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Designing Assistive Technologies to Facilitate Activities of Daily Living for Older Adults: Evaluation of Existing Design Guidelines and Recommendations From Field Studies

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Background: Although Older Adults (OA) are among the largest consumers of Assistive Technology (AT), their complex needs are not fully understood by designers. Spending time to understand user needs is strongly associated with device success; development based on poor user understanding results in product dissatisfaction and/or abandonment. Prevalence of difficulty with transferring (on/off toilet, in/out of tub, etc) among OAs suggests ample design opportunities for innovations in transfer-related AT. **Purpose:** The purpose of this work is to explore how designers may be better supported to develop transfer-related AT for OAs, by asking: 1) how useful are current design guidelines in facilitating design of bathroom-related AT for OAs? and; 2) what are the relative merits of different interaction methods (Phone, Interview with visual guides, virtual home visits) to engage OAs to inform unmet needs for AT? **Methods:** A two-phase approach was taken in this study: Phase 1: a literature review to identify design guidelines intended to guide designing for OAs; Phase 2: field studies to gain insight into how design guidelines may be supplemented with direct interaction methods with OAs. **Results:** Phase 1 findings suggest that while guidelines facilitate understanding the range of abilities and limitations in the OA population, they do not adequately address the environmental and occupational factors that impact design decisions. Phase 2 findings suggest a degree of success in all three forms of interviewing methods for gathering user needs from OAs regarding unmet needs for AT; however, the virtual home visit proved to be most useful in terms of gathering more detailed responses. **Discussion & Conclusion:** Incorporating feedback from designers can help develop future design guidelines tailored to older adults. Creating more activity-specific design guidelines would improve the effectiveness of AT in various environments. Occupational Therapists could help bridge the knowledge gap between designers & OAs.

Caregiver Roles Associated with Successful AT Delivery in Caregiving Dyads: A Conceptual Framework

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Background: The provision of assistive technology (AT) is a complex process requiring an in-depth understanding of multiple factors, including personal, contextual and environmental influences that impact AT use. One understudied area within AT delivery is roles played by family caregivers in facilitating AT use; the many ways in which caregivers are, and should be, utilized, in the AT provision process are not yet well characterized. **Purpose:** The purpose of this work is to support clinicians to incorporate caregivers more effectively in the AT process, by in-depth investigation of roles played by caregivers, which is represented into a framework. **Methods:** A two-phase approach was taken in this study: Phase 1A) a literature review to identify a range of factors (care recipient, caregiver, and dyad-specific) found to be important to consider when providing AT; Phase 1B: Interview AT subject matter experts (N=5) to gain insight into the clinical experiences of working with caregiving dyads in AT delivery. These formed the foundation of creation of a framework, which was validated in Phase 2. **Results:** Finding from Phases 1A and B were analyzed and coded using the ICF language to inform the creation of a conceptual framework. This framework identified five caregiver role set in the context of the stages of the AT delivery process (gatekeeper, informant, motivator, educator, maintainer), which are most relevant at different parts of the AT process. This framework can be used to inform and educate clinicians on how to better integrate caregivers into the assistive technology service delivery. **Discussion:** Increased understanding of varied caregiver roles may support more caregiver-inclusive AT practice. Future work includes further validation of this framework with a larger number of clinicians. This Framework can help establish a conceptual foundation for further lines of research into dyadic influences of AT delivery.

A Survey on Clinicians' Perspectives and Usage of Rehabilitation Technology

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Objective: To investigate clinicians' opinions, experiences, and usage of rehabilitation technology in their respective practice areas. **Design:** Cross sectional study **Setting:** English online survey **Participants:** Occupational therapists, occupational therapy assistants, physical therapists, physical therapy assistants, and speech language pathologists from North America (n=108). **Interventions:** Not applicable. **Main Outcome Measure(s):** Responses to multiple choice, Likert-scale, and open-ended questions about clinicians' demographics, experiences, education, funding, and opinions regarding rehabilitation technology. **Results:** This survey explores clinicians' use, knowledge, comfort, and motivation regarding the implementation of rehabilitation technology in daily practice. Participants were occupational therapists (45.5%), physical therapists (32.7%), physical therapist assistants (12.9%), speech language pathologists (5.9%), and occupational therapy assistants (3.0%). Participants reported working in one or more of the following settings: outpatient (28.7%), private practice (20.4%), inpatient rehab (18.5%), acute care (20.4%), home health care (13.0%), skilled nursing facilities (19.4%), community-based settings (5.6%), and other settings (14.8%). Approximately half (45.3%) of the participants strongly agreed that they were motivated to learn about new rehabilitation technology, and less than one-third (28.6%) strongly agreed that they felt comfortable implementing new rehabilitation technology. Very few respondents (3.6%) reported feeling strongly that they received adequate rehabilitation technology education in school, and less than one-tenth (7.1%) of clinicians felt very prepared to use rehabilitation technology following graduation. **Conclusions:** The findings of this survey identify gaps in clinicians' readiness to use rehabilitation technology. These results indicate the need for continuing education opportunities to help clinicians navigate, implement, and advocate for rehabilitation technology in their current practice. **Key Words:** Rehabilitation; Technology; Education, Continuing; Occupational Therapy; Physical Therapists

Effect of Task Constraints on Children's Reaching Kinematics Using Virtual Reality

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Object size and the goal of object manipulation are established qualifiers of movement, influencing reaching kinematics. Moreover, children's fine motor is expected to mature by 9-10 years old. It is unclear if these task constraints or age affect reaching kinematics in children using virtual reality (VR). This study's purpose was to assess the effects of object constraints (size, goal) and age on VR for children, ages 6-12. Forty-four neurotypical children participated (23m, 21f, avg. 9.07 ± 2.12 y), blinded to the purpose. A VR bubble popping game (SuperPop VRTMTM) examined children's reaching kinematics (movement time, straightness ratio, number of movement units, average speed, elbow and shoulder range of motion (ROM)). Participants played 24 games total; 3 trials were completed on each hand in four different conditions based on bubble size (large, small) and task goal (fast, comfortable pace). Means for these conditions were compared with a mixed design ANOVA. There was no significant age effect on any of the kinematics. With both the dominant and non-dominant hand, reaching for large bubbles showed faster reaching speeds, straighter reaching trajectories, less jerky movement patterns and shorter reaching duration ($p < .05$). Further analysis showed significant interaction effects pertaining to both hands. When using the dominant hand, at a comfortable pace, straighter reaching paths occurred significantly more for the large bubbles condition ($p < .006$). At a fast pace, average reaching speeds were greater for the large bubbles condition ($p = .002$). For the large bubbles condition, average reaching speeds were greater during fast pace trials ($p = .007$). When using the non-dominant hand, in the small size condition, elbow ROM was greater during fast pace trials ($p = .004$). At a fast pace, there was more elbow ROM when reaching for small bubbles ($p = .002$). The results of this study indicate bubble size and task goal influence children's reaching kinematics in VR settings, but not age.

Strategies for Recruiting Young African American Men for Stroke Prevention Research

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Background: Young (age 20-35) African American (AA) men have the shortest life span, the highest rate of premature mortality, and experience the highest rate of disability of any group by race and gender. Despite these realities, young AA men continue to be underrepresented in research studies. Objective: The goal of this study is to evaluate the efficacy of different recruitment methods in enrolling young AA men in research studies. Methods: A literature review was conducted to assess previously-established studies in recruiting young AA men. As a result, a mixed-methods approach to recruitment was implemented. The methods included social media, flyers, and word-of-mouth/snowball sampling. Results: Of the 81 young AA men who completed the screening survey, 42% (n = 34/81) were reached through word-of-mouth/snowball sampling, 28% (n = 23/81) were reached through social media, 20% (n = 16/81) were reached through flyers (via e-mail or physical copies), 7% (n = 6/81) were reached through prior participation. Conclusion: Word-of-mouth/snowball sampling continues to prove effective in recruiting underrepresented populations, including young AA men. Social media was shown to be an effective recruitment measure. While the impact of social media may have been magnified by the nature of the COVID-19 pandemic, social media's ability to disseminate information to young people is not to be understated.

