



Relational Design for Dementia and Job Significance (ReDeSign): Study protocol for a randomized controlled trial of an online dementia training for retail workers

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ABSTRACT

Background: The need for dementia training for retail workers has been recognized by dementia-friendly initiatives. However, evidence for dementia training in non-healthcare workplaces is lacking, and dissemination is challenging due to constraints on private companies' time and finances. The online training program ReDeSign (Relational Design for Dementia and Job Significance) applies mobile micro-learning methods and Relational Design Theory against time and financial constraints, respectively, and is designed to improve work-related outcomes.

Methods: This study will evaluate the effectiveness of ReDeSign with a randomized controlled trial. One hundred and twenty-four convenience store workers in Tokyo will be recruited and randomly assigned to the intervention or control groups. ReDeSign consists of four contents relevant to the job: simulation games, lectures and quizzes, virtual contacts, and information about benefits to others. Self-reported surveys will be conducted for individual workers at baseline, one month later, and three months later. ReDeSign will be delivered to workers in the intervention ($n = 62$) and control ($n = 62$) groups immediately after the baseline survey and after the one-month survey, respectively. The primary outcome is the change of attitude toward people with dementia, and the secondary outcomes are dementia knowledge, helping behavior, job satisfaction, workers' intention to stay, and persistence.

Discussion: ReDeSign provides dementia training to convenience store workers and contributes to developing an inclusive community for people with dementia. The results of this study may provide a new strategy for the dissemination of dementia training in non-healthcare workplaces.

1. Introduction

Globally, more than 43 million people are estimated to have dementia [1], the majority of whom live in the community [2]. A global action plan [3] calls for establishing dementia-friendly initiatives, which aim to change the attitudes and behaviors of the public, promote social inclusion, and help people with dementia engage in meaningful activity in the community [4,5]. Shopping is the most common outings for people with dementia [6], and 80% of them were reported to enjoy this activity [7]. While people with dementia rely on small neighborhood stores within walking distance to avoid complicated transportation and getting lost [8], they often have difficulty finding and paying for items in the store and may need help from store staff [8,9]. People with dementia

and their informal caregivers want the stores' staff to be trained in dementia, be helpful, and respond to emergencies [10,11], thus dementia training for store staff is integrated into the dementia-friendly initiatives [4,10,11].

Although dementia training is expected to convey dementia knowledge, improve attitudes toward people with dementia, and promote helping behavior for people with dementia [12,13], there is insufficient evidence of dementia training in non-healthcare workplaces like retail stores. To the best of our knowledge, only evaluation of dementia training implemented in local government agencies [14], the police [15], banks [16], and convenience stores [17] have been reported; however, these studies adopted qualitative evaluations or single-group, pre- and post-test designs. Given that these designs provide weak

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information about the counterfactual inference, our present study will use a randomized controlled trial (RCT) design.

Furthermore, dementia training in non-healthcare workplaces, including retail stores, poses challenges in terms of dissemination. In these workplaces, unlike healthcare organizations, supporting people with dementia is generally not part of the organizational mission, and there is no obligation to introduce dementia-friendly training. Nevertheless, with the aging of society and national dementia awareness campaigns, more stores are gradually understanding the importance of dementia-friendly training. However, even if the importance of such training is acknowledged, there are still two critical challenges that hinder its dissemination—time and financial constraints, the latter concerned with paying the employees [18,19]. On-site training is time-consuming and hinders employee participation. Many retail store employees work part-time [20], which makes it more challenging to participate. Furthermore, part-time employees' participation in the training necessitates additional wages; even if managers are interested in dementia training, they dislike the extra expenditure [18]. These constraints need to be mitigated to disseminate training.

Considering these challenges, a new dementia training program named ReDeSign (Relational Design for Dementia and Job Significance) was developed. ReDeSign is characterized by its course design with mobile micro-learning [21] and work-related outcome orientation based on Relational Job Design Theory [22] against time and financial constraints, respectively.

