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Self-Esteem Trajectories After Occupational Injuries and Diseases and Their Relation to Changes in Subjective Health: Result From the Panel Study of Workers' Compensation Insurance (PSWCI)

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ABSTRACT

Background: Occupational injuries and diseases are life events that significantly impact an individuals' identity. In this study, we examined the trajectories of self-esteem among victims of occupational injury and disease and their relation to health.

Methods: The Panel Study of Workers' Compensation Insurance conducted annual follow-ups on workers who had experienced occupational injury or disease. A total of 2,000 participants, who had completed medical care, were followed from 2013 to 2017. Growth mixture modeling was utilized to identify latent classes in the self-esteem trajectory. Additionally, logistic regressions were conducted to explore the association between trajectory membership, baseline predictors, and outcomes.

Results: Three distinct trajectory classes were identified. Total 65.8% of the samples (n = 1,316) followed an increasing self-esteem trajectory, while 31.1% (n = 623) exhibited a constant trajectory, and 3.1% (n = 61) showed a decreasing trajectory. Individuals with an increasing trajectory were more likely to have a higher educational attainment (odds ratio [OR], 1.86; 95% confidence interval [CI], 1.20–2.88), an absence of a moderate-to-severe disability rating (OR, 0.49; 95% CI, 0.25–0.96), no difficulty in daily living activities (OR, 0.81; 95% CI, 0.75–0.88), and were economically active (re-employed: OR, 2.46; 95% CI, 1.52–3.98; returned to original work: OR, 4.46; 9% CI, 2.65–7.50). Those with a decreasing self-esteem trajectory exhibited an increased risk of poor subjective health (OR, 1.89; 95% CI, 0.85–4.85 in 2013 to OR, 3.17; 95% CI, 1.04–13.81 in 2017), whereas individuals with an increasing trajectory showed a decreased risk (OR, 0.54; 95% CI, 0.43–0.68 in 2013 to OR, 0.44; 95% CI, 0.33–0.57 in 2017).

Conclusion: Our findings emphasize the diversity of psychological responses to occupational injury or disease. Policymakers should implement interventions to enhance the self-esteem of victims.

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The authors have no potential conflicts of interest to disclose.

Author Contributions

Conceptualization: Baek SU, Won JU. Formal analysis: Baek SU. Investigation: Baek SU, Lee WT, Kim MS, Lim MH. Methodology: Baek SU. Software: Baek SU. Writing - original draft: Baek SU. Writing - review and editing: Yoon JH, Won JU. Visualization: Baek SU. Supervision: Yoon JH, Lee WT, Kim MS, Lim MH, Won JU.

Keywords: Psychological Health; Work-Related Injury; Work-Related Disease; Return-to-Work; Self-Rated Health

INTRODUCTION

Occupational injuries and diseases are a major public health concern in South Korea.^{1,2} According to the burden of disease study, annual occupation-attributable deaths are estimated to be approximately 1.5 million globally.³ In addition, occupational injuries or diseases impose a great economic burden on countries.⁴ Even without causing fatal outcomes, some physical hazards in the workplace can result in diseases that lead to permanent disability.⁵

Recent research has focused not only on preventing occupational injuries and diseases but also on managing the quality of life of victims.⁶⁻⁸ Occupational injuries and diseases have serious psychological consequences for workers. For example, victims of occupational injuries exhibit a high prevalence of psychiatric disorders such as major depression or post-traumatic stress disorder (PTSD).^{9,10} Furthermore, previous studies have shown that injured workers are likely to experience a decrease in their physical and occupational functions, which contributes to lowering their quality of life after occupational accidents.^{8,11}

Self-esteem refers to one's evaluation of their worth, and high self-esteem plays a key role in protecting psychological health in response to negative life events.¹² Moreover, high self-esteem is an important motivating factor affecting an individual's social and occupational engagement.¹³ Thus, high self-esteem has found to be associated with better mental health and subjective health.^{14,15} Previous studies have shown that major injuries and diseases can negatively affect self-esteem. Those severely injured experience drastic changes in their appearance and physical and social functioning, which has a profound impact on their identity, self-esteem, and self-concept.¹⁶ In the occupational context, little is known about the self-esteem of victims of occupational injuries and diseases. In the existing literature, severe occupational injuries have been found to cause a loss of self-worth and identity.¹⁷ However, no study has examined longitudinal self-esteem trajectories after occupational injuries or diseases.

It is noteworthy that individuals' self-esteem can follow different trajectories depending on their demographic features and socioeconomic environment.¹⁸ Particularly, a previous study revealed that individual differences are observed in the impact of life events on subsequent changes in self-esteem trajectories.¹⁹ Therefore, it can be hypothesized that self-esteem trajectories after occupational injury or disease vary according to the worker's circumstances. If so, investigating which characteristics or environments are related to the increasing (or decreasing) self-esteem trajectory will provide new insight into workers' quality of life after occupational injuries or diseases.

To the best of our knowledge, the present study is the first to explore the self-esteem trajectories of workers who have experienced occupational injury or disease. Based on a nationally representative cohort consisting of Korean workers who had experienced occupational injury or disease, this study aims to 1) identify and classify subgroups of the longitudinal self-esteem trajectory, 2) explore how individual features and socioeconomic environments (e.g., gender, age, and income) are related to trajectory membership, and

3) confirm the difference in subjective health conditions among trajectory subgroups. Consequently, our findings will provide policymakers with useful information to implement appropriate policies to improve the quality of life and psychological health of victims of occupational injury or disease.