Physical Therapists' Perceptions on the Lack of Diversity in Home Exercise Programs for Patient Education

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Home exercise programs (HEPs) are an important part of physical therapy interventions. Current HEP handouts may lack diversity as most of the models demonstrating the exercises are white and relatively young and fit. While this lack of diversity may impact patient compliance, how physical therapists (PTs) perceive the diversity content in HEPs remains unclear. This study examined clinicians' perceptions of diversity, equity, and inclusion within current HEPs to help improve patient education and compliance by enhancing treatment inclusivity. Subjects included 90 PTs (76% white; 68% female; 60% greater than 5yrs work experience) A survey was completed by PTs who are currently practicing. The survey included demographics of the clinicians and inquiries on their perceptions regarding whether they notice a lack of diversity and the importance of diverse content in the HEPs that they use and prescribe. Responses were summarized using descriptive statistics. Chi-squared tests were used to examine whether the responses to survey questions differ between PTs with different races, genders, or years of practice. While the majority of PTs noticed a lack of diversity in race (69%) and age (58%) in HEPs, only 22% of PTs indicated a lack of diversity in gender. A significantly greater % of responders who are not white (95%) or who have practiced ≤ 5 years (83%) indicated a lack of diversity in race of HEP models when compared to responders who are white (60%, $p < 0.01$) or who have practiced > 5 years (58%, $p = 0.02$). A significantly greater % of female responders (69%) indicated a lack of diversity in age of HEP models when compared to male responders (36%, $p < 0.01$). 56% of the responders agreed that a diverse handout is important to patient compliance with the prescribed exercises. Specifically, 63%, 72% and 44% of responders agreed on the importance of using an exercise model similar to the patient's race, age and gender, respectively. A significantly greater % of responders who are not white (64%) indicated the importance of exercise models being of the same gender as patients when compared to white responders (37%, $p = 0.05$). 64% of the responders agreed that a diverse HEP would help improve patient therapist connection (77% in those have practiced ≤ 5 years vs. 55% in those who have practiced > 5 years; $p = 0.04$). 79% of the responders recommended use of a more racially diverse HEP (89% in those who have practiced ≤ 5 years vs. 68% in those who have practiced > 5 years; $p = 0.04$). Overall, PTs recognized the lack of diversity in race and age in current HEP handouts. However, perceptions varied among PTs based on the clinician's race, sex, and/or years of practice.

Does Insurance Status Impact Functional Outcomes Post-TBI?:

A TBIMS-ND Study

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Background: For individuals with a traumatic brain injury (TBI), research shows that insurance status is an important predictor of access to post-hospital care and significantly impacts treatment and health outcomes. However, existing research investigating this relationship is limited in geographic scope, sample size, and length of follow-up. **Purpose:** The purpose of this study is to use a larger, national sample to investigate how insurance status impacts long-term functional outcomes post-TBI. **Method:** Data from the TBI Model Systems National Database (TBI-MS) on individuals who were hospitalized with a moderate to severe TBI in 2015-2016 was used to perform multiple regression analysis (N = 1,933). Insurance status was determined by reported payer source for rehabilitation services. Functional Independence Measure (FIM) scores 1- and 2-years post-injury were used as a measure of functional independence. **Results:** After controlling for various demographic factors and injury severity, insurance status was a significant predictor of FIM scores. Patients with public insurance had significantly lower FIM scores 1 year and 2 years after injury than uninsured patients. There was not a significant difference in FIM scores between people without insurance and people with private insurance. **Discussion:** The results of this study should be considered by healthcare professionals to determine which patients may be at higher risk for poorer outcomes. More research is needed to understand functional recovery beyond one-year post-injury and what interventions are most effective for patients with TBI once they return to the community.

Diversity of Occupational Opportunities within Walking Distance Predicts Community Health Score in Atlanta and Its Neighborhoods

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Research indicates built environment structures affect a population's occupational participation and resultant health outcomes. In this article, the results of a path analysis utilizing data sourced from Walk Score® and the AARP Livability Index indicates a strong relationship between diversity of destinations and health outcomes. Secondly, diverse opportunities that increase the potential for social participation within walking distances were also found to be positively associated with health. This imparts guidance for policy to be benefited by the holistic perspective of occupational therapy that underscores the complex interplay of factors that contribute to occupational participation and health. Similarly, this indirectly reinforces the need to promote participation in a diverse set of activities on an individual level to promote well-being and physical activity.

The Role of Community Nursing in Assessing Healthcare Disparities for Homeless Populations

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An issue not limited to major cities, homelessness continues to present a multitude of concerns as it pertains to public health in the state of Georgia. As the COVID-19 pandemic persists in exposing the inequities and flaws of our systems, there is an increasing devotion to researching the risk factors, reasons, and effects of homelessness from a community and public health perspective. Conducting my community nursing clinical at SafeHouse Outreach, a facility that provides resources to those experiencing homelessness, I first-handedly witnessed the stress that the pandemic has placed upon this particular population in managing their health and wellness. The overarching theme of this article analysis is that PEH are not only at greater risk for health inequities and disparities, but these disparities have been exacerbated by the COVID-19 pandemic. Each one of the articles highlighted an issue magnified by the pandemic whether it was testing, prevention of disease, housing, or basic necessities. All of the initiatives detailed in the analysis focused on interventions on a more localized level, partnering with proximal facilities that directly interacted with PEH. Even though these projects were completed on a more intimate scale, the data and results offer evidence that the sustainability and scalability of the projects is possible. As the COVID-19 pandemic continues to evolve the status of the homeless population, public health officials can contribute to the development of policy that recognizes both the acute and long term needs. Assessment is the most crucial tool in identifying the characteristics of a community, offering data that can shape interventions. The assessments that have been conducted during the pandemic have brought attention to the inequities experienced by PEH, inspiring change on local, state, and federal level.

The Effects of COVID-19 on Social Participation and Mental Health Among U.S. Adults

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Background: To date, there are 78,739, 443 cases of COVID-19 in the United States (WHO, 2022). Social isolation during the pandemic was found to be a strong precursor for an array of mental health problems (Twenge & Joiner, 2020a). Specifically, the prevalence of depression and anxiety was three times higher amongst adults living in the United States during COVID-19 (Twenge & Joiner, 2020b). Our study is the first to examine social participation's effect on mental health for all adult age groups during the COVID-19 pandemic. The purpose of this study is to: 1. Examine the effects of social participation on mental health during COVID-19 2. Investigate differences in mental health and social participation amongst various adult age groups 3. Examine how the availability of the vaccine has changed social participation and mental health. Methods: This survey was administered to two waves of participants; wave one was recruited before the vaccine became available, and wave two was recruited after the vaccine became available. Data was collected on demographics, anxiety symptoms, depression symptoms, and participation of the participants in both waves. Results: Anxiety, depression, and participation were highest in the young adult age group (aged 18-30). Productivity of participation was correlated with levels of depression (p-value=.031) and anxiety (p-value=.014). Social relations are the only domain of participation with a significant difference before and after the vaccine (p-value = .050). The availability of the vaccine did not impact levels of depression (p-value=.078) and anxiety (p-value=.772). Discussion: Mental health resources should be increased for younger adults in the upcoming years. Occupational Therapists can provide recommendations for engaging in social participation, along with mental health resources and coping strategies to clients struggling with their mental health. Occupational Therapists can also engage in advocacy with universities and schools by providing resources about warning signs of anxiety and depression for students.

