

Original Research

Application and Validation of the PRECEDE Model for Measuring the Quality of Life of the People with Physical Disabilities

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Abstract

Background: This study aimed to diagnose the quality of life of people with disabilities through social, epidemiological, behavioural, educational, and ecological factors based on the Predisposing, Reinforcing, and Enabling Causes in Educational Diagnosis and Evaluation (PRECEDE) diagnostic model. **Methods:** Using the systematic stratified cluster sampling method, 605 people with disabilities from five districts (Seoul, Gyeonggi, Chungcheong, Jeolla, and Gyeongsang) who were registered at the welfare centres in 2019 were recruited. In addition, the study participants were limited to grades 1 to 4 with disabilities, and those with physical disabilities who did not have intellectual disabilities. The final model's goodness of fit was found to be good ($\chi^2 = 554.257$ ($p < 0.001$), Tucker Lewis Index (TLI) = 0.921, comparative fit index (CFI) = 0.939, root mean square error of approximation (RMSEA) = 0.059). **Results:** The finding demonstrated that physical self-efficacy and social support, excluding the health promotion behavioural intention, were found to have a statistically significant effect. The behavioural factor was found to have a statistically significant effect on the epidemiological and the social factor. The former was also found to have a statistically significant effect on the latter. The results for each group according to gender were the same as for the integrated group in the case of men. In the case of women, it was found that there was a direct effect on the promotion behavior and health status, the promotion behavior and the quality of life, and all other pathways were found to be statistically insignificant. **Conclusions:** This research demonstrated that it is important to increase the sense of efficacy and social support for enhancing the quality of life of the physically disabled. Moreover, their health promotion behaviour had a positive effect on their health status and quality of life. This evidence could be used as data for establishing an efficient system for improving their quality of life.

Keywords: diagnosis; health promotion; physically disabled; quality of life

1. Introduction

The desire to improve the quality of life (QoL), the qualitative measure of life, is commonly pursued as valuable in the human race [1]; further, in doing so, there will be no difference between the persons with and without disabilities. In South Korea, the former's number increased by 1,240,000 from 1,330,000 in 2000 to 2,580,000 in 2017 due to the surge in the risk factors for various issues such as the ageing population and tragic events and diseases [2].

People with physical disabilities in Korea face more health problems than non-disabled people, and they suffer from complications due to disability and secondary disabilities that occur in addition to the existing disability [3]. There is a growing interest in their economic stability and health [2]. Further, they experience challenges with their upper or lower body or body structure. As compared to those without disabilities, they have poor physical health and a higher level of depression [4]. Their reduced physical and mental health can directly impact their health deterioration and negatively affect their societal adjustment [5]. All humans have the right to enjoy health, including physical, mental, and social well-being. Nonetheless, domestic and international studies about people with disabilities have

reported them as being a vulnerable group within adequate health and low QoL as they encounter greater health problems and have a higher likelihood of being exposed to diverse socio-economic issues than those without disabilities [6–9].

The health-related programs' analysis intending to improve the people with disabilities' QoL revealed the following problems [10–13]. Most programs were operated in a short and fragmentary manner, leading to only one-time participation [14,15]. In addition, most participants were passive and not self-motivated to partake in them [16]. In particular, the programs were inefficient because they offered the same contents as those developed for persons without disabilities by failing to consider their attributes [17,18]. This demonstrated the limitation that such health promotion programs have been unsuccessful in applying or reflecting the people with physical disabilities' special nature or demands. This could be due to insufficient research about building a system regarding the pre-existing health promotion programs for these individuals.

Heller *et al.* [15] advocated the importance of a community-based health promotion system that reflects personal and social factors because the practice or the main-



tenance of self-management behaviours for health promotion is affected not only by personal aspects such as knowledge and coping skills but also by the environmental ones such as social support and access to resources. Specifically, to enhance the people with physical disabilities' health, it deems necessary to establish a health promotion scheme that can promote health from a continuous and long-term perspective by considering both their personal and social factors. To consider diverse and complicated variables for developing such a system, pre-diagnostic research involving these individuals is required.

The Predisposing, Reinforcing, and Enabling Causes in Educational Diagnosis and Evaluation (PRECEDE) model is a framework that integrates multiple theories about psychological, sociological, and physical activities. It is used for developing and evaluating the programs for behavioural change related to an individual's health [19]. Further, it has been employed for developing health-related programs for diverse individuals [20]; overseas scholars are applying the model in the research regarding these people's health attributes [21–23]. Similarly, the PRECEDE model can be utilised for people with physical disabilities. Their ecological attributes and unique needs can be considered as individual units for improving their QoL [24]. In addition, it can provide an answer to what causes the health problems or behavioural decisions for individuals and organizations; this can direct us to the right path towards eliminating the causes or inducing a desirable behaviour [22].

In other countries, there is a growing need for diagnostic research on people with disabilities' attributes [21]. In Korea, such an investigation that applies the PRECEDE model to examine the domestic factors influencing the QoL of this group can provide the baseline data for the health promotion systems to improve the feasibility and satisfaction among the Korean people with physical disabilities, considering that they may have unique attributes on a personal or circumstantial level. The aim of this study is to perform validation procedure of PRECEDE diagnosis model to measure QoL.

The PRECEDE model can be applied to enhance the people with physical disabilities' QoL by implementing the phase-wise access strategy as follows. Phase 1 includes performing a social diagnosis and identifying the subjects' social problems or interests. This study aimed to diagnose the QoL perceived by individuals with physical disabilities. The QoL is a representative variable of social diagnosis and shows what one perceives to be valuable in life and what hinders the improvement in the QoL [25,26]. Phase 2 is an epidemiological diagnosis; it determines the social or health issues or goals that have been recognised in Phase 1. This research purported to analyse the health condition perceived by people with physical disabilities. Health condition refers to the status of effective adjustment or balance with the environment regarding the physical, mental, social, and spiritual states [27]. In particular, the spiritual

state means self-judgment of the meaning and satisfaction of life. Furthermore, Phase 3 involves a behavioural diagnosis of specific health behaviours linked to the selected health issue, which was examined by this study. Health promotion behaviours entail planned and systematic activities that promote health [28]. Phase 4 is an educational and ecological diagnosis and valuation of the factors that affect the subjects' health-related behaviours or lifestyles, such as the predisposing, reinforcing, and enabling factors. Predisposing factors influence motivation as the driving force for behavioural change. To examine the health attributes of people with physical disabilities, we selected physical self-efficacy as perceived by them [29]. Moreover, reinforcing factors serve to strengthen the drive for a subject's behaviour or to stop it. This research selected social support for the health promotion behaviours of people with physical disabilities as a reinforcing factor. Social support encompasses all types of support from an interpersonal relationship; it is a positive resource that fuels the affiliation with others [30,31]. Lastly, enabling factors facilitate action and influence the fulfilment of motivation and the condition for behavioural change. The health promotion behavioural intention of the individuals with physical disabilities was chosen as this research's enabling factor; it entails any personal behavioural intention for all health-related preventative actions [32].

