

Dementia-Inclusive Choices for Exercise Toolkit: Impact on the Knowledge, Perspectives, and Practices of Exercise Providers

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Physical activity improves the well-being of persons living with dementia but few exercise programs include them. The Dementia-Inclusive Choices for Exercise (DICE) toolkit aims to improve exercise providers' understanding of dementia and ability to support persons living with dementia in physical activity. We evaluated the co-designed DICE toolkit with exercise providers using a mixed-methods approach comprising pre/post questionnaires and interviews and reflection diaries. Among 16 participants, self-efficacy for exercise delivery to persons living with dementia and both knowledge and attitudes toward dementia significantly improved. Thematic analysis suggested participants (a) had a deeper understanding of the variability of dementia, (b) were planning for equitable access for persons living with dementia, (c) planned to promote social connection through exercise, and (d) were optimistic for future engagement with persons living with dementia. The DICE toolkit may improve exercise providers' knowledge and confidence to plan proactively to support persons living with dementia in programs and services.

Keywords: education, staff development, health services accessibility, right to health

Key Points

- The Dementia-Inclusive Choices for Exercise (DICE) toolkit includes training modules and manuals, videos, and resources with an aim to expand physical activity opportunities and supports for persons living with dementia (www.dementiaexercise.com).
- Exercise providers who completed the DICE training had increased self-efficacy for exercise delivery to persons living with dementia and improvements in both knowledge and attitudes toward dementia.
- Exercise providers who completed DICE training gained the necessary knowledge and strategies to make their exercise programs accessible to persons living with dementia, purposefully creating an inclusive, encouraging, and social environment.

In 2015, there were almost 50 million persons living with dementia globally (Prince et al., 2015; World Health Organization, 2015). This number is expected to more than double by 2050, resulting in over 130 million persons living with dementia

worldwide (Alzheimer Society of Canada, 2022; Prince et al., 2015; World Health Organization, 2015). People meet the diagnostic criteria for dementia if they experience a decline in cognitive abilities sufficient to restrict their independence in everyday activities (American Psychiatric Association, 2013). Since there is no pharmaceutical cure for dementia, the identification of nonpharmaceutical approaches to support the health, well-being, and quality of life of persons living with dementia is a priority of research and practice (Bethell et al., 2018).

Physical activity is recommended as a therapeutic strategy for persons living with dementia (Ontario Brain Institute, 2014; Vedel et al., 2020). Persons living with dementia who take up exercise—physical activity that is planned and done specifically to improve fitness or function—experience improved mobility, balance, and aerobic fitness (Lam et al., 2018), which are important predictors of fall risk in this group (Chantanachai et al., 2021). Meta-analyses also conclude that exercise improves cognitive abilities among persons with dementia (Groot et al., 2016; Jia et al., 2019; Northey et al., 2018; Sanders et al., 2019). The physical and cognitive benefits of exercise likely underlie the greater than 30% improvement in functional abilities observed among persons living with

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dementia who start exercising compared with individuals who remain inactive (Forbes et al., 2015). Though rarely captured in clinical trials of exercise, persons living with dementia describe important social and mental benefits from physical activity (Thompson et al., 2019). Physical activity is an opportunity for social connection and support (Bechard et al., 2020; Cedervall et al., 2015; Hobson et al., 2020; Malthouse & Fox, 2014; McDuff & Phinney, 2015; Phinney et al., 2016). Physical activity can be an opportunity for persons living with dementia to demonstrate continued capacity and success, as well as a place to exert choice and control in their lives (Cedervall et al., 2015).

Despite these benefits, only a small minority of persons living with dementia currently meet recommended physical activity levels, and half of persons living with dementia reported no regular physical activity (Laurin et al., 2001; O'Connell et al., 2015). Changes common with dementia (e.g., memory loss, change in mobility, and fall risk) make independent physical activity more difficult. Structural stigma likely magnifies the challenges of dementia. Structural stigma describes inequities that result from organizational and societal practices or policies that exclude members of the population, including persons living with dementia (Bolster-Foucault et al., 2021). Structural stigma influences the participation of persons living with dementia if their needs are not considered when exercise programs are designed.

Persons living with dementia and care partners report that poor understanding and accommodation of dementia by exercise providers is a barrier to participation (Malthouse & Fox, 2014). Indeed, many exercise providers confirm that they have no formalized training regarding dementia (Bechard et al., 2020). As a result, knowledge of dementia is diverse, informed by varied personal and professional experiences of exercise providers related to dementia (Bechard et al., 2020). Focus groups of exercise providers identified a willingness to support people living with dementia but identified a lack of standardized education and training as a major gap, forcing them to rely on ad hoc strategies to meet the needs of clients living with dementia (Bechard et al., 2020).

