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Effects of a smartphone application for cognitive rehearsal intervention on workplace bullying and turnover intention among nurses

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Abstract

Background: Bullying in nursing workplaces has been considered a serious problem that increases nurse turnover.

Aim: To develop a cognitive rehearsal intervention for workplace bullying and examine its effects on nurses' bullying experiences and turnover intentions.

Methods: We developed a smartphone application to cognitively train nurses to handle bullying situations in the workplace. This application included common bullying situations and appropriate non-violent communication scenarios. A cluster quasi-randomized trial was performed with 72 hospital nurses working in a university hospital in South Korea from November 2016 to January 2017. We measured workplace bullying experiences and turnover intention before intervention and 4 and 8 weeks after intervention in both intervention and control groups.

Results: The cognitive rehearsal intervention developed in this study was effective for decreasing nurses' person-related bullying, work-related bullying experiences, and turnover intention. However, it had no effects on intimidation-related bullying experiences.

Conclusions: The smartphone application-based cognitive rehearsal intervention can serve as a personal coping measure for person-related and work-related bullying among nurses. It is recommended that the intervention developed in this study be applied as a strategy to reduce nurse turnover.

KEYWORDS

cognitive rehearsal, non-violent communication, nursing, smartphone applications, workplace bullying

SUMMARY STATEMENT

What is already known about this topic?

- Bullying in the nursing workplace is prevalent and a major cause of turnover.
- Cognitive rehearsals that reproduce specific situations and train positive coping skills can serve as an intervention for workplace bullying.

What does this paper add?

- Cognitive rehearsal using smartphone applications is effective in lowering workplace bullying and turnover intention.

- Unit-based intervention for workplace bullying can be implemented effectively.

The implications of this paper:

- Cognitive rehearsal application can be used as a personal training tool.
- Workplace bullying scenarios can be applied in simulated nursing education.

1 | INTRODUCTION

As nurse turnover increases, interest has grown in workplace bullying (WB) as one of its causes. WB is defined as "repeated exposure to person-, work-, and intimidation-related negative acts such as abuse, teasing, ridicule, and social exclusion over a period of time in the workplace" (Einarsen, Hoel, Zapf, & Cooper, 2003). The incidence rate of WB among nurses is 22% (Ganz et al., 2015), much higher than the rate of 3.7% to 9.0% in general workers (Mikkelsen & Einarsen, 2001). WB can result in psychological symptoms such as depression and anxiety, as well as physical symptoms such as palpitations, headaches, and fatigue (Laschinger & Nosko, 2015). Symptom experience due to bullying in the workplace affects the burnout and turnover intention of nurses (Laschinger, Wong, & Grau, 2012). This increase in turnover eventually destabilizes the nursing workforce and negatively affects the quality of care and patient safety (Baldwin & Daugherty, 2008). Thus, there is a need to find ways to reduce or prevent bullying in the nursing workplace.

A systematic review of nurses' bullying in the workplace (Stagg & Sheridan, 2010) suggested cognitive rehearsal (CR) as an intervention to cope with bullying situations. CR is a type of cognitive behavioural therapy (CBT) that can be used as a coping strategy for bullying situations (Smith, 2011). CBT posits that thinking plays a major role in behaviour. CBT focuses on bringing about behavioural changes through changes in thinking (Dobson & Dozois, 2019). CR recreates a specific situation and cognitively trains individuals in positive interactions or coping processes. Through CR, an individual can stop acting automatically when faced with a situation and respond in a prelearned way (Stagg & Sheridan, 2010). Accordingly, CR for WB can be expected to reduce negative consequences by allowing nurses to cope effectively when they encounter real WB situations.

A search yielded four studies reporting the effectiveness of CR in addressing nurses' WB. First, Griffin (2004) improved awareness of WB and reduced turnover by educating 26 new nurses using CR techniques. This study is significant in that it developed an intervention to cope with WB based on CBT. However, it is difficult to regard it as supporting the effectiveness of CR because only qualitative data were presented; validated quantitative instruments were not applied. Second, Stagg, Sheridan, Jones, and Speroni (2011) reported that CR intervention for 10 types of WB situations increased knowledge and awareness of nurses' WB and increased confidence in coping with bullying. Their intervention combined education on WB and CR. Because their study design did not include a control group and only knowledge and awareness of WB were measured as outcome variables, it is difficult to determine whether their programme actually reduced WB. The third study (Stagg, Sheridan, Jones, & Speroni, 2013) was conducted 6 months later among the same nurses participating in the intervention of Stagg et al. (2011), 40% of whom reported a decrease in bullying. The authors reported long-term effects of CR, but since only 10 nurses participated in the survey, the implications of the study results could be limited. All three studies above yielded positive results, but they had disadvantages in research design, in that the number of subjects was small and a control group was not included.

