An Integrative Model of Workplace Self-protective Behavior for Korean Nurses

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Summary
Purpose: This study was conducted to develop and test a hypothetical stage model of workplace self-protective behaviors with respect to blood transmitted infections and musculoskeletal injuries for Korean nurses.

Methods: A nonexperimental, cross-sectional study design was adopted. The study participants were 320 nurses at two Korean university hospitals. Perceived sensitivity, severity, barriers, benefits, self-efficacy, social support, and safety climate were assessed.

Results: Overall, fit indicators showed a good fit for the hypothetical model of self-protective behaviors against blood transmitted infections and musculoskeletal injuries. The significant factors of self-protective behaviors against blood transmitted infections were perceived barriers and social support. The significant factors of self-protective behaviors against musculoskeletal injuries were perceived benefits, barriers, and self-efficacy.

Conclusion: Our findings suggest that the significant psychosocial constructs of stages of self-protective behavior are dependent on health problem type. Accordingly, we advise that characteristics of behavior and types of disease and health problem should be given priority when developing intervention programs for particular self-protective health behaviors.

Introduction
Much research has described work-related health problems in nurses (Castiglia et al., 2008; Smith, Kondo, Tanaka, Hirasawa, & Yamagata, 2003; Smith et al., 2006; Stone, Clarke, Cimiotti, & Carrea-de-Araujo, 2004). Musculoskeletal disorders are among the most common health problems related to nursing practice (Lee, Faucett, Gillen, Krause, & Landry, 2010; Pompeii, Lipscomb, & Dement, 2008). Smith et al. (2003) reported a 12-month prevalence rate of musculoskeletal injury of 92%, and that low back pain was the most common musculoskeletal injury with a prevalence of 83%, followed by injuries of the shoulder, neck, and knee. In addition, musculoskeletal injury has been reported to contribute to nurse turnover (Trinkoff, Brady, & Nielsen, 2003). The next most common work-related health problem for nurses is blood transmitted infections from sharps or needles contaminated with blood or body fluid, and the most frequent are blood-transmitted hepatitis B and C and HIV infections (Grosch, Gershon, Murphy, & Dejoy, 1999).

Recent studies regarding self-protective or health-protective behaviors in the workplace, including self-protective behaviors against blood transmitted infections and musculoskeletal injuries, have addressed the following four topics: (a) the relationship between characteristics of workers and injury experience, (b) the relationship between the characteristics of workers and safety performance, (c) modification of safety-related behavior through reinforcement, and (d) identification of the organizational and environmental correlates of safety performance (Grotta, Meinzen, & Burleson-Rine, 2005; Lee et al., 2010; Reddy, Welch, Thorne, & Ameratunga, 2012). These studies have provided good descriptive details of the characteristics of workers, jobs being performed, and working environments with respect to safety performance, but have not provided a comprehensive understanding of workplace
self-protective behaviors. Furthermore, few studies have been conducted on the development and testing of comprehensive workplace self-protective behavior models that provide a systematic and integrative understanding of self-protective behavior in the workplace.

Because work-related health problems are common among nurses, the development and implementation of an intervention program to facilitate self-protective behavior is important. However, a comprehensive workplace self-protective behavior model for nurses needs to be devised and verified to enable the design of an effective intervention program.

**Theoretical background**

Value-expectancy models and the transtheoretical model (TTM) (Ben-Ami, Shaham, Rabin, Melzer, & Ribak, 2001; Chia et al., 2005; Ozakan, Lajunen, Dogruyol, Yıldırım, & Coymak, 2012; Reid & Aiken, 2011) have been generally adopted to conceptualize the behavioral change process. Value-expectancy models include the health belief model (HBM), the theory of reasoned action (TRA), and theory of planned behavior (TPB). Some investigators have expressed doubts regarding the contributions made by such health behavior models/theories to the accretion of knowledge in the health behavioral field. Based on such considerations, investigators have proposed that more effort is needed to develop integrative models by combining highly explicable constructs extracted from previous empirical evidence.