Persons living with dementia have a right to participate in physical activity programs in their communities (UN General Assembly, 2006). While some dementia-specific physical activity programs are available, these are usually insufficient in location, frequency, and/or intensity to help most persons living with dementia to meet physical activity guidelines (Regan et al., 2019). Given the relatively poor understanding of dementia among exercise providers and the lack of dementia-related training (Bechard et al., 2020), we brought together the Dementia-Inclusive Choices for Exercise (DICE) Research Team to address this gap (Middleton et al., 2023; www.dementiaexercise.com).

The DICE Toolkit

The DICE toolkit was developed using a participatory action research approach, detailed elsewhere (Middleton et al., 2023). In brief, our DICE Research Team included two persons living with dementia, a family care partner, exercise providers, dementia service providers, health care providers (physicians), and researchers from multiple disciplines who worked together using a participatory approach in authentic partnership (Dupuis et al., 2012). Additional people living with dementia were involved in the development of DICE tools. We met regularly with an advisory group of people living with dementia. In addition, we engaged other people living with dementia in our co-design workshop. The multistep DICE participatory action research process included: (a) engaging and

maintaining the participatory action research team, (b) setting and navigating ways of engagement, (c) understanding barriers to physical activity, (d) prioritizing audience and actions, (e) iterative development of the toolkit, (f) usability testing, and (g) implementation and evaluation. The final DICE toolkit includes a website where all resources are housed (www.dementiaexercise.com). Training modules for exercise providers and the accompanying training manual provide education and training regarding the diversity of dementia, the rights of persons living with dementia, the benefits and meaning of physical activity, and dementia-inclusive exercise delivery strategies. Three videos that show the perspectives of persons living with dementia, care partners, and exercise providers regarding exercise and dementia (“I have dementia but I’m still me,” “Staying active helps me live well with dementia,” and “Dementia-inclusive exercise”) were created and are included within training modules as well as independently on the project YouTube channel (www.youtube.com/@dementia-inclusivechoicesf8051). The toolkit includes a handout for persons living with dementia and their care partners, adapted in partnership with the Ontario Brain Institute, and wallet cards that persons living with dementia can use to communicate their goals, experiences, and needs. The DICE website also houses complementary resources produced by other organizations and teams.

Study Objective

The objective of the current study was to evaluate the impact of the DICE Toolkit on the knowledge, attitudes, self-efficacy, and practices of exercise providers.

Methods

A mixed-method explanatory, pre–post design was used to evaluate the impact of the DICE toolkit among exercise providers, persons living with dementia, and family care partners between October 2020 and February 2021. This manuscript reports the evaluation of the DICE toolkit among exercise providers, including surveys conducted before and after the use of the DICE toolkits as well as interviews conducted after use. Exercise providers also documented their learning and reactions to the DICE toolkit using reflection diaries. Qualitative data (interviews and reflection diaries) were used to further explain the quantitative (survey) results to better understand the impact of the DICE toolkit. This study was approved by the University of Waterloo Office of Research Ethics (ORE #41816). All participants provided oral informed consent.

Participants

Exercise providers who reported providing physical activity or exercise programs or services at least weekly to any group were eligible (even if current practice was restricted due to COVID-19). Although study staff were located in two Canadian provinces (Ontario, British Columbia), participants across Canada were eligible.

Convenience and snowball sampling were used. Recruitment materials were distributed to DICE Research Team members and partners (including health and fitness, dementia services, and community organizations) to share with exercise providers within or connected to their organizations. These member organizations were purposively engaged in our project because they represented diverse settings (e.g., YMCAs, seniors/community centers, Alzheimer Society, etc.) in which persons living with dementia could reasonably be included in physical activity or exercise programs and services. We used social media to identify additional exercise providers (Twitter,

Facebook). In many cases, exercise provider participants knew of other eligible exercise providers who might be interested in participating and were invited to share the study information.

Procedures

Exercise providers who were interested in the study completed a baseline survey that assessed demographics, their professional role, and knowledge, attitudes, and self-efficacy for exercise delivery related to dementia. Exercise provider participants then had 6–8 weeks to review the DICE toolkit, including the training modules, training manual, and other handouts and resources. Exercise providers documented their thoughts and feedback while reviewing tools in a reflection diary. We encouraged exercise providers to implement learnings over the intervention period, where possible, or reflect on potential changes to their practice. At the end of the intervention period, exercise providers completed a postintervention survey (assessing similar outcomes to the baseline survey) and an interview. In the interview, participants were asked to reflect on the impact of the toolkit on their knowledge, attitudes, and self-efficacy, as well as changes they had made to their practice. However, we understood that some people were not currently delivering exercise due to COVID-19 restrictions. In this case, we asked exercise providers to reflect on planned changes to their practice.

