

Correlation Between Psychological Rumination and Symptoms of Traumatic Stress in Patients with Mild Paralysis in Acute Phase of Stroke: A Cross-sectional Study

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Abstract

Background: Research shows that post-traumatic stress symptoms (PTSS) are common in survivors of acute life-threatening illnesses, and rumination is considered to be associated with PTSS. Additionally, post-stroke symptoms of post-traumatic stress disorder (sPTSD) usually manifest as a type of anxiety disorder after a stroke. This study investigated the prevalence of sPTSD and the relationship between PTSS and rumination.

Methods: The participants comprised 29 patients admitted to the Saitama Medical University International Medical Center within one week after experiencing a stroke. The Impact of Event Scale-Revised Japanese version (IES-R-J) and Leuven Adaptation of the Rumination on Sadness Scale Japanese version (LARSS-J) were employed for the evaluation of PTSS, sPTSD, and rumination.

Results: The 29 patients (15 males, mean age: 63 ± 11 years) were classified as follows: 17 patients with cerebral infarction, 10 patients with cerebral hemorrhage, and 2 patients with subarachnoid hemorrhage. The ratio of persons with sPTSD (IES-R-J total score > 25) was 34% (10 patients). A significant positive correlation was found between PTSS and rumination ($r = 0.460, p < 0.05$).

Conclusion: The findings indicated that approximately 30% of acute stroke patients experienced sPTSD, and that the severity of PTSS is related to rumination.

Background

Those who undergo traumatic experiences, such as victims of conflicts, disasters, or abuse, may have post-traumatic stress symptoms (PTSS). Additionally, post-traumatic stress disorder (PTSD) often manifests as a type of anxiety disorder [1]. Traumatic events, such as stroke, can cause distress and often lead to PTSS [2, 3]. PTSS includes symptoms of intrusion, avoidance, and hyperarousal—all of which have been observed in patients with stroke [4]. Research has shown that stroke is one of the factors which causes PTSD [5, 6]. In a meta-analysis of nine studies, the prevalence of PTSD after a stroke was reported to be approximately 28% [7]. However, all studies included in the analysis were conducted one month after the onset of the stroke; thus, the experience of stress in the acute phase immediately following the onset of a stroke is not clear. Based on previous studies, PTSD after a stroke is referred to in this study as sPTSD (post-stroke symptoms of post-traumatic stress disorder) [8]. Previous studies screened patients for PTSD using questionnaire cut-off values, which were not based on clinical considerations or the time elapsed since stroke onset. According to this criterion, existing reports related to the functional outcome of patients with brain injury—with or without PTSD—are based on investigations conducted more than one month after the stroke onset [9, 10]. As there have been no reports of sPTSD in the early post-onset period, the time periods which are critical for developing sPTSD after the onset of a stroke remains unclear. In addition, existing evidence is unclear as to whether or not psychological stress is more common than sPTSD in patients with stroke.

Studies have reported that the quality of life (QOL) of patients with stroke is affected by motor paralysis and disturbances in activities of daily living (ADL) from one month [11] to three months [12] after the onset. In patients who have experienced a stroke and reported experiencing sPTSD more than one month after the onset, such sPTSD may be affected by stroke-related movement disorders, ADL disturbances, and decreased QOL. Therefore, in order to understand the relationship between stroke onset and sPTSD, it is necessary to investigate the sPTSD in patients with acute stroke by removing the effects of dysfunction and ADL disorders as much as possible. If sPTSD is triggered by the onset of a stroke, medical personnel should consider the psychological outcomes in the patient early after the onset. While traumatic events cause negative psychological conditions, such as PTSD, they are also thought to cause post-traumatic growth (PTG) brought on by conflict with trauma [13, 14]. PTG is believed to reduce the negative effects of early post-traumatic injury and contribute to improved well-being in the long term [15]. In addition, a previous study on PTG in patients with chronic stroke showed a negative correlation between the degree of PTG and the severity of depression and anxiety [16]. Furthermore, since PTG is caused by a conflict with a traumatic event, it has been reported that the higher the PTSS and the fear related to the crisis, the higher the degree of PTG [17, 18]. A meta-analysis conducted in 2017 reported a positive correlation between PTSS and PTG [19]. Positive psychological change has also been observed two weeks after the occurrence of a traumatic event [20]. Therefore, it is expected that PTG similarly occurs early after a stroke.