The Effect of the COVID-19 Pandemic on Nurses' Burnout

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Purpose: This project aims to identify the effect of the COVID-19 pandemic on the level of burnout experienced by nurses in acute care settings. **Introduction:** The influx of high acuity patients, increased patient mortality, insufficient federal assistance, and public distrust during the COVID-19 pandemic have resulted in negative psychosocial effects on nurses. Nurses' burnout is defined as “a widespread phenomenon characterized by a reduction in nurses' energy that manifests in emotional exhaustion, lack of motivation, and feelings of frustration and may lead to reductions in work efficacy”. Assessing risks and addressing issues related to nurses' burnout is integral to understanding and overcoming the phenomena. **Methods:** A review of literature utilized multiple databases using the search terms “COVID-19”, “burnout”, and “nurses”. Across six databases there were 347 results, and 10 articles were selected for review. **Results:** Through our review of various articles, it is evident that the Covid-19 pandemic has caused a significant increase in the nurses' burnout. Nurse burnout had negative effects on the quality of patient care and increased the incidence of adverse effects. Several sociodemographic, social, and occupational factors also affect burnout levels as well, however, there are positive and negative factors that can affect how resilient a nurse is and the burnout the nurse might experience. **Implications/Conclusion:** As the COVID-19 pandemic has increased nurses' burnout significantly, both hospitals and individuals must take measures to help reduce the negative effects of burnout. Maintaining personal hygiene, setting boundaries, providing psychological support systems are ways to help mitigate burnout in this stressful time. If burnout is not managed and prevented efficiently, future implications could be a worsened staffing shortage, decreased patient care, and more. Further research is needed to validate these findings. **Keywords:** COVID-19, burnout, and nurses

Cause of oxygen and mechanical ventilator shortage in the Atlanta area due to the Covid 19 Pandemic and impact on healthcare settings

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Background: In the Atlanta area, hospitals experienced oxygen and mechanical ventilator (MV) shortages. The exact reasons why these shortages occurred is not understood. The aim is to discover measures to implement to avoid future shortages. The research questions are: What was the extent of Atlanta area oxygen or MV shortages? What factors contributed to oxygen and MV supply issues before and during the COVID-19 Pandemic How did hospitals in the Atlanta area mitigate effects of experienced shortages? Methods: The research methodology used an anonymous survey instrument to ask Atlanta area hospitals about current shortages in oxygen and MVs. After IRB approval, the survey was emailed to RTs that worked in GSU affiliated hospitals. Data was analyzed using SPSS version 28. Results: Of the 45 potential participants, 21 responded to the survey for a 54% response rate. 76% of facilities (16) did not experience an oxygen shortage over the past 20 months. However, 62% (13) facilities did experience a MV shortage. 60% of the MV shortages experienced lasted three weeks or less. 90% of the facilities that obtained additional MVs obtained traditional ventilators. Conclusion: While Atlanta area hospitals did report some shortages, these shortages were short-lived. Oxygen transportation issues, then oxygen supply issues were the top reasons contributing to the oxygen shortage. Atlanta area hospitals frequently ordered oxygen, and some implemented oxygen conserving triage methods to mitigate the effects of a shortage. Quick implementation of additionally obtained MVs helped lessen effects of the MV shortages. Limitations include reliance on respondents for accuracy of data provided. Memory might have made certain data points less accurate. Another limitation is that 21 respondents is a low response rate and is a lack of generalizability. Future research should be geared towards enhancing the MV national stockpile and improvement of oxygen supply transportation.

Interventions to Reduce Role Strain of Informal Caregivers

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Objectives: Learners will understand interventions that may reduce stress **Title:** Interventions to Reduce Role Strain of Informal Caregivers of Patients with Neurocognitive and mental disorders **Background:** The value of the unpaid labor performed by caregivers is estimated to be at least \$306 billion annually, nearly double the combined costs of home health care (\$43 billion) and nursing home care (\$115 billion). However, studies show caregivers are at risk of developing high levels of physical, emotional, and mental strain, which can negatively impact their role, quality of life and increase medical costs. **Purpose:** The project aims to ascertain if giving informal caregivers nonpharmacological interventions such as self-guided bibliotherapy, stress reduction interventions, and improving health literacy will reduce role the strain of informal adult caregivers' and improve their quality of life. **Methods:** This project employed a mix-method design focusing on the role strain and quality of life of relatives and friends assisting individuals with neurocognitive or mental health disorders. The subjects engaged in weekly self-guided activities for eight-week and responded to survey questions regarding demographics, depression, anxiety, and stress levels. Personal health information (PHI) was not obtained. The subjects were required to answer qualifying questions. A \$5 Amazon was given to participants who completed the project. **Results:** The project was concluded on January 7, 2022, but the analysis is still on going. There was a pre and posttest online surveys. Four subjects completed the pretest but only two completed the online survey. **Conclusion/ Implications:** The current COVID-19 has led to an increase in mental health issues. Because of the overwhelming increase in mental health cases, many individuals with mental health problems are being turned away. The decrease in the availability of mental health providers has led to an increased need for informal caregivers. However, studies show stress from caregiving can negatively affect the health of caregivers and result in loss of work productivity. However, specialized support for caregivers is frequently limited. Brown et al. (2016) said non-pharmacological self-help interventions such as bibliotherapy, stress-reduction techniques, and health literacy training could improve caregivers' health. Therefore, law makers and healthcare professionals need to come up with interventions to help caregivers. **Keywords:** informal caregiver role strain theory, caregiver stress theory, Roy's adaptation model.

The Association of Perceived Burdensomeness and Thwarted Belongingness with Suicide-Related Behavior Among Individuals Living with HIV

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Background: Individuals with HIV are at an increased suicide risk^{1,2,3,4}. There is a 2-30% lifetime prevalence of suicide-related behavior among people living with HIV (PLWH)^{5,6} compared with a 4.8% rate in the general population⁷. Perceived burdensomeness and thwarted belongingness are potential predictors of suicide risk. However, perceived burdensomeness and thwarted belongingness have not been evaluated in relation to suicide-related behavior among PLWH. Purpose: The purpose of this study is to determine the association of perceived burdensomeness and thwarted belongingness with suicide-related behavior among PLWH. Methods: This is a cross-sectional study. The Interpersonal Theory of Suicide will be used to guide this study. A total of 80 participants will be recruited from infectious disease clinics in metro-Atlanta. Participants' suicide-related behavior, perceived burdensomeness and thwarted belongingness will be assessed. Multiple logistic regression will be used to test the association of each study variable with suicide-related behavior. Data will be analyzed using SPSS. Significance level is set at $p < 0.05$. Expected Outcomes: The expected outcome of this study is a better understanding of the association of perceived burdensomeness and thwarted belongingness to suicide-related behavior in PLWH. Findings will provide a foundation to develop effective and sustained interventions for preventing and reducing suicide-related behavior among PLWH. Conclusions/Implications: Intervention recommendations will be proposed for future research and clinical practice. The success of this study will lead to an important positive impact on suicide prevention in this underserved population, and thereby improve their mental health. Keywords: Suicide, Perceived Burdensomeness, Thwarted Belongingness

Prevalence and Risk Factors for Cervicogenic Headaches in Health Profession Students

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Purpose: Cervicogenic headaches (CGH) are a type of secondary headaches in which pain is referred to the head from the cervical spine. CGH are often described as unilateral, starting at the posterior neck and wrapping around to the front of the head. The exact cause of CGH is largely unknown due to the multitude of contributing factors. Therefore, the goal of the study was to determine the prevalence of CGH in health professional students to help identify the prevalence of common risk factors present in the subjects with CGH. **Hypothesis:** We hypothesize that a high percentage of health professional students who report headaches will classify their headaches as cervicogenic with increased risk factors such as sleep, stress, and screen time as significant predictors of CGH. **Number of Subjects:** 107 **Methods:** Health professions students were recruited to participate in a 35-question online survey about headaches. Six criteria based on these questions were used to distinguish between CGH and other headaches. Based on the responses, subjects were assigned to 1 of 3 groups: CGH, other non-cervicogenic headaches (NCGH), and no headaches (NHA). A one-way ANOVA or independent Student's t-test was used to evaluate significant differences between groups. **Results:** Overall, 19 of 107 subjects (17.76%) were assigned to the CGH group, 72 were assigned to the NCGH (67.29%) group and 16 were assigned to the NHA (14.95%) group. The NCGH group reported the most sleep, followed by the CGH group and the NHA group reported the least sleep. There was only a significant difference in sleep between the NCGH and NHA groups. In regards to stress, the NHA group reported the least amount of stress followed by the CGH group and the NCGH group reported the most stress which was significantly greater than both groups ($p < 0.05$). While reported screen time was highest in the CGH group and NCGH groups, it was not significantly different when compared to the NHA group ($p > 0.05$). The NHA group reported a significantly higher frequency of lifting weights compared to both the NCGH and CGH groups ($p < 0.05$). The CGH group reported the highest BMI out of all three groups, but there was no significant difference across groups. **Conclusions:** There was a high reported rate (17.76%) of CGH headaches in the health professional students who completed the survey when compared to the general population (4%). Several risk factors in the development of CGH and NCGH headaches are elevated in health professions students: increased stress, increased screen time, less strength training, increased age, and increased BMI. These factors pose potential risks for the development of CGH in health professions students and early education and modification on risk factors could reduce the severity and frequency of headaches. **Clinical Relevance:** This study aims to determine the prevalence of CGH headaches in health profession students and indicates risk factors for CGH. If these risk factors can be modified in student populations, relief from the recurring headache symptoms and prevention of future symptoms may result.

