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EDUCATION AND TRAINING

Instilling positive beliefs about disabilities: pilot testing a novel experiential learning activity for rehabilitation students

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ABSTRACT

Purpose: To develop and test a novel impairment simulation activity to teach beginning rehabilitation students how people adapt to physical impairments.

Methods: Masters of Occupational Therapy students ($n = 14$) and Doctor of Physical Therapy students ($n = 18$) completed the study during the first month of their program. Students were randomized to the experimental or control learning activity. Experimental students learned to perform simple tasks while simulating paraplegia and hemiplegia. Control students viewed videos of others completing tasks with these impairments. Before and after the learning activities, all students estimated average self-perceived health, life satisfaction, and depression ratings among people with paraplegia and hemiplegia.

Results: Experimental students increased their estimates of self-perceived health, and decreased their estimates of depression rates, among people with paraplegia and hemiplegia after the learning activity. The control activity had no effect on these estimates.

Conclusions: Impairment simulation can be an effective way to teach rehabilitation students about the adaptations that people make to physical impairments. Positive impairment simulations should allow students to experience success in completing activities of daily living with impairments. Impairment simulation is complementary to other pedagogical methods, such as simulated clinical encounters using standardized patients.

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➤ IMPLICATION OF REHABILITATION

- It is important for rehabilitation students to learn how people live well with disabilities.
- Impairment simulations can improve students' assessments of quality of life with disabilities.
- To be beneficial, impairment simulations must include guided exposure to effective methods for completing daily tasks with disabilities.

Introduction

Rehabilitation professionals are tasked to help people with disabilities achieve optimal quality of life (QOL). It is essential that they develop positive perceptions of people with disabilities and their potential QOL during their education. People without disabilities often underestimate the subjective QOL attainable by people with disabilities and their capacity to participate in important social roles [1–4], and health and rehabilitation students are not immune to these biases [5–7]. For example, recent research in physical therapist education has found that while generally positive attitudes toward people with disabilities are common among physical therapy students, negative perceptions of people with disabilities and discriminatory biases exist [8]. In fact, rehabilitation's focus on ameliorating functional challenges can inadvertently strengthen beliefs linking individuals with disabilities with poor health and QOL and underestimations of their abilities [9].

In response to these concerns, professional organizations and accrediting bodies of rehabilitation professional preparation programs have identified the importance of including positive disability content in program curricula. For example, the Occupational Therapy Model Curriculum [10] and the Blueprint for Entry-Level Education [11] identify disability theory and culture as content within occupational therapy education. Occupational therapy programs are also required to include content and assess students for outcomes that demonstrate support for the QOL, well-being, and occupation of the individual, group, or population to promote physical and mental health [12]. Similarly, in the discussion of physical therapist practice, the Commission on Accreditation of Physical Therapist Education's (CAPTE) evaluative criteria speaks to the role of the physical therapist in the promotion of health and QOL with respect to disability [13]. Furthermore, the Normative Model of Physical Therapist Professional Education's perspective on developing cultural competence specifically includes disability and health status with respect to individual and cultural differences [14] and is inferred in the primary diversity dimensions of the *Blueprint for Teaching Cultural Competence in Physical Therapy Education* [15].

There is a need for empirical research to identify specific learning activities that cultivate this desirable understanding of disability in rehabilitation students. In occupational therapy, few studies have used empirical methods to examine pedagogical approaches for teaching-specific content, such as positive disability attitude promotion, and whether the delivery of content aligns with

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changes in student outcomes [16–18]. Evaluations of attitude change programs in physical therapy training have yielded mixed results [19–21].

Impairment simulation is an appealing, but controversial, strategy to improve attitudes toward people with disabilities [22–24]. During impairment simulations, students adopt temporary physical or sensory impairments (e.g., using blindfolds, earplugs, knee immobilizers, arm slings, or gloves to block tactile sensation) and attempt to perform activities of daily living (ADLs) either with or without assistive devices. In contrast to impairment simulation, recent examinations of simulation have mainly focused on the use of standardized patient simulation in which actors are trained to play the role of patients, family members, or other health care providers [25,26]. In contrast, there are few studies in recent literature on health care education that examine impairment simulation and its alignment with specific student learning outcomes.