Mobile learning involves online education and allows participants to take courses on their smartphones, reducing waiting and traveling time for learning. Meanwhile, micro-learning involves dividing course contents into small independent blocks, making it possible to take courses during the participants' fragmented spare time. Mobile micro-learning is motivating and effective for memory retention [23,24], and more companies are introducing it into their human resource training programs [25]. The online program is also resilient to pandemics, such as COVID-19.

Relational Job Design Theory, developed by Grant [22], is an extension of the classic Job Characteristic Theory [26]; it implies that relational job architecture, consisting of contact with and job impact on beneficiaries, improves workers' prosocial motivation and influences work-related outcomes (i.e., job satisfaction, intention to stay, and persistence). The highlight of this theory is that it assumes that relational job architecture is modifiable. Store workers have less contact with beneficiaries (i.e., customers) and less opportunity to recognize the positive impact on them than, for example, health-care workers. However, it is possible to intervene in the job architecture by providing opportunities for contact with beneficiaries and information on their positive impact. Several RCTs have tested and demonstrated the effectiveness of such interventions based on this theory [27–29]. ReDeSign aims to improve work-related outcomes by providing opportunities for virtual contact with people with dementia and emphasizing the relationship with the beneficiary. Such improvements in work-related outcomes are desirable not only for individual workers but also for the organization, because they make the workers more likely to stay in the workplace and work longer. This tendency is beneficial to Japanese retailers who suffer from a chronic shortage of human resources [30]. Thus, demonstrating the effectiveness of ReDeSign on work-related outcomes is expected to boost the introduction of the program by organizations overcoming financial constraints.

ReDeSign RCT aims to evaluate the individual-level effectiveness of a dementia training program using a mobile micro-learning method on attitude toward people with dementia, helping behavior for customers who might have dementia, and work-related outcomes.

2. Methods

2.1. Research design

The effectiveness of ReDeSign will be evaluated with RCT. ReDeSign RCT is designed, implemented, and reported following the Consolidation Standards of Reporting Trials (CONSORT). The ReDeSign RCT was registered in the UMIN Clinical Trials Registry (UMIN000043623) and approved by the Ethics Committee of the School of Medicine, The University of Tokyo (2020348NI).

2.2. Setting

ReDeSign RCT will be conducted in convenience stores. In Japan, convenience stores—defined as establishments selling food and drink, with a retail space of 30–250 m², and a service time of 14 or more hours a day—is a typical small neighborhood store. There are 50,000 convenience stores across Japan, with 78% of older adults in Tokyo living within 300 m of a convenience store [31]. Annually, approximately 7000 people are urgently sheltered in convenience stores because of dementia, meaning they are temporarily kept in the backyard of the store while the staff calls the police or caregivers [32].

2.3. Participants and procedure

Fig. 2 shows the flow of participant selection in this study. First, one hundred and twenty-four workers will be recruited to participate in ReDeSign RCT. Registration cards will be sent to the convenience stores using direct mail. Store managers who intend to participate will then distribute the cards to the store workers. Using the card, individual workers will access the registration form and then read the research document, providing online consent. This two-step recruitment process is used to identify the clustering structure of the stores and ensure that the participants are employees of the convenience store. Every registration will be allocated to the training or control group by the researcher using a web-based randomization program [33], with a 1:1 allocation ratio and blocking. Registrations will not be disclosed to store managers.

The participants will complete the baseline survey (T1) immediately after registration. After the first survey (T1), participants will be told their allocation group. Those in the intervention group will be required to complete ReDeSign within one month. Their progress will be monitored, and they may receive a maximum of two reminders. The second survey (T2) will be completed one month after the T1 survey, while the third survey (T3) will be completed three months after the second survey.

Meanwhile, participants in the control group will complete the T2 survey one month after the T1 survey. Afterward, they shall complete ReDeSign within one month. Finally, they will complete the T3 survey four months after the T2 survey. A four-month interval shall exist between T1 and T3 surveys in the intervention group.