Phase 5 encompasses an administrative and policy diagnosis based on the analysis of the budget and human resources so that the planned program can be easily implemented in the organization's system. This research employed Phases 1 to 4, while excluding Phase 5, which is an administrative and policy analysis.

2. Materials and Methods

2.1 Research Design

In this cross-sectional research, we built a hypothetical model for diagnosing people with physical disabilities' QoL by applying the PRECEDE model and performed a structural model analysis to verify the model's suitability and hypotheses. This study's conceptual framework is shown in Fig. 1. Although the diagnosis model of PRECEDE is the first stage of social diagnosis, this study aims to verify the impact on the quality of life of people with physical disabilities. Therefore, from the 4th stage, ecological diagnosis, the effect on quality of life, which is a social diagnosis, is to be verified.

2.2 Research Subject

As this study's subjects, we selected individuals with physical disabilities attending social welfare programs since 2019. We extracted the sample from five regions (Seoul, Gyeonggi, Chungcheong, Jeolla, and Gyeongsang) using the systematic stratified cluster sampling method. In the structural equation model, the sample size needs to be 10 to 20 times per observation variable [33]. Therefore, overall

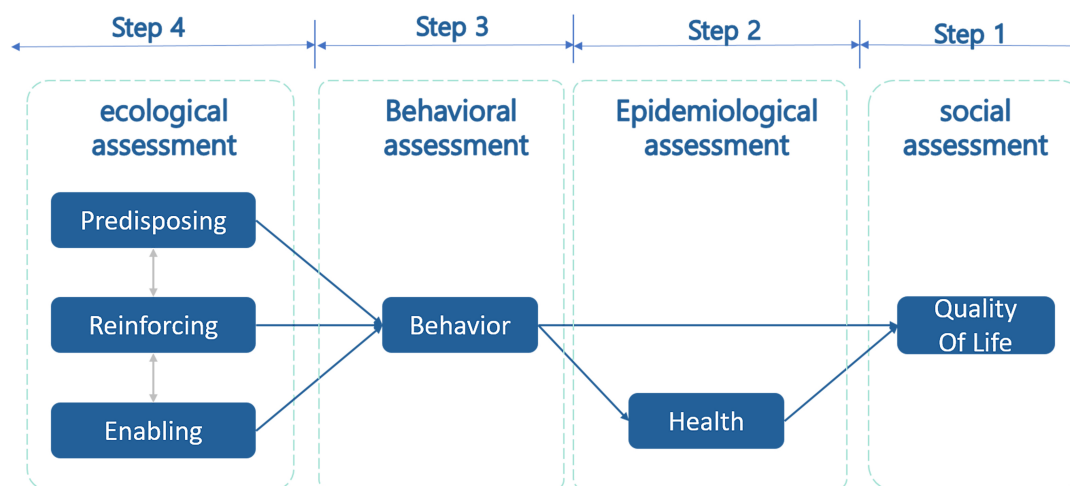


Fig. 1. Statistical schematic of structural models.

625 people with physical disabilities were recruited as the research subjects, thus meeting the sample size requirement for the 18 observation variables. Of the collected responses, the final analysis included 605 responses after eliminating 20 responses that were either inconsistent or incomplete.

2.3 Characteristics of the Subjects

Regarding the subjects' age, 278 people (46.0%) were in their 40s and 50s, followed by 170 in their 30s (28.1%), and 157 in their 60s (26.0%). In terms of sex, there were more men (64.3%) than women (35.7%). Furthermore, those whose income was below 1,000,000 KRW were 380 (62.8%), followed by 153 (25.3%) with 1,010,000 KRW–1,500,000 KRW, and 72 (11.9%) with 1,510,000 KRW–2,000,000 KRW. Moreover, 407 individuals (67.3%) had acquired disabilities. Regarding the severity class, 222 individuals (36.7%) were found to have Class 2 severity, followed by 169 (27.9%), 109 (18.0%), and 105 people (17.4%) with Class 3, 1, and 4 severities, respectively (Table 1).

2.4 Measures

This study used a structured questionnaire to achieve its objective. To develop a proper research scale pertaining to the PRECEDE model's four diagnostic factors, we held a panel of nine experts: three people with physical disabilities (employed at an organization related to sports for individuals with disabilities); one Special Physical Education professor; two Special Physical Education doctors; one Health Sciences professor; and two Public Health doctors. Moreover, for social diagnosis, quality of life, meaning the individual's perception of the position he occupies in goals, expectations, standards, and interests, in the context of the culture and value system in which he lives, was selected. For epidemiological diagnosis, health condition was selected, which means continuous and dynamic with respect to effective adaptation or opposing forces, is being adjusted for bet-

ter, and is in balance with the environment. For behavioral diagnosis, health promotion behaviour, which means activities for health promotion planned and systematically, was selected. Perceived confidence related to the body for ecological diagnosis. Physical self-expression confidence and perceived physical ability, meaning physical self-efficacy, and health promotion behavioural intention, meaning individual behavioral intentions for all preventive behaviors related to health. Also, social support, which means all types of help given and received through interpersonal relationships, and a positive resource that provides relationships with others, was selected.

2.4.1 Social Diagnosis: Quality of Life (QoL)

The QoL was measured using the Quality of Life Questionnaire developed by Song and Oh [1]; after modifying it, it was employed by Shin [34] for assessing people with physical disabilities. It consists of 16 questions pertaining to four sub-factors: physical and mental health, leisure activities, sense of self and general life, and relationship with friends and other people. All questions were measured on a five-point Likert scale; a higher score indicated a greater level of QoL. Based on the results of the exploratory factor analysis, we eliminated the following items as their factor loading was below 0.50: physical and mental health, leisure activities, sense of self and general life, and relationship with friends and other people (2, 2, 1, and 1 items, respectively).