In the fourth, most recent study (Kang, Kim, & Yun, 2017), a CR programme for nurses to prevent WB was conducted for 10 sessions, and its effects were tested with a more rigorous controlled trial. The programme improved interpersonal relationships and reduced the turnover intention of nurses, but two issues remain. First, the CRs were intended to reduce WB, but they did not reduce the experience of bullying itself, perhaps because even though WB occurs in a social context (Hershcovis, Reich, & Niven, 2015), the intervention was applied to individual nurses in different units in the study. Accordingly, a strong need for group interventions for WB is indicated. Second, the duration of the CR programme was long (10 sessions of 20 h), and all participants had to gather at the designated site. Therefore, it was necessary to modify the developed CR programme to a more practical form in terms of time and cost.

As noted above, CR can be an effective intervention for nurses' bullying in the workplace. Formatting such an intervention for nursing units and providing training via a smartphone application would increase efficiency and convenience. The use of smartphone applications in nursing and health care has been rapidly expanding, especially with increased accessibility and availability (Ventola, 2014).

The purpose of this study was to develop a smartphone application CR intervention for WB and to examine its effects on nurses' bullying experiences and turnover intention. The hypotheses of the study are as follows.

> **Hypothesis 1.** *Person-related bullying in the CR intervention group will differ from that in the control group.*
>
> **Hypothesis 2.** *Work-related bullying will differ in the intervention and control groups.*
>
> **Hypothesis 3.** *Intimidation-related bullying will differ in the intervention and control groups.*
>
> **Hypothesis 4.** *Turnover intention in the intervention group will differ from that in the control group.*

2 | METHODS

2.1 | Design

This was an intervention study to investigate the effects of a unit-based CR intervention using a smartphone application on nurses

working in four different units. We adopted a cluster quasi-randomized design.

2.2 | Setting and participants

The study was conducted in a university hospital in Busan, Korea, with 979 beds and a total of 28 in-patient units. The total numbers of nurses working in the hospital was 890.

The participants in this study were nurses with 6 months or more of experience. Nurses with less than 6 months of experience were excluded because they might be undergoing orientation and lack familiarity with the work environment. Thus, they might perceive WB differently, which could be a source of bias. Because the scenarios in the CR were written for general staff nurses, managerial nurses such as head nurses were also excluded.

The sample size was calculated in two steps. First, the number of samples required to compare the two independent group means was calculated. Second, the final sample size was adjusted using the design effect for clustering. With effect size (d) = 0.8 (Kang et al., 2017), α = .05, and statistical power ($1 - \beta$) = 0.8, the minimum number of participants for the difference between two independent means was 49. The design effect of clusters in each group was 2.39 when cluster size (m) = 20 (number of nurses expected to participate per unit) and within-cluster correlation coefficient (ρ) = 0.05. Based on the above, 80 subjects were required (Leyrat, Morgan, Leurent, & Kahan, 2018).

Participants were publicly recruited as groups in work units, more than 70% of whose members wanted to participate. Four units, including two general and two intensive care units (ICUs), indicated their intention to participate. The total number of nurses working in the four participating units was 98, and the number who wanted to participate was 74 (75.2%). Consent was obtained from 73 nurses, excluding one who had experience of less than 6 months.

We assigned the participating units to the intervention and control groups quasi-randomly. We prepared four balls, two each marked "A" and "B" for the intervention and control groups, respectively, and placed them in an opaque bag. The representatives of the units each picked one ball from the bag. In order to assign two units to each group, we did not return the drawn balls to the bag. Two nursing units (one general and one ICU) were allocated to the intervention group (36 nurses) and the remaining two units to the control group (37 nurses). In the control group, one nurse rotated to another unit and could not participate in the postmeasurement after 4 weeks. As a result, the data from 36 nurses in the intervention group and 36 nurses in the control group were used for the final analysis (Figure 1).