Participants who complete the entire course and survey responses will be paid 3000 yen, which is the wage equivalent to the time required for training and compensation for internet access fees. This payment is designed to prevent the participants from being biased toward groups with a greater interest in dementia. Stores will not be informed whether their employees are taking the course; hence, the participants are not organizationally scheduled for the course. They will take the course during off hours from work.

2.4. Eligibility

2.4.1. Eligibility of stores

The convenience stores in Tokyo and franchised by the seven franchisors in Japan Franchise Association are eligible. Stores located in hospitals or universities were excluded due to their different customer

compositions.

2.4.2. Eligibility of individuals

Participants must be at least 16 years old, currently working at a convenience store, available Internet via computer or smartphone, and fluent in Japanese. Employment status at the store is assumed to be franchisee owner, full-time employee, part-time employee, and in some cases, the owner's family members working as employees. The following shall be ineligible for this study: those under the age of 16, who are visually impaired, and who cannot view the e-learning.

2.5. Sample size

We estimated the sample size needed to detect the primary outcome, which is a change in attitude toward people with dementia. For estimation, we set the power to 80% and a two-sided alpha level of 0.05. Using the mean difference (1.73) and standard deviation (3.40) observed in a previous study [17], an effect size of Cohen's $d = 0.5$ is expected, and a study sample of $N = 124$ participants would provide adequate power.

In our previous study, the response rate for a survey targeting convenience stores was approximately 20%. Since this study is more burdensome, we expect a participation rate of approximately 5%. Informal interviews with store managers indicate that about three to five people per store would participate in the study. Thus, 25 to 40 stores are needed to recruit 124 participants, and direct mailings will be sent out to 500 to 800 stores.

2.6. Intervention program

An online dementia training program, ReDeSign, was developed for this study. The intervention group will be delivered ReDeSign immediately after the baseline survey. The control group will wait for one month after the baseline survey, and the same program will be delivered after the second survey.

ReDeSign is a 50-min course. Table 1 shows the table of contents, which is described in detail in the following sections. The program has seven lessons consisting of 40 units of less than 5 min, following the principles of micro-learning. In the first lesson, the participants will learn about the significance of understanding dementia and receive an overview, and in lessons 2–5, they will ascertain the symptoms of dementia and watch videos of people living with dementia. In Lessons 6 and 7, they will understand how to respond to people with dementia. These units are categorized into four components: simulation game in a store setting, lectures and quizzes, virtual contact with people with dementia, and information about the benefit of the convenience store for customers. We used iSpring Suite [34] for content authoring and TalentLMS [35] for delivery.

2.6.1. Program theory

The program theory of ReDeSign, shown in Fig. 1, was developed mainly through a deductive approach [36]. ReDeSign, consisting of four components, is hypothesized to influence helping behavior and work-related outcomes through three paths. The first is regarding dementia knowledge. Simulation games and lectures are intended to convey knowledge about dementia, focusing on the early symptoms of dementia and how to respond to people with dementia. The focus is guided by the Bystander Intervention Model [37], which illustrates that helping behavior occurs through the process of noticing an event, interpreting the situation as requiring help, taking responsibility, and deciding how to help. Participants are expected to learn to notice and interpret the situation as a person with dementia needing help and understand how to provide help.

The second path is attitudes toward people with dementia. Previous studies have identified that attitudes toward people with dementia and knowledge of dementia are positively associated with the intention to

Table 1
Table of contents.