2.4.2 Epidemiological Diagnosis: Health Condition

For measuring the health condition, we utilised a Korean version of the Total Health Index; it was developed by Lim [35] and used among people with physical disabilities by Hwang [36] after modifying the health condition items for this study. After collecting the responses, we reverse-coded them because the questionnaire developed by Lim [35] comprised negative items. This measure consists of

Table 1. General characteristics of participants.

| Characteristic | | Categories | n | Ratio (%) |
|-------------------------------|----------------------|----------------------------------|-----------------|-----------|
| Personal background variables | Gender | Male | 389 | 64.3 |
| | | Female | 216 | 35.7 |
| | Age | 30's or younger | 170 (M106/F64) | 28.1 |
| | | 40's to 50's | 278 (M171/F107) | 46.0 |
| | | 60's | 157 (M112/F45) | 26.0 |
| | Income level | Less than 1 million won | 380 | 62.8 |
| | | Less than 101 to 1.5 million won | 153 | 25.3 |
| | | 1.5–2 million won or less | 72 | 11.9 |
| Disability-related variables | Type of disability | Congenital | 198 | 32.7 |
| | | Acquired | 407 | 67.3 |
| | Degree of disability | 1st grade | 109 | 18.0 |
| | | 2nd grade | 222 | 36.7 |
| | | 3rd grade | 169 | 27.9 |
| | | 4th grade | 105 | 17.4 |
| Total | | | 605 | 100.0 |

16 questions included in four sub-factors: physical, mental, spiritual, and social health. All questions were assessed on a five-point Likert scale, with a higher score indicative of an increased level of health condition.

2.4.3 Behavioural Diagnosis: Health Promotion Behaviour

To assess the health promotion behaviour, we used the questionnaire developed by Walker *et al.* [37] that was used among people with physical disabilities by Kim *et al.* [38] after modifying the health promotion behaviour items for this study. It comprises three sub-factors with 12 items: health management, interpersonal relationship, and physical activities. All questions were measured on a five-point Likert scale, with a higher score indicating a greater engagement level of health promotion behaviour.

2.4.4 Ecological Diagnosis

The questionnaire for the educational and ecological diagnosis comprised three factors, namely, the predisposing, reinforcing, and enabling factors.

2.4.4.1 Predisposing Factor: Physical Self-efficacy. For measuring the physical self-efficacy as a predisposing factor, we used the Physical Self-efficacy Scale developed by Ryckman *et al.* [39]; it was employed among people with physical disabilities by Lee and Seok [29] after modifying it. It consists of eight items included in two sub-factors: physical ability and physical self-expression. A higher score indicates a greater perception level of the two.

2.4.4.2 Reinforcing Factor: Social Support. Social support, as a reinforcing factor, was examined using the Social Support Scale developed by Yoo and Seol [40]; after modifying the items, it was utilised among people with physical disabilities by Oh [30]. It has 16 items and the follow-

ing four support sub-factors: materialistic, informational, emotional, and appraisal. A greater score indicates a higher level of social support.

2.4.4.3 Enabling Factor: Health Promotion Behavioural Intention. For examining the health promotion behavioural intention as an enabling factor, we used the Health Promotion Behavioural Intention Scale, utilized in Kim and Cha's [41] study after modifying its items. It consists of four items rated on a five-point Likert scale, with a higher score indicating a greater level of health promotion behavioural intention.

2.5 Data Collection Method and Process

Regarding the data collection, the researcher and the research assistant surveyed 625 subjects from September 2019 to November 2019. We visited the social welfare centres for individuals with disabilities in five regions and obtained prior consent from their directors after describing the research. Subsequently, the researcher and the research assistant explained the study's purpose to the subjects, who were the members of these centres; the self-administered questionnaires were distributed and retrieved immediately after they were filled out by willing individuals.

2.6 Data Analysis

The collected data were analysed using the SPSS 22 (IBM Corp., Armonk, NY, USA) and AMOS 22.0 (IBM Corp., Armonk, NY, USA) programs. To identify the subjects' attributes, we used descriptive statistics. The research scale's validity was tested using confirmatory factor analysis. The normality of the sample was verified using a multivariate normality test based on the mean, standard deviation, skewness, and kurtosis. The correlation between the measurement variables was examined using Pearson's correlation coefficient. The model parameters were esti-

mated using the maximum likelihood method. To assess the fit of the model, the χ^2 test, χ^2/df , and standardized root mean square residual (SRMR) were employed to estimate the absolute fit indices. The root mean square error of approximation (RMSEA) and the intermediate fit indices were estimated using the comparative fit index (CFI) and the normed fit index (NFI). The Tucker Lewis Index (TLI) and the sample fit indices were computed using the AIC. The significant validation of the model's path was verified using the regression coefficient, standard error, critical ratio, and p -value. The explanatory power of the endogenous variables was confirmed using asquared multiple correlation. We employed the bootstrapping method to examine the significance of the direct, indirect, and total effects of the research model.

3. Results

3.1 Verification of the Reliability of the Research Tool

Prior to hypothesis testing, the reliability and validity of the research tool were secured through exploratory factor analysis and reliability verification. The quality of life questionnaire's reliability was as follows: 0.90, 0.88, 0.80, and 0.67 for physical and mental health, leisure activities, sense of self and general life, and relationship with friends and other people, respectively. The health condition questionnaire's based on the exploratory factor analysis's results, we eliminated those items whose factor loading was found to be below 0.50; they are as follows: physical, mental, social, and spiritual health (1, 1, 2, and 2 items, respectively); their reliabilities were 0.75, 0.73, 0.75, and 0.71, respectively. The health promotion behaviour questionnaire's based on the exploratory factor analysis' results, we eliminated one item in health management because the factor loading was found to be below 0.50. The questionnaire's reliability was as follows: 0.61, 0.83, and 0.83 for health management, interpersonal relationship, and physical activities, respectively. The physical self-efficacy questionnaire's based on the exploratory factor analysis' results, we eliminated one item in physical expression because the factor loading was below 0.50. The questionnaire's reliability was 0.75 for physical ability and 0.70 for physical expression. The social support behaviour questionnaire's based on the exploratory factor analysis' outcomes, two items from the materialistic, informational, emotional, and appraisal support each were excluded as their factor loadings were below 0.50. The questionnaire's reliability was reported to be 0.76, 0.79, 0.75, and 0.77 for the materialistic, informational, emotional, and appraisal support, respectively. The health promotion behavioural intention questionnaire's exploratory factor analysis' result showed that the factor loading of each item was above 0.50 and the reliability of the questionnaire was 0.82.