Rumination, which is defined as the repeated consideration of symptoms, causes, meanings, and consequences [21], is considered to be associated with PTSS and depression [22]. A positive correlation between rumination and PTSS severity was reported by Michael et al. [23], and Ehlers and Bryant reported that persons diagnosed with PTSD are more likely to fall into a psychological state of rumination [24]. Therefore, PTSS may be associated with rumination in stroke patients; however, the nature of such relationship remains unclear. If a stroke can have the same effect on patients as a traumatic event, it is speculated that sPTSD may occur early after a stroke, and that PTSS might be a psychological state related to PTG and rumination. The present study focused on clarifying these relationships, considering that the resulting knowledge would aid medical staff's understanding of the psychological aspects of patients with acute stroke and lead to improvements in providing care. Therefore, this study sought to verify two hypotheses: 1) sPTSD occurs at a constant rate in patients with mild motor dysfunction and disturbance of ADL due to the acute phase of stroke, and 2) PTSS severity is related to PTG and rumination.

Methods

This study was a cross-sectional observational study of acute stroke patients. The participating patients were admitted to Saitama Medical University International Medical Center for stroke treatment (cerebral infarction, cerebral hemorrhage, or subarachnoid hemorrhage) and were prescribed occupational therapy. Verbal and written explanations regarding the study were provided to all patients, and their written consent was obtained thereafter. This study was approved by the Saitama Prefectural University Ethics Committee (No. 30525) and the Saitama Medical University International Medical Center Ethics

Committee (No. 18–089). The inclusion criteria were: 1) patients whose current episode was the first onset of stroke; 2) no current illness or history of mental illness, such as depression or anxiety disorder [25]; 3) had the ability to hold a sitting position for 40 minutes or more, in order to answer the study questionnaire; and 4) provided written consent to participate in the research within one week of hospitalization. In order to exclude the effects of motor and cognitive impairments as much as possible, the following exclusion criteria were established: 1) patients with a Mini-Mental State Examination (MMSE) score of less than 24, indicating a cognitive decline which could interfere with their ability to respond to the questionnaire [16]; 2) patients with motor paralysis in one of the four limbs in Brunnstrom recovery stage IV or less; and 3) those with a score below 90 on the Functional Independence Measure (FIM) and in need of ADL assistance.

Measures

sPTSD and PTSS severity

The Impact of Event Scale-Revised Japanese version (IES-R-J) was used to measure sPTSD and PTSS severity [26]. This scale is the Japanese version of the self-administered questionnaire developed by Weiss et al., and its reliability and validity as a screening scale for PTSD have been verified [27]. The IES-R-J consists of 22 items: 8 items on intrusion symptoms, 8 on avoidance symptoms, and 6 on hyperarousal symptoms. The instructions at the beginning of the questionnaire read: “Below is a list of difficulties sometimes faced later in life by people who have experienced highly stressful events. With respect to stroke, in the past one week (including today), for each item, please indicate how distressing each difficulty has been for you by answering the following question: ‘How much did you worry about the following difficulties?’” Each item is rated on a scale from 0 (not at all) to 4 (extremely), with total scores ranging from 0 to 88, and higher scores indicating higher PTSS severity. Studies on the prevalence of sPTSD are classified according to the IES-R cutoff value [1, 28]. Cut-off scores of 25 points or more have been used for auxiliary diagnosis for the screening and clinical interview diagnosis of PTSD and partial PTSD. In this study, a total IES-R-J score of 25 or more was considered to be indicative of sPTSD.