Units	Media	Category
Lesson 1		
Introduction	Video message	–
Why we learn about dementia	Animated video	Lecture
What is dementia: definition and causes	Animated video	Lecture
Many people live with dementia in the community	Animated video	Lecture
Quiz 1	Quiz	Quiz
Lesson 2		
When you see a customer wandering around the store	Mini game	Simulation
Early symptoms of dementia (1): Memory and language	Animated video	Lecture
Quiz 2	Quiz	Quiz
Message from a person with dementia	Documentary movie	Virtual contact
Lesson 3		
When you notice a customer buying the same thing repeatedly a day	Mini game	Simulation
Early symptoms of dementia (2): Orientation	Animated video	Lecture
Dementia and independent shopping	Animated video	Benefit info
Quiz 3	Quiz	Quiz
Autonomy, independence, and support	Interview movie	Virtual contact
Lesson 4		
When a customer takes a long time to pay	Mini game	Simulation
Early symptoms of dementia (3): Calculation	Animated video	Lecture
Connecting to the community through shopping	Animated video	Benefit info
Quiz 4	Quiz	Quiz
Remaining engaged in community activity after diagnosis	Documentary movie	Virtual contact
Lesson 5		
When you suspect that a customer is being defrauded	Mini game	Simulation
Early symptoms of dementia (4): Thinking and attention	Animated video	Lecture
Convenience stores are dementia-friendly	Animated video	Benefit info
Quiz 5	Quiz	Quiz
Lesson 6		
Early symptoms of dementia (5): Depression and anxiety	Animated video	Lecture
Prevention of dementia	Animated video	Lecture
If someone familiar might have dementia	Animated video	Lecture
Diagnosis of dementia	Animated video	Lecture
Quiz 6	Quiz	Quiz
Lesson 7		
Key points for response at convenience stores	Animated video	Lecture
Quiz 7	Quiz	Quiz
Concluding remarks	Video message	–

provide help to people with dementia [12,38]. Common strategies to improve negative attitudes toward people with mental illness include education and contact [39,40], both of which were integrated into ReDeSign as lectures/quizzes (education) and virtual contact. Education improves attitudes by replacing inaccurate stereotypes and beliefs with facts. Contact Hypothesis [41] suggests that intergroup contact can reduce prejudice between groups. While this theory initially assumed direct interaction as contact, it has expanded to virtual contact [42]. It has been reported that video contact with people with mental illnesses can reduce negative attitudes [43].

The third path is perceived social impact. Based on Relational Job Design Theory, previous studies have shown that making contact with beneficiaries [28] and giving information about the benefits of the job to others [27] increase helping behavior and work-related outcomes through perceived social impact. The positive association between perceived social impact and job performance has also been identified in the context of retail services [44]. Considering people with dementia as beneficiaries of convenience store jobs, ReDeSign incorporates virtual

