

ORIGINAL ARTICLE

Association of Internet Use and Depression Among the Spinal Cord Injury Population



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Abstract

Objective: To examine the relation between the frequency of Internet use and depression among people with spinal cord injury (SCI).

Design: Cross-sectional survey.

Setting: SCI Model Systems.

Participants: People with SCI (N=4618) who were interviewed between 2004 and 2010.

Interventions: Not applicable.

Main Outcome Measures: The frequency of Internet use and the severity of depressive symptoms were measured simultaneously by interview. Internet use was reported as daily, weekly, monthly, or none. The depressive symptoms were measured by the Patient Health Questionnaire-9 (PHQ-9), with 2 published criteria being used to screen for depressive disorder. The diagnostic method places more weight on nonsomatic items (ie, items 1, 2, and 9), and the cut-off method that determines depression by a (PHQ-9) score ≥ 10 places more weight on somatic factors. The average scores of somatic and nonsomatic items represented the severity of somatic and nonsomatic symptoms, respectively.

Results: Our multivariate logistic regression model indicated that daily Internet users were less likely to have depressive symptoms (odds ratio = .77; 95% confidence interval, .64–.93), if the diagnostic method was used. The linear multivariate regression analysis indicated that daily and weekly Internet usage were associated with fewer nonsomatic symptoms; no significant association was observed between daily or weekly Internet usage and somatic symptoms.

Conclusions: People with SCI who used the Internet daily were less likely to have depressive symptoms.

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Depression is the primary psychological problem that interferes with adjustment to disability and affects quality of life after a spinal cord injury (SCI).¹ More than 30% of people with SCI report clinically significant symptoms of depression.¹ SCI is a catastrophic event, and an individual suffering an SCI may require a lengthy adjustment period.¹ It has been suggested that physical barriers, such as the natural environment and transportation difficulties, cause daily activities to be challenging for people with SCI, which induces psychological stress.^{2,3} During the past decade, access to the Internet has increased in the United States, and 73% of the general population and 67% of those with SCI have access to the

Internet.^{4,5} The Internet is a virtual environment that provides people with disabilities access to shopping, school, work, entertainment, networking, and health information with fewer physical barriers.⁶⁻⁹ The use of the Internet may reduce stress associated with physical barriers and reduce depression in disabled people. More research is needed to understand this issue better.

Several studies have indicated possible benefits of Internet usage with respect to health-related quality of life for people post-SCI, but few population-based studies have directly assessed its benefit for reducing depressive symptoms.^{5,8} Many researchers have suggested that Internet usage in adolescents and college students may have a negative effect.^{10,11} Internet dependence, addiction, and abuse were found to be prevalent in college students, especially for those who use the Internet for social

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networking, and were related to social isolation, sleep disturbances, and depression.^{10,11} For people with SCI, the virtual environment of the Internet may improve health-related quality of life, and it is not known whether Internet abuse may increase in this population.^{5,8} Because people with SCI have a greater age range than most college students and are not able-bodied, their reasons for using the Internet may differ. It is unclear whether relying on the virtual environment of the Internet would cause an increase in Internet abuse or depression in people with SCI.^{7,10,11}

In 2004, Drainoni et al⁵ performed a linear regression analysis on data (N=230) from the National Spinal Cord Injury Database (NSCID) and determined that there was no significant association between the frequency of Internet use and the total score on the Patient Health Questionnaire-9 (PHQ-9), a screening tool for the probable existence of a *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*-defined depressive disorder. We considered the possibility that a significant association might be detected if different parameters were used. These authors applied a multivariate linear regression model on the total PHQ-9 scores⁵; however, the severity of depression might not be linearly correlated to the PHQ-9 scores. The existence of nonsomatic symptoms may be an essential factor when screening for depression in people with SCI because those without depression may have other medical conditions (eg, sleep disturbances, fatigue, difficulty concentrating, and gastrointestinal dysfunction) that are mistaken as somatic symptoms of depression by the interviewer.¹²⁻¹⁹ Several researchers have suggested that somatic factors have less predictability for future depressive symptoms than nonsomatic factors and that including somatic scores might inflate the PHQ-9 score.²⁰⁻²² The NSCID has adopted a screening method that inquires into the existence of nonsomatic symptoms.²³ However, previous studies have had mixed results about the utility of somatic and nonsomatic factors when screening people with SCI for depression.²⁰⁻²² In the Drainoni study,⁵ the use of the total PHQ-9 scores did not emphasize the nonsomatic factors. An analysis using depression parameters that place different weights on somatic and nonsomatic factors may be useful.