Self-Care: A Vital Practice to Improve Health Promoting Lifestyles of a Novice Nurse Practitioner

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Purpose. The project aimed to improve students' health-promoting lifestyles while enrolled in a master's degree nurse practitioner (NP) program by integrating self-care plan modules in their final-year curriculum. **Background.** Self-care practices can promote a smooth transition for novice NPs in undertaking unfamiliar roles as healthcare providers because they can effectively manage occupational stressors. New NPs should be equipped with self-care practices while enrolled in the master's degree program to develop health-promoting lifestyles, enhance overall well-being, and endorse healthy lifestyles to their patients. **Methods.** A convenience sampling was used in a single group pre-, and post-survey using health-promoting lifestyle profile II (HPLP II) administered to NP students after performing a lifestyle self-care plan (LSCP) for eight consecutive weeks. The survey included the six HPLP II subscales: spiritual growth, interpersonal relations, nutrition, physical activity, health responsibilities, and stress management. **Results.** Out of 17 participants, only 13 completed the project. On average, participants' healthy lifestyles improved; and health responsibility and interpersonal relations improved significantly. Stress management, physical fitness, and nutrition improvement minimally. Spiritual growth was consistently high in pre- and post surveys. Participants reported they liked the self-care videos and found them helpful, but most did not have time to practice self-care due to busy schedules. **Significance.** Although new NPs cannot always avoid stress, adding self-care practice modules in the master's degree curriculum could help improve healthy lifestyles, which may benefit them and the entire healthcare system. **Keywords:** self-care, health-promoting lifestyles, nurse practitioners, nursing students, nurses, health-promoting lifestyle profile

Cancer-related fatigue: The referral to physical therapy as a collaborative treatment approach.

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Learning Objectives: 1. The learner will be able to understand the need for a standardized treatment approach for the treatment of cancer-related fatigue. 2. The learner will be able to recognize ways to overcome barriers to the implementation of physical therapy as a standard treatment approach for cancer-related fatigue.

Title: Cancer-related fatigue: Referral to Physical Therapy as a Collaborative Treatment Approach Background: Cancer-related fatigue is one of the most commonly reported symptoms among cancer patients and is often exacerbated by cancer treatment;1,2,3 however, it remains undertreated despite the negative impact it has on quality of life.4,5 Purpose: To determine if referral of patients with cancer-related fatigue to physical therapy improves patient fatigue levels and quality of life and to implement a change in policy and procedure to adequately address cancer-related fatigue. Methods: Participants recruited from outpatient oncology clinics affiliated with a large healthcare system completed a fatigue assessment and quality-of-life scale pre and post completion of 4 to 6 weeks of physical therapy. A treatment protocol was developed for integration into the EHR to facilitate provider assessment and referral of patients to physical therapy for treatment of cancer-related fatigue. A system-wide policy and procedure change to ensure provider compliance with referral was proposed. Results: Of the participants who completed the initial phase of the project, all showed improvements in their fatigue scores and two of the three showed improvement in their quality of life. Barriers to patient access to physical therapy were identified. Conclusion: Referring patients to physical therapy to treat cancer-related fatigue may be an effective way to improve this symptom and positively impact patient quality of life. Implementing a system-wide change in policy and procedure to simplify the process of assessment and treatment of cancer-related fatigue would increase provider compliance in addressing this debilitating symptom. Keywords: Cancer-related fatigue, Physical Therapy, Standardization of Care

A combination of γ -tocotrienol and brusatol for the treatment of lung cancer

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Lung cancer is the leading cause of cancer deaths in the United States. While progress has been made in developing effective therapeutics for the treatment of lung cancer, lung cancer has a 5-year survival rate of just 18.6%. There is a demand for novel treatment approaches that can effectively target cancer cells while inducing minimal adverse effects on the patient's quality of life. Nutritional approaches (nutraceuticals) may be a viable option. Vitamin E contains two vitamers: tocopherols and tocotrienols. Tocotrienols are potent antioxidants that have exhibited anti-cancer effects in preclinical models. Additionally, brusatol, a novel compound isolated from the plant, *Brucea Javanica*, inhibits cancer growth in preclinical models. Independently, tocotrienols and brusatol reduce cancer progression, likely through differing mechanisms. It is likely that a combination of tocotrienol and brusatol synergistically inhibits cancer progression. However, the efficacy of a combination of tocotrienols and brusatol against lung cancer has not been investigated. Therefore, the aim of this project was to determine if the combination of γ -tocotrienol and brusatol inhibit lung cancer growth and to determine the mechanism of action of this combination therapy. Approximately 85% of lung cancers are non-small cell lung cancer (NSCLC). We utilized A549 cells, which are a model of NSCLC. A549 cells were treated with media supplemented with vehicle, tocotrienol (TT; 20 μ m), brusatol (Bru; 10 nM), and tocotrienol and brusatol combined (20 μ m TT + 10 nM Bru). Cell proliferation was measured at days 0, 3, and 6. Protein was collected after 24 hours of treatment for analysis of proteins of interest. TT, Bru, and TT+Bru significantly reduced lung cancer proliferation at day 3 (8.0, 23.0, and 7.6% of control, respectively) and at day 6 (7.8, 13.3, 8.0% of control, respectively). TT, Bru, and TT+Bru tended to reduce expression of STAT3 (a transcription factor important for cancer cell growth) but not significantly. These studies suggest that a combination of TT and Bru may be an effective treatment for lung cancer. Ongoing studies in the lab will optimize dosages of these treatments and elucidate effects on cellular signaling pathways mediating the anticancer effects of this combination therapy.

The combination of brusatol and methionine restriction for treatment of lung cancer

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Lung cancer is the leading cause of cancer deaths in the U.S. There is a need for alternative or adjunctive therapies to treat cancer or enhance efficacy of standard treatments. Nutritional therapies like methionine restriction (MR) are being explored because of the essential amino acid's role in cancer metabolism. MR is effective at slowing growth of various cancers in preclinical models. The novel compound, brusatol, inhibits cancer growth in preclinical models. Likely through differing mechanisms, both reduce cancer progression. It is probable that a combination of the two could synergistically inhibit cancer progression. The efficacy of this polytherapy has not been investigated. Therefore, this study's aim was to determine if the treatment with MR and brusatol inhibits lung cancer growth and to determine the mechanism of action of this combination therapy. We focused on oxidative stress markers since brusatol is a known inhibitor of the antioxidant transcription factor, NRF2. We utilized A549 cells, which are a model of human non-small cell lung cancer. A549 cells were treated with vehicle or brusatol (5 nM) in control or MR media. Cell proliferation was measured at days 0, 3, and 6. Protein was extracted from cells after 24 hours of treatment. Protein expression of NRF2 and its target protein, NQO1, were measured by western blot. On days 3 and 6, MR and combination of MR+brusatol significantly reduced lung cancer proliferation compared to control, while brusatol alone had no significant effect. MR tended to reduce NRF2 expression ($p=0.068$). However, brusatol alone, and with MR, significantly reduced NRF2 expression by 38% and 43%, respectively. NQO1 expression was not affected by any treatment. Together MR and brusatol may be an effective intervention for lung cancer that induces minimal adverse effects on noncancer cells. Our ongoing studies continue to explore the mechanism of action of MR+brusatol.