Even before this opinion was widespread, Dejoy (1996) developed an integrative health protective behavior model based on the HBM, TRA, TPB, and TTM. Based on the assumption that an integrative model consisting of previously verified constructors of health behavior may provide a more complete understanding and prediction for health behavior, Dejoy included five major constructs extracted from the HBM, TRA, and TPB, and four stages of workplace self-protective behavior as proposed by the TTM in the integrative health protective behavior model. The four stages are: (a) the hazard appraisal stage, (b) the decision-making stage, (c) the initiation stage for self-protective action, and (d) the adherence stage for self-protective action. The five major constructs of the Dejoy’s model are threat-related beliefs (beliefs about hazard susceptibility and severity), response efficiency (perceived effectiveness or benefits of self-protective behavior), self-efficacy (individuals’ beliefs regarding their ability to perform a self-protective behavior successfully), facilitating conditions (expands the concept of barriers relative to its usage in the value-expectancy models and emphasizes the importance of social supports in self-protective behavior), and safety climate (a combination of social and organizational factors).

Different factors are expected to be important at different stages, and therefore, factors important in one stage may be unimportant in another (Dejoy, 1996). For the hazard appraisal stage, beliefs of personal dimensions, such as, threat-related beliefs and response efficiency, have been proposed to be the primary factors of self-protective behavior. However, for the initiation and adherence stage, factors of environmental dimension, such as, facilitating conditions and safety climate, have been proposed to be more important (Dejoy).

Dejoy’s model is an exemplary integrative model because it contains various influencing factors extracted from verified theories, and systemizes stages of behavioral change. However, of the five major model constructs, facilitating conditions were considered to require modification. As mentioned above, facilitating conditions was vaguely defined as an expanded concept of barriers and a combination of social supports in Dejoy’s model (1996). Because such conceptual ambiguity inevitably made it difficult to be measured, facilitating conditions was decoupled into conceptually more concrete components, barrier and social support, in the present study. Various value-expectancy models include barrier and social support as major constructors, and also specifically define threat-related beliefs as perceived sensitivity and severity (Ben-Ami et al., 2001; Chia et al., 2005; Ozakan et al., 2012; Reid & Aiken, 2011). Therefore, perceived sensitivity, severity, benefits, self-efficacy, barriers, social support, and safety climate were included in our hypothetical model (Figure 1).

![Figure 1. Hypothetical model of workplace self-protective behavior stage for nurses.](source)
Purpose

The present study was conducted to develop an integrative stage model for nurse self-protective behavior in the workplace based on Dejoy's self-protective behavior model. In addition, we tested the fitness of the modified Dejoy's model developed to assess self-protective behavior against blood transmitted infections and musculoskeletal injuries for nurses.

Methods

Study design and participants

A nonexperimental, cross-sectional study design was adopted. The study participants were 320 staff nurses that worked at two university hospitals located in Incheon and Kyungi province of South Korea (Table 1). Data were obtained using a questionnaire distributed and collected directly by the first author. There was no omission or exclusion.

Ethical consideration

This study was approved by the human research committee of the university hospital where data was collected (institutional review board no.: 11-0496). It was made clear to all participants that they were free to not participate and withdraw from the study at any time without prejudice. It was also explained that information would be collected anonymously and that data would be presented as mean values, not as individual values. The study purposes and procedures were explained and participants were then allowed to decide upon participation. Informed consent was obtained from all those who agreed to participate.

Measurements

Stage of self-protective behavior

Based on DeJoy's study (1996), stages of self-protective behavior (hazard appraisal, decision-making, initiation, and adherence) were determined for all study participants (Table 2).

Psychosocial factors

Perceived sensitivity, severity, barriers, benefits, self-efficacy, social support, and safety climate were measured. Because no specific scales for such psychosocial factors of self-protective behavior against workplace blood transmitted infections or musculoskeletal injuries have been developed, we modified the Health Belief Model Scale (Champion, 1993; Champion, 1999; Champion & Scott, 1997) to assess perceived sensitivity, severity, barriers, benefits, and self-efficacy. In addition, scales of social support and safety climate were devised by the authors in the present study (Table 2).

The Health Belief Model Scale was translated into Korean by the first author of the present study. To verify translation validity, two nursing professors fluent in both Korean and English confirmed whether individual items of the translated scale had the same meaning as the original items in English. Detailed information regarding the instruments used to measure psychosocial factors is presented in Table 2.

The face and content validities of the scales used were confirmed in the present study. Face validity was assessed with the aid of two nursing professors and two nurses in the Infection Control Centers at the two university hospitals, by determining whether items appeared to be adequate for measuring the psychosocial factors examined in the present study. Content validities were obtained with the aid of an expert panel (2 nursing professors, 2 nurses in the Infection Control Center at the two participating university hospitals, and 4 senior nurses) by confirming the correspondence between each item and the conceptual definition of the related psychosocial factor, and by determining whether the scales contained major components of the psychosocial factor. Content validity indices were computed.