Assessments

All assessments were conducted virtually. At baseline and after the 6- to 8-week intervention period, exercise providers completed a survey and a semistructured interview. We focus here on the postintervention interviews as baseline interviews assessed existing knowledge and practices regarding dementia but were not valuable in determining change due to the DICE toolkit. Reflection diaries were used to document exercise providers' learnings and reactions to the DICE toolkit during the intervention period.

Survey

We used a survey to collect data on demographic characteristics, occupation, exercise qualifications and certifications, details regarding their exercise practice (e.g., where they delivered exercise, the types of exercise they delivered, people they worked with), and how their current position and practices had been affected by COVID-19.

Participants also completed several standardized or study-specific questionnaires at baseline and postintervention. The Dementia Attitude Scale was used to assess participant attitudes toward dementia (O'Connor & McFadden, 2010). Study findings demonstrate the reliability and validity of this scale, supporting its use as a research tool (O'Connor & McFadden, 2010). This scale includes 20 questions scored on a 7-point Likert scale with responses ranging from *strongly disagree* (1) to *strongly agree* (7). Higher scores indicate more positive attitudes. The statements in the Dementia Knowledge Assessment Scale (DKAS) were used to assess participant knowledge of dementia as it has been found to be a reliable and valid measure of dementia knowledge for diverse populations (Annear et al., 2017). The DKAS includes 25 statements that are factually correct or incorrect. Participants indicated whether the statements were true or false. The answers were used to create a total summative score (/50). The DKAS replaced the Alzheimer's Disease Knowledge Scale partway through the study as its use was reconsidered midway through the study when participants and researchers reflected that some items no longer

align with our current understanding of dementia and care. (Ten of 16 participants who completed the evaluation also completed the DKAS at baseline and postintervention.)

A self-efficacy scale for exercise delivery to persons living with dementia was modified from a teaching self-efficacy scale developed by Bandura (1977). Participants rated their confidence in a variety of tasks related to engaging with persons living with dementia in exercise. Confidence was rated on a 100-point scale, where 0 indicated *cannot do* and 100 indicated *highly certain you can do*. The full self-efficacy scale is included as [Supplementary Material S1](#) (available online). The average score out of 100 indicated participants' self-efficacy for dementia-inclusive exercise delivery.

Reflection Diaries

During the intervention period, participants were asked to document their thoughts in a reflection diary as they progressed through the DICE toolkit. For each resource in the toolkit, the reflection diary prompted participants to think and write about what they learned, what was most useful, what stood out to them or surprised them, how the information may change their practice, and what they would change about the resources ([Supplementary Material S2](#) [available online]).

Semistructured Interview

Following the completion of the postintervention survey, we met with participants online to conduct an individual interview prompted by a semistructured discussion guide. The interview was facilitated by a research assistant who asked questions that probed what they learned from the DICE toolkit, what they liked and didn't like about the toolkit, what changes they planned to make to their practice, and how their confidence had changed because of the DICE toolkit.

Data Analysis

Quantitative Data

Participant characteristics were described as mean (range) or percent (n), as appropriate. Changes in scores for all scales from pre- to postintervention were evaluated using paired t tests or the Wilcoxon test, as appropriate. $p < .05$ was used to denote statistical significance. We described change scores in exercise providers who had experience delivering exercise to people living with mild cognitive impairment (MCI) or dementia and those who were inexperienced (mean and SD), but were not sufficiently powered to test the significance of between-group differences.

Qualitative Data

The interviews were transcribed verbatim, cleaned, and anonymized. The reflection diaries were also anonymized. Inductive analysis of the transcripts and reflection diaries was conducted by two members of the DICE Research Team (co-authors Koch and Norman). We followed the six-step generalized thematic analysis outlined by Braun and Clarke (2006). We familiarized ourselves with the data by reading and rereading the transcripts and reflection diaries. We then independently coded several transcripts and reflection diaries using an inductive approach to identify important features of the data around what exercise providers learned and how they would change their practice. Researchers (Koch and Norman) then met to review and discuss the codes and came to a consensus on the initial coding framework.

The remaining transcripts and reflection diaries were divided among the two researchers, which were coded using the initial codes, adding new codes where needed. Researchers (Koch and Norman) then met to discuss any new codes and to collate and finalize the list of codes. The codes were reviewed, and preliminary themes were developed. The emerging findings were then shared with the DICE Research Team with example quotes to support the themes. DICE Research Team members reflected on the emerging themes and quotes. The Team met to discuss whether the themes made sense, whether there was any overlap between themes, and whether there were any other themes in the data. Based on this discussion, themes were modified and codes within each theme were recategorized, ensuring the data supported and captured the essence of each theme. Modified themes with codes, names, and descriptions were recirculated to the DICE Research Team, or subgroups of the team, until agreement was made on the final themes. Due to the context of the study during COVID-19, we were aware that changes due to the DICE training would primarily be in reaction and learning domains, due to the shutdown of exercise programs due to COVID-19, with probes for planned changes to behavior (i.e., practices).