Raspberry increases expression of antioxidant enzymes in the kidney of angiotensin II-treated rats

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Objective: To examine whether dietary supplementation with raspberries attenuates angiotensin (Ang) II-induced oxidative stress in the kidneys of rats. **Methods:** Eight-week-old male Sprague-Dawley rats were fed an AIN-93M diet (control and Ang II groups) or AIN-93M diet supplemented with 10% w/w freeze-dried raspberry (RB + Ang II) for seven weeks. At week 4, rats were implanted with subcutaneous osmotic minipumps that delivered 0.9% saline (control) or Ang II (270 ng/kg body weight/day) for an additional three weeks. Protein expression of antioxidant enzymes in the kidneys, such as heme oxygenase-1 (HO-1) and NADPH quinone oxidoreductase-1 (NQO1), were assessed by western blot. Results were analyzed using ANOVA followed by Tukey-Kramer post-hoc test. **Results:** Raspberry polyphenols exhibited activation effects on the mas receptor, which in turn activates the transcription factor nuclear factor erythroid 2- related factor 2 (Nrf2). This resulted in the increased production of antioxidant enzymes NQO1 and HO-1, showing potential protective effects of raspberry polyphenols in the kidney against oxidative stress induced by Angiotensin II. **Conclusion:** Our findings indicate that supplementation with raspberry has the potential to significantly increase the expression of antioxidant enzymes in a model of ang II-induced oxidative stress. **Future work** will focus on elucidating the mechanism through which raspberries elicit their action in the kidneys. **Funding Sources:** This work is supported in part by the Agriculture and Food Research Initiative (grant no. 2019-67017-29257/project accession no. 1018642) from the USDA National Institute of Food and Agriculture.

Effects of delta-tocotrienol on inflammation in Neuro-2A cells

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Objectives: Chronic neuroinflammation plays a central role in the development of neurodegenerative diseases, such as Alzheimer's disease. Like many chronic diseases, Alzheimer's disease has no cure and there are only minimally effective FDA-approved treatments. A vitamer of vitamin E, tocotrienols have been shown to possess potent anti-inflammatory and antioxidant properties. There are limited studies that investigate tocotrienols on neuroinflammation. Our study aimed to determine the effects of δ -tocotrienol on neuroinflammation and to examine the mechanism of action of δ tocotrienol in Neuro2A (N2A) cells. **Methods:** There were four treatment groups: CON-VEH (control media + vehicle), CON-TT (control media + δ tocotrienol), CM-VEH (conditioned media + vehicle), and CM-TT (conditioned media + δ -tocotrienol). N2A cells were pretreated with vehicle or 10 μ M δ tocotrienol for 6-8 hours. To induce inflammation, a combination of lipopolysaccharide (LPS) and conditioned media from activated macrophages was used. After the 6-8 hour pretreatment with vehicle or δ -tocotrienol, cells were treated with control media or macrophage conditioned media along with vehicle or δ -tocotrienol for 16-18 hours. Protein was extracted, quantified, and separated via SDS-PAGE. Components of the inflammatory signaling pathway, including phosphorylated and total STAT3, phosphorylated and total NF- κ B, and phosphorylated and total I κ B α were measured. One-way ANOVA and Tukey's multiple comparison test was used for data analysis. **Results:** CM increased NF- κ B phosphorylation, but TT did not affect phosphorylation of NF- κ B. CON-TT significantly decreased STAT compared to CON-VEH and CM-TT. Neither CM nor TT affected I κ B α phosphorylation. **Conclusion:** This study shows that TT does not significantly decrease treatment groups in either groups, but that CON-TT. Ongoing studies in the lab will determine the effects of δ -tocotrienol on gene expression of neuronal inflammatory cytokines. Our future studies will continue to elucidate the mechanisms by which TT reduce neuroinflammation.

Raspberry supplementation attenuates blood pressure and improves mesenteric artery relaxation in a nitric oxide-independent mechanism in angiotensin II-treated rats

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Objective: Polyphenols, found abundantly in berries, are suggested to exert antihypertensive properties which may be due to increasing levels of endothelial nitric oxide (NO), a potent vasodilator. Thus, the objective of this study was to evaluate the effects of raspberry supplementation on vascular function in angiotensin (Ang) II-treated rats. **Methods:** Eight-week-old Sprague-Dawley rats (n=8/group) were fed an AIN-93M diet (control, Ang II, and Losartan (LOS; 20 mg/kg/BW) groups) or AIN-93M diet supplemented with 10% w/w freeze-dried raspberry (RB + Ang II) for 7 weeks. At week 5, rats were implanted with subcutaneous osmotic minipumps that delivered 0.9% saline (CON) or Ang II (270 ng/kg BW/min) for an additional 3 weeks. Blood pressure (BP) was measured using tail-cuff plethysmography. Mesenteric arteries were isolated for vascular relaxation measurements in a wire myograph. Data were found to be normal and analyzed using ANOVA or mixed-model where appropriate. **Results:** Final SBP was significantly lower in the CON (-26.4%, $p = 0.01$), LOS (-28.3%, $p = 0.0005$), and RB + Ang II (-20.8%, $p = 0.03$) groups compared to Ang II group. Relaxation was significantly inhibited in the Ang II group in the presence of acetylcholine after incubation with L-NAME (100 μ M), a NO synthase inhibitor, when compared to LOS ($p = 0.0003$) and RB + Ang II ($p = 0.0004$) groups. Similarly, relaxation in the Ang II group was significantly inhibited after incubation with ODQ (10 μ M), a sGC inhibitor, when compared to CON ($p = 0.0002$), LOS ($p = 0.0004$), and RB + Ang II ($p = 0.0001$) group. Incubation with LY294002 (20 μ M), a PI3K inhibitor, showed no significant changes. **Conclusion:** We demonstrate that RB supplementation attenuated Ang II-induced hypertension and abolished the inhibitory effects of L-NAME and ODQ suggesting that RB may exert its vasodilatory effects in a NO-independent manner.

Methionine Restriction Affects Metabolic Parameters in a Fibroblast Growth Factor 21- and Sex-Dependent Manner

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Objectives: In rodents, dietary restriction of methionine protects against obesity. Fibroblast growth factor 21 (FGF21) is an important mediator of methionine restriction's (MR) metabolic benefits. Most preclinical work investigating the impact of MR has been conducted in males, leaving a gap in our understanding of female responses. This study aimed to examine the impact of high-fat diet (HFD) feeding and MR on body weight (BW) and adiposity in both sexes. Furthermore, we sought to determine the sex-dependent role of endogenous FGF21 in mediating metabolic responses to HFD and MR. **Methods:** Male and female wild-type (WT) and Fgf21 knockout (Fgf21^{-/-}) mice were fed low-fat diet (LFD) or HFD versions of control (0.86% methionine) or MR (0.17% methionine) diets for 5 weeks. BW and food intake were recorded weekly. Insulin tolerance tests were performed at week 4. Week 5, mice were euthanized, and adipose depots were collected. **Results:** Neither HFD nor MR significantly altered BW of female mice regardless of genotype. However, while HFD did not significantly affect BW, MR significantly reduced BW of both WT and Fgf21^{-/-} males ($p < 0.0001$). Neither HFD nor MR significantly altered adiposity (gonadal adipose tissue weight/body weight) in female mice regardless of genotype. However, HFD significantly increased adiposity in male WT and Fgf21^{-/-} mice, and MR prevented this increase in both genotypes. MR increased energy intake in all WT mice. The ability of MR to increase energy intake was abolished in all Fgf21^{-/-} mice. **Conclusions:** The effects of MR on BW and adiposity are sex-dependent, but FGF21-independent. HFD feeding affects adiposity differently in males and females. The effects of MR on energy intake are dependent upon FGF21. As we progress towards developing FGF21 as a therapeutic agent, it is essential to understand its impact on both sexes. **Funding Sources:** Center for Neuroinflammation and Cardiometabolic Diseases Seed Grant

Raspberry consumption reduces ACE1 and NADPH oxidase expression in the kidneys of mice, mitigating the hypertensive effects of a high-fat, high-sucrose diet

