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The Effectiveness of Familiar Auditory Sensory Training (FAST) in Increasing Consciousness Levels among Stroke Patients

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Abstract

Stroke is a leading cause of death worldwide, along with myocardial infarction and cancer. Stroke often results in loss of consciousness and neurological deficits that affect sensory perception. To support recovery, non-pharmacological therapies like auditory sensory stimulation are crucial. Familiar Auditory Sensory Training (FAST) is one such intervention. This study assessed the effectiveness of FAST in improving consciousness levels in stroke patients using a one-group pretest-posttest design. It involved 35 stroke patients aged 35-75, who were selected through purposive sampling and underwent three FAST sessions. Consciousness levels were measured using the Glasgow Coma Scale (GCS) before and after the intervention. Data analysis with the Wilcoxon rank test at a=0.05 revealed a significant increase in consciousness from a mean of 6.77 to 10.83 post-intervention (p=0.001), demonstrating FAST's effectiveness in enhancing consciousness in ICU stroke patients.

Keywords: *Strokes, Familiar Auditory Sensory Training (FAST), Consciousness Level*

INTRODUCTION

Stroke can cause patients to experience decreased consciousness (Sedova *et al.*, 2021). In this case, there are two possibilities, namely post-stroke with disability or death. Approximately 70% of stroke incidents and 87% of disability and death due to stroke occur in low and middle-income countries. According to data from the World Stroke Organization, every year there are 13.7 new cases of stroke and around 5,5 million deaths due to stroke (Feigin *et al.*, 2022).

Based on the results of the non-communicable disease cohort study conducted by the Ministry of Health of the Republic of Indonesia (2023), the main cause of mortality (Underlying Cause of Death) is dominated by cerebrovascular disease, namely stroke. From the Indonesian Health Survey data, cases of death were found stroke is 20.2%, this event is related to hypertension (Indonesian Ministry of Health, 2024).

According to the Indonesian Stroke Foundation, in the last ten years there has been an increase in the number of stroke sufferers. Basic health research in 2018 shows that the prevalence of stroke increases every year, namely 2,137,941 people in Indonesia and 190,449 people in West Java (Indonesian Ministry of Health, 2019).

The condition of a stroke patient with decreased consciousness will require the patient to be treated in a special room with an environment that limits sensory exposure (Campbell and Khatri, 2020). This condition will have an impact on reducing sensory stimulation leading to an increase in the activation threshold of the reticular

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activating system which can inhibit stimulation of the hypothalamus and loss of ability to induce normal levels of brain activation (Boehme, Esenwa and Elkind, 2017). Thus, stroke patients who experience decreased consciousness require non-pharmacological therapy as additional therapy to support the healing process, one of the non-pharmacological interventions is auditory sensory stimulation in the form of Familiar Auditory Sensory Training (FAST).

This application is supported by previous research that the provision of Familiar Auditory Sensory Training therapy is effective for improving awareness status or GCS scores in head injury patients. FAST given 3 times a day for 10 minutes and carried out 2 hours apart for three consecutive days showed significantly higher GCS values (Vanoni, Salmani and Jouzi, 2022). Previous research conducted by Sandra *et al.* (2021) shows that providing therapeutic methods of sensory stimulation will stimulate the reticular activation system in the brain and facilitate the reorganization of brain activity through the creation of new neural connections (Sandra, Daniati and Harni, 2021). Research by Aripratiwi *et al.* (2020) also explains that the FAST intervention does not have a bad effect on participants' brain activity because it is non-invasive, auditory stimulation can increase brain activity without causing significant side effects. When the patient listens to auditory stimulation/Familiar Auditory Sensory Training (FAST), the waves will be transmitted through the ossicles in the middle ear and travel to the auditory nerve through the cochlear fluid after which it will stimulate the release of endorphin hormones which will relax the body. The resulting effect is reducing the stimulus of the sympathetic nervous system, reducing neuromuscular tension and increasing the threshold of consciousness, which can usually be seen from HR, RR, and a decrease in blood pressure (Aripratiwi, Sutawardana and Hakam, 2020).

The application of FAST to stroke patients can be carried out by nurses as a non-pharmacological action while providing services in the hospital. Nurses can also empower the immediate family, especially those close to the patient, regarding the implementation of FAST to actively participate in supporting patient awareness. Several studies have revealed that decreased consciousness is a reflection of the condition of most critical patients in the ICU and one of the recommended actions to overcome this problem is reorientation through the voice of the family (Rosbergen *et al.*, 2017).

