organization, motor sequencing, inhibition, and attention. The control group, who received no intervention, demonstrated a decline in planning, organization, and motor sequencing from baseline. A similar dual cognitive and motor task intervention in 19 patients with a neurological injury found improvements in cognitive–motor tasks compared to a control group, but other dual-task combinations (e.g., cognitive-cognitive, motor-motor) showed no change (Evans et al., 2009).

Authors of two systematic reviews concluded that combined cognitive and physical exercise training programs improve cognition in older adults with and without cognitive impairments (Law et al., 2014; Tait et al., 2017). Others have suggested a cognitively stimulating environment or cognitive enrichment could augment cognitive effects over a physical intervention alone (Sacco et al., 2016; Tait et al., 2017). Sacco et al. evaluated the effect of adding a cognitive enrichment component to physical exercise on cognitive performance in older adults with MCI compared to physical exercise alone. They concluded that cognitive enrichment increased the positive effects of physical exercise on reaction time and response inhibition.

One systematic review did not support the positive effect of simultaneous dual-task therapy in older adults with MCI (Bruderer-Hofstetter et al., 2018). The authors found cognitive and physical interventions completed separately were more effective in participants with MCI, and simultaneous DTI interventions were more successful in participants with normal cognition.

Technology and Cognitive and Physical Training

Integrating technology into cognitive and physical training interventions is becoming a widely used strategy, especially computer-assisted cognitive training and exergaming (see Table 2). Exergames combine physical exercise and cognitive tasks using an interactive platform such as virtual reality or electronic gaming. Anderson-Hanley et al. (2017) compared neurogaming via virtual reality-enhanced cybercycling with traditional stationary cycling in older adults. An interactive component was added to a virtual cycling path where participants memorized a list of errands, guided the bike to reach set locations, and chose the path to return to start. The cybercycling group had a 23% reduced risk of progressing to MCI compared to the stationary cycling group. Researchers concluded that reality-enhanced cybercycling demonstrated greater cognitive benefits than traditional cycling alone (Anderson-Hanley et al., 2017). Maillot et al. (2012) implemented a 12-week, 1-hour session twice per week, exergaming intervention. This single-group study demonstrated improved executive function and processing speed in older adults with no change in visuospatial performance.

Table 2 Technology and Cognitive and Physical Training

Study	Study design and quality	Participants	*N*	Intervention(s) and timing	Outcome(s)
Choi et al. (2015)	RCT; high risk of bias	Patients with subacute stroke Age range: 47–71	*N* = 20	IG: Simultaneous balance and cognitive training using BioRescue administered 3 months poststroke.	DTI group had significant improvements in balance, auditory continuous performance test, and backward visual span test compared to the control group
Anderson-Hanley et al. (2012)	RCT; fair risk of bias	Independent living older adults Mean age: 68.8 Age range: 50–94	*N* = 30	IG1: Neuroexergaming (cognitive exercise while pedaling stationary bike) IG2: Exergaming group (pedaling bike on path without cognitive tasks) IG3: Neurogaming group completed iPACES program without exercise component (no pedaling of bike). Intervention delivered to nonhospitalized, community residing adults.	It was feasible for older adults to use a physical and cognitive exercise system; participants in the neuroexergame group (simultaneous cognitive and physical exercises) showed significant changes in pre- and posttest results compared to other groups.
Maillot et al. (2012)	RCT; high risk of bias	Healthy older adults Mean age: 73	*N* = 32	IG: Participants played Wii sports games. Intervention delivered to nonhospitalized, healthy older adults.	Exergaming participants had significant improvements in executive function and processing speed domains.
Anderson-Hanley et al. (2017)	Quasi-experimental pilot study	Older adults with MCI and their caregivers/companions Mean age: 76	*N* = 31	IG: Participants completed neuroexergame intervention that required pedaling stationary bike using Memory Lane. Intervention delivered in nonhospitalized participants' residences.	Participants who completed the prescribed dose for the study had significant improvements in executive function and verbal memory after 3 months; no significant change found in participants who did not complete the program.

Note. RCT = randomized control trial; IG = intervention group; DTI = dual-task intervention; MCI = mild cognitive impairment.

Varied results have been reported regarding effectiveness of cognitive training games in improving general cognitive functioning (Tait et al., 2017). Effects of exergaming are limited in improving cognitive function in older adults (Tait et al., 2017). Exergaming interventions improved cognition in both clinical and healthy populations (Stanmore et al., 2017).

Combined Interventions and Cognition in ICU Survivors

Few studies have combined physical and cognitive training in interventions specifically for ICU survivors (see Table 3). The Activity and Cognitive Therapy in the Intensive Care Unit (ACT-ICU) Study determined the feasibility of a sequential physical and cognitive training intervention for ICU patients in-hospital and after discharge (Brummel et al., 2012; Brummel et al., 2014). Researchers concluded the combined training program was feasible and safe, but it was not powered to detect efficacy.