3.2 Descriptive Statistics of the Study Variables and the Verification of Normality

The research variables' descriptive statistics and the verification of normality are shown in Table 2. Regarding the subjects' QoL, the scores of each sub-factor ranged from 3.00 to 3.48. In perceived health conditions, they ranged from 2.19 to 2.61. Furthermore, the score for health management in health promotion behaviour, interpersonal relationship behaviour, and physical activities was 3.20, 3.48, and 3.36, respectively. The physical self-efficacy and social support scores of each sub-factor ranged from 2.84 to 3.57 and from 3.46 to 3.57, respectively. The score for health promotion behavioural intention was 3.65. The condition of the normal distribution necessary for applying the structural equation model was satisfied as the relevant absolute values of all measurement variables satisfied the standards for skewness (± 2) and kurtosis (± 4) suggested by [42]. There was no problem of multicollinearity among the study variables because all their correlation coefficients were below 0.90, with the tolerance limit and the VIF value over 0.10 and below 10, respectively [43]. The convergent validity was tested using factor loading, Average Variance Extracted (AVE), and Composite Construct Reliability (CCR; Table 2).

3.3 Testing the Structural Model

3.3.1 Validation of the Study Variables

The convergent and discriminant validities were used to determine how appropriately the construct was measured by the observation variables (Table 2). According to this study's result, the convergent validity was verified because each of the standard factor loading, AVE, and CCR were above 0.5, 0.5, and 0.7, respectively. The discriminant validity is verified when the AVE of the latent variable is greater than the square value of the correlation coefficient between them [43]. This criterion was met in this study, proving the discriminant validity.

3.3.2 Validation of the Structural Model

To determine whether to statistically accept or reject the hypothesis established in this study, we designed a statistical model to be confirmed using path analysis. Fig. 2 shows the details. To verify the structural relationship between the factors that influence the health promotion of people with physical disabilities, we carried out a structural model analysis (Fig. 2). First, we examined the model fit; the result was as follows: $\chi^2 = 554.26$ ($p < 0.001$), TLI = 0.92, CFI = 0.94, and RMSEA = 0.06; this indicated that the fit indices met the critical value. Since the established model was found to be suitable, we analysed the path coefficients between each variable, while simultaneously assessing the hypothesis to determine the structural relationship between the factors that influence the subjects' QoL. The results are presented in Table 3. The effect of the educational and ecological factors (physical self-efficacy, social

Table 2. Descriptive statistics and convergent validity of measured variables.

| Variables | | Mean | S.D. | Skewness | Kurtosis | CCR | AVE |
|-----------|-------------------------|-------|-------|----------|----------|-------|-------|
| QoL | Body spirit | 3.003 | 1.088 | 0.031 | −0.589 | 0.805 | 0.615 |
| | Leisure activities | 3.487 | 1.026 | −0.430 | −0.384 | | |
| | Ordinary life | 3.433 | 1.013 | −0.260 | −0.567 | | |
| | Human relationship | 3.484 | 0.984 | −0.384 | −0.323 | | |
| HS | Physical health | 2.433 | 1.033 | 0.404 | −0.488 | 0.737 | 0.563 |
| | Mental health | 2.610 | 0.972 | 0.348 | −0.334 | | |
| | Social health | 2.196 | 1.031 | 0.587 | −0.371 | | |
| | Spiritual health | 2.350 | 1.051 | 0.466 | −0.461 | | |
| HPB | Healthcare | 3.203 | 0.858 | −0.033 | −0.281 | 0.727 | 0.561 |
| | Interpersonal behaviour | 3.489 | 0.915 | −0.252 | −0.333 | | |
| | Physical activity | 3.361 | 1.079 | −0.267 | −0.631 | | |
| PSE | Physical ability | 2.841 | 0.903 | 0.142 | −0.212 | 0.744 | 0.578 |
| | Body expression | 3.215 | 0.917 | −0.044 | −0.295 | | |
| SS | Evaluative support | 3.571 | 0.950 | −0.398 | −0.189 | 0.805 | 0.683 |
| | Material support | 3.474 | 0.967 | −0.329 | −0.373 | | |
| | Informational support | 3.464 | 1.023 | −0.301 | −0.536 | | |
| | Mental support | 3.508 | 1.019 | −0.345 | −0.496 | | |
| HPBI | | 3.654 | 0.992 | −0.483 | −0.291 | 0.773 | 0.582 |

QoL, quality of life; SS, social support; PSE, physical self-efficacy; HPBI, health promotion behavioural intention; HS, health status; HPB, health promotion behaviour.

support, and health promotion behavioural intention) on the behavioural factor (health promotion behaviour) were examined. The finding demonstrated that physical self-efficacy ($\beta = 0.53$, $t = 4.45$, $p < 0.001$) and social support ($\beta = 0.40$, $t = 6.39$, $p < 0.001$), excluding the health promotion behavioural intention ($\beta = 0.07$, $t = 1.63$, $p = 0.223$), were found to have a statistically significant effect. The behavioural factor was found to have a statistically significant effect on the epidemiological (health condition; $\beta = 0.37$, $t = 7.82$, $p < 0.001$) and the social factor (QoL; $\beta = 0.74$, $t = 12.69$, $p < 0.001$). The former was also found to have a statistically significant effect on the latter ($\beta = 0.13$, $t = 2.60$, $p < 0.01$). The results for each group according to gender were the similar as for the integrated group in the case of men. In the case of women, it was found that there was a direct effect on the promotion behavior and health status, the promotion behavior and the quality of life, and all other pathways were found to be statistically insignificant.

4. Discussion

4.1 Relationship between the Ecological and Behavioural Factors

Regarding the factors that influence the subjects' QoL, physical self-efficacy and social support were found to exert a significant positive effect, whereas the health promotion behavioural intention was not found to have a statistical effect. This finding is partially consistent with multiple previous studies that identified the relationship between these factors [27,44–48].