Careful processes were used to ensure the trustworthiness of results. The frequent debriefing sessions within the coding team, and then with the research team, enhanced the credibility of the findings. In addition, confirmability was enhanced through the use of quotes to support the themes and investigator triangulation by involving multiple coders and the research team in thematic development, which helped to balance the individual predispositions of the researchers. In addition, methods triangulation was used to understand the impact of the DICE toolkit on knowledge, attitudes, and self-efficacy for exercise delivery related to dementia among exercise providers by integrating both surveys and interview data. The detailed description of the study participants gives insight into whom our results may be transferable.

Results

At baseline, 19 exercise providers completed the survey. In brief, participants had an average age of 42 years, 58% were women, 47% delivered exercise in Northern and/or rural locations, and about two-thirds currently worked with people living with dementia (Table 1).

Three exercise providers dropped out of the study during the 6- to 8-week intervention period, leaving 16 exercise providers who participated in the postintervention survey and interview. One dropped out because of time constraints, one dropped out because they changed jobs, and one was lost to follow-up. The semistructured interviews averaged 35–40 min in length, and the reflection diaries were four pages in length for each participant.

Quantitative Results

Self-efficacy for exercise delivery, attitudes toward dementia, and knowledge of dementia all improved after use of the DICE toolkit ($p < .05$; details in Table 2). Though we were not powered for subgroup analyses, the magnitude of changes in self-efficacy and attitudes were larger for exercise providers who did not have prior experience working with persons living with dementia compared with those who did (Table 3). Change in knowledge of dementia was slightly larger in the group with prior experience working with persons living without dementia compared with those with prior experience.

Table 1 Participant Demographics Expressed as Median (Range) or n (%) ($N = 19$)

	Median (range) or n (%)
Characteristics	
Age, years	41 (21–59)
Gender, female	11 (58%)
Residence, % Northern and/or remote	7 (46.7%)
Currently work with persons living with dementia, yes	13 (68.4%)
Exercise training and certifications	
Fitness instructors or personal trainer	7 (36.8%)
Registered kinesologist/clinical exercise physiologist	6 (31.6%)
Physiotherapist	2 (10.5%)
Recreational therapist	2 (10.5%)
Other	2 (10.5%)
Location of practice (all that apply)	
Community/seniors center	9 (47.3%)
Fitness facility	7 (36.8%)
Retirement home or long-term care	5 (26.3%)
Rehabilitation clinic	2 (10.5%)

Note. In some cases, people did not answer a question or indicated more than one answer so frequencies may not sum to the same total across categories.

Qualitative Results

We identified four main themes and three subthemes that encompass exercise providers’ changes in knowledge, attitudes, and planned changes to practice after engaging with the DICE tools. The four main themes are as follows: (a) understanding and accommodating the variability of dementia, (b) planning for equitable access for persons living with dementia, (c) promoting social connection through exercise, and (d) building confidence creates optimism about engaging with persons living with dementia. The themes and subthemes are described below.

Understanding and Accommodating the Variability of Dementia

Participants described an improved recognition of the variability of how dementia affects people and the diverse changes that persons living with dementia may experience. They reflected that they felt empathy for the experience of persons living with dementia and more deeply identified with them as human beings.

Even though some participants had experience working with persons living with dementia, our participants described a deeper understanding that each person living with dementia is unique and expressed plans to accommodate each person’s goals and preferences moving forward that they would “focus more on assessing/treating people as an individual” (P13). Further, participants described gaining a deeper understanding of the variability that exists among the abilities and challenges of persons living with dementia. One participant expressed:

But I think learning more about the spread of people, like I’d always known that persons living with dementia are, can be quite different but I didn’t think I quite fully grasped the spread of it. Because I maybe was biased towards my long-term care experience of seeing one, one part of the spectrum. (P1)

Table 2 Change in Self-Efficacy for Exercise Delivery to Persons Living With Dementia, Dementia Attitudes, and Dementia Knowledge From Pre- to Postintervention With the Dice Toolkit (Mean [SD])

Assessment	Preintervention	Postintervention	p for difference
Self-Efficacy for Exercise Delivery (/100)	78.8 (12.0)	85.3 (11.3)	.02
Dementia Attitudes Scale (/140)	112.1 (12.9)	118.9 (8.5)	.03
Dementia Knowledge Assessment Statements (/50)	37.0 (7.2)	42.8 (4.2)	.03