Research Objectives

General Objectives

To determine the effectiveness of Familiar Auditory Sensory Training (FAST) in increasing stroke patients' consciousness level.

Specific objectives

To determine the characteristics of the patients based on age, gender, stroke duration, stroke event history, and types of strokes.

To detect the average level of consciousness of stroke patients before Familiar Auditory Sensory Training (FAST)

To determine the average level of consciousness of stroke patients after Familiar Auditory Sensory Training (FAST)

To determine the effectiveness of Familiar Auditory Sensory Training (FAST) on stroke patients' consciousness level

Theoretical Framework

The level of consciousness framework (Pisula, 2016) was utilized in this study. This framework focuses from the level of arousal/alertness, through the continuum of content complexity, we are presented with degrees of consciousness on a continuum, resulting in the level of its organization (form). Inevitably, in our thinking of consciousness we move away from treating it as a perfect continuum, and towards defining states and levels of consciousness. The following 3 theories use this framework.

Levels of Consciousness—Step I: According to Morgan approach, consciousness is an evolutionary phenomenon emerging from more basic phenomena (lower levels), which he calls infra-consciousness.

Levels of Consciousness—Step II: The usefulness of the integrative levels approach is in the ability to generate theoretical hypotheses founded on a hierarchical structure and enabling us to incorporate their verification into the overall investigation of a particular phenomenon. And yet, this approach appears not to have been effectively applied to the study of other psychological phenomena, including consciousness.

Levels of Consciousness—Step III—Proposed Model of Consciousness within the Integrative Levels Framework. Current theories of consciousness often refer to the concept of levels who attempts to combine a number of theoretical approaches to the study of consciousness. The approaches differ in the number and content of identified levels of consciousness, however, their outer limits are the same. The lowest level is nonconsciousness, which is characterized by a complete lack of the ability to be in touch with the world around. The other extreme is usually self-awareness and meta-consciousness—a term describing the state where the subject has available the information that he is a distinct subject experiencing reality (self-awareness) and that there are other individuals who possess a similar ability (meta-consciousness). The intermediary levels will be the subject of further analysis.

Significance of the Study

This research aims to assess the effectiveness of Familiar Auditory Sensory Training (FAST) in increasing consciousness level among stroke patients. The study's findings suggest that proper implementation of this intervention can significantly enhance the quality of life for stroke patients and benefit the broader community.

The findings will be valuable in providing specialized training for patients' immediate families and health workers, especially nurses. The procedure for implementing FAST is easy and cheap. Can be done by a nurse or by involving the patient's family. Therefore allowing them to provide familiar auditory stimulation training to more stroke patients.

Ultimately, this research will implementation of FAST provides positive hope for patients and their families who are in the ICU room, thereby contributing to the overall well-being and quality of life of stroke patients.

Related Literature & Studies

Epidemiology of Stroke

Incidence of stroke is higher in older women (>50% higher incidence compared to men aged 75 years or older), the less educated population, and some racial or ethnic groups (for example, 1.91 per 1,000 in the Black population vs 0.88 per 1,000 in the White population). Conventional projections show that by 2030, an additional 3.4 million US adults, representing 3.9% of the adult population, would have had a stroke and absolute stroke mortality would increase by ≈50%, which is ≈64,000 additional stroke deaths per year compared to 2012. These values are higher in middle- or lower-income countries. Over the past decade in India, the cumulative incidence of stroke ranged from 105 to 152 per 100,000 persons per year, and the crude prevalence of strokes ranged from 44.3 to 559 per 100,000 persons in different parts of the country. A population-based study in Tianjin, China, from 1992 to 2014 showed that the age-standardized first-ever stroke incidence was 297 per 100,000 persons, which significantly increased across sex and strokes subtypes: increase of 6.3% overall, 5.5% for men and 7.9% for women, 4.6% for HS, and 7.3% for IS (Saini, Guada and Yavagal, 2021).

Stroke is a major public health issue in Indonesia, with a rising prevalence driven by an aging population and increasing risk factors such as hypertension, diabetes, and obesity. The Indonesian Basic Health Research (RISKESDAS) 2018 reported a prevalence of approximately 10.9 per 1,000 people. Stroke incidence is higher in older adults and more common in males. Urban areas show higher rates compared to rural regions due to lifestyle differences and access to healthcare. Stroke is a leading cause of death and long-term disability in the country, despite government efforts to improve stroke care through the development of stroke centers and public awareness campaigns. Challenges remain, particularly in ensuring equitable access to healthcare and rehabilitation services across all regions.