PTG

The Japanese version of the Posttraumatic Growth Inventory (PTGI-J) was used for PTG measurement. The PTGI-J is the Japanese version of the self-contained scale developed to measure positive changes after traumatic life experiences. It has adequate reliability and validity [29], and has also been used in a systematic review of PTG [30]. The PTGI-J consists of 21 items in five categories: interpersonal relationships, new possibilities, personal strength, spiritual change, and philosophy of life. Regarding the psychological growth experienced due to a traumatic event, the participants were asked to indicate, for each of the statements, the extent to which a change had occurred in their way of life as a result of their experience of stroke. Each item is rated on a scale from 0 (*not experienced at all*) to 5 (*experienced quite strongly*), with total scores ranging from 0 to 105, and higher scores indicating higher levels of growth

and awareness. The cutoff values for evaluating the strength of PTG have not been discussed in literature.

Rumination

To measure rumination, the Japanese version of the Leuven Adaptation of the Rumination on Sadness Scale (LARSS-J) was used. The reliability and validity of this scale have been verified [31]. It has also been reported in literature that rumination is associated with depressive symptoms [32]. The LARSS-J consists of 17 items, and respondents have to answer each question preceded by the phrase “When you feel sad or depressed...” on a scale of 1 (*not at all*) to 5 (*a lot*). Total scores range from 17 to 85, and higher scores indicate a higher tendency of rumination. The questions comprise three sub-categories of rumination: cause analysis (5 items), understanding (6 items), and uncontrollability (6 items). There is no cutoff value that indicates the presence or absence of rumination tendency.

Procedure

After obtaining informed consent from the participants, an occupational therapist administered the IES-R-J, the PTGI-J, and the LARSS-J on a one-on-one basis with them. The entire psychological examination took approximately 15 minutes.

Sample size

According to previous findings, correlational analysis has demonstrated a relationship ($r = 0.478$) between PTSS and PTG [33]. In this study, the effect size was set to 0.478, the power was set to 0.8, and the significance level was set to 5% using the software G*Power. As a result, the minimum required sample size was 29.

Analysis

In this analysis, sPTSD prevalence and predisposition in patients in the acute phase of stroke were identified through a total IES-R-J score of 25 or higher. In order to measure the relationships between PTSS severity and PTG and rumination, Spearman’s correlation coefficient was used with the total scores from the IES-R-J, PTGI-J, and LARSS-J. As sub-analyses, the IES-R-J sub-item scores on “intrusion,” “avoidance,” and “hyperarousal,” the PTGI-J total score, and the LARSS-J sub-item scores on “cause analysis,” “understanding,” and “uncontrollability” were analyzed using Spearman’s correlation coefficient. The software IBM SPSS Version 26 was used for statistical analysis, and the significance level was set at 5%.

Results

Participant selection results

Figure 1 displays the results of participant selection. From September 2018 to November 2019, 933 stroke patients were admitted to the research cooperation facility and were prescribed occupational

therapy. 36 patients met the eligibility criteria, but seven patients were excluded based on the exclusion criteria. Finally, a total of 29 patients, comprising 14 females (aged 64 ± 10 years) and 15 males (62 ± 12 years), were included in the study. 10 patients were diagnosed with cerebral hemorrhage, 17 with cerebral infarction, and 2 with subarachnoid hemorrhage (Table 1). Of the 29 patients, 2 had mild consciousness disorder at the onset, but none had loss of consciousness. None of the participants refused or discontinued participation in the study.

Prevalence of sPTSD in patients with acute stroke

The median (interquartile range) score in the IES-R-J was 16 (6–32) points, and the median scores in the subordinate items were: intrusion = 6 (3–12); avoidance = 6 (2–14); and hyperarousal = 3 (1–6) (Table 2). Ten patients had IES-R scores of 25 or above, with a prevalence of 34%.