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Objective: To determine whether a diet supplemented with raspberry (RB) is effective at reducing high-fat, high-sucrose (HFHS) diet-induced hypertension through alterations in the renin angiotensin system (RAS) in the kidneys. **Methods:** Eight-week-old male C57BL/6 mice were fed an AIN93M control diet with or without RB supplementation (10% w/w freeze-dried RB) for 4 weeks. At week 4, animals were randomized into three groups: low-fat low-sucrose (control, LFLS), HFHS, or RB + HFHS. After 24 weeks of dietary treatment, blood pressure (BP) was measured via tail-cuff plethysmography, mice were then sacrificed, and kidneys were collected for analysis. Protein expression of the pro-oxidant enzymes, NADPH oxidase (NOX) 1 and 4, and RAS components, angiotensin II receptor type 1 (AT1R) and angiotensin converting enzyme 1 (ACE1), were analyzed by western blot. Data were analyzed by ANOVA or Kruskal-Wallis, dependent on normality, followed by Dunnett's post-hoc analysis for multiple comparisons. **Results:** Consumption of a HFHS diet for 24 weeks led to a significant increase in systolic BP (120.6 ± 6.8 vs. 98.0 ± 7.1 mmHg, $p < 0.0001$) compared to control, which was prevented by dietary RB supplementation (98.9 ± 6.3 mmHg, $p < 0.0001$). In the kidney, a HFHS diet significantly increased the expression of NOX1 and NOX4 compared to LFLS. Additionally, RB consumption attenuated the expression of NOX1 and NOX4 compared to the HFHS. The HFHS diet significantly increased the expression of AT1R in the kidney compared to LFLS. While raspberry consumption did not significantly decrease AT1R compared to the HFHS group, its expression did not differ significantly from LFLS. RB consumption did significantly decrease expression of ACE1 in the kidney compared to HFHS. **Conclusion:** Our results suggest the potential for RB to mitigate the hypertensive effects of a HFHS diet by favorably altering the expression of RAS components and markers of oxidative stress in the kidney.

Differential expression of endothelial nitric oxide synthase (eNOS) and nitric oxide (NO) bioavailability between sexes in human endothelial cell lines.

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Objective: To investigate sex-differences in eNOS expression and NO bioavailability in human aortic endothelial cells (HAECs) and human umbilical vein endothelial cells (HUVECs) in an attempt to explain differences in hypertension incidence and cardiovascular disease (CVD) mortality between males and females. **Methods:** HAECs and HUVECs derived from healthy male and female hosts were grown to 80% confluency in cell culture, then starved (0.5% fetal bovine serum) for 24 h. Cells were then A) isolated for protein analysis via western blot to assess expression of eNOS and eNOS phosphorylation sites, B) probed with DAF-2 DA to assess NO bioavailability, or C) probed with dihydroethidium to assess superoxide production. Data were analyzed utilizing one-way ANOVA with Tukey-Kramer post-hoc analysis and are expressed as arbitrary units as mean \pm standard deviation. Significance was reached with a P-value \leq 0.05. **Results:** Protein expression of eNOS in HAECs was greater in males compared to females, while in HUVECs, eNOS was greater in females compared to males. Phosphorylation of eNOS^{Ser1177}, the site of upregulation, was increased in males compared to females in both HAECs and HUVECs. However, phosphorylation of eNOS^{Thr495}, the site of downregulation, was greater in females compared to males in HAECs, while the inverse occurred in HUVECs. Cellular NO production was increased in males compared to females in HAECs, while females had increased NO production compared to males in HUVECs. Lastly, superoxide production was greater in females compared to males in HAECs, while males had greater superoxide production compared to females in HUVECs. **Conclusion:** Endothelial cells express eNOS and produce NO in a differential manner between sexes which may be explained by differences in superoxide. Further, these differences are cell line-specific, highlighting the importance of tissue-specific differences when considering cell models to investigate mechanisms of disease.

Effects of Rhythmic and Tonal Interventions for Upper Extremity Functioning in Individuals with Parkinson's Disease: A Literature Review

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Background: There is emerging evidence for the use of music therapy in treating motor functions for patients with Parkinson's disease (PD), but there is a limited understanding of how music interventions impact upper extremity (UE) functioning. This review aimed to compare the effects of rhythmic-based interventions with tonal music therapy interventions on UE functioning in patients with PD. **Methods:** A literature search was conducted across five electronic databases to include participants diagnosed with PD, interventions that include music or rhythmic components, and outcome measures assessing UE motor function. Sixty-three articles were initially identified for full text review, and twenty-two articles were included in the present study. **Results:** Most studies examined the impacts of either rhythmic cues or tonal interventions, so the current evidence did not support a direct comparison of the identified music-based interventions. Results of studies utilizing rhythmic interventions suggest that rhythmic interventions are effective in improving the motor function of specific UE functions including finger tapping and others. Results of studies utilizing tonal interventions are less conclusive, suggesting that tonal interventions may be effective for finger tapping and coordination tasks, but were not shown to be effective for improving UE motor performance in functional tasks such as self-feeding. All studies utilizing simultaneous tonal and rhythmic interventions showed positive effects on UE motor performance. **Conclusion:** Rhythmic interventions and tonal interventions are effective in improving rhythmic UE movements, though rhythmic interventions are supported by a greater number of studies. Tonal interventions are not effective in addressing functional UE movements, but simultaneous rhythmic and tonal interventions were found to be effective in improving functional UE movements in one study. Additionally, the tempo of the rhythmic cue and the familiarity of music should be considered when utilizing a music-based intervention to address UE function for people with PD.

Translating Knowledge Into Practice: Remote Delivery of Stroke Rehabilitation

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Healthcare knowledge rapidly changes with emerging research, but there is often a gap between the dissemination and implementation of research into practice. Knowledge translation (KT) is defined as the exchange, synthesis, and application of knowledge between researchers and users, leading to improved health and services. 1 This presentation will explain an educational method to translate knowledge about the remote delivery of stroke rehabilitation to OT students. Task-oriented training (TOT) has been identified as one of the most effective intervention methods for patients with stroke. 2 TOT is a “repetitive and intense practice of meaningful, goal-oriented activities” and is ideal for home-based intervention where patients can train in their own environment. 3 Stroke assessments measure deficits, identify goals, guide interventions, and track progress. 4 Telerehabilitation is a service delivery model that is increasingly used in OT practice because it decreases barriers for patients and offers therapeutic benefits, functional improvement, and improved quality of life. 5 This poster will describe the results of an online educational program to teach OT students about remote delivered stroke rehabilitation through four modules on KT, TOT, assessments, and telerehabilitation. The purpose of this feasibility study was to examine if knowledge increased after participation and to gather feedback regarding the program’s acceptability.

The effects of music-based therapy on upper extremity motor functioning in individuals with Parkinson's Disease: A systematic review

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Introduction: Among the many symptoms associated with Parkinson's Disease (PD), motor symptoms present some of the greatest therapeutic challenges. Motor symptoms in the upper extremities (UE) commonly impact independence in activities of daily living (ADLs) in individuals with PD. Music-based therapy has been shown to bypass the damaged loop between the basal ganglia and the supplementary motor area and stimulate neuroplasticity to facilitate movement and improve motor function. However, the majority of research has focused on lower extremity and trunk function. The benefits of music-based interventions in UE are not well understood. **Objectives:** This scoping review aims to determine the impact of music-based therapy on UE functions and deliver a comprehensive summary that provides insights for clinical implementation of music-based interventions on occupational performance in individuals with PD. **Methods:** A systematic search using the databases of PubMed, EMBASE, Cochran, CINAHL, and MedLine was carried out to identify studies that met our criteria. Six different types of music-based therapy interventions were included, which were further categorized to understand approach-specific outcomes. **Results:** The search strategy identified a total of 1589 articles and 149 articles were selected for a full-text reading. 26 studies involving 850 total participants were included in this scoping review. **Conclusion:** This is the first scoping review to assess the possible benefits of music-based therapy on UE function in individuals with PD. The findings of this review provide occupational therapists with evidence-based analysis that music-based interventions may be beneficial for short-term improvements in UE function in PD. However, there is little evidence to support long-term effects of music-based interventions. More research needs to be conducted to understand the impact of music-based therapy on occupational engagement, participation, and functional performance in individuals with PD. Future research should include more specific functional tasks and studies with long-term follow-up outcome measures.

