Cumulative Effect of Education over Time on Health and Life Satisfaction after Spinal Cord Injury (SCI)

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Introduction

- The protective effects of education on people's well-being, e.g. health and life satisfaction, are well documented in both general population and SCI population.
- Little consensus is reached on whether education's effects continue over time. While some suggest education's effects on health diminish in later life due to selective survival, some argue that the effect strengthens over life course, because education's protective effects, small at the beginning, can be accumulated over time, eventually making large contributions to well-being in later life.
- No empirical research has been conducted on the temporal variation of education's effect in SCI population.

Objective

1. To quantify the association between education and health and life satisfaction of people with spinal cord injury (SCI).
2. To examine whether education effect differs by years post injury.
3. To investigate whether education effect is different by age.

Design

Multi-center follow-up study

Participants

- Enrolled in the longitudinal National SCI Database and injured at the age of 23 to 75 year, completed year 1 and year 5 follow-up in January 1997- March 2010.
- Education attainment did not change within 5 years.
- 1639 participants: 77% men, 41.2 ± 12.8 years old at injury, 53.4% tetraplegic, 48.3% of complete lesion, 69.5% White, and average years of education 12.8± 2.6 at the year 1 follow-up.

Table 1. Education's association with SRH, And Life Satisfaction in Year 1 and Year 5 ♦

	Year 1	Year 5
Self Rated Health	0.04 **	0.07 **
Life Satisfaction	0.09	0.21 *

♦ Controlling for age, gender, race, level and completeness of injury, bladder management, mechanical ventilation, paid job hours and number of rehospitalization.

* 0.01≤ p< 0.05; ** p< 0.01.

Methods

Measurement

1. Outcomes:
   - Health status: Self-Rated Health (SRH), from 1 (poor) to 5 (excellent).
   - Life satisfaction: Diener's Satisfaction with Life Scale (SWLS), range from 5 (least satisfied) to 35 (most satisfied).
2. Independent variable of interest: years of education at injury.
3. Time-invariant covariates: age at injury, gender (male vs. female), race/ethnicity (non-Hispanic White vs. others), completeness of injury (complete vs. incomplete), level of injury (tetraplegic vs. paraplegia), use of mechanical ventilation (yes vs. no), utilization of bladder management at hospital discharge (yes vs. no).
4. Time-variant covariates: number of hours at paid job, and number of rehospitalizations.

Statistical analysis:

- For objective 1, multiple regressions were conducted to quantify the relationship of education with health and life satisfaction at year 1 and year 5, separately.
- For objective 2, difference model (fixed-effects model) was utilized. Mathematically, the difference model is to subtract the adequately specified cross-sectional equation of time 1 from that of time 2:

$$Y_{i2}-Y_{i1}=(\alpha_2-\alpha_1)+\beta_2(X_{i2}-X_{i1})+(\beta_2-\beta_1)X_{i1}+\gamma_2(W_{i2}-W_{i1})+(\gamma_2-\gamma_1)W_{i1}+(\varepsilon_{i2}-\varepsilon_{i1})$$

For a time-invariant variable X_{i1}, if $(\beta 2-\beta 1)\neq 0$, it means the effect of X_{i1} change from time 1 to time 2.

- For objective 3, the difference model was further stratified by two age groups (23-49, and 50-75).

Results

- Table 1 shows a positive effect of education on SRH at both year 1 and year 5 and a positive effect on life satisfaction at year 5. Assuming 7 years more schooling for master graduates than high school graduates, figure 1 presents that education's protective effect on health strengthens by 86% over the 5 years period, and its effect on life satisfaction increases by 124%.
- The difference model analyses (table 2) shows that the increased effect of education on health over 5 years is statistically significant, while its effect on life satisfaction did not differ between year 1 and year 5.
- While taking age into account, the effect of education on both health and life satisfaction increased significantly from year 1 to year 5 for the younger group, but remained the same for the older group (table 3) .

Conclusions

- Education attainment is significantly related to subjective health and life satisfaction for SCI population.
- Education's effects will change over time.
- Age may modify the changing effect of education.
- Education plays an important role for young individuals with SCI in improving health and life satisfaction over time, which supports Mirowsky and Ross's theory "education as learned effectiveness" that education helps people effectively to achieve their valued ends including health. The null finding among older individuals with SCI might be partly attributed to selective mortality; that is, survived old people are less sensitive to education effect.

Table 2. Difference Model Analyses for SRH and Life Satisfaction

	SRH (n=1325)	Life satisfaction (n=1283)
Years of Education	0.03 **	0.14
Age at Injury	-0.01 *	0.01
Male	-0.01	0.68
Non-Hispanic White	-0.03	-0.82
Paraplegia	-0.08	0.06
Complete Injury	-0.01	0.00
Using Bladder Management	0.07	-1.12
Using Mechanical Ventilation	-0.02	0.77
Rehospitalization Number	-0.13 **	-0.38 *
Hours of Pain Job	0.00	0.05 **

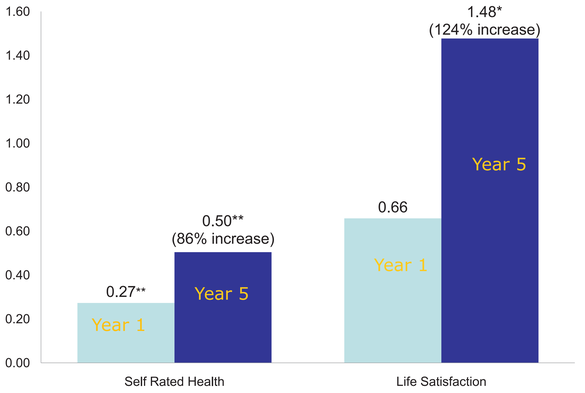
* 0.01≤ p< 0.05; ** p< 0.01.

Table 3. Stratified Difference Model Analyses for SRH and Life Satisfaction

	SRH		Life satisfaction	
	Age 23-49 (n=974)	Age 50-75 (n=351)	Age 23-49 (n=946)	Age 50-75 (n=337)
Years of Education	0.04 **	0.02	0.28 *	-0.11
Age at Injury	0.00	-0.01	-0.02	0.00
Male	-0.01	0.00	0.35	1.59
Non-Hispanic White	0.00	-0.17	-1.20 *	0.44
Paraplegia	-0.11	0.03	-0.07	0.68
Complete Injury	0.00	-0.01	0.18	-0.44
Using Bladder Management	0.26	-0.29	-0.19	-2.84
Using Mechanical Ventilation	0.03	-0.13	0.09	2.42
Rehospitalization Number	-0.13 **	-0.12 *	-0.48 *	0.00
Hours of Pain Job	0.00	0.00	0.06 **	0.00

* 0.01≤ p< 0.05; ** p< 0.01.

Figure 1. Mean Difference of SRH and Life Satisfaction between High School Graduates and Master Graduates in Year 1 and Year 5 ♦



♦ Controlling for age, gender, race, level and completeness of injury, bladder management, mechanical ventilation, paid job hours and number of rehospitalization.
* 0.01≤ p< 0.05; ** p< 0.01.

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