Consciousness Level

Risk Factors for Consciousness Level

The risk factors of An altered level of consciousness (ALOC) include a history of hypertension, diabetes, epilepsy, chronic renal disease (CRD), chronic liver disease (CLD), and chronic obstructive pulmonary disease (COPD) (Ali and Mohamud, 2022).

The predisposing factors of ALOC include hypertension, diabetes, hypercholesterolemia, and chronic organ failure. The causes of ALOC were sub-divided into two categories: traumatic (such as a brain injury) and non-traumatic (such as neurological disorders, metabolic diseases, diffuse physiological malfunction of the brain (such as epilepsy or drugs), and psychiatric or functional disorders) (Cooksley, Rose and Holland, 2018).

Assessment of Consciousness Level

The Glasgow Coma Scale (GCS) is the most common scoring system used to describe the level of consciousness in a person following a traumatic brain injury. It is used to help gauge the severity of an acute brain injury. The test is simple, reliable, and correlates well with outcomes following severe brain injury.

The GCS is a reliable and objective way of recording the initial and subsequent level of consciousness in a person after a brain injury. It is used by trained staff at the site of an injury like a car crash or sports injury, for example, and in the emergency department and intensive care units. The GCS measures the following functions: Eye Opening (E), Verbal Response (V), and Motor Response (M).

Assessment of a patient's level of consciousness with the GCS provides an index of the likelihood of intracranial complications before further deterioration occurs. The tool we use to assess the level of consciousness is the Glasgow Coma Scale (GCS). This tool is used at the bedside in conjunction with other clinical observations and it allows us to have a baseline and ongoing measurement of the level of consciousness (LOC) for our patients. The GCS has been in use in clinical practice for approximately forty years and is used universally around the world.

Using a universal assessment tool allows clinicians to quantify LOC of people in our care and produces a shared understanding of patients' conditions (Brennan *et al.*, 2024). For patients with a traumatic brain injury or other acute brain impairment (such as stroke, infective cerebritis, or toxic encephalopathy), assessment of their clinical condition, and how it may change, is fundamental to their care. For almost 50 years, the Glasgow Coma Scale (GCS) has been used worldwide to assess a patient's responsiveness, or level of consciousness, in acute brain impairment. When using the GCS, the response of a patient is documented in three components: eyes, verbal, and motor. Each of these components is assessed simultaneously. Over time, lessons learnt have prompted developments to support and extend the usefulness of the GCS (Amirtharaj, Lazarus and Alzaabi, 2022).

Evaluation of Consciousness Level

Accurate evaluation of patients with disorders of consciousness (DoC) is crucial for personalized treatment. However, misdiagnosis remains a serious issue. Neuroimaging methods could observe the conscious activity in patients who have no evidence of consciousness in behavior, and provide objective and quantitative indexes to assist doctors in their diagnosis (Wang *et al.*, 2023).

Treatment for Consciousness Level

Treatments for patients with disorders of consciousness (DoC) are currently limited. The cornerstone of therapy is early intensive neurorehabilitation combining physical, occupational, speech/language, and neuropsychological therapy, which appear to improve long-term functional recovery (Edlow *et al.*, 2021).

Pharmacologic stimulant therapies are also used throughout the rehabilitation process to promote recovery of consciousness. Treatment selection has been guided by the observation that multiple neurotransmitter systems contribute to human consciousness and are disrupted by brain injury.

Electromagnetic Therapies with direct electrical stimulation of the human CNS began with the nineteenth century investigations of Vilensky, *et al.* (2002) and have evolved into advanced techniques, such as deep brain stimulation (DBS), which is now in routine clinical use for a range of condition. To improve arousal and awareness, direct CNS stimulation has been applied to a variety of targets in patients with prolonged DoC, including the cervical spine, midbrain reticular formation, the pallidum, nucleus accumbens, and the central thalamus.