METHODS

Data source

We obtained the study sample from the cohort of the Panel Study of Workers' Compensation Insurance (PSWCI), which was followed up from 2013 (Wave 1) to 2017 (Wave 5) by the Korea Workers' Compensation and Welfare Service (KCOMWEL). KCOMWEL is the national organization in charge of compensation for occupational injuries and diseases in Korea and has information on all workers recognized as having occupational injuries and diseases in Korea. In 2013, KCOMWEL sampled workers who had experienced occupational injuries or diseases and annually followed up on their health and socioeconomic status until 2017. The target population of the PSWCI cohort was 82,493 workers who completed workers' compensation medical care in 2012 after experiencing occupational injury or disease. 2000 survey participants were selected via systemic sampling, in which sex, age, region, and disability rating were stratifying variables and were followed from 2013 (Wave 1) to 2017 (Wave 5). Annual surveys were conducted via one-on-one face-to-face interviews with trained interviewers. The response rates during the 5 years were: 100.0% in 2013; 90.2% in 2014; 85.2% in 2015; 83.2% in 2016; 80.8% in 2017. Finally, our study sample included 2000 participants with 8783 total observations.

Measures

Self-esteem

Self-esteem was assessed by the Rosenberg Self-Esteem Scale (RSES).²⁰ The RSES consists of 10 questions and the response to each question is based on a 4-point Likert scale. The reliability and validity of the Korean version of the RSES were reported in a previous study.²¹ Answers to the negative questions were coded in reverse so that higher scores indicated higher self-esteem. In this study, Cronbach's alpha for each year ranged from 0.77 to 0.79. The summed scores for the ten questions were used.

Covariates

The baseline characteristics of the survey participants were obtained during the first survey year (2013; Wave 1). Demographic features (age and sex) were also included as covariates. Age was classified into "< 40," "40–49," "50–59," or "≥ 60." Educational level was classified as having completed "middle school or below" or "high school or above." The total household income was divided by the median value (low and high). Marital status was classified as unmarried/others and married. Certification was defined as having one or more professional certifications. The accident type was classified into "occupational injury" or "occupational disease." The disability rating, which was assessed according to the Industrial Accident Compensation Insurance Act in Korea, consisted of 14 grades. The KCOMWEL assesses disability ratings for each case based on the opinions of specialized physicians to determine the amount of compensation. We classified the disability rating into "moderate-to-severe (grade 1–10)," "mild (grade 11–14)," and "no grade." Questions on difficulties in daily living activities consisted of questions regarding 1) learning, remembering, and concentrating; 2) domestic activities such as dressing and bathing; 3) out-of-home activities such as shopping;

4) occupational activities. Responses to each question were assessed based on a 5-point Likert scale, in which a higher score indicates greater difficulty in daily living activities. The total score, which ranged from 4 to 20, was treated as a continuous variable. Finally, workers' return-to-work (RTW) status was classified into "non-RTW" (unemployed), "re-employed," and "returned to original work." Accident type and disability rating were obtained from the administrative data of the KCOMWEL, and other variables were self-reported by the survey participants.

Subjective health

Subjective health was assessed using the following question: "How do you feel about your current health?" The responses were measured on a 4-point Likert scale: 1) "very bad," 2) "fairly bad," 3) "fairly good," 4) "very good." Either "very bad" or "fairly bad" was defined as poor subjective health.

Statistical analyses

As a descriptive analysis, aggregate trends of mean RSES of overall participants and subgroups stratified by age group and sex were presented.

Next, we employed the growth mixture model (GMM) to classify the subgroup (latent class) in the longitudinal trajectories of self-esteem. GMM, which is an extension of the latent growth model (LGM), derives latent patterns of trajectories of a variable of interest and allocates the latent class to each individual.²²

The GMM analysis involved the following three-step procedure: First, we checked whether there were latent classes in the pattern of self-esteem trajectories based on the LGM, which included only one group. We constructed a linear LGM that included latent growth factors, representing the intercept and slope. If the variances in the latent growth factor (intercept or slope) are significant, it can be assumed that there is heterogeneity in the patterns of self-esteem trajectories.²³ Second, GMMs with different numbers of latent classes are fitted to determine the optimal number of latent classes. The following model fit indices were calculated to select the number of latent classes: Akaike information criterion, Bayesian information criterion (BIC), sample size adjusted BIC (SABIC), Lo-Mendell-Rubin adjusted likelihood ratio test (LMR-LRT), parametric bootstrapped likelihood ratio test (BLRT), and entropy. Third, after selecting the GMM, we explored how individual characteristics measured in the baseline year were associated with trajectory membership. The R3STEP procedure in Mplus,²⁴ which involves multinomial logistic regression, was conducted to estimate the odds ratios (ORs) and 95% confidence intervals (CIs). Fourth, the association of self-esteem trajectories and risk of poor subjective health in 2013 (Wave 1) and 2017 (Wave 5) was estimated using logistic regressions that adjusted for covariates measured in the same year (time-varying covariates). Descriptive analyses and visualization were conducted using R (version 4.2.2; R Foundation for Statistical Computing, Vienna, Austria). The GMM analysis was conducted using Mplus (version 8.8; Muthén & Muthén, Los Angeles, CA, USA).