Data analysis

Statistical analysis was performed using SPSS Statistics version 19/PC (IBM SPSS Inc., Chicago, IL, USA). Descriptive analysis was used to determine general subject characteristics. Ordinal regression, analysis of variance, and Duncan's test were conducted to verify the hypothesized model.

Ordinal regression can be used to determine relations between ordinal dependent variables and either continuous or categorical independent variables. The ordinal regression model includes three major components: local and scale components and a link function.
Table 2  Measurement Tools.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Items of the scales used in the present study</th>
<th>CVI</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
</table>
| Perceived sensitivity           | - Champion’s scale was modified<sup>a</sup>   
- 6-item, 5-point scale         | 0.91 | 0.90            |
|                                 | - Items consist of: 1) It is not likely that I will get blood transmitted infection (or musculoskeletal disorder); 2) My chances of getting blood transmitted infection (or musculoskeletal disorder) in the near future are great; 3) I feel I will get blood transmitted infection (or musculoskeletal disorder) sometime in the near future; 4) I am frequently exposed to blood transmitted infection (or musculoskeletal disorder); 5) May colleagues were exposed to blood transmitted infection (or musculoskeletal disorder); and 6) I am concerned to expose to blood transmitted infection (or musculoskeletal disorder) | 0.71 | 0.89            |
| Perceived severity              | - Champion’s scale was modified<sup>a</sup>   
- 5-item (blood transmitted infection) and 7-item (musculoskeletal injury), 5-point scales. | 0.87 | 0.88            |
|                                 | - Consists of items asking the degree of perceived severity due to blood transmitted infection (or musculoskeletal disorder) in terms of house works, occupational works, family, work evaluation, medical expenses, treatment process, etc. | 0.88 | 0.75            |
| Perceived benefits              | - Champion’s scale was modified<sup>a</sup>   
- 5-item (blood transmitted infection) and 6-item (musculoskeletal injury), 5-point scales. | 0.91 | 0.89            |
|                                 | - Consist of items asking questions: 1) blood transmitted infection (or musculoskeletal disorder) needs not to be worried as long as following safety protocols; 2) blood transmitted infection (or musculoskeletal disorder) can be prevented by practicing self-protective behaviors; 3) self-protective behaviors help to prevent from developing blood transmitted infection (or musculoskeletal disorder) into severe illness; 4) self-protective behaviors against blood transmitted infection (or musculoskeletal disorder) promote self-confidence about health, and 5) self-protective behaviors against blood transmitted infection (or musculoskeletal disorder) promote job satisfaction. | 0.83 | 0.90            |
| Perceived barriers              | - Champion’s scale was modified<sup>a</sup>   
- 8-item (blood transmitted infection) and 6-items (musculoskeletal injury), 5-point scales. | 0.90 | 0.93            |
|                                 | - Consists of questions with respect to cost, time-requirements, awareness, support condition, knowledge, and procedure complexity. | 0.81 | 0.76            |
| Self-efficacy                   | - Scale was developed in the present study based on self-efficacy subscale of Champion’s scale<sup>a</sup>   
- 5-item (blood transmitted infection) and 7-item (musculoskeletal injury), 5-point scales. | 0.95 | 0.90            |
|                                 | - Consist of items asking the extent of self-confidence or belief in the ability of following safety protocols, making time to follow safety protocols during working, adhering safety protocols in spite of causing an interruption of working, properly handling when exposed to blood transmitted infection (or musculoskeletal disorder), and following safety protocols without supports from colleagues or supervisors. | 0.89 | 0.79            |
| Safety climates                 | - Scale was developed in the present study based on Zohar safety climate questionnaire (Johnson, 2007).   
- 10-item (blood transmitted infection) and 9-item (musculoskeletal injury), 5-point scale | 0.88 | 0.90            |
|                                 | - For safety-climate scale related to blood transmitted infection: consists of items regarding availability of biohazard waste facilities, the use of safety needles and gloves, the presence of an official safety department responsible for blood transmitted infection, the presence of a reporting system related to hospital infection, the provision of a related safety education program, etc. was used. | 0.84 | 0.74            |
|                                 | - For safety-climate scale related to musculoskeletal injury: consists of items regarding availability of a patient transport team, availability of transportation devices, the provision of a related safety education program, equipment condition, facilities available in patient rooms and nurses’ station, etc. was used. | 0.74 | - could not be examined due to 1-item scale. |
| Social supports                 | - Scale was developed in the present study  
- 4-item, 5-point scale | 0.93 | 0.93            |
|                                 | - Consists of items asking the extent of perceived support from colleagues or supervisors in terms of instrumental and emotional encouragement and modeling | 0.92 | - could not be examined due to 1-item scale. |
| Stage of self-protective behavior | - Scale was developed in the present study based on the definitions of self-protective behavior stages in the Dejoy’s model.  
- 1-item scale | 0.98 | 0.98            |
|                                 | - Consists of an item asking “Of hazard appraisal, decision-making, initiation, and adherence stage, at what stage of self-protective behavior against BTI/MI are you at this time?” | - | - could not be examined due to 1-item scale. |