First, this research's finding that physical self-efficacy (a predisposing factor) affects health promotion behaviour

is supported by many previous studies [27,45]. It is speculated that confidence in one's own physical ability and positive physical self-efficacy to accept and overcome one's disability can induce health promotion behaviour in the individuals with physical disabilities. Specifically, a higher level of physical self-efficacy indicates a greater likelihood of encouraging health promotion behaviour in such persons.

Second, the health promotion behavioural intention (an enabling factor) had no effect on the health promotion behaviour. It is difficult to compare this finding directly with the previous ones because there are insufficient studies examining the relationship between these variables. Nevertheless, it is contrary to Choi's [44] result that behavioural intention to prevent oral diseases influences oral disease prevention behaviour, as well as to Kim and Cheon's [47] finding that the intention to participate in general sports class has a positive effect on the college students' health behaviour. Unlike these studies, which were conducted on persons without disabilities, this research's subjects were those with physical disabilities. It is believed that the health promotion behavioural intention could not account for the health promotion behaviour because the subjects could have encountered various external obstacles such as environmental aspects that inhibited such behaviour even if the individuals had health promotion behavioural intention. Specifically, it can be inferred that the people with physical disabilities' health promotion behaviour is constrained by external factors, despite their own intention. Thus, it should be classified as a key factor to be considered in building a health promotion system.

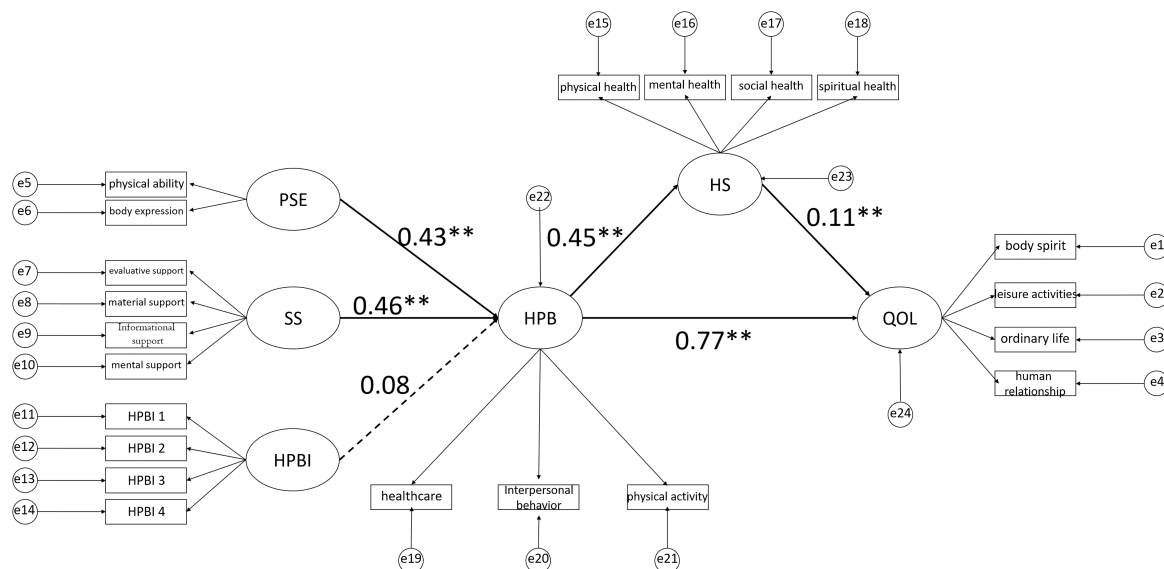


Fig. 2. Conceptual framework. Note: QoL, quality of life; SS, social support; PSE, physical self-efficacy; HPBI, health promotion behavioural intention; HS, health status; HPB, health promotion behaviour. This framework and further computation are performed in the AMOS software.

Third, this study's outcome that social support (a reinforcing factor) has a positive effect on the health promotion behaviour is supported by many previous studies [46,48,49]. Social support refers to receiving positive feedback about health behaviours from the surrounding people [30]; regarding the people with physical disabilities, it indicates the other people's acceptance and support of their health behaviour. It was found that a higher level of social support increases or reinforces this group's health promotion behaviour level.

In summary, the ecological attributes such as the predisposing (physical self-efficacy) and reinforcing factors (social support) can induce or reinforce the people with physical disabilities' health promotion behaviour. Thus, it deems necessary to develop programs tailored to their characteristics by considering their ecological attributes. Specifically, programs should improve their physical self-efficacy, while inducing positive feedback from the surrounding people on their behaviour. Meanwhile, it is believed that the health promotion behavioural intention did not exert a significant effect on the health promotion behaviour because of its various limitations for the people with physical disabilities. This implies the requirement for an in-depth analysis of such limitations.

4.2 Association between the Behavioural and Epidemiological Factors

Among the factors that influence the people with physical disabilities' QoL, the result of examining the link between the behavioural (health promotion behaviour) and epidemiological factors (health condition) showed that health promotion behaviour exerted a positive effect on health conditions. This finding is consistent with that of

Lee and Lee [50] regarding the association between the health promotion behaviour and the health condition; they found that 65-year-old people's health management behaviour had a positive effect on the latter. Elderly people develop various health conditions as they age, however, their health management behaviour can maintain or improve their health condition. Similarly, it is believed that the individuals with physical disabilities—this study's subjects—can prevent secondary diseases, despite having a higher risk of developing them; further, they can maintain or improve their health condition through health promotion behaviours. Nonetheless, insufficient research findings are available to support this outcome. Previous studies have focused on the effect of health conditions on health promotion behaviour. Although the latter was not used as a direct variable, Namgung's [51] study about health conditions based on the level of partaking in daily sports indicated that more frequent participation was an indicator for a better health condition, which is consistent with this study's result. Therefore, it can be considered that the health promotion behaviour of people with physical disabilities improves health condition. Thus, it is necessary to develop programs to induce such behaviours for enhancing their health condition. Additionally, it implies that the criteria for a health condition could be used as indicators to manifest the health promotion behaviour programs' effect.

