



## Factors associated with post-traumatic stress symptoms among adolescents exposed to the Sewol ferry disaster in Korea



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### ABSTRACT

This study evaluated the factors associated with post-traumatic stress symptoms in Korean adolescents who lived in a disaster-affected community. A total of 1101 students attending secondary and high schools in Jindo, the location of the Sewol ferry disaster, were enrolled in a cross-sectional survey. The Child Report of Post-traumatic Symptoms (CROPS), the Center for Epidemiological Studies Depression Scale (CES-D), and the State Anxiety Inventory for Children (SAIC) were administered. Female gender, older children, poor academic achievement, and directly witnessing the rescue scene were associated with post-traumatic stress symptoms. The CES-D and SAIC scores of subjects with witness of the rescue were significantly higher than those of respondents without such experiences. The regression analysis revealed that directly witnessing the rescue scene was significantly associated with post-traumatic stress symptoms after adjusting for other variables. The results of this study suggest that witnessing the rescue scene following a disaster might be a risk factor for post-traumatic stress symptoms in adolescents in disaster-affected communities.

### 1. Introduction

On April 16, 2014, the Sewol ferry sank off the coast of Jindo Island, South Korea. The ferry capsized with 476 people on board, most of whom were second-year students from Danwon High School. A total of 295 people, including 250 high school students, died, and 9 passengers remain missing. Family members of the missing passengers waited for their return at Paengmok Harbor on Jindo Island, which was the base camp for the search until the government ended the search for missing bodies on November 11, 2014. As the search continued for a long time, the Jindo residents witnessed the overwhelming grief of family members, and heard their wailing when bodies were identified at the harbor.

Students living in the Jindo area were at risk of developing post-traumatic stress symptoms following the Sewol ferry disaster for several reasons. First, most victims of the Sewol ferry disaster were also students. Second, the rescue effort and missing person investigation continued in the Jindo area for several months. Third, family members of the nearly 300 missing passengers waited at the harbor, and the residents of Jindo witnessed their overwhelming grief when bodies were identified. Finally, rescue workers, soldiers, policemen, and members of the media were stationed in the area, which disrupted the work and family lives of residents.

Secondary exposure to traumatic events (e.g., rescue work, witnessing a disaster, exposure through the media) is sufficient for the

development of PTSD in children and adolescents (Nader et al., 1990; Vila et al., 1999; Otto et al., 2007), and the degree of exposure has been identified as a critical contributor to the development of this disorder. Most studies on the effects of indirect trauma on children and adolescents have investigated the influence of media coverage. Young people exposed to a disaster via media have more distorted perceptions of the world, exhibit avoidant behavior, and show PTSD and other anxiety symptoms (Comer et al., 2008; Field, 2007). Additionally, print media, being female, and being an older child are associated with more severe PTSD symptoms (Pfefferbaum et al., 2003; Saylor et al., 2003; Smith and Wilson, 2002). However, less is known about the post-traumatic stress symptoms of children and adolescents who directly witness rescue from locations relatively close to the disaster.

Thus, the primary aims of the present study were to investigate whether the secondary experience of a trauma (witnessing the rescue scene) would contribute to the development of PTSD symptoms. Additionally, the secondary aims of this study were to examine other predictors of PTSD symptoms following a community disaster and to assess the prevalence of PTSD symptoms in a sample of community adolescents who witnessed the rescue scene.

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## 2. Methods

### 2.1. Study design and participants

This cross-sectional survey was conducted on Jindo Island, Korea, the location of the Sewol ferry disaster. The participant pool included all students attending secondary and high schools on Jin-do Island. This survey was approved by the Ministry of Education as well as the principal of each school after a full explanation of the purpose of the study by investigators; the principal of one high school did not agree with the purposes of this survey due to concerns about causing further distress to the students. Thus, the overall selected sample for the present study included 1173 students (550 boys and 623 girls) aged 13–18 years in Grades 7–12 who were drawn from 10 of the 11 schools on Jindo Island. Each student was given a package of self-report questionnaires that included a written explanation of the purpose of the study and informed consent was obtained from all students and parents prior to participation. Data from 1101 (93.9%) students who answered a question about whether they had directly witnessed the rescue scene and who completed the Child Report of Post-traumatic Symptoms (CROPS) were included in the analyses. The study was conducted between May 25 and June 3, 2014, 1–2.5 months after the Sewol ferry accident. During the approximately 2.5 months following the Sewol ferry accident, the bodies of more than 290 of the 304 victims were found in the sunken Sewol ferry and transported to Paengmok Harbor. The Institutional Review Board of Chonnam National University Hospital also approved this study.