2.3 | Procedure

After the selection of participants and group assignment, premeasurement of both groups was conducted. Postmeasurements were conducted in both the intervention and control groups 4 and 8 weeks after the application was distributed to the intervention group. All outcomes were measured using self-report paper questionnaires. A research assistant who did not know the group allocation of the participants distributed and collected three sets of questionnaires. After the questionnaires were completed, they were collected in a sealed state. Each questionnaire was marked with a participant number rather than the real name, allowing the three sets of questionnaires to be linked. The blindness of group allocation was maintained during statistical analysis. Groups of participants were coded as group 1 or 2 instead of intervention or control group, so that the statistician did not know group assignments.

2.4 | Measurements

2.4.1 | Workplace bullying

WB was measured using the Negative Acts Questionnaire-Revised (NAQ-R), developed by Einarsen, Hoel, and Notelaers (2009) and translated into Korean by Nam, Kim, Kim, Koo, and Park (2010). This tool consists of 22 items about experiences of negative behaviour, divided into 12 items on person-related bullying, five items on work-related bullying, and five items on intimidation-related bullying. The participants responded from 1 for *never* to 5 for *almost every day* for each item. Higher scores indicate more WB. The original tool asked about experiences in the last 6 months, but this was revised to *since the last survey* in the 4-week/8-week measurement of the current study to measure the effect of intervention on bullying experience. This tool has been validated for Korean nurses. The construct validity of the Korean version of NAQ-R was estimated through factor analysis, which yielded the same factor structure as the original tool. The criterion validity, estimated by correlation with the Psychosocial Well-being Index Short Form, was satisfactory. Nam et al. (2010) reported a value of Cronbach α for the NAQ-R of.92, indicating high reliability. In the current study, Cronbach α = .93.

2.4.2 | Turnover intention

Turnover intentions were measured using a modified version of "intent to quit" (Becker, 1992), adapted and validated for Korean nurses by Yun and Kang (2018) using an expert content validity test and internal consistency evaluation. This tool consists of four questions regarding the nurses' intention or plans to leave the current workplace. Each item was scored on a 5-point Likert scale from 1 = *not at all* to 5 = *very strongly*. Higher scores indicate higher turnover intention. Regarding reliability, Cronbach α reported by Yun and Kang (2018) and in this study, respectively, were.82 and.88.

2.5 | Intervention

The CR intervention using a smartphone application in the current study was designed to allow nurses to practice situations to effectively cope with WB. CRs require scenarios that can reproduce real situations and standard communication that can be applied to the situation (Smith, 2011). Our CR consisted of six WB situations that nurses