Note. CVI = content validity index; BTI = blood transmitted infection; MI = musculoskeletal injury.
<sup>a</sup>Scale for blood transmitted infection; <sup>b</sup>Scale for musculoskeletal injury; <sup>c</sup>We modified the Health Belief Model Scale (Champion, 1993; Champion, 1999; Champion & Scott, 1997).

Location components are portions of an equation that include coefficient and independent variables such as, $b_1X_1 + b_2X_2 + \ldots + b_nX_n$. Scale components account for differences in variability for different values of independent variables. The link function is a transformation of cumulative probabilities that allow model estimation. Available link functions are the logit function (for equal categories), the probit model (for normally distributed dependent variables), the negative log-log model (for high probability of the lower category), the complementary log-log model (for high probability of the higher category), and the cauchit model (for the presence of extreme values) (SPSS Korea Consulting Team, 2011). In the present study, the ordinal regression model included seven constructs (i.e., sensitivity, severity, benefits, self-efficacy, barriers, safety climate, and social support) as influencing factors of self-protective behaviors against blood transmitted infections and musculoskeletal injuries.

Like general regression analysis, ordinal regression also allows model fitness to be tested and a set of predictors (factors or covariates) to be identified. However, ordinal regression evaluates model fitness using model fitness information, goodness of fit, test of parallel lines, and the pseudo $R^2$ values instead of $F$ and $p$ values used in general regression analysis. Beta estimates were used to identify significant predictors (SPSS Korea Consulting Team).
Results

Descriptive statistics of participant characteristics and major variables

In total, 320 nurses were included in this study. Mean subject age was 30.10 (± 5.41) years (Table 1). Most participants were under the age of 40 (93.8%) and working in general medical/surgical units (68.4%). Career years as a registered nurse were less than 5 years for 159 participants (49.7%), 5–10 years for 76 participants (23.7%), and more than 10 years for 85 participants (26.6%). In addition, 284 participants (88.8%) had previous experiences of skin contact with contaminated blood or body fluid (n = 206, 64.4%) or from sharps or needles (n = 163, 50.9%), suggesting that a lot of the participants were exposed to potential risk of blood-transmitted infections. On the other hand, a majority of the participants had previous experience of a work-related musculoskeletal injury (n = 235, 73.4%).

In terms of stages of self-protective behavior against blood transmitted infection, 28 (8.8%) participants were in the hazard appraisal stage, 100 (31.2%) in the decision-making stage, 60 (18.8%) in the initiation stage, and 132 (41.2%) in the adherence stage. Regarding stages of self-protective behavior against musculoskeletal injury, 115 (35.9%) participants were found in the hazard appraisal stage, 111 (34.7%) in the decision-making stage, 38 (11.9%) in the initiation stage, and 56 (17.5%) in the adherence stage. Detailed information about subject characteristics and major study variables is summarized in Table 1.

Analysis of hypothetical model

Hypothetical model of self-protective behavior against blood transmitted infection

Overall, fit indicators showed a good fit for the hypothetical model of self-protective behavior against blood transmitted infections (MFI: $\chi^2 = 31.80, p < .001$; GOF: $\chi^2 = 934.74, p = .588$; TPL: $\chi^2 = 13.30, p = .348$), although the pseudo $R^2$ value was relatively low (.10), indicating 10% explicability (Table 3). The factors significantly associated with self-protective behavior against blood transmitted infections were perceived barrier ($\beta = -0.7, p = .001$) and social support ($\beta = .03, p = .029$). That was, perceived barrier and social support were found to significantly influence the progression to higher stages of self-protective behavior against blood transmitted infection. Perceived sensitivity, severity, benefit, self-efficacy, and safety climate were not found to be significant.