Table 3 Change in Self-Efficacy for Exercise Delivery to Persons Living With Dementia, Dementia Attitudes, and Dementia Knowledge From Pre- to Postintervention With the Dice Toolkit Among People With and Without Experience Delivering Exercise to Persons Living With Mild Cognitive Impairment or Dementia

Assessment	Worked with persons living with MCI or dementia in exercise		Did not work with persons living with MCI or dementia in exercise	
	Preintervention	Postintervention	Preintervention	Postintervention
Self-Efficacy for Exercise Delivery (/100)	80.4 (11.7)	85.5 (9.3)	75.1 (13.2)	84.7 (16.2)
Dementia Attitudes Scale (/140)	118.1 (9.3)	118.6 (8.3)	98.8 (9.2)	119.6 (9.9)
Dementia Knowledge Assessment Statements (/50)	18.2 (4.6)	22.1 (1.6)	18.8 (2.9)	20.0 (2.3)

Note. MCI = mild cognitive impairment.

With a fuller understanding of the uniqueness of each person living with dementia, they recognized a need to change their own practices by determining each person's abilities and goals and challenging persons living with dementia in a way that is compatible with that person's preferences. One participant mentioned in their reflection diary that they will change their practice by "Keep[ing] exercises challenging, not just simple, assuming [persons living with dementia] cannot do them" (P6). Another said, "challenging to the level that [persons living with dementia] want to be challenged" (P4).

Hearing directly from persons living with dementia in the videos was particularly impactful to participants, encouraging them to probe and understand the different experiences of persons living with dementia. One participant said,

... And giving you an enlightening view about [the] specifics of individuals living with dementia. It's one thing to sort of read it in a module and read through it and see diagrams and whatnot, but when you hear it and you see those specific people actually exercising and sharing their experiences, it's sort of hit a spot with me specifically. (P1)

The personal experiences of persons living with dementia and the changes they experience throughout their dementia journey helped them understand what it might feel like to live with dementia and encouraged them to reflect on how to respectfully support them in exercise.

Planning for Equitable Access for Persons Living With Dementia

Participants expressed a growing recognition that barriers in the social and physical environment restricted exercise participation among persons living with dementia. They understood that changes in the environment could, and should, be made so that communities become more dementia inclusive and persons living with dementia can participate:

Disability comes from lack of proper accommodations. Every facility/professional should be able to provide all the necessary

steps to make sure anyone can walk in their practice and not be hindered because of whatever they are diagnosed with or anything else. (P12)

Within this theme, three subthemes are detailed below: *understanding the rights of persons living with dementia, adopting dementia-inclusive communication and delivery, and identifying and reducing barriers in the exercise environment.*

Understanding the Rights of Persons Living With Dementia

Participants report that recognizing and understanding the rights of persons living with dementia was a key motivator for planning for equitable access. The DICE training module content about the rights of persons living with dementia stood out to participants. A number of participants with prior experience working with persons living with dementia had heard about the Canadian Charter of Rights for Persons Living with Dementia or the United Nations Convention on the Rights of Persons with Disabilities. Other participants had never heard about these documents or the rights contained therein:

Regulations within the United Nations Convention for the rights of people with disabilities—never seen this before—great info. (P11)

The DICE training content about the rights of persons living with dementia made participants realize that they needed to plan to support the rights of persons living with dementia within their practice. Specifically, participants discussed proactively planning to support and include persons living with dementia, instead of adapting in the moment. For example, one participant mentioned that they will now be:

Planning for equal accessibility for persons living with dementia instead of waiting until I have to accommodate someone on the spot. (P16)

Participants reflected on and started to plan ways they could promote inclusion in their own practice and facility. For example, one participant described ways they could be inclusive, including

information they could add to their facility website for persons living with dementia about accessibility features:

The charter of rights addressing inclusiveness in community, this started me thinking what we offer or could offer at the YMCA to help more with this. (P3)

Adopting Dementia Inclusive Communication and Delivery

Participants described that the content about dementia-inclusive communication strategies was valuable in improving their ability to support persons living with dementia in exercise. Participants who had less experience working with persons living with dementia mentioned that the communication strategies that they learned from the DICE toolkit made them feel more confident that they could work effectively with persons living with dementia. For instance, one participant said,

You would just be like, OK, I don't really know how to deal with these people, so it's just scary and I'm not going to do anything about it. But like, if they just give you the communication tools and it's like, there's your answer right there. (P12)

Although participants with experience were often aware of the described communication strategies, the DICE toolkit prompted participants to engage in deeper self-reflection on their own communication. One participant who worked with persons living with dementia planned to be more observant and reflective in their practice moving forward:

Continue to try and be "in the moment" or mindful when teaching so I can really see what is happening, how participants are doing/feeling/reacting and be most responsive and encouraging. Overall this made me think about "slowing down", baby steps etc., it's the journey not the final result. (P5)

Participants were also more aware of how they use body language when working with persons living with dementia:

It's not so much what I would do with them, but how I would show them. I did not ever think that facing the same way isn't the way you're supposed to do [it]. (P3)

Participants were more comfortable as they anticipated working with persons living with dementia in the future. Reinforced knowledge about communication strategies prompted participants to critically reflect on their communication style and make changes with the hopes of better-supporting persons living with dementia in inclusive exercise.