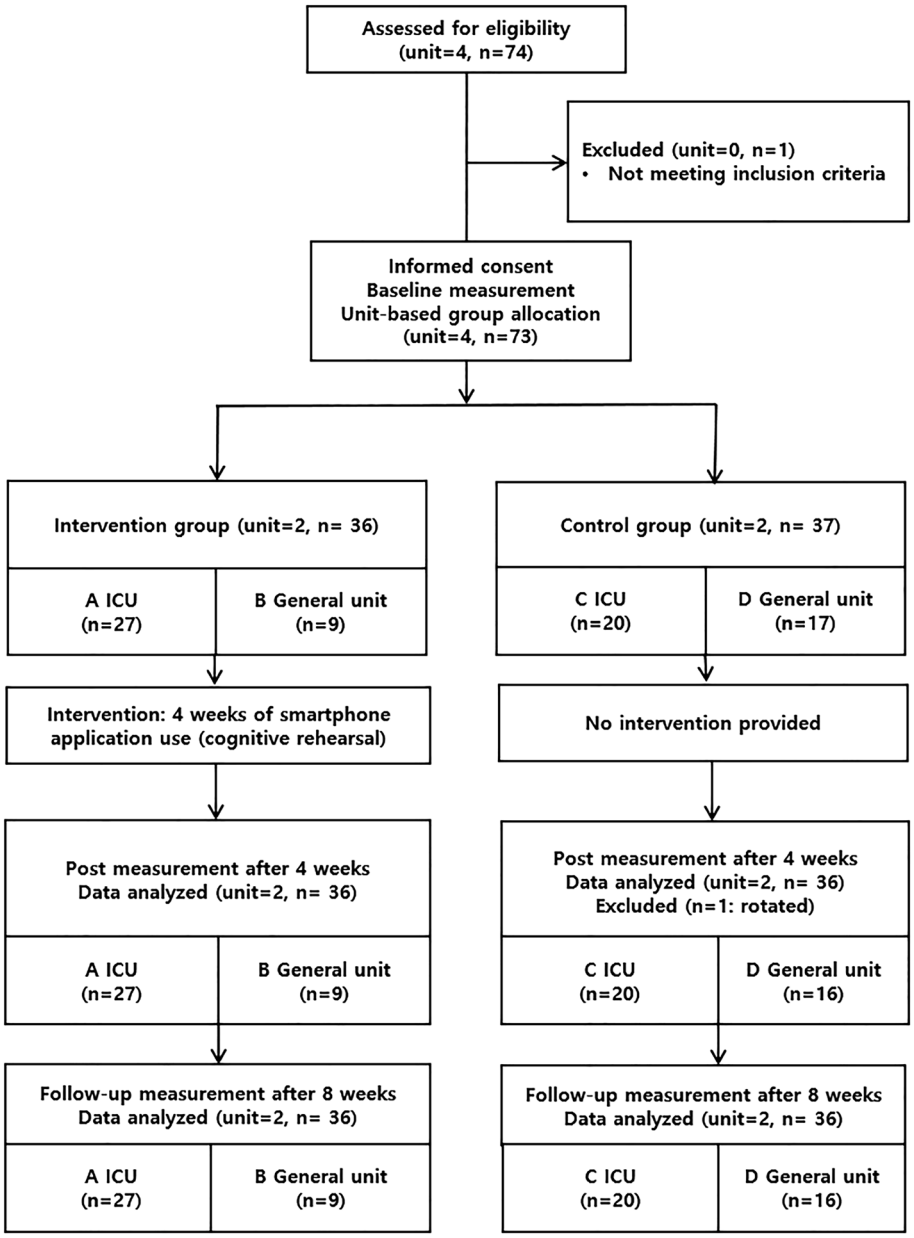

FIGURE 1 Flow diagram of the study. ICU = intensive care unit

frequently encounter and non-violent conversations that can be used in each situation. Nurses who have been trained in CR can expect to experience less negative behaviour of WB and to be less intent to leave. The conceptual framework of the study is shown in Figure 2.

In the current study, the participating nurses were provided CR intervention through a smartphone application for accessibility and convenience. The smartphone application consists of an introduction to non-violent conversation as a standard communication, six webtoons of WB situations, and a bulletin board for questions and answers. The application was designed using the Swing 2.0 program and made available for both Android and iOS.

A total of six webtoons were uploaded for CR, and the topics of each webtoon included "when a colleague nurse gets angry and shouts at me," "when he or she interrupts my work," "when he or she treats me as if I am invisible," "when he or she disregards me," "when he or she humiliates me in front of others," and "when pointing out personal issues." Six scenarios were selected from nine developed in a previous study (Kang et al., 2017) through a total of 10 consultation meetings with two communication specialists, two nursing professors, and five staff nurses. We used non-violent communication (Rosenberg & Chopra, 2015) as a standard communication tool to cope with anticipated bullying situations. Frequently occurring situations in the nursing workplace were selected and modified to create scenarios using non-violent communication techniques. The completed scenarios were constructed in a webtoon format by a professional writer. An example user screen is shown in Figure 3.

The study was conducted from November 2016 to January 2017. The intervention group was introduced to non-violent communication and training in the application usage for 2 hours, at which time the researchers installed the application on the smartphones of the

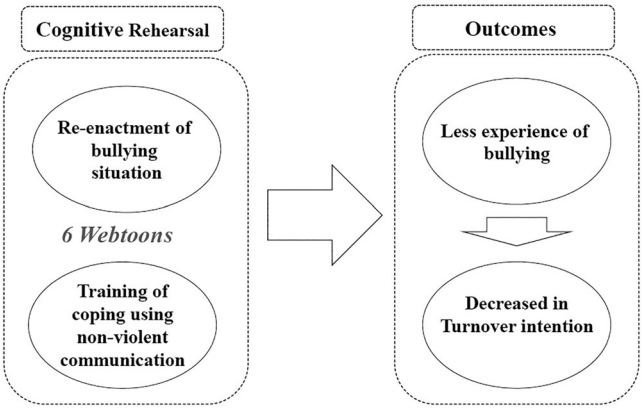

FIGURE 2 Conceptual framework of the study

intervention group. The same training was repeated in the morning and afternoon so that all the participants could attend regardless of their shifts. After that, the intervention group used the application in their free time in any location for individual rehearsals of WB situations. During the 8-week intervention period, we sent push alarms twice a day to encourage the use of the application.