Our results also showed that perceived barrier levels were significantly higher for participants in the hazard appraisal, decision-making, or initiation stage than for participants in the adherence stage (Table 3). Perceived barrier levels were not significantly different among participants in the hazard appraisal, decision-making, or initiation stage. Level of perceived social support was significantly lower for participants in the hazard appraisal stage than for those in the decision-making, initiation, or adherence stage (Table 3). Perceived social support levels were not different significantly among participants in the decision-making, initiation, or adherence stage.

Hypothetical model of self-protective behavior against musculoskeletal injuries

Overall, fit indicators showed a good fit for the hypothetical model of self-protective behavior against musculoskeletal injuries (MFI: $\chi^2 = 30.61, p < .001$; GOF: $\chi^2 = 939.20, p = .483$; TPL: $\chi^2 = 11.75, p = .626$), although the pseudo $R^2$ value was relatively low (.10), indicating 10% explicability (Table 4). The significant factors of self-protective behavior against musculoskeletal injuries

### Table 3: Goodness of Fit and Significant Constructs of the Stage Model of Self-protective Behavior Against Blood Transmitted Infection.

<table>
<thead>
<tr>
<th>Goodness of fit</th>
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</thead>
<tbody>
<tr>
<td>Indicators of fitness</td>
<td>$\chi^2$</td>
</tr>
<tr>
<td>Model fitness information</td>
<td>31.80</td>
</tr>
<tr>
<td>Goodness of fit</td>
<td>934.74</td>
</tr>
<tr>
<td>Test of parallel lines</td>
<td>13.30</td>
</tr>
<tr>
<td>Pseudo $R^2$</td>
<td>Nagelkerke: .10</td>
</tr>
</tbody>
</table>

### Table 4: Goodness of Fit and Significant Constructs of the Stage Model of Self-protective Behavior Against Musculoskeletal Injury.

<table>
<thead>
<tr>
<th>Goodness of fit</th>
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<tbody>
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</tr>
<tr>
<td>Pseudo $R^2$</td>
<td>Nagelkerke: .10</td>
</tr>
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</table>

Note. aTo test whether all parameters in the model are zero or not; $p \leq .05$ means that at least one of the parameters is nonzero. bTo test whether the established model fits the data or not; $p \geq .05$ means that established $H_0$ can be accepted, that is, the model fits the data. cTo test whether the parameters are the same for all categories ($H_0$: the parameters would be the same for all categories. When parameters are the same for all categories, it can be inferred that the model is fit). dCorrespondence with $R^2$ of multiple regression analysis. eOne-way analysis of variance. fDuncan’s test (A, hazard appraisal stage; B, decision making stage; C, initiation stage; D, adherence stage).
were perceived benefit ($\beta = .06, p = .003$), barrier ($\beta = -.07, p < .001$), and self-efficacy ($\beta = .04, p = .021$). That was, perceived benefit, barrier, and self-efficacy were found to significantly influence the progression to higher stages of self-protective behavior against musculoskeletal injuries. However, perceived sensitivity, severity, social support, and safety climate were not found to be significant.

Our results showed that perceived benefit level was significantly higher for participants in the initiation stage of self-protective behavior against musculoskeletal injuries than for those in the hazard appraisal, decision-making, or adherence stage (Table 4). Perceived barrier levels were not found to be significantly different between participants in the hazard appraisal, decision-making, initiation, or adherence stage.

Discussion

Although various theoretical models of health-related behaviors have been developed, it has not been determined which models or combinations of model constructs most useful describe health-related behaviors. Some researchers have suggested that more efforts are needed to develop an integrative model by combining highly predictable constructs extracted from previously verified models (Baranowski, 2005; Nigg & Jordan, 2005). In fact, such integrated models have been shown to enhance the predictability of behavior, such as, in the case of condom use (Reid & Aiken, 2011). However, even before this opinion became popular, Dejoy (1996) developed an integrative model of workplace self-protective behavior based on various health behavioral theories.