Mechanical Therapies: Transcranial Focused Ultrasound: State of the Science. The ability to focus low-intensity, subthreshold ultrasound toward subcortical targets allows ultrasound modulation to be conducted through an intact skull and scalp, permitting noninvasive stimulation. Low-intensity focused ultrasound pulsation (LIFUP) relies on direct mechanical effects on tissue rather than chemical or electromagnetic mechanisms. In preclinical studies, focused ultrasound has been used in rodents to ameliorate the effects of anesthesia and brain injury. A first-in-human study of LIFUP thalamic stimulation reported behavioral improvement in a single patient with acute posttraumatic DoC. However, because the therapy was delivered only 19 days after injury, there is potential confounding by spontaneous recovery. A recent LIFUP study in three patients with chronic DoC provided further proof-of-principle evidence for its therapeutic potential, with two patients showing new behavioral responses after therapeutic stimulation. Adverse events of LIFUP are still being investigated but potentially include the modulation of unintended targets and physical discomfort from the device during stimulation (Camelo, 2022).

Sensory Therapies: Tactile and Auditory Stimulation: State of the Science. Sensory stimulation therapies have been administered to patients with DoC for decades in rehabilitation settings. They may be administered through any sensory modality, with tactile and auditory stimuli being the most common. The mechanistic rationale for this class of therapies is that environmental stimulation may enhance neural processing, support neuroplasticity, and thus promote reemergence of consciousness. Sensory stimulation is postulated to reengage dormant subcortical networks that modulate arousal, resulting in reactivation of cortical networks that mediate awareness. Auditory stimulation is targeted toward activating auditory and language networks, as has been demonstrated in small placebo-controlled studies. Music therapy aims to optimize the therapeutic impact of sensory stimulation by providing a live or recorded music stimulus, preferably performed in a personalized way by a music therapist, to activate neural networks that mediate attention, emotion, auditory processing, and self-awareness. A recent meta-analysis suggested that music therapy may improve functional outcomes in patients with DoC (Edlow *et al.*, 2021).

METHODOLOGY

This study applies the Familiar Auditory Sensory Training (FAST) in increasing consciousness level of stroke patients in the ICU Room using a pre-experimental one-group pretest-posttest design. This design is useful for initial assessments of interventions but has limitations in establishing causal relationships due to potential confounding variables and the absence of a control group for comparison. The researchers conducted preliminary assessments of the Familiar Auditory Sensory Training (FAST) intervention before investing in more rigorous experimental designs. Further, this design is used to explore the potential effects of the intervention, providing data that can justify more controlled experimental studies in the future.

Study Population and Sampling Technique

The study concentrated on stroke patients with reduced consciousness, utilizing purposive sampling with 35 participants. Inclusion criteria were: patient consent from their family, age between 35-75 years, a Glasgow Coma Scale (GCS) score of 3-14, a companion who was at least 18 years old, and a member of the patient's immediate family. Exclusion criteria included: discharge of blood or pus from the ears or nose, recent surgical procedures such as craniotomy or ventriculoperitoneal shunt, nosocomial infections, hearing loss, use of a ventilator, and opioid medication.

Ethical Considerations

The research proposal has been reviewed and approved by the Research Ethics Committee of Wijaya Husada Institute for research involving human subjects. Participation in this study is entirely voluntary, and respondents will not receive any monetary compensation. Participants have the right to refuse or withdraw from the study at any time without affecting their compensation or employment. To safeguard participant privacy, all data is stored securely in a cloud-based Gmail account and is accessible only to the researchers involved. Confidentiality and anonymity were upheld throughout the research process, with participant information coded to protect privacy. Additionally, no personal names or identifiable data were included in the final research report.

Site of the Study

This research was conducted in the ICU Room, of the Indonesian Red Cross Hospital of Bogor City, West Java, Indonesia. This hospital was chosen as a research location because there were appropriate criteria for research samples and it was accessible to researchers.

Research Instrument

The instruments in this study used an observation results sheet to record the GCS values measured by the researcher, a recorder or phone cellular and earphones were used to listen to the recording results to the patient as well as a FAST sheet. GCS or Glasgow Coma Scale is an instrument used to quantitatively assess the level of consciousness which consists of three assessment components, namely eye, verbal and motor responses with the lowest score being 3 and the highest being 15.

Validation of Instrument

The validity of the Glasgow Coma Scale comes under fire because a lot of hospitals administer the test while patients have been sedated, often underestimating patient scores (Marion and Carlier, 1994). It's also difficult to elicit accurate scores when patients are intubated. Recent research has refuted that intubation elicits significantly different survival rates with the verbal score of $r = 0.90$ and the total score of $r = 0.97$. The motor score is consistently the most predictive component of the GCS (Meredith *et al.*, 1998).