PTGI-J score

The median PTGI-J score was 46 (34–67), and the average (standard deviation) was 49 (± 19). Nine patients' (31%) scores were over the reported average in stroke patients, 61 (± 25), within two weeks of onset and over six months [34] (Table 2).

LARSS-J score

The median (interquartile range) LARSS-J score was 31 (21–45), and the median scores of the sub-categories were: cause analysis = 10 (6–14); understanding = 11 (7–14); and uncontrollability = 11 (8–15) (Table 2).

Correlation between PTSS severity and PTG and rumination

There was no significant association between the IES-R-J total score and the PTGI-J total score ($r = 0.312$, $p = 0.10$). The total score of IES-R-J was significantly positively correlated with the total score of LARSS-J ($r = 0.460$, $p < 0.05$) (Fig. 2).

The results of the sub-analysis demonstrated that the intrusion score of IES-R-J was significantly positively correlated with the PTGI-J total score ($r = 0.380$, $p < 0.05$), and the LARSS-J cause analysis sub-score ($r = 0.432$, $p < 0.05$), understanding sub-score ($r = 0.428$, $p < 0.05$), and uncontrollability sub-score ($r = 0.603$, $p < 0.01$). The avoidance score of IES-R-J was found to be significantly positively correlated with the uncontrollability score of the LARSS-J ($r = 0.467$, $p < 0.05$). The hyperarousal sub-score of IES-R-J was also found to be significantly positively correlated with the LARSS-J sub-scores of cause analysis ($r = 0.483$, $p < 0.01$), understanding ($r = 0.486$, $p < 0.01$), and uncontrollability ($r = 0.569$, $p < 0.01$) (Table 3, Fig. 2).

Discussion

In this study, a psychological assessment of patients with acute stroke was conducted and the prevalence of sPTSD was measured. The correlations between PTSS severity, PTG, and rumination were

also analyzed. The results revealed that 34% of the participating patients with acute stroke reported having sPTSD during the week-long evaluation period. PTSS severity was positively associated with rumination, but not with PTG. These results suggested that rumination is related to high PTSS severity in patients in the acute phase after stroke. The prevalence of sPTSD among the participants of this study, 34%, is consistent with previous reports (24–31%) which used the IES and the IES-R [5, 25, 29]. A study that used a different scale reported that the prevalence of sPTSD one month after the onset of a stroke was 30%, but it decreased to 23.1% three months later, during follow-up [7]. The participants of these previous studies were assessed 1 to 12 months after stroke onset; however, in the present study, they were assessed within 1 week of onset. The results of this study suggested that patients with acute stroke may experience sPTSD to the same extent as patients one month after the onset. Changes in sPTSD prevalence among patients over time are still unknown. In the present analysis, factors such as motor paralysis, cognitive decline, and ADL disturbances were controlled. In previous studies, however, the effects of these confounding factors were not controlled [2, 3, 5, 6]. Thus, the prevalence of sPTSD in the present findings suggested that it may be due to the stroke itself, rather than the consequences of the onset. The median PTGI-J score in patients with acute stroke was 46, with a mean of 49. According to previous studies on post-stroke PTG, the average PTGI value was 51–61 within two weeks after the stroke onset and thereafter [16, 34–36]. Although the scores of the present study's participants were slightly lower than those of previous studies, the findings suggested that the same degree of PTG occurred in patients with acute stroke within one week of the onset. Higher PTGI scores were reported in patients with traumatic brain injury [37] and breast cancer [38] for whom a longer time period had elapsed from the onset than those with a shorter time period. The PTGI scores of the patients in this study may also change over time, so a longitudinal study is needed to understand this factor.