Identifying and Reducing Barriers in the Exercise Environment

Participants discussed a greater awareness and understanding of barriers in the exercise environment after using the DICE tools. Participants described barriers that may occur in exercise facilities and during exercise delivery (e.g., poor lighting, noise, mirrors, flooring, group classes). One participant stated:

And then another thing I really liked was how different things that could aggravate or bother someone like mirrors, it's not everyone, but that's something that could bother them, noise, group setting stuff like that. Just things you don't really think about when you don't have a client that's bothered by it. (P3)

Participants felt that they were better prepared to recognize and reduce barriers in the exercise environment so that persons living with dementia would be more comfortable. They recognized the importance of being observant of the person living with dementia and how they were responding to the environment so they could understand what prompted emotions or actions. One participant said,

Looking for what is causing the problem, looking at the surroundings and understand why someone is acting a certain way. (P16)

Participants better understood that barriers in the environment may cause persons living with dementia to feel distress and frustration. One participant described this recognition:

But I really found it interesting just about, 'cause I think at the beginning of this, I was a little bit fearful of the aggressive behaviours because I have kind of come in contact with that before and just the constant reassurance that it's just identifying what they're upset about and fixing that problem was a big aha moment for me as well. (P3)

Being aware of the barriers in the exercise environment made participants feel more prepared to accommodate persons living with dementia. One participant said, "I better understand the environmental concerns that someone might find difficult, and I now have some ideas on how to help change those to be better" (P3). Although participants felt more prepared to accommodate persons living with dementia, they recognized that some barriers were outside of their control—for example, building layout or staffing issues. To fully accommodate persons living with dementia, one participant felt that they would need the help of others, which was not available:

Right, and so to effectively do my job in a group setting I would need help. That institution or that private studio wouldn't be able to give me the help that I require. That's the hurdle. And that's a big hurdle. (P19)

Although participants brought attention to barriers that are outside their control, they described trying to proactively identify and reduce barriers in the exercise environment that could constrain the participation of persons living with dementia.

Promoting Social Connection through Exercise

The theme *Promoting Social Connection through Exercise* captures participants' reflections on the benefits of social engagement during exercise and the relationships that can be formed. Participants planned to purposefully facilitate social engagement and connection in their exercise programs and practice by promoting the social aspects of exercise beyond the physical and allowing time and space for people to develop friendships and feelings of belonging. This was, however, more challenging when their classes were delivered virtually due to COVID-19 pandemic-related restrictions.

Participants said that the social benefits of exercise stood out during the DICE training, which was new to some participants and resonated with others. One participant said,

And because it mentioned that a big part of why they want to be a part of these exercise groups is the environment and like the social aspect of it. And so that was kind of something I hadn't thought about. (P12)

Participants planned to take time to highlight the social benefits of exercise, "If promoting an exercise program, I will

make sure to talk about the social aspect along with it” (P16). Participants also planned to integrate social components into their programming and facilitation moving forward:

Being aware that there is so much more to be gained outside of the typical benefits of exercise is such a positive take on this and can help me facilitate a class that can be so much more. (P5)

Most specifically, participants reflected on how they could integrate relational aspects more intentionally moving forward by making some changes and additions to their current exercise practice:

I also feel I have a better understanding of the importance of making friendships in the group and allowing some time to help develop that sense of belonging [I will] advocate for longer class times to include a social component to each, host special events to encourage more friendship building and feelings of belonging like holiday socials or summer potluck. (P3)

Participants recognized that the social benefits of exercise are particularly impactful for persons living with dementia. Participants planned to purposefully facilitate social engagement and relationships during exercise programs, even if they were virtual.

