Systematic Review on Multiple Sclerosis

Virgil Mathiowetz, PhD, OTR/L
Chih-Huang Yu, MS, OTR/L in Taiwan
University of Minnesota

Systematic Review Question

What is the effectiveness of interventions within the scope of occupational therapy practice for persons with Multiple Sclerosis?

Additions to MS Search Strategy

- Articles included:
  - January 2003 to May 2011

Search results

- Initial screening yielded a total of 3484 titles and abstracts
- 70 Articles relevant to the research question were included:
  - Level I – 43
  - Level II – 13
  - Level III – 14
  - Level IV – 0
  - Level V - 0

Themes of evidence

- Integrated Rehabilitation Programs
- Fatigue Management Programs
- Health Promotion Programs
- Client Factors and Performance Skill:
  - Cognition
  - Emotional Regulations
  - Motor and Praxis Skills
    - Exercise
    - Motor training

Integrated Rehabilitation Program

- Sixteen studies were categorized into this theme:
  - Inpatient rehabilitation program
    - 2 Level I and 3 Level III
  - Outpatient rehabilitation program
    - 1 Level I and 1 Level II
  - Home-based program
    - 1 Level I, 1 Level II, and 1 Level III
  - Rehabilitation program in a variety of settings
    - 2 Level I
  - Vocational rehabilitation
    - 1 Level I
  - Functional mobility
    - 2 Level I and 1 Level II
Integrated Program: Inpatient Rehabilitation

  - Level III, N = 193
  - The greatest improvement were in ADLs
  - Participants may benefit from self-care skill training directly compared to therapeutic exercise
  - Increasing OT intensity was positively associated with the improvement of ADL performance.

- Strong evidence that MS patients may benefit from the individualized and goal-oriented multidisciplinary rehabilitation program (MDR) in improvement of functional status, motor function, self-perceived quality of life, MS related disability.
  - Total sample size across studies: N=538

Integrated Program: Inpatient Rehabilitation

- OT’s role in MDR:
  - Maintaining use of upper extremities for ADL
  - Enhancing communication skills and attention span
  - Providing adapted equipment
  - Fatigue and stress management

- Khan et al, 2008 (Level I):
  - MDR had short term effect on the levels of activity but not participation.
  - Significant improvements in FIM scores: transfers, locomotion, and self-care.
  - Low intensity outpatient and home based MDR provided strong evidence for longer term improvement in quality of life

Integrated Program: Home-based rehabilitation

- Inconsistent evidence supports the use of telerehabilitation program in home based setting.
  - 12-week telerehabilitation program (HAT) was effective in improving balance and walking ability (Finkelstein et al, 2008, Level III)
  - No significant differences between usual care and a one-month home based telerehabilitation system (HCAD) in grasping, gross movement, and finger dexterity (Huijen et al, 2008, Level I)

Rehabilitation Program: Vocational Rehabilitation

- Systematic Literature Review (Khan et al, 2011, Level I)
- No conclusive statements could be drawn for vocational rehabilitation
  - the diversity of target population, aim of intervention, and the small number of studies included
Rehabilitation Program: Functional Mobility

- Insufficient evidence supports the use of assistive technology
  - Both static and dynamic AFOs helped improve static balance (Cattaneo et al., 2002, N = 14, Level II)
  - A combination of an AFO and external FES had significant improvement in performance and satisfaction of COPM (Esnouf et al., 2010, N = 64, Level I)
  - Exercise training on core stability had significant improvement in satisfaction of COPM (Esnouf et al., 2010, N = 64, Level I)

Fatigue Management: Face-to-Face

- 3 Level I and 1 Level II included
  - Fatigue: Take Control (Hugos et al, 2010, N = 30, Level I)
    - Included multiple strategies for managing fatigue
    - Immediate effect only
      - Significant improvement in fatigue impact and self-efficacy
      - No significant improvement in fatigue severity was observed

Fatigue Management: Face-to-Face

  - First proposed by Packer et al. (1995)
  - Short term efficacy (immediately post-course)
    - Reduction of fatigue impact
    - Improved some aspects of quality of life
    - Improved self-efficacy
  - Long term efficacy (1 year post-course)
    - Beneficial effects of the course were maintained for both outcomes

Fatigue Management: Long distance

- 1 Level I and 2 Level III studies were included
  - Online fatigue self-management program (Ghahari et al, 2010, N = 95 (74 MS), Level I)
    - Adapted from Managing Fatigue program
    - After intervention,
      - Significant improvement in fatigue impact
      - Fatigue self-management group had no better improvement than the information-only group