Evidence has been mixed regarding the value of impairment simulation. Simulation-based learning is an attractive pedagogical approach that can stimulate interest, empathy, and reflection while teaching participants how to solve specific problems [27,28]. Some impairment simulations have been shown to increase self-reported empathy among students and rehabilitation professionals [24,29] and more interest in supporting disability advocacy [30].

If not done carefully, however, impairment simulations can convey an unintended "hidden curriculum" in addition to the intended lessons [31]. Several disability scholars have argued that impairment simulation could exacerbate negative stereotypes about living with a disability [32–34]. Specifically, simulations that focus on the immediate challenges of becoming impaired could lead participants to under-estimate how well people can function with those impairments long term. Supporting this, college students rated people who are blind as less employable, and blindness as more debilitating, after a brief blindfolded exercise [35]. In other studies, students reported experiencing negative feelings such as fear and frustration during the simulation activities, and reported believing that people with disabilities similarly experience those feelings [30,36–38]. This suggests that while impairment simulations may promote a sense of empathy toward people living with those impairments, this empathy may be misplaced, and may contribute to a bleak picture of life with disability.

Given this evidence, it is important to determine whether or not impairment simulations are appropriate educational tools for rehabilitation students. Although some impairment simulations have shown unintended negative consequences, these simulations were explicitly designed to highlight the challenges of initial impairment and to provoke negative feelings [22]. Less is known about the effects of impairment simulations that emphasize strengths and positive adjustment. Furthermore, impairment simulations often lack guidance in the use of assistive devices. For example, in the Wilson et al.'s [24] neurodisability simulations, participants were instructed to thread a needle while wearing blurred-vision spectacles, but there was no mention of commercially available self-threading needles and other aids to make needle threading easier with impaired vision.

The purpose of the present study was to evaluate a novel impairment simulation learning activity for occupational and physical therapy students. The training combined simulations of two common physical impairments, paraplegia and hemiplegia, with a guided lesson in the use of basic assistive devices. We used a randomized controlled design in which half of the students participated in this activity while the other half instead viewed videos of people with these impairments using the same assistive devices. This manipulation equated the information that students received while isolating the effects of firsthand experience with the impairments and associated assistive devices. We measured the students' estimates of QOL for people with these impairments both before and after the learning activities to assess how they influenced their beliefs about living with disability.

Method

Participants

Participants were a convenience sample of first-year Masters of Occupational Therapy (MOT) and Doctor of Physical Therapy (DPT) students. Students were recruited within the first month of their respective programs to minimize the influence of course curriculum on participant attitudes toward people with disabilities. Recruitment materials for the study were posted on department bulletin boards, presented in classes, and sent electronically via department email contacts. Students' instructors were not involved in study procedures and a student's choice to participate or not had no bearing on their coursework. Students were given an information statement to review prior to participation. The study consisted of two sessions, one online and one in-person, and students were compensated $10 for completing each session. A total of 32 students (14 MOT, 18 DPT) completed both sessions. To safeguard confidentiality, students reviewed a written information statement in lieu of providing signed informed consent. The University of Washington institutional review board approved all study procedures.

Procedures

Overview

All students first completed an online survey, where they provided demographic information and pretest measures. Then, students came to the in-person study session in groups of 2–5. *The average time between sessions was 10 days (range: 1–24 days) and all experimental sessions were completed within 1 month after the start of the term.*

Each group was randomly assigned to either the experiential learning or the control (video-viewing) activity. Randomization was determined using a computerized random number generator, and the randomization scheme was shared only between the principal investigator, the research assistant, and the physical therapist assisting with the experimental learning activity. Participants in both conditions were kept unaware of condition assignment, and both activities were described as novel educational exercises that were being tested for use with future MOT and DPT students. At the end of the activity, students completed posttest measures individually, were debriefed regarding the research hypotheses, and were compensated.

Experimental procedures

Participants in the experimental groups were told that they would be learning how to complete ADLs at two different stations while pretending to have experienced paraplegia and hemiplegia. First, participants were encouraged to freely explore the equipment at each station and review instructions for approximately 5 min. Then, participants were brought to the paraplegia station one at a time, in a randomized order. After the first participant completed the paraplegia station and moved to the hemiplegia station, the next participant began the paraplegia station. This procedure was repeated until all participants had completed both stations.