Building Confidence Creates Optimism About Engaging With Persons Living With Dementia

Participants felt better prepared to proactively plan to include and support the preferences of persons living with dementia and create a positive experience for them in exercise. During a conversation about the impact of the DICE training on their confidence in working with persons living with dementia, one participant said,

It’s [impacted my confidence] definitely quite a bit. I was, you know, 20, 30 percent before and now the 70s for sure, just for knowing before I’ve never Even school, you know, my postgrad, everything you never really learned about dementia that much, so we didn’t, I didn’t have lots of opportunities to learn how to deal with if they’re having kind of an issue or anything like that. But with the screening, even the simple little things, that increased my confidence quite a bit, knowing that don’t correct them if they’re saying the wrong day or what-not. (P16)

In other cases, participants indicated that the DICE toolkit increased their confidence because the content affirmed their approach to working with persons living with dementia. Feeling more confident helped participants to feel more optimistic and prepared to work with people living with dementia. One participant mentioned feeling motivated to support a positive exercise experience:

I think it makes me feel more sympathetic. If I ever do have a client with dementia, I won’t feel discouraged, but rather motivated to give the most comfortable experience for them. There will be proactive steps put in place to better accommodate persons living with dementia. (P12)

Even experienced participants still viewed the DICE toolkit as a valuable resource to share with others. Sharing the DICE tools with their students could increase the students’ confidence as they start out:

But one thing that I made note of is, bookmarking this, so that way, if and when I get students again to get them to run through this, because they themselves are pretty, very, very vanilla, they’re coming in with what they learn in class. But something specific as dementia exercises is something that I want to get my students to understand. (P1)

After engaging with the DICE toolkit, participants felt motivated to proactively work to accommodate the needs and preferences of persons living with dementia. Participants considered the DICE toolkit to be a useful resource for improving their own confidence, and that of others, for including and supporting the needs of persons living with dementia.

Discussion

Our study results suggest that the use of the DICE toolkit gives exercise providers a more nuanced understanding of the diversity of dementia experiences. Trained exercise providers expressed improved self-efficacy for exercise delivery to persons living with dementia and foresaw proactively creating exercise programs that are accessible to and inclusive of persons living with dementia. Exercise providers planned to use the knowledge and skills that they gained from the DICE toolkit to reduce barriers to participation and facilitate social engagement and connection in exercise programs and facilities.

Our participants described the co-designed DICE toolkit as relevant, useful, and impactful. Even exercise providers with prior dementia training and experience delivering exercise to persons living with dementia described the DICE toolkit as a useful training tool to refresh their knowledge and train staff and students. Indeed, over 500 people from across the globe completed the DICE training outside of the current study in the first year after its launch, despite limited marketing. By providing research-informed tools like the DICE toolkit to educate and train exercise providers on the preferences and needs of persons living with dementia, consistent “best practice” standards can be employed to design and deliver exercise programs, a need expressed in a prior study of exercise providers (Bechard et al., 2020). Furthermore, trained providers could provide “social support” for exercise among people living with dementia and be a “credible source” for information regarding exercise and dementia, which were identified as two behavior change techniques that could be effective in promoting physical activity among people living with dementia in a recent study (Nyman et al., 2018).

After the use of the DICE toolkit, participants reported greater self-efficacy for exercise delivery to persons living with dementia and described plans to proactively create exercise programs that could accommodate and support the needs and rights of persons living with dementia. Similar results have been achieved in other groups, where psychoeducational interventions have improved self-efficacy among family/friend care partners and care staff (Chenoweth et al., 2016; Tang & Chan, 2016). Exercise providers explained that they had better strategies to support people living with dementia in exercise and prevent and handle challenges that may arise, including communication challenges and personal expressions of frustration or agitation. Adoption of these practices, along with other actions, would signify a shift toward accessibility to exercise for persons living with dementia in alignment with human rights conventions, which support the inclusion of persons with disability (UN General Assembly, 2006). Even so, exercise providers understood that their delivery would need to adapt to the

individual's abilities and composition of the class, which reinforces reflections from physiotherapists in a prior paper who described an ongoing need to respond to participants actions and feelings in the moment (Fjellman-Wiklund et al., 2016).

Though not targeted among exercise providers before, self-efficacy for dementia care is a frequent target of psychoeducational interventions among family/friend care partners and care staff. In these groups, self-efficacy for care is associated with improved psychological well-being of the care provider and with lower care burden (Coates & Fossey, 2019; Gallagher et al., 2011; van der Lee et al., 2014). It is possible that exercise providers may experience improved emotional well-being when working with people living with dementia after the DICE training, though this would need to be examined in a future study. In addition, some studies find that paid care staff who undergo dementia training have a better quality of work life and more highly rated quality of care (Davison et al., 2007, Duffy et al., 2009). We are optimistic that the quality of exercise provision to people living with dementia will improve among DICE-trained exercise providers, though this was not directly evaluated.

We observed an improvement in dementia-related knowledge from before to after the DICE training. Knowledge of dementia was associated with a greater openness toward inclusiveness and dementia-friendly communities in a prior study (Parkinson et al., 2022). Though relatively few studies have used the DKAS questions to measure change in dementia knowledge, the magnitude of change with the DICE toolkit was similar to two published interventions (Chan & Leung, 2020; Tierney et al., 2019). This improvement was affirmed by interview responses, where participants described having a deeper understanding of dementia, the variety of changes experienced with dementia, and the diversity of dementia between people and over time. While our study did not capture retention of knowledge over time, exercise providers will have ongoing access to the learning modules and the learning manual to refresh themselves as needed, as will others as the DICE toolkit is accessible online, free of charge.