Missing values

No missing values were observed for the covariates or self-esteem measured at baseline (Wave 1). Therefore, all participants (N = 2,000) were included in the analysis. However, sample attrition and non-response occurred because of the longitudinal nature of the study. In this study, the full information maximum likelihood method was applied to GMM to fully use cases with missing values.

Sensitivity analysis

Information on the covariates was obtained in all survey years and not only in the baseline year. To fully use our dataset, the generalized estimation equation (GEE) was used to investigate the association between covariates and self-esteem measured in the same year during Waves 1 to 5. The fully adjusted GEE model was fitted.

Data availability

The raw PSWCI data are available at <https://www.comwel.or.kr/Researchinstitute/index.do>.

Ethics statement

The Institutional Review Board (IRB) of Yonsei Health System approved this study (IRB No. 4–2022–1411). Informed consent was waived by the IRB due to the retrospective nature of the study.

RESULTS

Descriptive analysis

Table 1 shows the baseline characteristics of the study participants. The study participants consisted of 1686 men (84.3%) and 314 women (15.7%). In addition, there were 1,832 injury cases (91.6%) and 168 disease cases (8.4%).

Supplementary Fig. 1 depicts the aggregate trend of the mean RSES during the study period, stratified by age and sex. An overall increasing trend was observed among study participants. The mean RSEs were higher among young participants.

Preliminary analysis

Supplementary Table 1 presents the results of LGM which included only one group. Variances in the latent growth factors (intercept and slope) were significant (P value < 0.001). This indicated that there were heterogeneous patterns of self-esteem trajectories both for the initial values and change rates; therefore, GMM analysis with latent classes was followed.

Supplementary Table 2 presents the model fit statistics and allocated percentages of study participants in each subgroup. GMMs with different numbers of latent classes were fitted. The supplementary details present the estimated means and spaghetti plots of self-esteem for each GMM (**Supplementary Data 1**). All GMMs showed a medium level of classification quality (entropy > 0.6).²⁵ The four- and five-class GMM had a greater BIC value than the three-class GMM. For class four- and five-class GMM, the number of the smallest subgroup was less than 1% of the total number of samples which could reduce generalizability and statistical power.²⁶ Additionally, although the LMR LRT of the three-class GMM is marginally insignificant, previous studies have suggested that BLRT is a better indicator of the number of classes.^{26,27} Thus, considering the model fit statistics and the interpretability of the classification, the three-class GMM was selected as the final model.

Main analysis

Fig. 1 presents the observed mean RSES and estimated values for the slopes of each latent class. Three distinct self-esteem trajectories were identified: the “Increasing” group ($n = 1,316$; 65.8%); the “Constant” group ($n = 623$, 31.1%); the “Decreasing” group ($n = 61$, 3.1%). Significant change rates (slope > 0 or slope < 0) were observed for the “Increasing” and “Decreasing” trajectories.

Table 1. Baseline characteristics of the cohort samples

Characteristics	Survey participants (N = 2,000)
Age, yr	
< 40	413 (20.6)
40–49	522 (26.1)
50–59	705 (35.2)
≥ 60	360 (18.0)
Gender	
Men	1,686 (84.3)
Women	314 (15.7)
Education	
Middle school or below	787 (39.4)
High school or above	1,213 (60.7)
Household income	
Low	1,000 (50.0)
High	1,000 (50.0)
Marital status	
Unmarried/Others	587 (29.3)
Married	1,413 (70.7)
Certification	
No	1,198 (59.9)
Yes	802 (41.1)
Type	
Occupational injury	1,832 (91.6)
Occupational disease	168 (8.4)
Disability rating	
No grade	350 (17.5)
Mild	1,181 (59.1)
Moderate-to-severe	469 (23.4)
Difficulties in activities of daily living	4.5 ± 3.3
RTW status	
Non-RTW	588 (29.4)
Re-employed	717 (35.9)
Returned to original work	695 (34.8)

Values are presented as number (%) or mean ± standard deviation.

RTW = return-to-work.

The baseline characteristics of the participants following three different trajectories are presented in **Table 2**, and the association between trajectory membership and covariates is presented in **Fig. 2**. Those following an increasing self-esteem trajectory, compared to those with a constant self-esteem trajectory, were more likely to have high educational attainment (OR, 1.86; 95% CI, 1.20–2.88), a high household income (OR, 1.75; 95% CI, 1.14–2.68), be married (OR, 1.94; 95% CI, 1.19–3.15), have a professional certificate (OR, 1.92; 95% CI, 1.24–2.99), without moderate-to-severe disability rating (OR, 0.49; 95% CI, 0.25–0.96), not having difficulty in daily living activities (OR, 0.81; 95% CI, 0.75–0.88), and be economically active (re-employed: OR, 2.46; 95% CI, 1.52–3.98; returned to original work: OR, 4.46; 95% CI, 2.65–7.50). Conversely, compared to those with an increasing self-esteem trajectory, those with a decreasing self-esteem trajectory were less likely to have a high household income (OR, 0.27; 95% CI, 0.09–0.77), a professional certificate (OR, 0.22; 95% CI, 0.05–0.90), absence of difficulty in daily living activities (OR, 1.62; 95% CI, 1.34–1.94), and be re-employed (OR, 0.10; 95% CI, 0.02–0.54).