The inter-rater reliability of the total Glasgow Coma Scale is $p = 0.86$. Some research has subdivided the inter-rater reliability for each subscale. For the eye score the inter-rater reliability is $p = 0.76$, the verbal score is $p = 0.67$, and the motor score is $p=0.81$. The research for test-retest reliability is not recent and should be updated, however, the best available evidence is $k = 0.66$ - 0.77 (Haldar *et al.*, 2020).

Based on a recent systematic review, the total score is typically less reliable than the individual components with a total Kappa value of 77% as compared to the eye, motor, and verbal scores which had Kappa values of 89%, 94%, and 88% respectively (Reith *et al.*, 2017).

The Glasgow Coma Scale (GCS) classifies traumatic brain injury (TBI) severity as follows: Mild TBI is indicated by a GCS score of 13-15, where patients are awake, may experience confusion, but can follow directions and communicate. Moderate TBI is associated with a GCS score of 9-12, with patients typically drowsy or obtunded, able to open their eyes and localize painful stimuli. Severe TBI, with a GCS score of 3-8, involves patients who are comatose or severely impaired, unable to follow directions, and may exhibit abnormal posturing, such as decerebrate or decorticate posturing.

Data Collection Process

FAST is administered three times daily over three consecutive days and involves close family members of patients with decreased consciousness. The therapy consists of three sessions: the first session (1 minute) addresses the onset of the patient's loss of consciousness, noting the time and place of the stroke; the second session (4 minutes) involves reminiscing about happy memories with the patient; and the third session (5 minutes) focuses on what family members will do upon the patient's recovery and offers encouragement. Family members are instructed to use the same encouraging words recorded during each session. Each FAST intervention begins with a 5-minute assessment of consciousness using the Glasgow Coma Scale (GCS), followed by a 10-minute FAST session and a 2-hour break before proceeding to the next session. This cycle is repeated until the final session, with a post-test conducted on the third day to evaluate consciousness levels using the GCS observation sheet.

Data Analysis

Descriptive statistics, including frequency and percentage, were utilized to outline sample characteristics based on age, gender, stroke duration, stroke event history, and stroke type. The mean consciousness levels before and after the Familiar Auditory Sensory Training intervention were assessed. To determine the difference between pre-test and post-test consciousness levels, a Wilcoxon rank test was employed, with a significance level set at $p < 0.05$ and a confidence level of 95%.

RESULTS

Table 1 presents patient characteristics by age: 16 patients were aged 50-60 years, representing 45.7%; 14 respondents were aged 61-70 years, making up 40%; and 5 patients were aged 71-80 years, accounting for 14.3%. Regarding gender, there were more women than men, with 21 female patients (60%) and 14 male patients (40%). In terms of stroke duration, 20 patients (57.1%) had experienced a stroke for less than 5 years, while 15 patients (42.9%) had suffered a stroke for more than 5 years. The majority of stroke events were first attacks, with 26 patients (74.3%), compared to 9 patients (25.7%) who experienced subsequent attacks. All patients were classified as having hemorrhagic stroke.

Table 1: Distribution of Patients Characteristics

Patients Characteristics	Frequency	Percentage (%)
Age		
50-60 years	16	45,7
61-70 years old	14	40.0
71-80 years old	5	14.3
Gender		
Man	14	40
Woman	21	60
Stroke Duration		
< 5 years	20	57.1
> 5 years	15	42.9
Stroke Even History		
First	26	74.3
Reccurent Stroke	9	25.7
Types of Strokes		
Hemorrhagic	35	100
Non Hemorrhagic	0	0

Table 2 reveals that the average level of consciousness before the FAST intervention was 6.77, with a minimum of 3 and a maximum of 12, and a standard deviation (SD) of 2.276. Following the Familiar Auditory Sensory Training (FAST) intervention, the average score increased to 10.83, with a minimum score of 6 a maximum score of 14, and a standard deviation of 1.978. The average change in score was 0.298. Statistical analysis yielded a p-value of 0.001 ($p<0.05$), indicating a significant improvement in the level of consciousness after the FAST intervention in stroke patients with decreased consciousness in the ICU.

Table 2: Difference in Mean of Consciousness Level Before and After Administration Familiar Auditory Sensory Training (FAST)

Consciousness Level	n	*mean*	*Min-Max*	*Standard Deviation (SD)*	*P value*
Pretest	35	6.77	3-12	2.276	0.001
Posttest	35	10.83	6-14	1.978	

DISCUSSION

Patients Characteristics

The research results indicated that most patients were aged 50-60 years, with 16 respondents (45.7%) falling into this range. Stroke incidence increases significantly after age 45 (Edzie *et al.*, 2021). In elderly individuals, stroke is often linked to atherosclerosis, which impairs blood flow in the vessels, a condition exacerbated by hypertension (Guo, Liu and Wang, 2022). As people age, a decline in neurological function can make them more susceptible to stroke (Vynckier *et al.,* 2021).