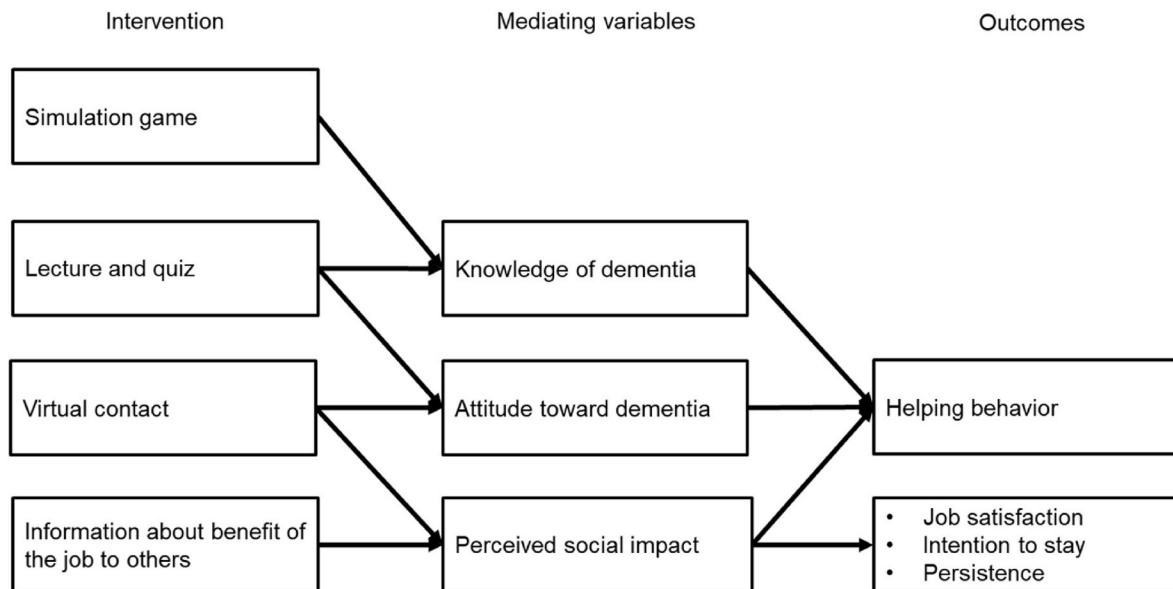


Fig. 1. Program theory.

contact as contact with beneficiaries and information about the benefit for others of a convenience store. While helping customers with dementia is not explicitly included in the job description of retail workers, workers redefine their jobs' boundaries and perceive social impact through the lens of relational architecture [45].

2.6.2. Simulation game

ReDeSign includes four simulation games set in a convenience store; each corresponds to four groups of early symptoms of dementia: (1) memory and language, (2) orientation, (3) calculation, and (4) thinking and attention. In the simulation scenes (e.g., a customer is taking a long time to pay), two response options are presented to the participants. If the participant chooses the better option (e.g., offering to help count coins), they are given positive feedback followed by the next scene. If they choose the other option (e.g., rushing to pay), the reason they should choose the other option is explained. The scenarios were developed based on existing documents [46] and collected best practices published by the Japan Franchise Association [32].

2.6.3. Education: lecture and quiz

Lecture and quiz contents were developed primarily based on the Dementia Supporter program in Japan [13] and were partly modified with Dementia Training Standards Framework Tier 1 [47] from the United Kingdom and an existing Delphi study [48]. Topics include the definition, causes, epidemiology, early symptoms, prevention, and diagnosis of dementia, along with the appropriate response. Narrative experiences extracted from the Dementia Knowledge Library [49] were added to description of symptoms. The lectures have a casual appearance using animated videos. Finally, after each lesson, participants will be presented with two to four quizzes that correspond to the lesson content. If they answer incorrectly, they will receive immediate feedback.

2.6.4. Virtual contact with a person with dementia

Virtual contact with people with dementia shall be delivered through three documentary and interview movies of people with dementia [50]. The movies illustrate that people can be autonomous even if they have dementia, that support is necessary, but independence must be encouraged, and that community engagement is essential.

2.6.5. Information about the benefit for others of convenience store

Based on the *Dementia-friendly retail guide* [7], independent shopping

is considered essential for people with dementia; furthermore, shopping is a preferred activity for people with dementia and is key to retaining independence and a sense of belonging to a community. Additionally, the advantages of convenience stores include the following: being within walking distance from their home, being compact and less confusing, and selling ready-to-eat food in manageable portions. Participants are expected to understand the positive impact of working in a convenience store on older adults and people with dementia.

2.6.6. Composition of the course

The table of contents is shown in Table 1. Participants must take the courses in order from the beginning and complete them without skipping any units. The first lesson explains why participants must learn about dementia. It is highlighted that dementia is familiar to most individuals, that some people who use convenience stores have dementia, and that these individuals can maintain their independence in shopping with some support from the store staff.

The second to fifth lessons focus on early symptoms. Participants will first play a simulation game to direct their attention to the symptoms of dementia, following a lecture on the symptoms that appeared in the game. The participants are expected to be better able to notice the symptoms of dementia and the need for help in their job settings. The virtual contact and information about the benefit of convenience stores for others are distributed across lessons two through five to prevent redundancy.