The control group received no intervention. In order to prevent the spread of the intervention, only those approved by the administrator could access the application.

2.6 | Data analysis

The data were analysed using SPSS/WIN 23.0 (IBM Corp, Armonk, New York). The participants' characteristics and the homogeneity between the two groups were analysed using frequency, mean, chi-square tests, Fisher exact tests, and *t* tests. The effects of CR intervention and cluster effects were analysed with repeated measures ANOVA. For post hoc analysis, the differences between the 4-week measurement and premeasurement and between 8-week measurement and premeasurement were analysed with *t* tests with a significance level of α = .017 after Bonferroni adjustment (Field, 2013).

2.7 | Ethical considerations

This study was approved by the institutional review board of Dong-A University based on the Declaration of Helsinki. Because the study addressed sensitive topics, we installed counselling bulletin boards on the developed application on which participants could write a text using a nickname, and only a professional counsellor could read and reply to the text.

3 | RESULTS

3.1 | Characteristics of the study participants

The mean (SD) ages of the intervention and control group were 30.78 (8.06) and 29.56 (7.24), respectively. The turnover rate was 4.2% in the intervention group and 4.0% in the control group for one year before the intervention. There was no statistically significant difference between the two groups for the premeasurement of the dependent variables (Table 1).

3.2 | Hypothesis testing

3.2.1 | Workplace bullying

Person-related bullying

The mean (SD) person-related bullying scores in the intervention group were 21.44 (7.78), 17.78 (6.77), and 15.83 (4.48) at premeasurement, 4-week measurement, and 8-week measurement, respectively, and 20.31 (8.27), 20.28 (5.29), and 17.56 (5.07) for the

FIGURE 3 Sample pages of developed application

TABLE 1 Homogeneity tests between the intervention and control groups (n = 72)

Variables	Categories	Int. (n = 36) n (%) or Mean (SD)	Cont. (n = 36) n (%) or Mean (SD)	χ^2 or t	P
Gender	Female	36 (100)	35 (97.2)		1.000[a]
Age, y		30.78 (8.06)	29.56 (7.24)	0.68	.501
Education	Associate degree	2 (5.6)	5 (13.9)	2.44	.305[a]
	Bachelor	29 (80.6)	29 (80.6)		
	≥Master	5 (13.9)	2 (5.6)		
Marital status	Married	13 (36.1)	10 (27.8)	0.56	.614
	Unmarried	23 (63.9)	26 (72.2)		
Position	Staff nurse	33 (91.7)	35 (97.2)		.614[a]
	Charge nurse	3 (8.3)	1 (2.8)		
Length of time worked as a nurse, y		8.26 (7.75)	6.80 (7.21)	0.83	.411
Length of time worked at current site, y		3.97 (4.51)	3.60 (4.03)	0.38	.709
Turnover rate in recent 1 year[b]		2 (4.2)	2 (4.0)	2.00	.500
Workplace bullying	Person related	21.44 (7.78)	20.31 (8.27)	0.60	.549
	Work related	11.11 (4.65)	9.25 (3.54)	1.91	.060
	Intimidation related	6.19 (1.47)	6.11 (1.80)	0.22	.830
Turnover intention		3.56 (0.81)	3.59 (0.84)	−0.14	.887

Abbreviations: Cont., control group; Int., intervention group; SD, standard deviation.

[a]Fisher exact test.

[b]Calculated for all nurses in the unit

control group. We observed a significant within-group effect (F = 17.34, P < .001) and interaction effect (F = 3.63, P = .034), but there was no significant between-group effect (F = 0.65, P = .423). Hypothesis 1 was supported because the interaction effect was significant. The difference in person-related bullying between the two groups over time was significant. Post hoc analysis revealed no significant mean difference at 4 weeks (t = −2.34, P = .022) or 8 weeks (t = −1.88, P = .064). The effect size of the intervention on person-related bullying was 0.23 (Table 2).