There has been a significant increase in Internet usage, and its psychological effect on people with SCI should be investigated.^{4,6} This study aimed to explore the association between Internet use and depression by reanalyzing the NSCID. We adopted a screening method that required the presence of nonsomatic symptoms²³ and assessed whether the association would change if the presence of nonsomatic symptoms was not required. The study conducted an exploratory analysis to examine whether there is a difference in the association of Internet use and somatic symptoms versus nonsomatic symptoms.

Methods

The NSCID was established in 1970 and recruited individuals with traumatic SCI who had been admitted to 1 of the regional centers in the SCI Model System in the United States.²⁴ By 2010, the NSCID

List of abbreviations:

AIS	ASIA Impairment Scale
CI	confidence interval
NSCID	National Spinal Cord Injury Database
OR	odds ratio
PHQ-9	Patient Health Questionnaire-9
SCI	spinal cord injury

had collected information from 27,553 people with SCIs: 80.7% were men, 46.4% were patients with paraplegia, and the average age at injury was 33 years.²⁵ The data were collected during a participant's initial post-SCI hospitalization (the initial interview using questionnaire form I) and follow-up interviews (by phone, mail, or in person using questionnaire form II) in the second year and every 5 years postinjury. Questionnaire form II included information on the frequency of Internet use since 2004 and the PHQ-9 scores since 2000. In this current cross-sectional study, we included 5147 participants for whom the following information was available: motor neurologic level of injury, ASIA Impairment Scale (AIS) grade of injury in form I, Internet use, and the PHQ-9 score in form II (fig 1). Of these participants, 529 (10.2%) were excluded because missing information on other covariates (see Covariates subsection) might be related to depression and Internet use.^{1,5,8,12,19,24,26,27} Overall, 4618 people were included: 78.5% were men and 46.7% were persons with paraplegia. The median year of injury was 2003, and the average age at injury was 36.4 years.

Exposure measurements

We categorized the frequency of Internet use as daily or nondaily. We subdivided the participants' frequency of Internet use as daily (5-7d/wk), weekly (<5d/wk but ≥ 3 times per mo), monthly (<3 times a mo), or never.

Outcome measurements

The PHQ-9, which consists of 9 items, was used to evaluate the severity of depressive symptoms for adults aged ≥ 18 years. The PHQ-9 has good internal consistency (Cronbach $\alpha = .89$) and reliability ($r = .84$).²⁸ The scale includes 5 somatic (items 3, 4, 5, 7, and 8) and 4 nonsomatic (items 1, 2, 6, and 9) items related to depressive symptoms.^{12-19,23} These 9 items pertain to (1) little interest or pleasure in doing things, (2) feeling depressed, (3) sleep disturbance, (4) fatigue, (5) poor appetite/overeating, (6) poor self-esteem, (7) trouble concentrating, (8) moving or speaking slowly/being fidgety or restless, and (9) thoughts of death.²⁰⁻²³ Each item has a score calculation depending on the persistency of the symptoms: 0 (not at all), 1 (several days), 2 (more than half of the days), and 3 (nearly every day).²³ The total score ranges from 0 to 27. Several screening criteria had been applied with the PHQ-9.^{28,29} Because the weighting of somatic and nonsomatic factors in depression screening may affect the estimation for the association between Internet use and depression, we applied 2 screening methods for PHQ-9 to define a probable depressive disorder. The diagnostic method applied by the NSCID requires the existence of nonsomatic symptoms (ie, item 1, 2, or 9),²³ whereas the cut-off method uses a cut-off score ≥ 10 on the total PHQ-9 score (table 1).^{28,29} The diagnostic method emphasizes nonsomatic factors in determining depression, whereas the cut-off method places more weight on somatic factors (5 of the 9 items are somatic factors). We generated average scores for the somatic items and the nonsomatic items separately such that the scores from the somatic and nonsomatic items were equally weighted and comparable.

Covariates

Several risk factors for depression for people with SCI are similar to those for nondisabled individuals, whereas other factors are specific to patients with SCI, such as the degree of neurologic

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