The sixth and seventh lessons provide instruction regarding how to respond when they, their family member, or a customer might have dementia. Interpersonal communication skills are explained as individual-level responses, and community resources to be coordinated, such as community general support centers [51], are presented as organization-level responses. Participants are expected to signpost people with dementia and their informal caregivers to dementia support and information. The course concludes with an encouraging message for engagement in a dementia-friendly society.

2.7. Measures

All measurements will be taken at the individual level using a self-administered survey. All variables, except the covariates, will be measured thrice (T1, T2, T3). Unless otherwise indicated, the items use a Likert scale, wherein 0 and 4 represent *disagree strongly* and *agree strongly*, respectively.

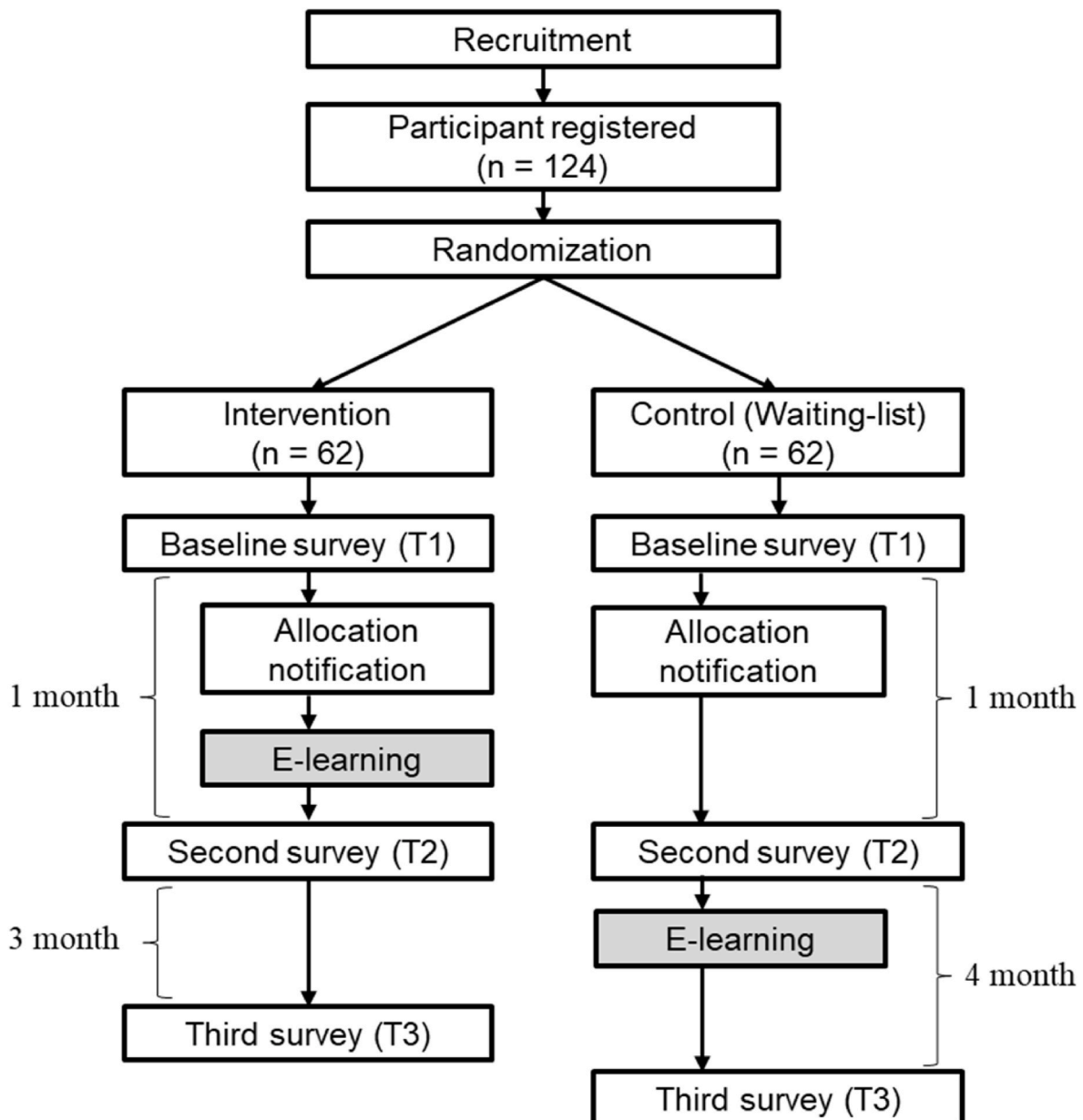


Fig. 2. Participant flow.