The present study was conducted to develop an integrative stage model of workplace self-protective behaviors for Korean nurses based on the Dejoy’s model and to test the applicability of the modified Dejoy’s model on health protective behaviors against blood transmitted infections and musculoskeletal injuries. The four behavioral change stages and major constructs of Dejoy’s model were adopted in the present study. However, of the five constructs of the Dejoy’s model, facilitating condition was not included in our model for reasons of conceptual ambiguity. After careful consideration, barriers and social support were included instead of facilitating conditions as described above in the Introduction.

Results showed that the hypothetical stage model provided a good fit with data. However, the explicabilities of self-protective behaviors against blood transmitted infections and musculoskeletal injuries were only 10%. In addition, not all psychosocial factors included in the hypothetical stage model were found to be significant factors of self-protective behaviors against either blood transmitted infections or musculoskeletal injuries. That is, the findings of the present study suggest that self-protective behaviors against blood transmitted infections and musculoskeletal injuries cannot be comprehensively described using psychosocial factors.

Many health behavior models are composed of psychosocial constructs, because individuals’ beliefs and attitudes have been consistently shown to affect health behavioral changes (Hornby, 2000). In addition to the psychosocial factors included in the present study, health beliefs and social norms have also been known to be influencing psychosocial factors of workplace self-protective health behavior, particularly for hand hygiene and vaccination (Ji & Jeong, 2013; Johnsen, Stenvig, & Wey, 2012; Stedma-Smith, Dubois, & Gray, 2012).

Isla Diaz and Diaz Cabrera (1997) reported that perceived sensitivity, severity, self-efficacy, and barriers significantly affected preventive behaviors against blood transmitted infections. However, perceived sensitivity, severity, self-efficacy, and safety climate were not found to be significant factors of self-protective behavioral stage against blood transmitted infections in the present study. In fact, only perceived barrier and social support were found to be significant.

For influenza vaccination decision-making, it has been reported that perceived benefits, barriers, sensitivity, and social supports are significant factors (Kim, Oh, Ham, Chung, & Seo, 2010; Nichol & Hauge, 1997; Prematunge et al., 2012). Unlike self-protective behavior against blood transmitted infections, as shown by the present study, influenza vaccination behavior was found to be significantly affected by perception of infection risk (sensitivity) and the belief that vaccination reduces infection risk (benefit). The common influencers of self-protective behavior related to blood transmitted infection behavior and influenza vaccination are perceived barriers and social support. That is, both health behaviors are promoted by providing social support and decreasing perceived barriers, which for influenza vaccination include cost and side effects, whereas barriers to self-protective behavior against blood transmitted infections include inconvenience related to the use of equipment and procedural complications related to the handling of biohazard wastes.

Regarding self-protective behavior against musculoskeletal injuries, perceived benefits, barriers, and self-efficacy were found to be significant factors. This implies that stage of self-protective behavior against musculoskeletal injuries can be promoted by convincing nurses of the effectiveness of a safety protocol, reducing barriers associated with safety protocols, and by increasing confidence regarding their ability to adhere to the safety protocol. In the present study, significant factors of stages of self-protective behavior against musculoskeletal injuries differed from those against blood transmitted infections, which implies that factors of self-protective behavior depend on health problems.

Relations between behavioral change and perceived benefits and barriers have been described in other models. According to the HBM, perceived positive aspects must outweigh perceived negative aspects in order to produce a significant behavioral change (Noar & Zimmerman, 2005). The TTM postulates that such potential gains (pros) and losses (cons) are two decisional balance constructs critical for transition across stages of health behavior (Chang, Kim, Kil, Seomun, & Lee, 2005).

Self-efficacy has been consistently reported to be a significant factor of behavioral changes (Ahn, Yeun, Kwon, Chung, & Ryu, 2005; Chang et al., 2005; Markham et al., 2009), particularly for the self-protective behaviors that requires specific techniques to be practiced (Pender, Murdaugh, & Parsons, 2002). In terms of musculoskeletal injury in nursing workplace, it has been reported that safe techniques for proper posture while transferring or repositioning patients and the proper use of mechanical lifting devices should be taught and sufficiently practiced to prevent this type of injury (Harber, 1990; Trinkoff, Lipscomb, Geiger-Brown, Storr, & Brady, 2003). This implies that self-protective behaviors against musculoskeletal injuries are the type of behaviors that requires practice with proper techniques over a certain period, and therefore, needs a higher level of self-efficacy to be promoted. Our results also showed that self-efficacy was a significant factor in self-protective behavior against musculoskeletal injuries.