There was no correlation between PTSS severity and PTG in this study. This finding was inconsistent with the findings of studies conducted after other traumatic events using the total scores of IES-R and PTGI, such as natural disasters [39], trauma [40], conflict [41], or disease [42]. The results of a systematic review of PTSS and PTG indicated that the relationship between PTSS and PTG differed depending on the type of trauma experienced and the time of evaluation [19]. The participants of this study and those of previous studies experienced different types of trauma and had different evaluation times, which may have influenced the results. These findings suggested that patients with mild acute stroke differed from the participants of other existing studies in the context of other traumatic events. In this study, a significant correlation was found between the intrusion score of IES-R-J and the total score of PTGI-J. In a previous study among adults who had been abused during childhood, there was no significant correlation between the total score of IES-R and the total score of PTGI [43]. Similarly, it has been reported that the intrusion score and hyperarousal score of IES-R have a significant correlation with the total score of PTGI. It is suggested that some types of stress may be related to PTG.

Regarding the relationship between PTSS severity and rumination, there was a positive correlation between the IES-R score and the LARSS score in the present study. These results were consistent with the findings in children and adults who had experienced an earthquake [44], as well as adults who had experienced various traumatic events [45], although the scales used were different. These data suggested

that the psychological state of patients with acute stroke may be related to PTSS severity and rumination, as in other trauma victims. Rumination has been well-known as a predictor of PTSS severity [46, 47]. Michael et al. reported that rumination three months after trauma is a predictor of PTSS severity at six months after trauma [23]. Therefore, stroke patients with rumination in the early stages after a stroke may have high PTSS severity even after a significant lapse of time.

Limitations

This study has certain limitations. First, it was aimed at patients with acute stroke, and did not investigate other diseases (e.g. trauma, heart disease) as a control group when comparing sPTSD and PTSS. No comparative verification has been made due to the differences in diseases. Whether these results are only characteristic of patients with acute stroke should be investigated and verified during the acute phase of other diseases. Second, since the investigation period for this study was different from that of previous studies with patients with stroke, the study period may have affected the results. In order to verify the influence of the study period, it is necessary to adopt a longitudinal study design and conduct a further survey. Third, the IES-R and the PTGI were used to assess factors related to the stroke onset, while LARSS was used to investigate mental states when feeling sad. There may be similarities between the IES-R intrusion items and the LARSS uncontrollability items. Therefore, it is possible that the participants were unable to correctly distinguish between “owing to the stroke” and “when I felt sad.” Finally, considering that patients with PTSD were more ruminative, the relationship between PTSS severity and PTG and rumination may differ depending on the presence or absence of sPTSD. For stratified analysis based on the presence or absence of sPTSD, the sample size should be increased to enable groupings, and the psychological relationships should be verified.

Conclusions

The results of this study show that sPTSD was present in approximately 30% of the patients with mild acute stroke within one week of onset. The severity of PTSS in patients with mild acute stroke had no correlation with PTG, but it was suggested that the severity of PTSS was positively correlated with rumination. Approximately 30% of the patients with mild acute stroke also experience sPTSD, so attention should be paid to the psychological status of the patients with stroke during early rehabilitation.

Declarations

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was approved by the Saitama Prefectural University Ethics Committee (No. 30525) and the Saitama Medical University International Medical Center Ethics Committee (No. 18-089).

Consent for publication

Not applicable.

Availability of data and materials

Subject data, except for personal information, will be provided in excel files upon researcher's request with the approval of the Ethics Committee. If a researcher wants to use the data, request should be made by e-mail to the corresponding author.

Competing Interests

The authors declare that they have no competing interests.

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Authors' contributions

Authors' contributions: TO and HT designed the study and wrote the initial draft of the manuscript. KK, HK, MS, TT, TI, and SM contributed to analysis and interpretation of data and assisted in the preparation of the manuscript. All other authors contributed to data collection and interpretation, and critically reviewed the manuscript. All authors approved the final version of the manuscript and agree to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Abbreviations

IES-R: Impact of Event Scale-Revised

IES-R-J: Impact of Event Scale-Revised Japanese

LARSS-J: Leuven Adaptation of the Rumination on Sadness Scale Japanese version

PTG: Post Traumatic Growth

PTGI-J: Japanese version of the Posttraumatic Growth Inventory

PTSD: post-traumatic stress disorder

PTSS: post-traumatic stress symptoms

sPTSD: post-stroke symptoms of post-traumatic stress disorder.