2.7.1. Primary outcome

The primary outcome is the attitude toward people with dementia, as measured by the Japanese scale developed by Kim et al. [52]. Improving attitudes is the primary aim of dementia training in the dementia-friendly initiative and is the most commonly used outcome in previous studies [53]. The scale uses a Likert scale wherein 0 and 4 represent *disagree strongly* and *agree strongly*, respectively; it includes 14 items, such as “I do not mind if people with dementia move into my neighborhood” and “People with dementia should participate more in community activities.” It consists of four sub-scales: familiarity, distance, rejection, and tolerance. The total score shall be used for our analysis. A higher score implies a more positive attitude toward people with dementia. Cronbach’s alpha in the development study is 0.793, and criterion-related validity is confirmed [52].

2.7.2. Secondary outcomes

The first secondary outcome is helping behavior for customers who might have dementia. Fifteen situations where a customer with

dementia would need helping behavior were extracted from previous survey results [17]. The respondents shall answer the incidence of each situation within one month (wherein 0 = *no* and 1 = *yes*) and the frequency of their helping behavior in the situation (wherein 0 = *never* and 3 = *always*). The definition of helping behavior in this scale contains both offering direct assistance and contacting supervisors or administrative institutions since the respondents include managers, full-time employees, and part-time employees. Through a preliminary survey of convenience store workers, three items with low incidence rates (<25%) and three items with low discriminant validity were deleted, considering the experience of the Dementia Supporter course. Nine items were thus listed. The final list includes “a customer who cannot find a way home,” “a customer who buys the same thing repeatedly a day,” and “a customer who relays the same story repeatedly.” Cronbach’s alpha for the authors’ preliminary survey is 0.815.

Other secondary outcomes are job satisfaction, intention to stay, and persistence. For job satisfaction, two items were used: “I am satisfied with my current job content” and “Overall, I am satisfied with my

current job [54].” Intention to stay shall be measured by a scale developed and translated in previous studies [55,56]. The wording has been changed to match convenience stores. It includes the following four items: “Within a year, I intend to change jobs to a different store,” “Within a year, I intend to change my job to a different industry from convenience stores,” “If I find another good job opportunity, I intend to quit the current store,” and “I sometimes feel like quitting my job at the current store.” The Cronbach’s alphas in the preliminary study are 0.923 and 0.746, respectively. Persistence is measured by hours worked last month and last week, following Grant’s measurement [27].

2.7.3. Mediating variables

Knowledge of dementia and perceived social impact will be measured as mediating variables. The J-DKAS (Japanese Dementia Knowledge Assessment Scale) is used to measure knowledge of dementia [57]. This scale is the Japanese version of the internationally used DKAS [58], which contains 18 statements. Perceived social impact shall be measured with Haraguchi’s scale [55], a translation of previous work [27].

2.7.4. Covariate

Demographic attributes including gender, age, and educational background will be collected. They will also be asked about their intrinsic motivation to work, whether they have had a family member with dementia, their former experience with a Dementia Supporter course, and the length of the working year at their current store. At the store level, franchisor and location information will be collected during recruitment, and the location data will be used to calculate the population density and aging rate of the neighborhood. These variables will be used to describe the participants’ demographics, check the balance of the allocation, and explore whether there are differences in intervention effects according to background through subgroup analysis.