4.3 Relationship between the Behavioural and Social Factors

Among the factors that influence the QoL of people with physical disabilities, it was demonstrated that health promotion behaviour exerted a positive effect on the QoL. This finding corresponds to the results from the studies that

Table 3. Standardized direct, indirect, and total effects of the modified model.

| Endogenous variables | Exogenous variables | Direct effect | | Indirect effect | | Total effect | | SMC |
|----------------------|---------------------|---------------|------|-----------------|------|--------------|-------|------|
| | | β | p | β | p | β | p | |
| ALL | HPB | SS | 0.46 | 0.014 | | 0.46 | 0.014 | 0.75 |
| | | PSE | 0.43 | 0.007 | | 0.43 | 0.007 | |
| | | HPBI | 0.08 | 0.223 | | 0.08 | 0.223 | |
| | HS | SS | | | 0.20 | 0.020 | 0.20 | 0.20 |
| | | PSE | | | 0.19 | 0.014 | 0.19 | |
| | | HPBI | | | 0.04 | 0.223 | 0.04 | |
| | | HPB | 0.45 | 0.028 | | 0.45 | 0.028 | |
| | QoL | SS | | | 0.38 | 0.011 | 0.38 | 0.70 |
| | | PSE | | | 0.36 | 0.008 | 0.36 | |
| | | HPBI | | | 0.07 | 0.024 | 0.07 | |
| | | HS | 0.11 | 0.009 | | 0.11 | 0.009 | |
| | | HPB | 0.77 | 0.018 | 0.05 | 0.013 | 0.84 | |
| Male Group | HPB | SS | 0.35 | 0.026 | | 0.35 | 0.026 | 0.75 |
| | | PSE | 0.73 | 0.012 | | 0.73 | 0.012 | |
| | | HPBI | 0.02 | 0.522 | | 0.02 | 0.522 | |
| | HS | SS | | | 0.18 | 0.020 | 0.18 | 0.21 |
| | | PSE | | | 0.18 | 0.020 | 0.18 | |
| | | HPBI | | | 0.37 | 0.010 | 0.37 | |
| | | HPB | 0.51 | 0.014 | | 0.51 | 0.014 | |
| | QoL | SS | | | 0.33 | 0.022 | 0.33 | 0.68 |
| | | PSE | | | 0.69 | 0.013 | 0.69 | |
| | | HPBI | | | 0.02 | 0.522 | 0.02 | |
| | | HS | 0.15 | 0.023 | | 0.15 | 0.023 | |
| | | HPB | 0.87 | 0.009 | 0.08 | 0.011 | 0.095 | |
| Female Group | HPB | SS | 0.55 | 0.121 | | 0.55 | 0.121 | 0.76 |
| | | PSE | 0.31 | 0.111 | | 0.31 | 0.111 | |
| | | HPBI | 0.11 | 0.438 | | 0.11 | 0.438 | |
| | HS | SS | | | 0.25 | 0.144 | 0.25 | 0.20 |
| | | PSE | | | 0.14 | 0.112 | 0.14 | |
| | | HPBI | | | 0.05 | 0.483 | 0.05 | |
| | | HPB | 0.45 | 0.023 | | 0.45 | 0.023 | |
| | QoL | SS | | | 0.48 | 0.104 | 0.48 | 0.76 |
| | | PSE | | | 0.27 | 0.111 | 0.27 | |
| | | HPBI | | | 0.09 | 0.453 | 0.09 | |
| | | HS | 0.06 | 0.527 | | 0.06 | 0.527 | |
| | | HPB | 0.84 | 0.014 | 0.03 | 0.417 | 0.87 | |

QoL, quality of life; SS, social support; PSE, physical self-efficacy; HPBI, health promotion behavioural intention; HS, health status; HPB, health promotion behaviour.

determined the relationship between health promotion behaviour and QoL [1,52]. Kim [52] reported that the health promotion behaviour of people with physical disabilities is a direct factor for improving the QoL and that they can overcome their disability and re-join the community through interpersonal relationships and participation in daily sports (health promotion behaviour). Specifically, the individuals with physical disabilities are isolating themselves from the community and viewing themselves negatively due to their incapacity; however, various health promotion behaviours can help them overcome this issue. Therefore, it is believed

that such behaviours of the people with physical disabilities are an extremely important variable for improving the QoL; thus, it is necessary to build a health promotion system that applies the ecological factors (physical self-efficacy and social support) that affects their health promotion behaviours.

4.4 Association between the Epidemiological and Social Factors

Among the factors that influence the people with physical disabilities' QoL, the result of examining the relationship between the epidemiological (health condition) and so-

cial factors (QoL) showed that health conditions exerted a positive effect on the QoL. This finding is consistent with those from the previous studies that determined the link between the two variables [53,54]. Jang [53] reported that all sub-factors of perceived health conditions among middle-aged adults (such as physical, social, and psychological domains) had a positive effect on their QoL. Specifically, the positively perceived health condition of individuals with physical disabilities can improve the QoL. Moreover, such people take their health conditions especially seriously and hold an extremely high expectation from the government, as reported by a national survey [2]. This could be considered as a suggestion for the establishment of the government-initiated system for enhancing health conditions through the people with physical disabilities' health promotion [2].

In summary, in establishing the strategies for improving the QoL of people with disabilities, it is necessary to consider diverse ecological factors that can reinforce their health promotion behaviour. Furthermore, when their perceived health condition improves through their health promotion behaviour, their QoL would also improve. However, a prior study involving people without disabilities reported that the health promotion behavioural intention positively affected health promotion behaviour; hence, this research's outcome that the former did not have a significant effect on the latter indicated that regarding their health promotion behaviours, such individuals experience obstacles in their physical environment due to their disability. Therefore, it is essential to conduct follow-up research to identify the factors that have an actual influence on their health promotion behavioural intention.

Also, the male group showed the same results as the total group, but the female group showed statistically significant results only in the relationship between promotion behavior and health status, and promotion behavior and quality of life. This is because sports for the disabled have been centered on men in the past, and in particular, in Korea, the activation of sports for the disabled is lower than that of men. Therefore, women with disabilities are classified as a vulnerable group compared to men with disabilities, and there is an urgent need to develop various programs to solve this problem.

This research has the following limitations. First, the study participants were limited to people with physical disabilities and failed to reflect the attributes of the other disability types. Therefore, follow-up research should include various disability types in addition to the physical ones and identify their health attributes and promotion needs. Second, this study restricted the number of sub-factors and failed to consider the others. Therefore, follow-up research should consider more diverse aspects. Based on this study's findings, it is necessary to design a program to promote the people with physical disabilities' health and to evaluate its effect.