Fatigue Management: Long distance

- Teleconference delivered energy conservation program (Finlayson, 2005, N = 29, Level III; Finlayson et al, 2007, N = 29, Level III)
  - Adapted from Managing Fatigue program
  - Immediate effect
    - Significant reduction in fatigue severity, fatigue impact, and increase quality of life (bodily pain and general health)
  - Strength
    - Social support and normalization, quality and usefulness of the resources, comfort and confidence with the format (participants)
    - Power of peers and value of repetition (therapists)
  - Limitation
    - Logistics and time (both participants and therapists)
    - Diverse needs of participants (participants)

Health Promotion Program

- 3 Level I studies were included
  - Individualized physical rehabilitation (IPR) vs. group wellness intervention (GWI) (Plow et al, 2009, N = 42, Level I)
    - Significant improvement in health and physical activity in both groups
    - IPR: more in reducing fatigue impact and impending the decline of physical health
    - GWI: better in improvement of mental health
Health Promotion Program

- 12-week motivational interviewing based telephone counseling (Bombardier et al, 2008, N = 130, Level I)
  - Significant improvement in physical activity, spiritual growth, and stress management
  - Significant improvement in self-reported minutes of exercise per week
  - No significant finding in fatigue.

Health Promotion Program

- Health promotion education program (OPTIMISE) (Ennis et al, 2006, N = 62, Level I)
  - Significant improvements found in the intervention group were health responsibility, physical activity, spiritual growth, and stress management
  - Beneficial effects were maintained 3 month post-intervention

Performance Skills

Emotional Regulations

- 5 Level I and 1 Level II studies were included


- MS patients may benefit from the combination of education, multidisciplinary program, goal setting, homework assignments, and discussion forums (Malcomson et al, 2007)

Performance Skills

Emotional Regulations

- Psychotherapeutic group and social discussion group were better on improvement of mood, self-efficacy, and resiliency than simply providing an education booklet. (Rigby et al, 2008, N = 147, Level I)

- Weak evidence supports relaxation and stress management in improving emotional disturbances (Malcomson et al, 2007; Hughes et al, 2006)

Performance Skills

Motor and Praxis: Exercise

- 14 Level I, 2 Level II, and 7 Level III studies were included

- Exercise types:
  - Physical activity
  - Aerobic exercise
  - Resistance training
  - Yoga

Performance Skills

Motor and Praxis: Exercise

- Targeted population:
  - Persons with mild to moderate MS

- Aerobic exercise was the most common type.

- No exacerbation of MS related symptom was reported secondary to exercise programs

- Effect sizes for body function, activity, and quality of life varied greatly (Asano et al, 2009, Level I systematic review)
Performance Skills
Motor and Praxis: Exercise
- Immediate or short term effect of exercise
  - Improved Walking performance
    - Geddes et al., 2009, N = 12; Level I; Perez, 2007, N = 36; Level III; Freeman et al., 2004, N = 10; Level III; Rombarg et al., 2004, N = 114, Level I)
  - Improved Physical fitness and mood
    - Cakil et al., 2010, N=45; Level I; De Souza-Torreira et al., 2009, N = 13, Level III; Fragoso et al., N = 10; Level I; Rajmadottir et al., 2007, N = 23; Level I; Rietberg et al., 2004, Level I; Schulz et al., 2004, N = 39; Level I; White et al., 2004, N = 8, Level III
  - Improved Quality of life
    - Reehns et al., 2004, N = 31, Level III; Schulz et al., 2004

Performance Skills
Motor and Praxis: Exercise
- Some evidence for aerobic exercise and/or strength training decreased fatigue impact but not disability (Velikonja et al. 2010, N=20, Level I; Freeman et al., 2004, N=10, Level III; McCullagh et al., 2008, N=30, Level I; White et al., 2004, N=8, Level III)
- Limited evidence for long-term effects of exercise (McCullagh et al., 2008, N=30, Level I)

Performance Skills
Cognition
- Limited evidence for attention training
- Beneficial effect on computer-based training program
  - On information processing/attention and decision making (Fiavita et al, 2009, N = 20, Level II)
  - Phonemic retrieval (Solari et al, 2004, N = 77, Level I)
- Long-term efficacy on cognitive function remained unclear

Performance Skills
Motor and Praxis: Exercise
- Yoga was beneficial for selective attention ability but not for mood, spasticity, or executive functions (Velikonja et al., 2010, N=20, Level I)
- Pilates-based group exercise program showed improvements in balance, walking performance, physical component and motor component of fatigue impact (Freeman & Allison, 2004)
- Men and women with MS benefitted equally from aerobic and strengthening exercises (Soraka et al., 2004, N = 35, Level I)
- Some evidence for unloaded leg cycling exercise to reduce MS related spasticity and pain (Sonnoll et al., 2009, N = 22, Level II)