Paraplegia station. At the paraplegia station, participants simulated being a 27-year-old who had sustained a T12 complete spinal cord injury (SCI) resulting in total loss of strength in their lower extremities. Participants were tasked with completing a transfer from an armless chair to a wheelchair. A physical therapist was present to demonstrate a safe transfer using the "sit-pivot" method [39] and to provide guidance in safely stabilizing and operating the wheelchair. Once a participant had successfully transferred to their wheelchair, they were instructed to maneuver the wheelchair to the hemiplegia station on the other side of the room. Participants were given written instructions on how to safely start, stop, and steer the wheelchair and the physical therapist provided verbal guidance if needed.

Hemiplegia station. Upon reaching the hemiplegia station, participants were instructed to stand and told to now simulate being a 25-year-old with hemiplegia who had experienced a traumatic brain injury in a motor vehicle accident. Participants were instructed to immobilize their dominant arm with the use of a sling before being asked to make a peanut butter and jelly sandwich using the provided ADL devices and their unencumbered non-dominant arm. ADL devices included an ergonomic angled knife, spiked cutting board with corner guards, Dycem™ Non-Slip 10″ × 7.25″ Mat, Dycem™ Non-Slip Jar Opener and Gordon Ellis™ Spill-Not. Detailed written instructions were provided to participants on index cards, and the research assistant summarized the instructions verbally and provided guidance as needed.

Control procedures

Participants in control groups were told that they would be observing how people with paraplegia and hemiplegia complete ADLs. They viewed approximately 8 min of video. The video began with a man with hemiplegia introducing himself, describing his condition and impairment, and then making a peanut butter and jelly sandwich using the same ADL devices as the experimental participants. In the second part of the video, a man with paraplegia introduced himself and demonstrated how he performs a "sit-pivot" transfer to move from a chair to a wheelchair.

Measures

Demographics

At baseline, students provided information regarding their gender, age, ethnicity, the program in which they were enrolled, and the kinds of contact they had had in the past with others who have physical disabilities.

Quality-of-life estimates

These served as primary outcome measures. Before and after the intervention, students estimated the QOL experienced by people with both paraplegia and hemiplegia by responding to three items for each impairment (a total of six items). First, they estimated the percentage of individuals with each impairment who considered their health to be good or excellent, ranging from 0% to 100%. Then, they estimated the average rating that individuals with each impairment would use to describe how satisfied they were with their lives, ranging from 1 (very dissatisfied) to 7 (very satisfied). Finally, students estimated the percentage of individuals with each impairment who experience clinical depression, again ranging from 0% to 100%. We chose these three metrics in order to assess students' beliefs about multiple dimensions of QOL with these impairments.

Intervention evaluations

Following the experimental or control activity, students were asked to describe in free-response form what they thought of the activity they had completed, and to rate its overall quality on a scale from 1 (poor) to 5 (excellent).

Data analysis

Primary analyses evaluated whether the magnitude of QOL estimate change differed between the experimental and control conditions. We performed a repeated-measures analysis of variance (ANOVA) for each of the six QOL estimates, testing the main effects of condition (experimental vs. control), time (pretest vs. posttest), and their interaction. Significant interaction terms would suggest that the magnitude of pretest-posttest change differed between conditions. We then performed simple effects tests of QOL estimate change separately for each condition. We hypothesized that estimated good health and life satisfaction rates for people with both impairments would increase between pretest and posttest in the experimental condition but not in the control condition, and that estimated rates of depression with both impairments would decrease in the experimental condition but not in the control condition. We also compared mean evaluative ratings of the experimental and control activities.

Because students were randomized to condition within session groups and interacted with other students in the same session group, we conducted all the above analyses using multilevel modeling (the mixed procedure in SAS 9.3) with students nested in session groups to account for possible dependency.

Results

Participant characteristics

Thirty-two students participated in the study, 14 from the MOTT program and 18 from the DPT program. Sixteen students (in 6 groups) were randomized to the experimental condition, and 16 (in 7 groups) were randomized to the control condition. There were equal numbers of MOT and DPT students in each condition. The sample was 78% female, with a mean age of 26.94 years ($SD = 5.80$, range =20–43 years). Most (81%) were Caucasian. All students reported having prior contact with people who have physical disabilities, but in many cases, this contact was of a helping nature (e.g., caring for children with disabilities, providing assistance services). Table 1 lists detailed demographics for the sample. We conducted a *t*-test (for age) and Fisher's exact tests for the categorical variables comparing the experimental and control groups on demographics. No differences were statistically significant (see Table 1).