Table 3 shows the association of self-esteem trajectories and poor subjective health. The risk of poor subjective health increased in those with decreasing self-esteem trajectory (OR, 1.89; 95% CI, 0.85–4.85 in Wave 1 to OR, 3.17; 95% CI, 1.04–13.81 in Wave 5). On the other hand, the risk of poor subjective health decreased in those with increasing self-esteem trajectory (OR, 0.54; 95% CI, 0.43–0.68 in Wave 1 to OR, 0.44; 95% CI, 0.33–0.57 in Wave 5).

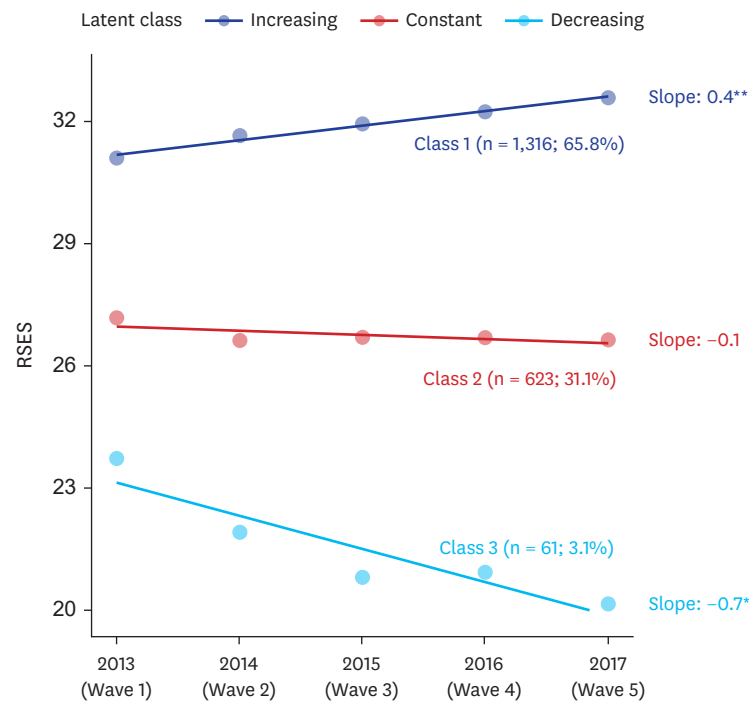


Fig. 1. Observed mean of RSES and estimated values for slopes from three-class growth mixture model. RSES = Rosenberg self-esteem scale. * $P = 0.011$; ** $P < 0.001$.

Sensitivity analysis

A GEE analysis was conducted to explore the concurrent association between covariates and self-esteem (**Supplementary Table 3**). Young age, female sex, high income, being married, having a certification, having no disability grade, and being economically active were related to higher self-esteem.

DISCUSSION

Our study identified and classified self-esteem trajectories using a nationally representative cohort of South Koreans who had experienced occupational injuries or diseases. Although an overall increasing trend was observed, three distinctive trajectory subgroups emerged. Approximately two-thirds of the sample followed an increasing trajectory; however, the rest of the sample followed a constant or decreasing trajectory. Thus, our findings highlight the heterogeneity of psychological responses to occupational injuries and diseases. Furthermore, trajectory membership was not equally distributed among the workers. We found that socioeconomic environment, personal resources, and return to work act as determinants of the self-esteem trajectory after occupational injury and disease. Finally, we confirmed that the trajectory of increasing self-esteem was related to the improvement of subjective health, while the trajectory of decreasing self-esteem was related to the deterioration of subjective health.

Previous studies have reported the psychological response of workers to occupational injuries or diseases. Those who experienced occupational injury or disease exhibited an elevated prevalence of depression and PTSD and frequently reported a loss of self-worth and identity.^{17,28} In addition, occupational injury or disease often causes permanent damage

Table 2. Comparison of baseline characteristics according to latent class membership

Characteristics	Class 1 'Increasing' (n = 1,316)	Class 2 'Constant' (n = 623)	Class 3 'Decreasing' (n = 61)	P value ^a
Age, yr				< 0.001
< 40	317 (24.1)	93 (14.9)	3 (4.9)	
40–49	363 (27.6)	143 (23.0)	16 (26.2)	
50–59	439 (33.4)	239 (38.4)	27 (44.3)	
≥ 60	197 (15.0)	148 (23.8)	15 (24.6)	
Gender				0.800
Men	1,111 (84.4)	522 (83.8)	53 (86.9)	
Women	205 (15.6)	101 (16.2)	8 (13.1)	
Education				< 0.001
Middle school or below	434 (33.0)	315 (50.6)	38 (62.3)	
High school or above	882 (67.0)	308 (49.4)	23 (37.7)	
Household income				0.003
Low	693 (52.7)	283 (45.4)	24 (39.3)	
High	623 (47.3)	340 (54.6)	37 (60.7)	
Marital status				0.033
Unmarried/Others	361 (27.4)	206 (33.1)	20 (32.8)	
Married	955 (72.6)	417 (66.9)	41 (67.2)	
Certification				< 0.001
No	718 (54.6)	431 (69.2)	49 (80.3)	
Yes	598 (45.4)	192 (30.8)	12 (19.7)	
Type				0.025
Occupational injury	1,194 (90.7)	585 (93.9)	53 (86.9)	
Occupational disease	122 (9.3)	38 (6.1)	8 (13.1)	
Disability rating				< 0.001
No grade	808 (61.4)	346 (55.5)	27 (44.3)	
Mild	254 (19.3)	186 (29.9)	29 (47.5)	
Moderate-to-severe	254 (19.3)	91 (14.6)	5 (8.2)	
Difficulties in activities of daily living	3.8 ± 2.8	5.6 ± 3.7	8.7 ± 4.0	< 0.001
RTW status				< 0.001
Non-RTW	271 (20.6)	269 (43.2)	48 (78.7)	
Re-employed	492 (37.4)	214 (34.3)	11 (18.0)	
Returned to original work	553 (42.0)	140 (22.5)	2 (3.3)	

Values are presented as number (%) or mean ± standard deviation.