Performance Skills
Motor and Praxis: Motor Training
- Improvement on Balance performance:
  - Balance-based torso weighting improved balance (Widener et al., 2009, N = 30, Level I)
  - Balance retraining aiming at motor and sensory strategies improved static balance (Catanzaro et al., 2009, N = 30, Level I)
- Improvement on Upper extremity motor function:
  - Constraint-induced movement therapy improved amount of use (Mark et al., 2008, N = 5, Level I)
  - Robot-based rehabilitation protocol reduced duration of tracking movement and improve smoothness of the trajectory. (Capofrilli et al, 2009, N = 16, Level I)
  - MS patient with ataxia may benefit from PT, but the benefits were not sustained (Wells et al, 2007, Level I systematic review)

Performance Skills
Cognition
- Limited evidence supports the efficacy of memory training
  - Healthy participants benefitted more at immediate recall with self-generation strategy whereas MS patients benefitted more at 4-week recall (Goverover et al, 2008, N = 38, Level II)
  - General memory, visual working memory, and verbal auditory working memory (Skall et al, 2010, N = 107, Level II)
- MS patients benefitted from spaced learning at the immediate and 30 minutes delayed recall (Goverover et al, 2010, N = 38, Level II)
Performance Skills: Cognition

- No positive effects in maintenance and long term (5 weeks) efficacy of the Story Memory Technique for MS participants (Chiaravalloti et al, 2005)

- Higher repetition had poorer recall ability across learning trials in healthy and MS participants (Chiaravalloti et al, 2003, N = 84, Level II)

- Pure treatment effect of 6-week non specific homework-based cognitive training program could not be determined (Brenk et al, 2008, N = 41, Level II)

Limitations

- Overall
  - Insufficient studies with strong methodology
  - Inconsistent outcome measures across studies
  - Potential publication bias if non-significant findings are not published

- Individual studies
  - Small sample size
  - High attrition rates
  - Lack of a control group
  - Lack of short- and long-term follow-up assessments
  - Presence of co-intervention
  - Mixed types of MS or other neurological conditions
  - Unreported reliability and validity of outcome measures
  - Difficult to determine OTs unique contribution in MDR

Implications Clinical and community-based

- MS patients benefit more from intervention addressing functional performance, participation, and symptom management

- Interventions executed in settings with the presence of professionals, such as inpatient and outpatient programs, had better results compared to those settings without, such as home-based exercise program

Implications Clinical and community-based

- Fatigue management:
  - Conducted independent of other rehabilitation services
  - Provide clearer evidence of the benefits of OT
  - Beneficial effects on reduction of fatigue impact and improvement of quality of life
  - Stronger evidence supports group management course delivered in face-to-face format
  - Weaker evidence supports teleconference and online formats
  - No study provides evidence of the efficacy of fatigue management in the individual format

- OT could have a role in development of wellness/health promotion programs

Implications Clinical and community-based

- Positive evidence for impairment level focused studies
  - Immediate but not long-term effects were observed
  - OT interventions should foster clients’ active learning and engagement in those chosen occupations

Implications Clinical and community-based

- Positive evidence for impairment level focused studies
  - Aerobic exercise (cycling and aquatic therapy), resistance and stretching exercises, and yoga studies revealed improvements in endurance and muscle strength

  - Although beneficial effect of cognitive retraining, it is unknown whether the results of these studies on memory and attention can be generalized to problem solving in the real world
Implications
Clinical and community-based
• Positive evidence for impairment level focused studies
  – CBT based psychological interventions are beneficial for reduction of depression
  – There is a need to evaluate activity-based intervention effects on psychological variables

Implications
Program Development
• Community-based settings
  – Developing programs that help persons with MS engage in wellness program, physical activity, and fatigue management
• Clinic
  – Contribute to improving MDR
  – Incorporate activity-based intervention strategies
• Both clinic and community-based OT practitioners
  – Developing programs addressing balance among person, occupation, and environment systems

Implications
Education and Training of OT students
• Evidence-based findings regarding factors influencing health and well-being of persons with MS
• Fatigue management and development of physical activity and wellness programs in curricula
• Fieldwork serving persons with MS in community-based programs will benefit future OT practitioners entering the workforce

Implications
Research
• Need more OT researchers evaluating OT interventions for persons with MS
• Need to evaluate both short-term and long-term efficacy of OT interventions
• Need to evaluate effects of OT interventions on the activity and participation level
• OT needs to be involved in design of MDR programs
• Comparison of group vs. individual formats for fatigue management
• Comparison of distance vs. in-person formats for fatigue management