QOL estimate change

All six QOL estimates changed more for experimental than for control students. The condition × time interactions were statistically significant for all six QOL estimates (all $ts > 2.03$, all $ps < 0.047$). Experimental students increased their estimates of perceived good health and decreased their depression estimates for people with both paraplegia and hemiplegia, and increased their estimates of life satisfaction for people with paraplegia (see Table 2). In contrast, control students showed no significant changes between pretest and posttest on any of the six QOL estimates.

Table 1. Participant demographics.

	Total Sample	Experimental	Control	*p* (diff)
Sample size	32	16	16	1.00
Program: physical therapy, *n* (%)	18 (56%)	9 (56%)	9 (56%)	1.00
Program: occupational therapy, *n* (%)	14 (44%)	7 (44%)	7 (44%)	–
Male, *n* (%)	7 (22%)	5 (31%)	2 (12%)	0.39
Female, *n* (%)	25 (78%)	11 (69%)	14 (88%)	–
Age in years: mean (SD)	26.94 (5.80)	27.00 (5.65)	26.88 (6.14)	0.95
Ethnicity: Caucasian/White, *n* (%)	26 (81%)	13 (81%)	13 (81%)	1.00
Ethnicity: Asian, *n* (%)	4 (13%)	2 (13%)	2 (13%)	1.00
Ethnicity: other, *n* (%)	2 (6%)	1 (6%)	1 (6%)	1.00
Disability contact: family member, *n* (%)	11 (34%)	3 (19%)	8 (50%)	0.14
Disability contact: friend, coworker, or partner, *n* (%)	13 (40%)	7 (43%)	6 (38%)	1.00
Disability contact: gave assistance or cared for children, *n* (%)	23 (72%)	10 (63%)	13 (81%)	0.43

Table 2. Changes in quality-of-life estimates.

	Experimental estimate			Control estimate		
Measure	Pretest mean (*SD*)	Posttest mean (*SD*)	*t*	Pretest mean (*SD*)	Posttest mean (*SD*)	*t*
Paraplegia good health	39% (24%)	62% (22%)	5.58***	42% (22%)	47% (23%)	1.42
Paraplegia life satisfaction	4.69 (1.40)	5.50 (1.09)	3.10**	5.25 (1.00)	4.88 (1.20)	−1.86
Paraplegia clinical depression	37% (23%)	22% (21%)	−4.87***	21% (13%)	18% (12%)	−0.75
Hemiplegia good health	35% (24%)	53% (26%)	3.07**	37% (25%)	39% (25%)	0.63
Hemiplegia life satisfaction	4.19 (1.4)	4.81 (1.31)	1.54	5.00 (1.4)	4.69 (1.4)	−1.43
Hemiplegia clinical depression	40% (24%)	24% (20%)	−3.30**	22% (17%)	21% (16%)	−0.24

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Activity evaluations

Students evaluated the experimental activity more positively ($M = 4.63$, $SD = 0.50$) than the control activity ($M = 4.00$, $SD = 0.53$; $t = 3.36$, $p = 0.0022$).

Discussion

Simulation has received increased attention as an instructional method in health care education, particularly in the delivery of interprofessional education with its focus on patient-centered care, reducing errors, and improving communication between health care providers and patients [40–42]. In this study, we aimed to investigate the effectiveness of impairment simulation as a strategy to instill positive beliefs about disabilities. We found that brief experiences with paraplegia and hemiplegia, coupled with the use of assistive devices to perform simple ADLs, led students to believe that people with these impairments are healthier and happier than they previously thought. Viewing videos had no effect, suggesting that the firsthand experience is a critical component of the attitude change that arose.

This finding is consistent with self-referencing theory [43], which posits that people use their own experience with a physical or emotional state to understand how others would feel in such a state. If students are given positive experiences with temporary impairment and the chance to successfully complete ADLs with that impairment, this positive experience improves their assessments of how well others could function with that impairment. Some narrative comments from the students support this mechanism. For example, one student wrote: "I discovered that going through the motions of completing these tasks made working with such a condition feel much more manageable. I can much more clearly envision an individual performing tasks independently". Another wrote: "I think its [*sic*] a good way to get people thinking about the challenges that a person with a disability may face, but at the same time remind them how incredibly functional and adaptive people with a disability are".