5. Conclusions

This study aimed to diagnose the individuals with physical disabilities' QoL. It showed that improving their self-efficacy and social support from the surrounding people is the key to enhancing their QoL. Furthermore, their health promotion behaviour had a positive effect on their health condition and QoL. This finding could be used as the data for building an efficient system for improving the QoL of people with physical disabilities. In addition, in all pathways, males showed the same results as in the total group, but in females, only the relationship between promotion behavior and health status, and promotion behavior and quality of life was found to be significant. This shows that women with disabilities are more vulnerable to health promotion than men with disabilities. Therefore, it is judged that it is necessary to develop various programs to promote the health of women with disabilities.

Author Contributions

YW designed the research study. YW performed the research. SH re-edited and revised the paper. YW and SH analyzed the data. YW and SH wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

Because the research subjects were persons with physical disabilities in an unfavourable environment, we obtained permission regarding the research ethics (DKU2019-08-002-001) from Dankook University Institutional Review Board before carrying out the field research. Before the study, the researcher obtained consent from the subjects and reassured them regarding the strict confidentiality and anonymity, ensuring the protection of their privacy and personal information in all circumstances.

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Conflict of Interest

The authors declare no conflict of interest.

References

- [1] Song CH, Oh BK. Comparison of Physical Self-concept by Participation Type with Participation Satisfaction of Sports for all in Disabled People. *Journal of Sport and Leisure Studies*. 2010; 39: 499–509.
- [2] Ministry of Culture, Sports and Tourism. Survey on the status of persons with disabilities in 2017. Sejong: Ministry of Culture, Sports and Tourism. 2017. Report No. 11-1352000-000568-12.

- [3] Zarb G, Oliver M. Ageing with a disability: What do they expect after all these years? University of Greenwich: London. 1993.
- [4] Roh SH, Shin YR, Kim CS. Effects of discrimination experience and social support on physical and mental health among the disabled. *Korea Rehabilitation Association for Persons with Disabilities*. 2017; 21: 113–137.
- [5] Shakespeare T. The Social Model of Disability. *The Disability Studies Reader*. 2010; 263–273.
- [6] Emerson E, Hatton C. Contribution of socioeconomic position to health inequalities of British children and adolescents with intellectual disabilities. *American Journal of Mental Retardation*. 2007; 112: 140–150.
- [7] Kinne S, Patrick DL, Doyle DL. Prevalence of secondary conditions among people with disabilities. *American Journal of Public Health*. 2004; 94: 443–445.
- [8] Matthews T, Weston N, Baxter H, Felce D, Kerr M. A general practice-based prevalence study of epilepsy among adults with intellectual disabilities and of its association with psychiatric disorder, behaviour disturbance and carer stress. *Journal of Intellectual Disability Research*. 2008; 52: 163–173.
- [9] Tyrer F, Mcgrother C. Cause-specific mortality and death certificate reporting in adults with moderate to profound intellectual disabilities. *Journal of Intellectual Disability Research*. 2009; 53: 898–904.
- [10] House JS, Lantz PM, Herd P. Continuity and change in the social stratification of aging and health over the life course: evidence from a nationally representative longitudinal study from 1986 to 2001/2002 (Americans' Changing Lives Study). *The Journals of Gerontology-Series B Psychological Sciences and Social Sciences*. 2005; 60: 15–26.
- [11] Krahn GL, Hammond L, Turner A. A cascade of disparities: health and health care access for people with intellectual disabilities. *Mental Retardation and Developmental Disabilities Research Reviews*. 2006; 12: 70–82.
- [12] Martin LG, Schoeni RF. Trends in disability and related chronic among the forty-and-over population: 1997-2010. *Disability and Health Journal*. 2014; 7: S4–S14.
- [13] Turk MA, Scandale J, Rosenbaum PF. The health of woman with cerebral palsy. *Physical Medicine and Rehabilitation Clinics of North America*. 2001; 12: 153–168.
- [14] Bennell KL, Hunter DJ, Hinman RS. Management of osteoarthritis of the knee. *British Medical Journal*. 2012; 345: e4934.
- [15] Heller A, Elliott MN, Haviland AM, Klein DJ, Kanouse DE. Patient Activation Status as a Predictor of Patient Experience among Medicare Beneficiaries. *Medical Care*. 2009; 47: 850–857.
- [16] Drum CE, Peterson JJ, Culley C, Krahn G, Heller T, Kimp-ton T, *et al.* Guidelines and criteria for the implementation of community-based health promotion programs for individuals with disabilities. *American Journal of Health Promotion*. 2009; 24: 93–101, ii.
- [17] Temple VA, Walkley JW. Perspectives of constraining and enabling factors for health-promoting physical activity by adults with intellectual disability. *Journal of Intellectual and Developmental Disability*. 2007; 32: 28–38.
- [18] Young AF, Chesson RA, Wilson AJ. People with learning disabilities, carers and care workers awareness of health risks and implications for primary care. *Family Practice*. 2007; 24: 576–584.
- [19] Green LW, Kreuter MW. Health program planning: An educational and ecological approach. 4th edn. McGraw-Hill Education: New York. 2005.
- [20] Nakamura J, Morishita M, Horiguchi I, Nakagawa J. Health Promotion Program for Adult Dental Health in a Community Part 1: Implementation and Planning of Periodontal Disease Prevention Program by PRECEDE-PROCEED Model. *Journal of Dental Health*. 2004; 54: 87–94.
- [21] Naruse T, Sakai M, Matsumoto H, Nagata S. Diseases that precede disability among latter-stage elderly individuals in Japan. *Bioscience Trends*. 2015; 9: 270–274.
- [22] Skolasky RL, Scherer EA, Wegener ST, Tosteson TD. Does reduction in sciatica symptoms precede improvement in disability and physical health among those treated surgically for intervertebral disc herniation? Analysis of temporal patterns in data from the Spine Patient Outcomes Research Trial. *The Spine Journal*. 2018; 18: 1318–1324.
- [23] Zia M, Anwar MI. Delayed diagnosis of neural signs of leprosy. *Journal of Pakistan Association of Dermatologists*. 2017; 27: 183–186.
- [24] Gielen AC, McDonald EM, Gary TL, Bone LR. Using the preceed-proceed model to apply health behavior theories. *Health Behavior and Health Education: Theory, Research, and Practice*. 2008; 4: 407–429.
- [25] Azar FE, Solhi M, Darabi F, Rohban A, Abolfathi M, Nejhadadgar N. Effect of educational intervention based on PRECEDE-PROCEED model combined with self-management theory on self-care behaviors in type 2 diabetic patients. *Diabetes & Metabolic Syndrome*. 2018; 12: 1075–1078.
- [26] Garcia ML, Gatdula N, Bonilla E, Frank GC, Bird M, Rascón MS, *et al.* Engaging Intergenerational Hispanics/Latinos to Examine Factors Influencing Childhood Obesity Using the PRECEDE-PROCEED Model. *Maternal and Child Health Journal*. 2019; 23: 802–810.
- [27] Kwon BA. The structural relationship among leisure sports participants' physical self-efficacy, health promotion behavior, perceived health status and quality of life. *Sport Science*. 2014; 31: 19–30.
- [28] Kim M, Ko SD, Kim YB, Kim HK, Son YL. Health education and health promotion theory (pp. 1–256). GyecheukMunwhasa: Seoul. 2016.
- [29] Lee JH, Seok HK. The Relationship among Disability Acceptance and Sport Socialization of Sport Participation persons with Acquired Disabilities. *Journal of Sport and Leisure Studies*. 2009; 35: 687–700.
- [30] Oh CK. The effects of the self-esteem, social support, and mental health of people with acquired physical disability on their independent living [dissertation] (pp. 1–165). University of Honam: Gwangju. 2015.
- [31] Cohen S, Hoberman HM. Positive events and social supports as buffers of life change stress. *Journal of Applied Social Psychology*. 1983; 13: 99–125.
- [32] Ajzen I. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*. 1991; 50: 179–211.
- [33] Woo JP. In Professor Woo Jong Pil's concept of structural equation model and understanding (pp. 1–568). Hanahara Publishing Co.: Seoul. 2016.
- [34] Shin WS. The effect of behavioral belief on exercise adherence and quality of subjective life of participant in physical disability sport. *The Korea Journal of Sports Science*. 2015; 24: 239–253.
- [35] Lim KH. A study on shifting nurses' health conditions and job satisfaction. Unpublished master's thesis [dissertation] (pp. 1–76). University of Hanyang: Seoul. 2002.
- [36] Hwang SH. The relationship between the demographic-sociological characteristic and preparation for later life of the physically challenged in middle and older ages. *Journal of the Korean Academy of Health and Welfare for Elderly*. 2015; 7: 25–42.
- [37] Walker SN, Volkan K, Sechrist KR, Pender NJ. Health-promoting life styles of older adults: comparisons with young and middle-aged adults, correlates and patterns. *ANS. Advances in Nursing Science*. 1988; 11: 76–90.