According to Dejoy’s model (1996), threat-related beliefs (perceived sensitivity and severity), and benefits play crucial roles in the promotion of health behavioral changes at the hazard appraisal stage. This implies that these three factors should be given priority when considering participants whose stage of self-protective behavior is hazard appraisal when developing intervention programs. For participants at the decision-making stage, perceived severity, benefits, self-efficacy, barriers, safety climate, and social support are the primary considerations. On the other hand, perceived barriers, safety climate, and social support should
be given priority in participants in the initiation or adherence stage (Figure 1).

In comparisons with Dejoy's model, not all constructs of Dejoy's model were found to be significant factors of self-protective behaviors against either blood transmitted infections or musculoskeletal injuries in the present study. Of the seven constructs, only two (perceived barrier and social support) were significant in explaining self-protective behavior against blood transmitted infection and three (perceived benefit, barrier, and self-efficacy) were significant for self-protective behavior against musculoskeletal injuries.

In addition, there are some discrepancies between our model and Dejoy's model regarding stage-matched primary/secondary constructs. Specifically, our results showed that perceived barrier was a primary construct in hazard appraisal, decision making, and initiation stages, but was a secondary construct in adherence stage of self-protective behavior against blood-transmitted infection. However, Dejoy's model proposes that perceived barrier acts as a primary construct in decision making, initiation, and adherence stages, but acts as a secondary construct in hazard appraisal stage. Similarly, our results showed that perceived benefit was a primary construct in hazard appraisal, decision making, and adherence stages, but was a secondary construct in initiation stage of self-protective behavior against musculoskeletal injury. On the other hand, Dejoy's model indicates that perceived benefit acts as a primary construct in hazard appraisal and decision making stages, but acts as a secondary construct in initiation and adherence stages.

Based on our findings, it can be suggested that an effective strategy to promote self-protective behavior stage against blood transmitted infection should focus on minimizing discomforts and barriers, and maximizing social support from colleagues and supervisors. On the other hand, strategies aimed at drawing a clear contrast between benefits and barriers and promoting self-efficacy of safety techniques are needed to efficiently prevent musculoskeletal injuries.

In the present study, the overall explicability of the hypothetical stage model, which utilizes only psychosocial factors to explain self-protective behavior against blood transmitted infections and musculoskeletal injuries, was low (10%). This implies that such self-protective behaviors cannot be comprehensively described by psychosocial factors alone. Therefore, a more comprehensive model including psychosocial factors and other potential influencing factors, such as, demographic factors, previous experiences related to self-protective behaviors, or self-protective strategies, needs to be developed to advance nursing knowledge.

The present study differs from other related studies in several respects. First, it evaluates stages of health behavioral changes as outcome variables of the effects of psychosocial factors, whereas the majority of previous studies evaluated the degree of practicing self-protective behaviors. Second, our stage model utilizes psychosocial constructs to describe each stage of behavioral change, whereas other stage models use specific strategies that can be adopted to promote behavioral changes (Ahn et al., 2005; Chang et al., 2005; Prochaska & DiClemente, 1983).

In general, self-protective behaviors require longitudinal analysis, but the present study was limited by its cross-sectional design. Therefore, we suggest that further prospective and longitudinal studies be conducted to illustrate more comprehensively self-protective behaviors against blood transmitted infections and musculoskeletal injuries. In addition, the majority of the participants had previous experience of work-related blood transmitted infections or musculoskeletal injuries, but this possible influencing factor was not controlled. Furthermore, biased sampling in terms of age and type of working unit could limit the generalization of our results.

Conclusions

The present study was conducted to develop and test a hypothetical stage model of self-protective behaviors related to blood transmitted infections and musculoskeletal injuries for nurses. Overall, the hypothetical stage model devised provided a good fit with data. Our findings suggest that the significant psychosocial constructs of self-protective behavior stage are dependent on health problem type. Furthermore, they indicate the characteristics of behavior, associated diseases, and health problems should be given priority consideration when developing intervention programs for particular self-protective health behaviors. The findings of this study aid the understanding of nurses' self-protective behaviors with respect to musculoskeletal injuries and blood transmitted infections, which are the most common work-related health problems for nurses. The information present could also be useful for developing an effective intervention program.

Conflict of interest

There are no conflicts of interest regarding this study.

Acknowledgment

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