RTW = return-to-work.

^aχ² test or ANOVA.

to one's appearance and physical and occupational function, leading to the deterioration of self-esteem.¹⁰ Overall, the existing literature has focused only on the negative effects of occupational injury or disease, neglecting how workers' psychological health can recover from an accident and adjust to their post-injury life.

The term "post-traumatic growth (PTG)" refers to an experience of positive change that occurs after struggling with challenging life crises.²⁹ Contrary to conventional wisdom, our results suggest that a substantial proportion of victims experienced PTG in self-esteem after an accident. Our findings are consistent with those of an earlier study that longitudinally followed the psychological well-being of patients who experienced occupational hand injuries.³⁰ According to this previous study, the prevalence of psychological stress, such as anxiety and depression, steadily decreased over 18 months after the accident.³⁰ Similarly, a previous study that analyzed post-injury mental health trajectories revealed that about three-quarters of patients who experienced a severe physical injury gradually recovered from the negative psychological impact of an accident.³¹

It should be noted that workers' self-esteem can follow different trajectories depending on individual characteristics. Our results are consistent with previous findings that revealed

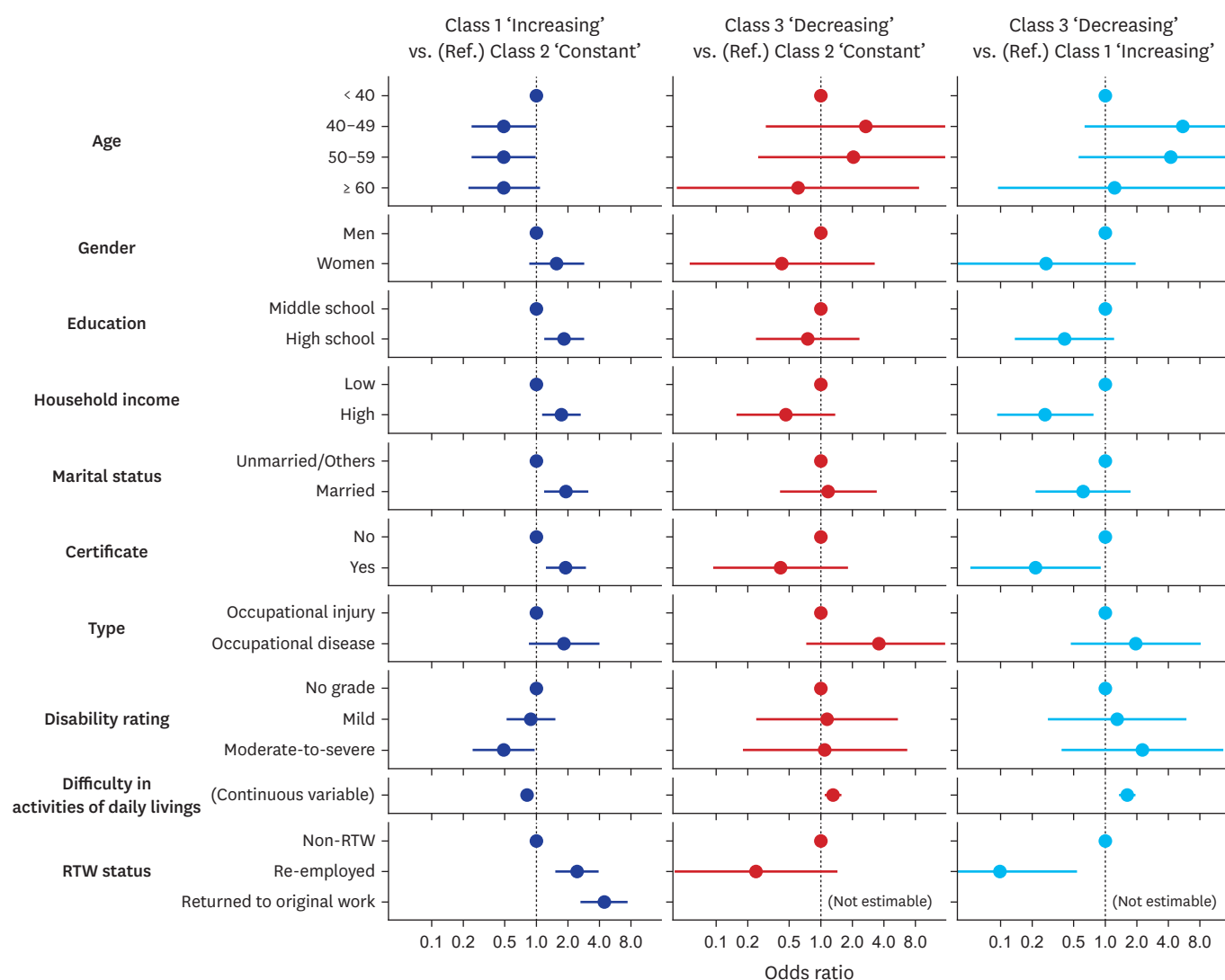


Fig. 2. Associations between baseline characteristics and trajectory membership based on multinomial logistic regression. RTW = return-to-work.