2.8. Data management and analysis

All data shall be collected and stored on SurveyMonkey and downloaded after the survey is completed. Participants will receive a unique survey link for each individual, and the data will be automatically tagged with the study ID. After downloading, an offline electronic backup will be stored in a locked cabinet of the research institution.

Stata IC 16 is used for the analysis. All p values are two-sided, and $p < 0.05$ is interpreted as statistically significant.

2.8.1. Estimation of short-term treatment effect

Changes in the primary and secondary outcome between surveys T1 and T2 shall be calculated and analyzed to estimate the treatment effect. All participants who completed the T1 and T2 surveys will be included in the analysis, regardless of e-learning completion. The independent t -test will be performed to compare mean values between the groups.

2.8.2. Estimation of medium-term treatment effect

Given that both groups shall complete the intervention by the T3 survey, medium-term effects will be estimated in a pre-post design framework. Data from the T1 and T3 surveys for the intervention group and T2 and T3 surveys for the control group will be pooled. The paired t -test will be performed to compare mean values before and after the intervention.

2.8.3. Mediation analysis

Mediation analysis will be conducted to assess the program theory. Although attitude toward people with dementia is the primary outcome of this study, it is a mediating variable in evaluating the theory. The following hypotheses will be tested:

- The treatment effect on helping behavior is mediated by attitudes toward people with dementia, knowledge of dementia, and perceived social impact.
- The treatment effects on job satisfaction, intention to stay, and persistence are mediated by perceived social impact.

2.8.4. Subgroup analysis

Subgroup analysis will be conducted based on gender, age, and intrinsic motivation values. Subgroup analysis will identify the context wherein ReDeSign is more effective.

3. Discussion and conclusion

The ReDeSign program aims to improve attitudes toward people with dementia and increase the helping behaviors of convenience store workers through multiple approaches. We will also investigate the impact on work-related outcomes by highlighting the relationship with beneficiaries. The project was started in April 2021, and data collection will be completed by December 2021.

The clear strength of this study is that it presents a strategy for dissemination, which private companies require to introduce dementia training to the workers, addressing time and financial constraints. First, ReDeSign mitigates the time constraints of training by using a mobile micro-learning approach. As mobile micro-learning becomes more common as training for business, ReDeSign can be easily incorporated. It may also be possible for workers to take the course in their spare time during the workday (e.g., when customers do not visit the store for a while), without having to take additional time. Second, based on the Relational Job Design Theory, we illustrate a path where dementia training is linked to work-related outcomes such as job satisfaction, intention to stay, and persistence. It is increasingly challenging to recruit employees at convenience stores [30], thus visualizing the effects on employment may encourage store managers to introduce the training program.

In this study, rewards were provided to prevent volunteer bias. In the future, we intend to offer this program to all employees, including those who are not interested in dementia, as part of their organizational training (i.e., during their salaried hours), so we included participants who were motivated by the payment. It is possible that low motivation to learn about dementia will result in negative outcomes, but it reflects the effectiveness of the program in the real world. While there is a risk that this additional payment may affect changes in work-related outcomes, such as job satisfaction, we minimized this risk by providing payment after the survey responses. In addition, all outcome measures in this study are self-reported. Since helping behavior is retrospective, it is difficult to exclude the risk of social desirability bias in the intervention group.

This RCT will be the first experimental study regarding dementia training at non-healthcare workplaces and will illustrate a dissemination strategy. If successful, ReDeSign can provide an evidence-based program that can be used as a framework for dementia training in various sectors, including supermarkets, banks, and transport” for enhanced specificity. The diffusion of dementia training programs in the workplace will encourage people with dementia to continue living in an inclusive community.

Authors’ contributions

HM conceived the study. HM, AI, and NYM initiated the study design. HM and AI are grant holders. YH provided statistical expertise in the clinical trial design, and HM conducted the primary statistical analysis. All the authors contributed to the refinement of the study protocol and approved the final manuscript.

Declaration of competing interest

The authors report no conflicts of interest in this work.

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