Jackson et al. (2012) conducted a 12-week randomized controlled trial of a combined, sequential physical, cognitive, and functional training intervention in ICU survivors. At 12 weeks, the intervention group had greater cognitive and physical function compared to the control group; however, the difference was not statistically significant. Effect sizes of the combined intervention were greater than that of other studies reviewed. The authors suggested the combined delivery enhanced the effectiveness of the cognitive training and the added functional component helped translate benefits to daily life.

Discussion

Research has demonstrated that independent cognitive and physical interventions improve cognitive function in healthy older adults both with and without cognitive impairment. Furthermore, combined cognitive and physical interventions, especially DTIs, have potential for improving executive functioning, memory, processing speed, and other cognitive domains.

Two major limitations exist in the current literature reviewed. First, most studies had small sample sizes, which weakens the generalizability of the results. Second, there

Table 3 Combined Cognitive and Physical Intervention in ICU Survivors

Study	Study design and quality	Participants	*N*	Intervention(s)	Outcome(s)
Brummel et al. (2014)	RCT; low risk of bias	ICU patients with respiratory failure and/or shock Age range: 48–69	*N* = 87	Three groups: usual care, physical therapy, sequential physical therapy with cognitive therapy (goal management training program) Intervention delivered during acute care, then postdischarge in outpatient setting	Early combined sequential cognitive and physical therapy intervention is feasible and safe in ICU patients during ICU stay and at home postdischarge.
Jackson et al. (2012)	RCT; low risk of bias	ICU survivors with post-illness cognitive or functional impairment Mean age: IG: 47 CG: 50 Age range: 41–69	*N* = 21	IG: Received sequential cognitive (goal management training), physical, and functional therapies in-home, via televisits and in-person CG: Usual care (sporadic rehabilitation) Intervention delivered for postdischarge ICU patients in their home setting	Participants who received combined intervention had greater improvements in executive functioning and functional ability compared to usual care group.

Note. ICU = intensive care unit; RCT = randomized control trial; IG = intervention group; CG = control group.

is wide heterogeneity in the types of cognitive and physical interventions, assessment tools, and follow-up protocols, and few studies in this review were high quality or had low risk of bias. More high-quality and sufficiently powered studies are needed to bolster recommendations to improve cognition in ICU survivors. Although experience and familiarity of the literature related to ICU survivorship added to the specificity of search terms selected by the authors, there is always a potential for studies to be missed. Furthermore, selection bias may be introduced when researchers choose articles to include in the final analysis. This risk was minimized by using multiple databases, a large variety of search terms, and required consensus of three author reviewers. Despite the limitations, the evidence reported in these studies and this review is useful in clinical practice.

Patients who have survived an ICU stay and are discharged to a medical-surgical or rehabilitation unit should be identified by rehabilitation nurses using the patients' medical records or by being asked to self-report during the health assessment. A question about ICU survivorship could be added to the assessment so survivors are easily identified. Knowing the patient's ICU history would cue rehabilitation nurses to carry out a cognitive assessment, along with the usual physical assessment so that the care plan could be tailored to the cognitive recovery needs of the ICU survivor.

Plans of care for patients who are recovering from a serious illness, in a subacute hospital unit, rehabilitation center, or at home, should be developed based on published evidence. In addition, the plan should specifically target the needs of this growing, vulnerable population. Because there is such a wide variance in interventions, nurses should determine the feasibility of effective interventions for their practice areas and the abilities of the patients they serve. Especially important is the partnership developed between the nurse and the ICU survivor, as this is critical to the success of recovery.

Conclusion

This review located only two studies testing effects of combined cognitive and physical exercise interventions on cognition in ICU survivors. Rehabilitation nurses have a professional role in contributing to the rehabilitation science for ICU survivors. By developing practice questions or joining research teams, rehabilitation nurses can formulate and explore research questions about ICU survivor recovery, along with other patients who could benefit from cognitive training. With the growing number of ICU survivors and associated challenges of recovering from post-intensive care symptoms, it is essential to develop effective interventions for restoring their cognitive and physical function. Research is needed to determine the best practice interventions, yielding the most effective cognitive outcomes, and to establish the intervention dose needed for recovery and prevention of cognitive decline in all ICU survivors.

Conflicts of Interest

The authors declare there are no conflicts of interest.

Funding

The authors declare that there is no funding associated with this project.

Key Practice Points

- Rehabilitation nurses are in a strategic position to advance research in areas of cognitive recovery for ICU survivors in the community.
- Physical activity and cognitive training are ways for rehabilitation nurses to help ICU survivors recover their cognitive function.
- Rehabilitation nurses are perfectly situated to generate and test innovative interventions to assist ICU survivors recover cognitive function.

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