Table 3. Association of self-esteem trajectories and risk of poor subjective health

Trajectory classes	2013 (Wave 1)			2017 (Wave 5)		
	Cases/No. (%)	Crude model ^a	Adjusted model ^{a,b}	Cases/No. (%)	Crude model ^a	Adjusted model ^{a,b}
Class 1 'Increasing'	459/1,316 (34.9%)	0.34 (0.28–0.41)	0.54 (0.43–0.68)	243/1,055 (23.0%)	0.28 (0.23–0.34)	0.44 (0.33–0.57)
Class 2 'Constant'	382/623 (61.3%)	Reference	Reference	279/509 (54.8%)	Reference	Reference
Class 3 'Decreasing'	54/61 (88.5%)	4.87 (2.33–11.89)	1.89 (0.85–4.85)	49/52 (94.2%)	5.03 (2.71–10.09)	3.17 (1.04–13.81)

^aValues are presented as odds ratio (95% confidence interval); ^bAge, gender, education, income, marital status, certification, type, disability rating, difficulties in activities of living, and RTW status were adjusted.

heterogeneity in patients' response to an injury or disease event. Studies examining psychological symptoms after physical injury suggest that patients could be categorized into those whose symptoms are improving, invariant, or deteriorating.^{31,32} In addition, our findings reinforce the evidence that an individual's self-esteem trajectory varies with the way they respond to life events depending on personal and social circumstances.¹⁹ Therefore, vulnerable workers who experience stagnant or decreased self-esteem after occupational injury or disease should not be masked by the aggregate trend of improvement in self-esteem of the total sample.

Our study is meaningful as we not only identified trajectory subgroups but also found how demographic, socioeconomic, and occupational factors are related to the increasing or deteriorating trajectory of self-esteem. Previous studies have described how different patients undergo psychological adjustment to accidents, including traumatic injury, spinal cord injury, and burns.³¹⁻³⁴ As a moderating factor, rich socio-economic resources, such as high educational and income levels, can mitigate the negative impact of critical events and facilitate PTG and psychological adjustment to post-injury life.³⁴ In this study, disability rating (severity of disease) and difficulties in activities of living were also related to worse self-esteem trajectories, which is in line with the findings of a previous study that disease severity is associated with psychological adjustment.³⁵

We found that self-esteem trajectories after occupational injuries and diseases were related to subsequent changes in the risk of poor subjective health. Our findings are consistent with those of previous studies that self-esteem is closely related to subjective health and mental health conditions.^{14,15} High self-esteem has been found to encourage individuals to adopt more desirable health-related behaviors. Also, high self-esteem helps individuals actively cope with psychological risks such as stress, increasing their capacity of resilience.³⁶

Our study has some practical implications in that certain modifiable factors were found to be related to trajectory membership after occupational injury or disease. Specifically, those who had a certification and were re-employed or returned to their original work were significantly more likely to follow an increasing trajectory and less likely to follow a constant or decreasing trajectory. Our results are in accordance with several studies that suggested that work serves as a means of preserving self-esteem, self-concept, and identity in patients who were injured or diagnosed with cancer.^{37,38} Additionally, a previous review found that multidomain interventions assisting RTW were effective in reducing the duration away from work in patients with musculoskeletal and mental health problems.³⁹ Therefore, interventions such as vocational retraining and encouraging re-employment may help injured workers follow an increasing self-esteem trajectory. Therefore, active policies are warranted to help the recovery of self-esteem and psychological status of workers, with low socioeconomic status, having higher odds of following worse self-esteem trajectories. Additionally, our results suggest that the level of self-esteem can serve as a meaningful performance indicator for mental health programs targeting victims of occupational injuries or diseases.

This study had some limitations. First, some variables, including injury/disease site and mechanism of injury/disease, are not available due to a lack of information. Considering that our sample encompasses heterogeneous types of occupational injuries and diseases, a more detailed interpretation is possible if a subgroup analysis is performed in the following studies that target a single injury or disease. Second, lack of information on the self-esteem of workers before occupational injury or disease limits the interpretation of temporal changes in self-esteem. If the information on self-esteem before an occupational injury or disease is available, it will provide an important clue for uncovering the overall trajectory of how self-esteem decreases and recovers before and after an event. Finally, considering that the self-esteem of the disabled can be influenced by social perception and stigma toward the disability,⁴⁰ it is necessary to verify whether similar self-esteem trajectories are observed in other cultural and social contexts.

Nevertheless, the present study has some notable strength. Our analysis was based on a nationally representative occupational cohort. Therefore, our study has several strengths in terms of

generalizability. Also, validated measurements were used to identify self-esteem trajectories. Finally, this is the first study to explore longitudinal self-esteem trajectories and their relation to subjective health in workers who have experienced occupational injury or disease.

This study explored longitudinal self-esteem trajectories among workers who had experienced occupational injury or disease. Although the increasing trajectory of self-esteem was the most common pattern, heterogeneous trajectories, in which workers experienced stagnant or decreased self-esteem were also observed. High socioeconomic status and return to original work were related to self-esteem recovery. Also, we found that self-esteem trajectories of victims of occupational injuries and diseases were closely related to subsequent changes in subjective health. Therefore, policymakers should consider individual circumstances when implementing interventions aimed at facilitating the self-esteem recovery of workers after occupational injury or disease.