- [38] Kim H, Ko D, Kim J. The Relationship of Exercise Satisfaction, Health behavior and Sociality of Disability Participating in Life-Time Sports. *Journal of the Korean Association for Physical Education*. 2018; 27: 133–145.
- [39] Ryckman RM, Robbins MA, Thornton B, Cantrell P. Development and validation of a physical self-efficacy scale. *Journal of Personality and Social Psychology*. 1982; 42: 891–900.
- [40] Yoo EK, Seol HS. Factorial structure of the Social Support Scale. *The Korean Association for Survey Research*. 2015; 16: 155–184.
- [41] Kim SJ, Cha HW. The effect of responsibility attribution message and emotion of obesity on policy support and health behavior intention: Focusing on attribution theory and planned behavior theory. *Korean Journal of Journalism & Communication Studies*. 2016; 60: 369–398.
- [42] West SG, Finch JF, Curran PJ. Structural equation models with non-normal variables: Problems and remedies. In Hoyle RH (ed.) *Structural equation modeling: Concepts, issues, and applications*. Sage Publications: Thousand Oaks, CA. 1995.
- [43] Bae BR. *Structural equation modeling by AMOS 27* (pp. 1–572). Cheongram Publishing: Seoul. 2021.
- [44] Choi YJ. Converged Relationship between Oral Health Beliefs, Oral Disease Preventive Intention and Oral Disease Preventive Activities in Partial Middle Aged Adults. *Journal of the Korea Convergence Society*. 2016; 7: 209–215.
- [45] Choi K, Han S. A Study of Factors Affecting Health Promoting Behaviors in Physically Disabled Person - Application of Pender's Health Promotion Model. *Korean Association for Learner-Centered Curriculum and Instruction*. 2017; 17: 647–663.
- [46] Huh JY, Song KH. Relationship between Social Support, Motivation Regulation, Health Promoting Behavior and Intention to Continuance in Female Participants of Life Time Sports. *Journal of Sport and Leisure Studies*. 2011; 45: 531–543.
- [47] Kim B, Cheon SH. Relationship between Students' Beliefs about Collegiate Physical Education, Intention, and Leisure-Time Exercise Behavior: Theory of Planned Behavior's Perspective. *The Korean Journal of Physical Education*. 2018; 57: 305–319.
- [48] Oh JS, Han HW. The Influence of Social Support on Health Promotion Behavior and Level of Participation in Female Leisure Dance Participants. *Official Journal of the Koeran Society of Dance Science*. 2012; 27: 1–16.
- [49] Lee HY, Hwang SS, Back JE, Kim YS, Ka MH, Sin JY, *et al.* The relationship of the social support and health promotion behavior in rural communities. *Journal of Agricultural Medicine and Community Health*. 2002; 27: 55–66.
- [50] Lee JS, Lee IS. A study of impacts of health promotion activities and socio-economic status on health status of the aged. *Korean Society of Gerontological Social Welfare*. 2005; 27: 231–253.
- [51] Namgung W. The Difference of Health Promotion Lifestyle of an Aged Person as Exercise Participation, Perceived Health and Sex. *Journal of Sport and Leisure Studies*. 2010; 39: 439–449.
- [52] Kim JT. Relationship among Perceived Health Status, Health Promotion Behavior, and Life Quality of Participants in Lifetime Sports Program. *Journal of the Korean Society for Special Sports*. 2011; 19: 43–55.
- [53] Jang EJ. Effect of aging awareness and health of middle-aged and elderly persons on quality of life [dissertation] (pp. 1–75). University of Dagu Hany: Gyeongbuk. 2017.
- [54] Jung JP, Lee ER, Sin MS. The health of the elderly impact on quality of life. *Journal of the Korean Academy of Health and Welfare for Elderly*. 2012; 4: 51–61.