The Effect of Motivational Interviewing on Physical Therapy Outcomes After Stroke: A Meta-Analysis

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Purpose: Motivational Interviewing (MI) has been shown to produce positive behavioral change in health and wellness, including adherence to treatment prescriptions. This evidence in physical therapy (PT), specifically in patients with stroke, is limited. Moreover, previous research has also failed to identify a reliable, specific, and consistent outcome measure to quantify the efficacy of MI in PT. The purpose of this meta-analysis was to investigate the benefits of using MI in the PT management of stroke. **Methods:** For this meta-analysis, outcome measures were pooled from Randomized Control Trials (RCTs) that included patients who had received PT for treatment of deficits after stroke. Databases were searched with Boolean logic including “stroke/cerebrovascular accident/CVA, PT, MI/coaching/cognitive behavioral therapy/CBT.” There were 13 RCTs that fit the inclusion criteria. Due to the high variability of outcome measures in the included RCTs, outcome measures were analyzed together using Comprehensive Meta-Analysis software. Forest plots were generated and results analyzed for heterogeneity and publication bias using Comprehensive Meta-Analysis software. **Results:** The pooling of all outcome measures resulted in a small, yet statistically significant effect favoring the inclusion of MI in PT management of patients with stroke: $SDM = 0.301$ ($SEM = 0.077$), $p < 0.001$. $Q = 22.49$ and $I^2 = 42.12\%$, indicating moderate heterogeneity. This may be explained by the inclusion of two outlier studies with small samples, yielding higher effect sizes. A secondary meta-analysis excluding these two outliers confirmed this theory. **Conclusions:** There was a small, yet statistically meaningful improvements in outcome measures for patients after stroke with the inclusion of MI in their PT, including increased adherence to treatment. These findings will guide further research in how MI can be used by PTs to improve outcomes in mobility, quality of life, and adherence to treatment.

Can exercise interventions reduce external knee adduction moment during gait? A systematic review and meta analysis.

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Purpose/hypothesis: An increased external knee adduction moment (KAM) has been identified as a factor contributing to the development of medial knee osteoarthritis (OA). Interventions that reduce KAM may help delay knee OA progression. While exercise interventions have been commonly used to prevent future knee OA and improve the symptoms associated with knee OA, studies examining the effects of exercises on KAM have reported varied results. The purpose of this systematic review and meta-analysis was to determine if exercise interventions are effective in reducing KAM during gait. **Subjects:** 768 exercise intervention subjects; 734 control subjects. **Materials/Methods:** Study reports (n=908) resulting from a search of 6 databases up through January 2021 were screened for: 1) outcomes including KAM during gait, 2) intervention group(s) receiving exercise training, and 3) presence of a control group. Studies were excluded if any surgical intervention was employed or if the intervention and control groups were from different populations. Eight studies met the eligibility criteria and yielded 22 Hedges' g effect sizes (ESs) comparing the post-intervention reduction in KAM of the exercise intervention group to the KAM reduction in the control group. A positive ES indicates a greater KAM reduction in the exercise group when compared to the control group. Control groups received either sham exercises, over the counter analgesic use, diet intervention, or no intervention. **Results:** The effect of exercise intervention compared to control on modulating KAM during gait were similar as indicated by the trivial, nonsignificant overall ES of 0.02 (p=0.76). A small amount of heterogeneity between study ESs was observed (Q-value=18.07, p=0.11; I²=34%). Subgroup analysis revealed that the ESs of studies containing only females were significantly greater than the ES from studies containing both males and females (ES=0.63 vs. -0.01; p=0.045). No significant differences in study ESs were identified when comparing studies with various muscle groups targeted during exercise training, types of exercise, types of control intervention, presence of therapist supervision, subjects' mean age, subjects' mean BMI, or training volume/frequency (all p>0.07). **Conclusion:** Results of the systematic review and meta-analysis indicate that exercise programs currently in use may not be effective interventions for reducing KAM during gait. Future studies examining the underlying mechanism(s) regarding a more positive response to exercise in studies involving only females may help the development of more effective interventions aimed to reduce KAM. **Clinical Relevance:** Clinicians looking to decrease KAM for the purpose of delaying the onset or progress of medial knee OA should consider alternative treatment options, such as knee valgus bracing, lateral wedge shoe insoles, and gait retraining that have been shown to be effective in reducing KAM. However, considering that exercise training is an active treatment with a myriad of other benefits, further development of novel exercise interventions to reduce KAM would be greatly beneficial in mitigating the negative impact of knee OA.

Altered Knee Flexion and Adduction Moments During Weight-Bearing Activities in Patients Following Meniscectomy: A Systematic Review and Meta-Analysis

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Purpose/Hypothesis: Following partial or full meniscectomies, it has been shown that patients' external knee flexion moment (KFM) and knee adduction moment (KAM) during functional activities may not resemble those of healthy individuals or the patients' non-surgical legs. Given that altered KAM and KFM have been associated with knee osteoarthritis (OA) development, a systematic examination of how knee KFM/KAM changes post-meniscectomy may provide guidance for developing effective interventions to preserve knee joint health. Thus, this meta-analysis aimed to determine if patients post-meniscectomy demonstrated altered KFM and/or KAM during weight-bearing activities. **Subjects:** 309 subjects with meniscectomy; 142 health controls **Materials/Methods:** Study reports (n=6393) resulting from a search of 8 databases up through 11/2021 were screened for: 1) human subjects receiving unilateral meniscectomy and 2) KFM or KAM during weight-bearing activities reported for the surgical legs and for the contralateral non-surgical legs or legs of healthy controls. Studies were excluded if patients received additional knee surgeries. Twelve studies met the eligibility criteria. Cohen's d effect sizes (ESs) were calculated to compare the KAM and KFM values of the surgical legs to the non-surgical or healthy control legs. A positive ES indicates a greater knee moment in the surgical legs when compared to the non-surgical or healthy control legs. **Results:** When compared to healthy controls, the surgical legs of meniscectomy patients showed no difference in KFM (ES=-0.104; p=0.237) but a significantly greater KAM (ES=0.252; p=0.003). When compared to the patients' contralateral non-surgical legs, however, the surgical legs demonstrated a significantly lower KFM (ES=-0.278; p<0.001) but a similar KAM (ES=-0.004; p=0.958). **Conclusion:** Meta-analysis results indicated that patients post-meniscectomy experienced altered knee loading in the surgical legs as evidenced by an increase in KAM compared to healthy controls but a reduction in KFM compared to their non-surgical legs during weight-bearing activities.

Is It Valid To Use the Uninjured Leg To Monitor Quadriceps Strength Recovery Following ACL Reconstruction? A Meta-Analysis Comparing Patients' Uninjured Leg Strength To Healthy Controls.

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Purpose of study: After anterior cruciate ligament reconstruction (ACLR), quadriceps (QUAD) strength recovery is often monitored using a limb symmetry index. This meta-analysis compared the uninjured leg's QUAD strength in ACLR patients to that of matched healthy controls to determine if the uninjured leg serves as a valid reference during rehabilitation. Subjects: 947 ACLR patients; 739 healthy controls. Materials and methods: 2167 English studies conducted in 2010-2020 were screened for: 1) human subjects, 2) unilateral ACLR, 3) QUAD strength reported for the uninjured legs of ACLR subjects and the legs of healthy controls. Studies over 10-years post-ACLR were excluded. 29 studies met the selection criteria, resulting in 119 Cohen's d effect sizes (ESs) comparing the uninjured legs of ACLR patients to control legs. Factors (time post-surgery, graft, sex, etc.) that may affect study ESs were analyzed using meta-regressions. Results: The QUAD strength of the uninjured legs was comparable to the strength of control legs (ES = -0.06, P=0.95). However, high heterogeneity among study ESs were observed (Q-value=103.7, I²=48.9%, P<0.01). Meta-regressions revealed that the ES in male patients increased as the time post-ACLR increased (P=0.02), with the uninjured leg strength predicted to be equivalent/stronger than controls (ES≥0) after 12.8 months post-ACLR. In studies with males and females, the uninjured leg strength remained comparable to controls but decreased over time (P=0.09). Uninjured leg strength in patients with hamstrings autografts or concomitant injuries was comparatively weaker, while patients with patellar autografts or isolated ACL tears had stronger uninjured legs than controls (all P<0.01). Compared to control legs the uninjured leg strength in US patients worsened over time, while improving in European patients (P<0.01). Conclusion: The results challenge using the uninjured leg as a valid reference of QUAD strength recovery after ACLR. The significant variability in study ES was partially due to other factors.