Exercise provider participants had more positive attitudes toward dementia (as assessed by the Dementia Attitudes Scale) after completing the DICE training (O'Connor & McFadden, 2010). Exercise providers' reflections demonstrated that they had moved beyond preconceived notions of dementia, describing persons living with dementia as unique individuals with a diversity of abilities, challenges, and goals. For some participants, their notion of dementia seemed to move from a focus on end-of-life stages, a common stereotype (Low & Purwaningrum, 2020), to a broader view of the abilities and experiences of people living with dementia. Sharing of the experiences and perspectives of persons living with dementia in the DICE videos was described as particularly impactful, possibly because they were an opportunity to observe persons living with dementia successfully participating in physical activity and conversation. Seeing persons living with dementia engage in successful and unexpected ways (e.g., in art, choir, or theatre) has been a successful strategy to reduce the stigma of dementia in prior research (Dupuis & Gillies, 2014; Dupuis et al., 2016).

Exercise providers' survey responses and interviews suggest a shift toward supporting the social citizenship of persons living with dementia, which requires recognition of persons living with dementia's right to citizenship, participation, and growth as well as social positions and relationships in the community (Bartlett & O'Connor, 2010). They recognized persons living with dementia as full citizens with rights and planned to proactively create accessible exercise opportunities for persons living with dementia with

opportunities for meaningful social engagement. These changes may also relieve the structural stigma of dementia, at least in the realm of exercise. Furthermore, when people living with dementia have a supportive environment to exercise, they may also be able to demonstrate continued capacity to perform and improve, which can help overcome preconceptions of dementia and reduce public stigma among exercise providers and other exercisers (Thompson et al., 2019). The long-term impact of the DICE toolkit on the inclusion and participation of persons living with dementia in physical activity, and the perspectives of those around them, is an area for future investigation.

Limitations

We acknowledge a few limitations of our study. Our study was conducted during the COVID-19 pandemic. As a result, many exercise providers were not delivering exercise programs or were delivering exercise programs in different ways (virtually, smaller classes) at the time of their participation. Future research should investigate changes in practice as they occur and how they are maintained (alongside knowledge and attitudes) over time due to engagement with the DICE toolkit. In addition, we only included 16 participants which may have limited our statistical power and perspectives in the interviews. However, our participants were from urban, remote, and northern geographies and a variety of exercise settings. Furthermore, about half of our participants already delivered exercise to persons living with dementia, much higher than in the broader population of exercise providers. This is likely due to sampling bias, due to recruitment through our study partners. The high portion of participants with prior experience working with people with dementia may have reduced the impact of the DICE training, given that participants without experience generally demonstrated more significant changes in attitudes toward dementia and self-efficacy for delivery compared with participants with experience. Although thematic analysis appeared to reach saturation among our participants, it is possible that more participants from different settings would have altered the themes and findings. Also, there was no control group in our study so similar changes in knowledge or attitudes related to dementia may occur due to repeated assessment with our scales, rather than due to our DICE toolkit. Maintenance of changes in knowledge, attitudes, and practice are still unknown, a topic worthy of future study. Finally, the DICE training is largely focused on structured exercise and physical activity programs in the community; however, we know persons living with dementia have different preferences and backgrounds regarding physical activity and various settings in which they are active. Future adaptations or additions to the DICE training should consider broader contexts for exercise and physical activity. For example, study participants specifically requested more content on exercise provision in long-term care, which was considered out of scope for the current funding but a subject of much interest for future adaptation. In addition, adaptations should consider how to accommodate persons living with dementia in diverse physical activity opportunities (e.g., cultural dance and walking programs) that exist in our communities and cultures.

Conclusion

Exercise providers had improved knowledge and attitudes toward dementia and reported having better strategies to support people living with dementia in exercise after using the DICE toolkit. By training the exercise professionals who deliver community programs,

we may be able to influence the accessibility of their exercise programs to people living with dementia. By supporting the participation of persons living with dementia in inclusive exercise programs and recognizing their continuing capacity to actively participate in the exercise, there is an opportunity to improve their health and well-being and challenge assumptions about dementia.

Acknowledgments

This work was supported by the Canadian Institutes for Health Research (grant 587 #01881-000) and the Alzheimer Society of Canada. The Canadian Consortium for Neurodegeneration in Aging (Team 14) provided trainee funding for author Norman. The Canadian Consortium on Neurodegeneration in Aging itself is supported by a grant from the Canadian Institutes of Health Research with funding from several partners.

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