Work-related bullying

The mean (SD) work-related bullying scores in the intervention group were 11.11 (4.65), 9.50 (3.36), and 8.31 (3.28) at premeasurement, 4-week measurement, and 8-week measurement, respectively, and 9.25 (3.54), 9.61 (2.91), and 9.03 (2.91) in the control group. We observed a significant within-group effect (F = 7.98, P = .001) and interaction effect (F = 6.28, P = .002), but there was no significant between-group effect (F = 0.24, P = .624). Hypothesis 2 was supported because the interaction effect was significant. Post hoc analysis revealed significant mean differences at 4 weeks (t = −2.44, P = .017) and 8 weeks (t = −3.26, P = .002). The effect size of the intervention on work-related bullying was 0.30 (Table 2).

Intimidation-related bullying

The mean (SD) intimidation-related bullying scores in the intervention group were 6.19 (1.47), 5.69 (1.21), and 5.67 (1.22) at premeasurement, 4-week measurement, and 8-week measurement, respectively, and 6.11 (1.80), 6.08 (1.68), and 5.89 (1.47) in the control group. There was no significant within-group effect (F = 2.38, P = .104), between-group effect (F = 0.38, P = .541), or interaction effect (F = 0.92, P = .391). Hypothesis 3 was rejected because the interaction effect was not significant (Table 2).

3.2.2 | Turnover intention

The mean (SD) scores of turnover intention in the intervention group were 3.56 (0.81), 3.13 (0.92), and 3.36 (0.77) at premeasurement, 4-week measurement, and 8-week measurement, respectively, and 3.59 (0.84), 3.66 (0.84), and 3.67 (0.71) in control group participants. We observed a significant interaction effect (F = 5.12, P = .007), but there was no significant between-group (F = 2.91, P = .093) or within-group effect (F = 2.56, P = .081). Hypothesis 4 was supported. Post hoc analysis revealed a significant mean difference at 4 weeks only (t = −3.52, P = .001). The effect size of the intervention on turnover intention was 0.27 (Table 2).

3.3 | Additional analysis for cluster effects

We analysed the differences between the ICU and the general unit within each group to determine the effect of the type of unit. The differences between the ICU and the general unit were not significant in any outcome variable (Table 3).

TABLE 2 Differences in workplace bullying and turnover intention between the intervention and control groups (n = 72)

Variables	Categories	Groups	P retest Mean (SD)	4 wk Mean (SD)	8 wk Mean (SD)	Sources	*F* (*P*)	Differences (4 wk-Pre) Mean (SD)	t	P	Differences (8 wk-Pre) Mean (SD)	t	P	Effect size (*f*)
Workplace bullying	Person related	Int. (n = 36)	21.44 (7.78)	17.78 (6.77)	15.83 (4.48)	Group	0.65 (.423)	−3.67 (5.92)	−2.34	.022	−5.61 (7.26)	−1.88	.064	0.23
		Con. (n = 36)	20.31 (8.27)	20.28 (5.29)	17.56 (5.07)	Time	17.34 (<.001)	−0.03 (7.22)			−2.75 (5.51)			
						Group * Time	3.63 (.034)							
	Work related	Int. (n = 36)	11.11 (4.65)	9.50 (3.36)	8.31 (3.28)	Group	0.24 (.624)	−1.61 (3.60)	−2.44	.017	−2.81 (3.65)	−3.26	.002	0.30
		Con. (n = 36)	9.25 (3.54)	9.61 (2.91)	9.03 (2.91)	Time	7.98 (.001)	0.36 (3.25)			−0.22 (3.05)			
						Group * Time	6.28 (.002)							
	Intimidation related	Int. (n = 36)	6.19 (1.47)	5.69 (1.21)	5.67 (1.22)	Group	0.38 (.541)	−0.50 (1.40)	−1.22	.226	−0.53 (1.58)	−0.80	.428	0.11
		Con. (n = 36)	6.11 (1.80)	6.08 (1.68)	5.89 (1.47)	Time	2.38 (.104)	−0.03 (1.84)			−0.22 (1.68)			
						Group * Time	0.92 (.391)							
Turnover intention		Int. (n = 36)	3.56 (0.81)	3.13 (0.92)	3.36 (0.77)	Group	2.91 (.093)	−1.72 (2.87)	−3.52	.001	−0.81 (2.74)	−1.75	.084	0.27
		Con. (n = 36)	3.59 (0.84)	3.66 (0.84)	3.67 (0.71)	Time	2.56 (.081)	0.31 (1.92)			0.31 (2.64)			
						Group * Time	5.12 (.007)							

Abbreviations: Cont., control group; Int., intervention group; SD, standard deviation.