ACKNOWLEDGEMENTS

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SUPPLEMENTARY MATERIALS

Supplementary Data 1

Results of the growth mixture models

[Click here to view](#)

Supplementary Table 1

Results of the latent growth model

[Click here to view](#)

Supplementary Table 2

Model fit indices for different number of latent classes of growth mixture model

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Supplementary Table 3

Results of GEE analysis

[Click here to view](#)

Supplementary Fig. 1

Overall mean score for RSES stratified by age group and gender.

[Click here to view](#)

REFERENCES

1. Cha EW, Jung SM, Lee IH, Kim DH, Choi EH, Kim IA, et al. Approval status and characteristics of work-related musculoskeletal disorders among Korean workers in 2020. *Ann Occup Environ Med* 2022;34(1):e31. [PUBMED](#) | [CROSSREF](#)
2. Kim UJ, Choi WJ, Kang SK, Lee W, Ham S, Lee J, et al. Standards for recognition and approval rate of occupational cerebro-cardiovascular diseases in Korea. *Ann Occup Environ Med* 2022;34(1):e30. [PUBMED](#) | [CROSSREF](#)
3. GBD 2016 Occupational Risk Factors Collaborators. Global and regional burden of disease and injury in 2016 arising from occupational exposures: a systematic analysis for the Global Burden of Disease Study 2016. *Occup Environ Med* 2020;77(3):133-41. [PUBMED](#) | [CROSSREF](#)
4. Leigh JP. Economic burden of occupational injury and illness in the United States. *Milbank Q* 2011;89(4):728-72. [PUBMED](#) | [CROSSREF](#)
5. Stoesz B, Chimney K, Deng C, Grogan H, Menec V, Piotrowski C, et al. Incidence, risk factors, and outcomes of non-fatal work-related injuries among older workers: a review of research from 2010 to 2019. *Saf Sci* 2020;126:126. [CROSSREF](#)
6. Won Y, Kim HC, Kim J, Kim M, Yang SC, Park SG, et al. Impacts of presenteeism on work-related injury absence and disease absence. *Ann Occup Environ Med* 2022;34(1):e25. [PUBMED](#) | [CROSSREF](#)
7. Lee WT, Lim SS, Kim MS, Baek SU, Yoon JH, Won JU. Analyzing decline in quality of life by examining employment status changes of occupationally injured workers post medical care. *Ann Occup Environ Med* 2022;34(1):e17. [PUBMED](#) | [CROSSREF](#)
8. Chin WS, Guo YL, Liao SC, Wu HC, Kuo CY, Chen CC, et al. Quality of life at 6 years after occupational injury. *Qual Life Res* 2018;27(3):609-18. [PUBMED](#) | [CROSSREF](#)
9. Lee KS, Joo SY, Seo CH, Park JE, Lee BC. Work-related burn injuries and claims for post-traumatic stress disorder in Korea. *Burns* 2019;45(2):461-5. [PUBMED](#) | [CROSSREF](#)
10. Lin KH, Guo NW, Liao SC, Kuo CY, Hu PY, Hsu JH, et al. Psychological outcome of injured workers at 3 months after occupational injury requiring hospitalization in Taiwan. *J Occup Health* 2012;54(4):289-98. [PUBMED](#) | [CROSSREF](#)
11. Salah Eldin W, Hirshon JM, Smith GS, Kamal AA, Abou-El-Fetouh A, El-Setouhy M. Health-related quality of life after serious occupational injury in Egyptian workers: a cross-sectional study. *BMJ Open* 2012;2(6):e000413. [PUBMED](#) | [CROSSREF](#)
12. Dentale F, Vecchione M, Alessandri G, Barbaranelli C. Investigating the protective role of global self-esteem on the relationship between stressful life events and depression: a longitudinal moderated regression model. *Curr Psychol* 2020;39(6):2096-107. [CROSSREF](#)
13. Baumeister RF, Campbell JD, Krueger JI, Vohs KD. Does high self-esteem cause better performance, interpersonal success, happiness, or healthier lifestyles? *Psychol Sci Public Interest* 2003;4(1):1-44. [PUBMED](#) | [CROSSREF](#)
14. Choi Y, Choi SH, Yun JY, Lim JA, Kwon Y, Lee HY, et al. The relationship between levels of self-esteem and the development of depression in young adults with mild depressive symptoms. *Medicine (Baltimore)* 2019;98(42):e17518. [PUBMED](#) | [CROSSREF](#)
15. Arsandaux J, Michel G, Tournier M, Tzourio C, Galéra C. Is self-esteem associated with self-rated health among French college students? A longitudinal epidemiological study: the i-Share cohort. *BMJ Open* 2019;9(6):e024500. [PUBMED](#) | [CROSSREF](#)
16. Beadle EJ, Ownsworth T, Fleming J, Shum D. The impact of traumatic brain injury on self-identity: a systematic review of the evidence for self-concept changes. *J Head Trauma Rehabil* 2016;31(2):E12-25. [PUBMED](#) | [CROSSREF](#)
17. Lax MB, Klein R. More than meets the eye: social, economic, and emotional impacts of work-related injury and illness. *New Solut* 2008;18(3):343-60. [PUBMED](#) | [CROSSREF](#)