One lingering question regards the accuracy of students' QOL estimates when compared to actual reports. Although exact population-level QOL data specific to paraplegia and hemiplegia (from all causes) are not available, published data from individuals with SCI suggest that students' estimates of perceived good health and depression tended to move closer to the actual values after the impairment simulation. According to the 2014 National Spinal Cord Statistical Center (NSCISC) report [44], approximately 70% of people with SCI (a common cause of paraplegia) perceived their health as good or excellent. Before the learning activity, experimental students estimated this rate for people with paraplegia at 39%; afterward, they increased their estimate to 62%. Similarly, the prevalence of major depression in SCI has been estimated at 22% [45], and experimental participants over-estimated this prevalence before the learning activity (37%) but not afterward (22%). Again, because the SCI and paraplegia populations are not identical, these comparisons must be interpreted with caution. *Furthermore, more research is needed to determine the clinical impacts of these activities, as instilling unrealistically positive beliefs about impairments could also have negative consequences for clinical practice.*

This study expands the literature on the short-term effects of impairment simulation. While some impairment simulations exacerbate negative beliefs about disabilities [35,36], our simulations instilled more positive beliefs. This suggests that the tools and guidance offered during the simulation experience can have powerful effects on the conclusions that students draw from the experience. Our learning activity emphasized effective adaptations to impairment, and the lesson included individualized guidance, employing principles of instructional scaffolding [46]. Our impairment simulation was designed to impart not only a cognitive introduction to the tools that people with impairments utilize, but also a positive emotional response to completing ADLs with impairment. In contrast, the impairment simulations that have shown negative effects have tended to include minimal scaffolding and little or no information about specific adaptations that people make to living with impairments.

Our findings complement research on other simulation-based pedagogical approaches in rehabilitation training. In a recent systematic review, Mori et al. [47] found a variety of simulation strategies employed in entry-level physical therapy education. These experiences varied and included simulated experiences with human participants, mechanical simulators, high fidelity human simulators (instrumented mannequins), interactive computer games or programed simulation learning activities, and mock clinics. Bethea et al. [40] found that the most frequently used type of simulation in occupational therapy education was human simulation with actors or students portraying a patient, with the intent of developing clinical reasoning, intervention planning, and interpersonal skills for the delivery of services. Instructional methods in occupational therapy curricula also include use of simulated training equipment [40]. This type of simulation emphasizes specific competencies in using the equipment. While these are important learning outcomes, our findings suggest that impairment simulation aligns with a different set of learning objectives and student learning outcomes and therefore serves a different purpose in the education of rehabilitation students. When carefully planned and executed, impairment simulations can potentially instill a balanced understanding of the impairment experience, respect for people with disabilities, and greater sensitivity to disability cultural values such as self-determination and interdependence [48].

These findings are preliminary, and are subject to some significant limitations. First, only about half of the students responded to the study invitation, and we fell short of an ideal sample size to maximize statistical power. It is possible that the students who volunteered to participate were more motivated or otherwise different from the students who did not enroll. Future research will be useful with larger and non-self-selected samples, especially if samples are large enough to compare subgroups of students (e.g., comparing occupational and physical therapy students' responses to the learning activities). Second, our measures were preliminary and have not undergone psychometric testing, so results may be different with established scales or with changes in the wording of the QOL estimate items. Third, in this study, we only measured attitude change immediately following the learning activities. More research is needed to determine whether the effects of impairment simulations are retained over time and how impairment simulations interact with other curricular elements. As with any self-report attitude measure, students' attitude reports may not fully capture their mental experience [49]. It is also possible that some change could be attributed to "experimental demand" – that is, students could have increased their QOL estimates if they thought that the impairment simulation was expected to move their beliefs in that direction [50]. The lack of significant findings in the control condition makes this explanation less plausible, but it is still a possible contributor to the results. Future studies should examine the impact of impairment simulations on students' behavior toward people with disabilities and on specific clinical competencies. Future research should also identify how factors such as the length and timing of the impairment simulation moderate its impact.

Despite these limitations, this study provides preliminary evidence that brief learning activities can impart students with more accurate, positive views of life with a physical disability. Impairment simulation is a pedagogical method that can help students better understand both the challenges and the successful adaptations that come with the disability experience. To instill positive beliefs, it is essential that these simulations offer students an opportunity to complete ADLs effectively with the simulated impairment. Impairment simulations may be even more effective when combined with exposure to role models with disabilities.

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