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Tables

Due to technical limitations, tables 1-3 are only available as downloads in the supplemental files section.

Figures

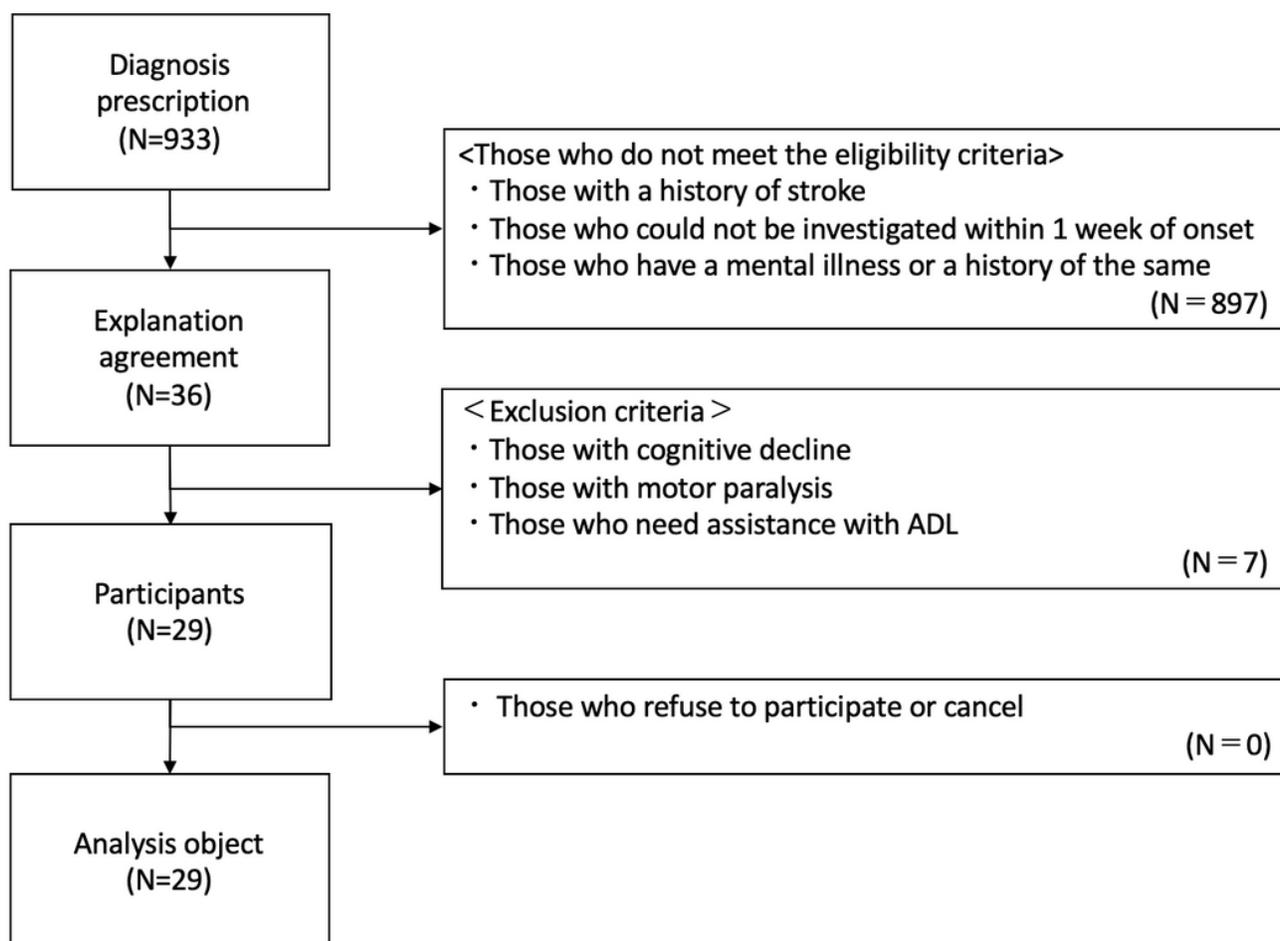


Figure 1

Search strategy flowchart.

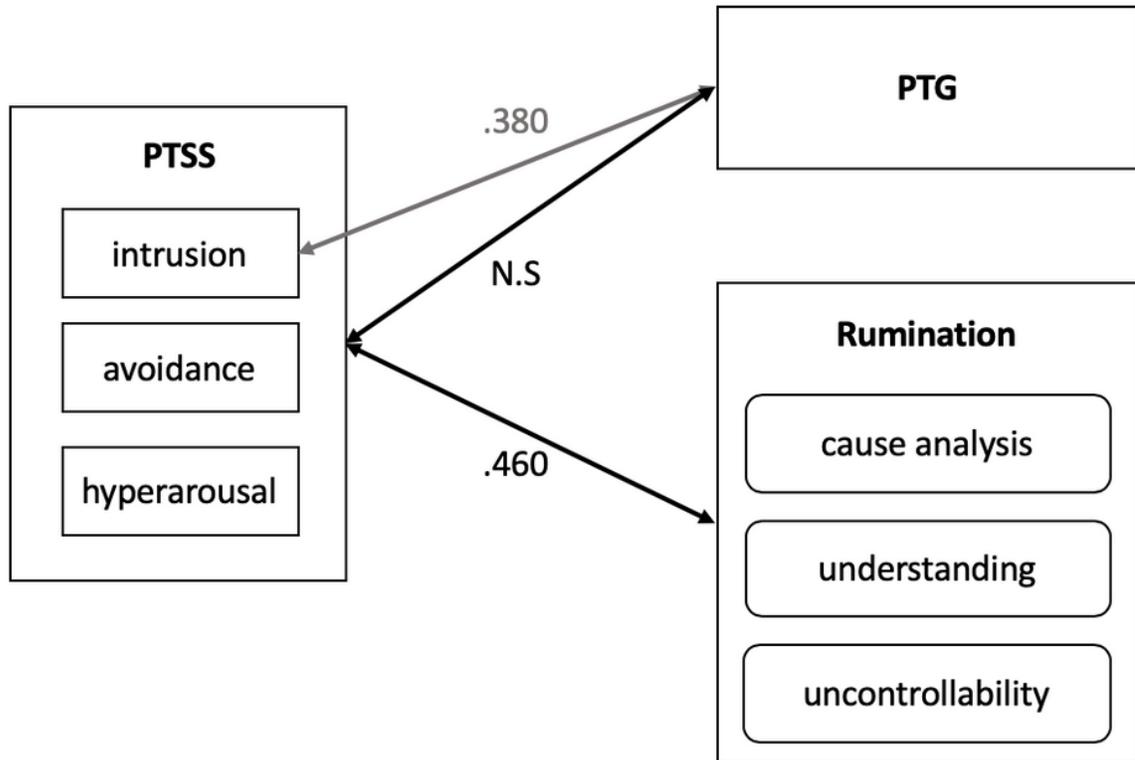


Figure 2

Correlations between psychological status of post-traumatic stress and ruminative behaviors among acute phase stroke patients. PTSS, scores of the Impact of Event Scale-Revised Japanese version; PTG, scores of the Japanese version of the Post-traumatic Growth Inventory; Rumination, scores of Leuven Adaptation of the Rumination on Sadness Scale Japanese version.

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