18. Mund M, Neyer FJ. Rising high or falling deep? Pathways of self-esteem in a representative German sample. *Eur J Pers* 2016;30(4):341-57.
[CROSSREF](#)
19. Reitz AK. Self-esteem development and life events: a review and integrative process framework. *Soc Personal Psychol Compass* 2022;16(11):e12709.
[CROSSREF](#)
20. Rosenberg M. *Rosenberg Self-Esteem Scale*. Washington, D.C., USA: American Psychological Association; 1965.
21. Bae HN, Choi SW, Yu JC, Lee JS. Reliability and validity of the Korean version of the Rosenberg Self-Esteem Scale (K-RSES) in adult. *Mood Emot* 2014;12(1):43-9.
22. Muthén B, Muthén LK. Integrating person-centered and variable-centered analyses: growth mixture modeling with latent trajectory classes. *Alcohol Clin Exp Res* 2000;24(6):882-91.
[PUBMED](#) | [CROSSREF](#)
23. Wickrama KK, Lee TK, O'Neal CW, Lorenz FO. *Higher-Order Growth Curves and Mixture Modeling With Mplus*. New York, NY, USA: Routledge; 2016.
24. Asparouhov T, Muthén B. Auxiliary variables in mixture modeling: Three-step approaches using M plus. *Struct Equ Modeling* 2014;21(3):329-41.
[CROSSREF](#)
25. Clark SL. *Mixture Modeling With Behavioral Data*. Los Angeles, CA, USA: University of California; 2010.
26. Jung T, Wickrama KA. An introduction to latent class growth analysis and growth mixture modeling. *Soc Personal Psychol Compass* 2008;2(1):302-17.
[CROSSREF](#)
27. Nylund KL, Asparouhov T, Muthén BO. Deciding on the number of classes in latent class analysis and growth mixture modeling: a Monte Carlo simulation study. *Struct Equ Modeling* 2007;14(4):535-69.
[CROSSREF](#)
28. Lin KH, Shiao JS, Guo NW, Liao SC, Kuo CY, Hu PY, et al. Long-term psychological outcome of workers after occupational injury: prevalence and risk factors. *J Occup Rehabil* 2014;24(1):1-10.
[PUBMED](#) | [CROSSREF](#)
29. Tedeschi RG, Calhoun LG. Posttraumatic growth: conceptual foundations and empirical evidence. *Psychol Inq* 2004;15(1):1-18.
[CROSSREF](#)
30. Grunert BK, Devine CA, Matloub HS, Sanger JR, Yousif NJ, Anderson RC, et al. Psychological adjustment following work-related hand injury: 18-month follow-up. *Ann Plast Surg* 1992;29(6):537-42.
[PUBMED](#) | [CROSSREF](#)
31. Quale AJ, Schanke AK. Resilience in the face of coping with a severe physical injury: a study of trajectories of adjustment in a rehabilitation setting. *Rehabil Psychol* 2010;55(1):12-22.
[PUBMED](#) | [CROSSREF](#)
32. Bonanno GA, Kennedy P, Galatzer-Levy IR, Lude P, Elfström ML. Trajectories of resilience, depression, and anxiety following spinal cord injury. *Rehabil Psychol* 2012;57(3):236-47.
[PUBMED](#) | [CROSSREF](#)
33. Klinge K, Chamberlain DJ, Redden M, King L. Psychological adjustments made by postburn injury patients: an integrative literature review. *J Adv Nurs* 2009;65(11):2274-92.
[PUBMED](#) | [CROSSREF](#)
34. deRoon-Cassini TA, Mancini AD, Rusch MD, Bonanno GA. Psychopathology and resilience following traumatic injury: a latent growth mixture model analysis. *Rehabil Psychol* 2010;55(1):1-11.
[PUBMED](#) | [CROSSREF](#)
35. Thombs BD, Notes LD, Lawrence JW, Magyar-Russell G, Bresnick MG, Fauerbach JA. From survival to socialization: a longitudinal study of body image in survivors of severe burn injury. *J Psychosom Res* 2008;64(2):205-12.
[PUBMED](#) | [CROSSREF](#)
36. Mann M, Hosman CM, Schaalma HP, de Vries NK. Self-esteem in a broad-spectrum approach for mental health promotion. *Health Educ Res* 2004;19(4):357-72.
[PUBMED](#) | [CROSSREF](#)
37. Jeong I, Yoon JH, Roh J, Rhie J, Won JU. Association between the return-to-work hierarchy and self-rated health, self-esteem, and self-efficacy. *Int Arch Occup Environ Health* 2019;92(5):709-16.
[PUBMED](#) | [CROSSREF](#)
38. Rasmussen DM, Elverdam B. The meaning of work and working life after cancer: an interview study. *Psychooncology* 2008;17(12):1232-8.
[PUBMED](#) | [CROSSREF](#)

39. Cullen KL, Irvin E, Collie A, Clay F, Gensby U, Jennings PA, et al. Effectiveness of workplace interventions in return-to-work for musculoskeletal, pain-related and mental health conditions: an update of the evidence and messages for practitioners. *J Occup Rehabil* 2018;28(1):1-15.
[PUBMED](#) | [CROSSREF](#)
40. Paterson L, McKenzie K, Lindsay B. Stigma, social comparison and self-esteem in adults with an intellectual disability. *J Appl Res Intellect Disabil* 2012;25(2):166-76.
[PUBMED](#) | [CROSSREF](#)