4 | DISCUSSION

In the current study, we developed a CR intervention using a smartphone application for coping skills for bullying. The intervention reduced nurses' person-related and work-related bullying experiences and turnover intentions but did not reduce intimidation-related bullying experiences. In a previous study (Kang et al., 2017), a 20-hour CR programme for individual nurses did not reduce the experience of WB. However, providing an intervention on a unit-wide basis, that is, one in which about 75% of the unit nurses participated, reduced person-related and work-related bullying, supporting the view that bullying in the workplace occurs in an organizational or social context (Hershcovis et al., 2015). In addition, the provision of an intervention using a smartphone application with high accessibility and convenience demonstrated the potential for cost-effective utilization of the developed intervention.

Previous studies (Griffin, 2004; Stagg et al., 2011; Stagg et al., 2013) applied CR for nurses to cope with WB and, like the current study, all reported positive effects. However, they had a small number of subjects and no control groups, so their quality evaluation was poor (Hodgins, MacCurtain, & Mannix-McNamara, 2014). Contrariwise, the current study had a control group, and the intervention showed a moderate effect size. Because the current study complements previous studies, it provides stronger evidence for applying CR interventions in institutional policy or education on WB. The CR developed in the current study can also serve as a scenario for standardized patients in simulated education, through which we can expect not only improvements in the coping skills of nurses but also primary intervention effects by spreading awareness of WB.

Another unique contribution of the current study was to use webtoons for CR. Previous studies (Kang et al., 2017; Stagg et al., 2013) suggested that face-to-face role-playing could help subjects to cope positively when faced with similar WB situations in the future. Unlike previous studies, the current study found that indirect rehearsal by watching webtoons might also be effective even via smartphone application, which could be a convenient approach for busy nurses. Mobile technologies such as smartphone applications are useful for busy health care providers in information gathering, time management, communication, and education and training, and their use has been increasing rapidly (Ventola, 2014).

However, applications have the drawback of indefinite intervention delivery. Because our participants were able to use the application at any convenient time, it was difficult to confirm the participants' level of exposure to the intervention. In the present study, the total number of visits to the application during the intervention period was 130 (a daily average of 4.6), and a total of 2698 (96.4 daily) page views were recorded. This performance is lower than expected, which may be related to the smaller effect size of the intervention than in face-to-face interventions (Kang et al., 2017). Thus, we must enhance exposure to the intervention through such methods as sequentially uploading webtoons or adding a chat function to enhance users' interest and future participation (Harrison, Flood, & Duce, 2013).

TABLE 3 Additional analysis for cluster effects

Variables	Categories	Groups	Cluster	Pretest Mean (SD)	4 wk Mean (SD)	8 wk Mean (SD)	Sources	*F* (*P*)
Workplace bullying	Person related	Int.	ICU (n = 27)	21.07 (8.38)	17.74 (7.32)	15.41 (4.03)	Cluster	0.28 (.600)
			General (n = 9)	22.56 (5.88)	17.89 (5.16)	17.11 (5.71)	Time	11.06 (<.001)
							Cluster * Time	0.24 (.762)
		Con.	ICU (n = 20)	20.60 (7.78)	20.80 (5.08)	17.80 (4.84)	Cluster	0.19 (.669)
			General (n = 16)	19.94 (9.10)	19.63 (5.63)	17.25 (5.50)	Time	5.06 (.017)
							Cluster * Time	0.06 (.898)
	Work related	Int.	ICU (n = 27)	11.19 (5.02)	9.15 (3.12)	7.81 (3.20)	Cluster	0.66 (.422)
			General (n = 9)	10.89 (3.55)	10.56 (4.00)	9.78 (3.23)	Time	5.91 (.005)
							Cluster * Time	1.63 (.205)
		Con.	ICU (n = 20)	8.70 (3.37)	9.45 (3.36)	8.80 (3.40)	Cluster	0.65 (.428)
			General (n = 16)	9.94 (3.73)	9.81 (2.32)	9.31 (2.24)	Time	0.63 (.531)
							Cluster * Time	0.42 (.655)
	Intimidation related	Int.	ICU (n = 27)	6.11 (1.58)	5.59 (1.01)	5.41 (0.80)	Cluster	2.20 (.147)
			General (n = 9)	6.44 (1.13)	6.00 (1.73)	6.44 (1.88)	Time	1.89 (.169)
							Cluster * Time	1.14 (.316)
		Con.	ICU (n = 20)	6.40 (2.16)	6.10 (1.59)	5.80 (1.47)	Cluster	0.13 (.726)
			General (n = 16)	5.75 (1.18)	6.06 (1.84)	6.00 (1.51)	Time	0.28 (.737)
							Cluster * Time	1.27 (.286)
Turnover intention		Int.	ICU (n = 27)	3.52 (0.80)	2.95 (0.81)	3.21 (0.71)	Cluster	3.31 (.078)
			General (n = 9)	3.69 (0.87)	3.67 (1.08)	3.81 (0.80)	Time	2.54 (.087)
							Cluster * Time	2.21 (.118)
		Con.	ICU (n = 20)	3.74 (0.95)	3.84 (0.97)	3.78 (0.78)	Cluster	1.84 (.184)
			General (n = 16)	3.41 (0.66)	3.45 (0.60)	3.53 (0.61)	Time	0.34 (.669)
							Cluster * Time	0.22 (.764)