Effect of Instructions on Lumbar Spine Kinematics During a Sit-to-Stand Transfer

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Purpose/Hypothesis: Physical therapy educational interventions focus on reducing the chronic stresses provided by daily activities to the patient and injured tissue. Based on performance, simple tasks such as sit to stand can lead to low back pain (LBP) and excessive stress to the spine. The purpose of this study is to compare trunk, lumbar and pelvic angles during performance of uninstructed and instructed sit to stand tasks while the subjects are using wearable motion sensors. We hypothesize that instructing the subjects on the appropriate sit to stand kinematics will decrease the overall angle of the lumbar spine and trunk, thereby decreasing the overall effect on the lumbar spine. **Subjects:** 31 healthy subjects (17 female; 24±3.13 years) **Methods & Materials:** Trunk, lumbar and pelvic flexion/extension angles were recorded during sit to stand tasks utilizing the DorsaVi wearable motion sensors. Each subject performed six trials of sit to stand under 4 experimental conditions (i.e. uninstructed back of chair, uninstructed front of chair, instructed front of chair, instructed split stance). Statistical analysis was conducted using pairwise comparisons between experimental conditions to determine whether specific instructions provided prior to performing a sit to stand transfer affected any of the observed angles. **Results:** The trunk flexion/extension angle was significantly lower with instructed sit-to-stand edge of chair (41.69±2.09) compared to no instruction edge of chair (48.37±2.09; P=0.026) and no instruction back of chair (53.79±2.09; P=0.00). The lumbar flexion/extension angle was significantly lower with instructed sit-to-stand edge of chair (36.46±2.23) compared to no instruction back of chair (46.33±2.23; P=0.002). Additionally, trunk flexion/extension angle was significantly lower with split stance (41.79±2.09) compared to no instruction edge of chair (48.37±2.09; P=0.028) and no instruction back of chair (53.79±2.09; P=0.00). Lumbar flexion/extension angle was significantly lower with split stance (40.10±2.23) compared to no instruction back of chair (46.33±2.23; P=0.05). No significant differences in pelvic flexion/extension angle were found when comparing the experimental conditions (P>0.05). **Conclusion:** From the data collected, the evidence suggests that an individual's sit-to-stand kinematics may be altered with the appropriate verbal cuing and patient education. As a result, these two factors may serve as a catalyst to limiting sit to stand biomechanics as being a concomitant factor in the prevention and treatment of LBP by changing the angle of inclination between differing areas of the spine. **Clinical Relevance:** With LBP being one of the most common reasons for PT referrals and missed work days, the effects of proper sit-to-stand education within this patient population may eventually improve productivity not only within the work sector, but in the patient's life itself. PTs as movement specialists are vital to this education process which may ultimately improve energy conservation and muscle imbalances and have a direct impact on improving or preventing the patient's condition. Providing multiple methods to perform a proper sit-to-stand (i.e., at the edge of the chair or split-stance) allows for multiple forms of educating patients to limit potential LBP stressors during performance of this quotidian task to optimize a patient's improvement. More research could be added to investigate what specific verbal cuing provides an optimal sit-to-stand action and what height chair allows for the most efficient sit-to-stand.

Effect of Upper Trapezius Dry-Needling on Myofascial Trigger Points and Cervicogenic Headache Symptoms

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Purpose/Hypothesis: Cervicogenic headaches (CGH) are a secondary type of headache caused by a dysfunction of the cervical spine and are often associated with myofascial trigger points (MTrP). Conventional manual therapy of the cervical spine can decrease symptoms, but the addition of MTrP dry needling appears to further facilitate a reduction in CGH symptoms. Therefore, the goal of this study was to evaluate the effect of MTrP dry needling on CGH symptoms, cervical strength and mobility, and MTrP tenderness and EMG activity. We hypothesized MTrP dry needling would lead to improvement in cervical mobility and strength, decreased MTrP sensitivity, and reduced prevalence of CGHs compared to exercise alone. In addition, we hypothesized that MTrPs result from excess cortical drive resulting in a shortened cortical silent period. **Number of Subjects:** 6 participants with CGH **Materials and Methods:** Participants were randomly assigned into a dry needling group (DN) or to a control group (CON). Both groups participated in an initial and final evaluation with 6 treatment sessions over 3 weeks in between. The evaluations consisted of a CGH questionnaire, cervical mobility and strength tests, MTrP pain threshold and EMG assessment including cortical silent period. Treatments consisted of cervical stretching and strengthening and a daily HEP. In addition, the DN group received static MTrP dry needling for 10 minutes. A student's t-test was used to identify differences between groups. **Results:** Cervical ROM increased for both groups, with the DN group showing greater improvements in all measurements except cervical rotation. All participants showed improvement with strength and cervical mobility, but there were no significant differences between groups. In regards to prevalence of CGHs, subjects reported having multiple headaches every week at baseline. After the 3 week study, the DN group averaged fewer CGHs compared to CON, and also had fewer headaches at follow-up. In terms of MTrPs, the DN group had a significantly increased pressure tolerance compared to CON. In terms of MTrP EMG activity, 2 of the 6 participants initially had active MTrPs, but no participants had active MTrPs during final evaluation. Further, a shortened cortical silent period was seen in 4 of the 6 subjects when compared to non-CGH controls. **Conclusions:** The DN group demonstrated greater improvements in most cervical ROM assessments, MTrP pressure tolerance, and CGH prevalence compared to the CON group. In addition, the shortened cortical silent period suggests heightened cortical or spinal circuitry activity resulting in hyperactive MTrPs. Although this study demonstrated promising results in support of the use of dry needling in treating CGHs, more participants are needed to verify the results of the study. **Clinical Relevance:** The present study helps to evaluate CGH and MTrP treatment. By adding MTrP dry needling to conventional PT intervention, a greater improvement in cervical function and CGH symptoms was seen. Therefore, MTrP dry needling may be beneficial when treating patients with CGH.

Training Load And Injury Risk in Elite Level Field Sport Athletes: A Systematic Review

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BACKGROUND: One proposed tool for mitigating injury risk in athletes is monitoring workload and managing variables that impact load related to volume and intensity, i.e. total distance (TD), high speed running, and number of accelerations. **OBJECTIVE:** The purpose of this systematic review was to determine the relationship of external training load monitored via wearable global positioning systems (GPS) and injury risk for field sport athletes. **METHODS:** A systematic review was performed searching 6 databases resulting in 191 studies which were screened and excluded based on the following inclusion criteria: 1) included athletes wearing GPS monitors during training and competition, 2) injuries reported, 3) external training load data for both non-injured and injured athletes, 4) risk analysis of workload on injuries, and 5) elite field sport athletes. Studies were excluded if total injuries were not reported, insufficient data, or only accelerometer data reported. Eleven studies were included for review. **RESULTS:** In the 11 studies, risk was calculated evaluating: total distance (n=7), high speed running (n=8), and acute:chronic workload ratio (ACWR) (n=7). A high ACWR was found to have a significant increase in injury risk in all 7 studies that evaluated ACWR. For training volume, 3 of 6 studies found an increased injury risk for athletes grouped in a low TD category, with 2 of those same studies also finding an increased risk in athletes in a high TD category. Higher chronic workloads were found to have a protective effect to injury risk. **CONCLUSION/CLINICAL RELEVANCE:** The results of this review highlight emerging evidence that very low and very high training load increase injury risk, as well as high spikes in ACWR. Physical therapists and other sports related professionals can track athletes' training load as a tool to adequately prepare them for elite competition with the lowest risk of injury.