### 2.2. Exposure to the rescue scene

Participants were asked the following question regarding whether they directly witnessed distressing scenes at the rescue site: “Did you visit Paengmok Harbor following the Sewol ferry disaster while victims or dead bodies were arriving there and family members of victims were waiting until victims were found?” Additionally, even if they were not directly exposed to the rescue scene, students were asked whether they had witnessed the Sewol ferry disaster via the media (TV and/or Internet). In the present study, those who visited the rescue site were defined as the ‘witness group’ and those who did not were defined as the ‘No witness group’.

### 2.3. Measures

#### 2.3.1. Sociodemographic characteristics

Data on the participants’ sociodemographic characteristics, including gender, age, religion, and level of academic achievement, were obtained.

#### 2.3.2. Post-traumatic stress symptoms

We administered the CROPS, a self-report instrument that uses 26 items to evaluate a broad range of PTSD symptoms in children and adolescents, to identify post-traumatic stress reactions (Greenwald and Rubin, 1999; Strand et al., 2005). A cut-off score of 19 indicates clinically relevant posttraumatic stress symptoms, and the validity and reliability of the Korean version of the CROPS have been well-established (Lee et al., 2011). In this study, Cronbach’s alpha for internal consistency was 0.93.

#### 2.3.3. Depression and anxiety

Depression was measured using the Center for Epidemiological Studies Depression Scale (CES-D) (Orme et al., 1986). The CES-D includes 20 items measuring the frequency with which depressive symptoms were experienced during the past week on four-point Likert-type scale ranging from 0 (*Less than 1 day*) to 3 (*Most or all (5–7) days*). Possible total scores range from 0 to 60, with higher CES-D scores indicate higher levels of depression. The reliability and validity of the

Korean version of the CES-D have been well-established (Cho et al., 1993). In this study, Cronbach’s alpha for internal consistency was 0.87.

The Korean version of the Spielberger State Anxiety Inventory for Children (SAIC), which assesses the level of anxiety before and after a child encounters a stressful situation, was used to measure anxiety (Spielberger, 1972; Choi and Cho, 1990). Items on this instrument are rated on a three-point Likert scale ranging from 1 (*almost never*) to 3 (*almost always*); total scores range from 20 to 60, with higher scores reflecting higher levels of anxiety. In this study, Cronbach’s alpha for internal consistency was 0.91.

### 2.4. Statistical analyses

Between-group comparisons of sociodemographic and clinical characteristics according to the presence of post-traumatic stress symptoms were analyzed using the chi-square test for categorical variables. Independent *t*-tests were used to analyze continuous variables, and to compare the rescue witness and control groups at a clinical level. A stepwise regression analysis was performed to determine the predictors of post-traumatic stress symptoms. SPSS for Windows software (ver. 21.0; SPSS Inc., Chicago, IL, USA) was used for the statistical tests. All statistical tests were two-tailed, and *p*-values < 0.05 were deemed to indicate statistical significance.

## 3. Results

The mean age of the students was  $14.6 \pm 1.6$  years and almost all students (99.6%) who participated in the survey reported watching the Sewol ferry disaster via the media. Table 1 presents students’ sociodemographic and clinical characteristics according to their PTSD status. We found significant differences in the gender, age, academic achievement, and witness status of subjects with and without post-traumatic stress symptoms. Female gender, older adolescents, poor academic achievement, and witnessing the rescue scene were associated with post-traumatic stress symptoms. The CES-D and SAIC scores of subjects with post-traumatic stress symptoms were significantly higher than those of respondents without such symptoms. The mean scores on the CROPS, CES-D, and SAIC in the witness group were significantly higher than no witness group (Fig. 1).

The application of stepwise linear regression analysis revealed four independent variables, including gender, age, academic performance, and witnessing the rescue, to predict PTSD symptoms with total variance explained 5.5% (Table 2). Witness of the rescue, female, older students, and poor academic performance were significant predictor of PTSD symptoms.

## 4. Discussion

The prevalence of traumatic experiences associated with natural and manmade disasters has increased in modern society. Such disasters can lead to mental health problems not only in the victims, but also among the general population of the affected community (Brackbill et al., 2009; Nair et al., 2012). Adolescence, which is a high-risk period for traumatic experiences, involves both increased psychological vulnerability and important developmental stages, including identity consolidation and cognitive development (Shrier et al., 1996). We found that 17.7% of students reported clinical levels of PTSD symptoms and that the prevalence of PTSD symptoms in the subjects who witnessed the rescue scene was 24.5% on the CROPS. The prevalence of PTSD varies widely according to type of disaster, duration of exposure, and ethnicity; thus, our prevalence rate cannot be directly compared with those of other studies using the same instruments. Nonetheless, the prevalence rate of PTSD symptoms in our study was comparable to those of previous studies (5–70%) of children (Shannon et al., 1994), and are also consistent with studies of children who were indirectly exposed to a traumatic event (Hoven et al., 2005; Calderoni et al., 2006;

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