Abbreviations: Cont., control group; Int., intervention group; ICU, intensive care unit; SD, standard deviation.

There might be two reasons why the intervention was effective in reducing only person-related and work-related bullying in the current study. First, the participants experienced more of these types of bullying. This was also true in previous Korean studies (Nam et al., 2010; Yun & Kang, 2014) that measured nurses' WB with the same scale. The average frequency of intimidation-related bullying experienced by the subjects was low, less than once a month. In other words, the effects of the intervention on the commoner types of bullying were prominent. Second, the fact that five of the six webtoons provided for cognitive training contained person-related and work-related contents also contributed to this result. The webtoons were built on themes that advisory nurses suggested frequently occur in practice, and as the rehearsed situations were person related and work related, these two types of bullying were reduced.

Unlike previous studies, this study provided an intervention on a working unit basis. WB does not occur in a "social vacuum" (Hershcovis et al., 2015), and the related factors of WB are mostly organizational rather than individual (Yun & Kang, 2014). Tambur and Vadi (2012) reported that WB was low when the members perceived their organizational culture as relationship oriented, and Law, Dollard, Tuckey, and Dormann (2011) reported that psychosocial safety culture could be an opposite indicator of WB. It is necessary to improve the organizational culture to reduce or prevent bullying in the workplace. Therefore, a unit- or hospital-based approach would be more appropriate than an individual approach.

Johnson (2011) proposed an intervention system for WB using an ecological model, suggesting that from the closest microsystem to the macrosystem, the most advanced system, interrelated systems were involved in the causes and consequences of WB. Unit-based intervention can be considered a microsystemic and mesosystemic approach. As the nurses in each unit could discuss the scenarios provided and possibly their own WB experiences, not only improvements in personal coping skills against WB but also positive changes in the unit atmosphere towards WB were expected.

4.1 | Limitations

The current study has certain limitations. First, the rigour of the research design remains low. True randomization and blinding were not used because the intervention was applied to work units and the outcome assessment was dependent on self-reporting. The sample size was also not sufficient to counterbalance the possible type 1 error inflation of the cluster design (Leyrat et al., 2018). Thus, a more rigorous research design needs to be introduced to confirm the validity of the results. Second, it is necessary to develop scenarios that reflect more kinds of bullying, including intimidation-related bullying, since the contents of the webtoons mainly concerned person- and work-related bullying. Finally, because the intervention used a smartphone application, there may have been differences in the duration and intensity of the intervention applied to individual participants. However, technical problems at the time of application development prevented us from recording the usage of individual participants. It is necessary to analyse the effects of the intervention by degree of

exposure for a more accurate evaluation and to find ways to increase the use of the application.

5 | CONCLUSIONS

In the current study, a unit-based CR intervention provided as a smartphone application was effective in reducing person-related and work-related bullying experiences and turnover intentions of nurses. These results are significant for the organizational approach and mobile utilization. We suggest that the CR intervention be used as a personal coping measure and an institutional strategy to reduce nurse turnover.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

AUTHORSHIP STATEMENT

Dr Kang and Jeong were responsible for the conception and design, data collection, data analysis and interpretation, and drafting of the article. Dr Jeong was responsible for data collection and drafting of the article. Dr Kang was responsible for revising it critically for important intellectual content and final approval of the version published.

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