The research results showed that there were more female respondents than male. The results of research conducted by Rexrode *et al.* (2022) showed that the incidence of stroke increases in women who have experienced menopause. Before menopause, women are protected by the hormone estrogen which plays a role in increasing HDL, where HDL plays an important role in preventing the atherosclerosis process (Rexrode *et al.,* 2022).

The study results revealed that 20 patients, accounting for 57.1%, had experienced a stroke for less than 5 years, while 15 respondents, or 42.9%, had suffered a stroke for more than 5 years. According to Yang *et al.*, the duration of a stroke impacts a person's ability to adapt to their physical condition, as recovery can be prolonged, and recurrent strokes are common. The longer the duration and the more complications present, the higher the risk of depression among stroke patients (Yang *et al.,* 2021).

The data on stroke event history revealed that the majority of patients, 26 (74.3%), experienced their first stroke, while 9 patients (25.7%) had a stroke after the initial event. These findings align with a study in Saudi Arabia, which reported that 1,249 patients had experienced a first stroke (Alhazzani *et al.,* 2021). Stroke carries a high risk of mortality, with treatment outcomes heavily dependent on the speed and accuracy of initial care, known as the "golden time." Effective treatment within approximately 3 hours of the stroke significantly improves outcomes. Delayed treatment increases the extent of brain infarction, worsening the stroke's severity and reducing the patient's life expectancy (Mianoki, Setyopranoto and Was'an, 2019).

The research conducted in the ICU of PMI Hospital Bogor City found that all patients had hemorrhagic strokes. Globally, hemorrhagic stroke has a prevalence of 34%, often linked to hypertension, diabetes mellitus, dyslipidemia, and smoking (Sahto, Shahzad and -, 2019). Belau *et al.* (2023) reported a 15% incidence rate of hemorrhagic stroke, with a mortality rate 2 to 6 times higher than that of ischemic stroke. Subarachnoid hemorrhage in hemorrhagic stroke can lead to coma and death due to the weakening of brain blood vessel walls and the formation of brain aneurysms (Che *et al.,* 2020).

The data underscores the prevalence of hemorrhagic stroke among ICU patients and highlights the significant impact of age, stroke duration, and prior stroke events on patient outcomes. The effectiveness of the FAST intervention in improving consciousness levels further emphasizes the need for timely and targeted therapeutic strategies. Understanding these factors is crucial for developing comprehensive treatment plans and improving patient care and recovery outcomes.

Differences in Pretest and Posttest GCS Scores

The GCS scores for stroke patients with decreased consciousness showed an average score of 6.77 before the intervention and 10.83 after it. The Wilcoxon statistical test revealed a significant result with a p-value of 0.001 ($p < 0.05$), indicating a notable change between the pretest and post-test GCS scores. This change is attributed to the auditory mechanism, where auditory stimulation activates the brainstem. The medial geniculate nucleus of the thalamus processes and directs these signals to the cortex, particularly the left and right temporalis regions. The auditory cortex (temporal lobe) then perceives and integrates these sounds into meaningful patterns (Gebreyohanns, 2015).

Decreased consciousness results from an imbalance in perfusion and ventilation, leading to insufficient oxygen transfer to the brain and impacting consciousness levels (Silbernagl, 2019). After the FAST intervention, the GCS scores improved because pain stimulation applied to the xiphoid process led to a gradual increase in motor scores by 1-2 points. Initially, respondents could only exhibit abnormal flexion or extension movements, but they eventually began to attempt to reach the pain stimulus, even if they could not fully reach it. Additionally, some respondents showed improved eye responses, where initially their eyes only reacted to pain. Over time, they began to open their eyes in response to their names being called or commands to open their eyes, though not fully (Rasid *et al.*, 2023).

Research by Ananth *et al.* (2023) indicates that a GCS score below 8 is associated with a higher risk of death (Ananth *et al.*, 2023). A lower GCS score reflects more severe stroke conditions, often due to blood vessel rupture, which can lead to increased intracranial pressure (Anand, Shahid and Shameel, 2024).

The data emphasizes the critical role of GCS scores in assessing stroke severity and predicting outcomes. Lower GCS scores correlate with higher mortality risk and more severe brain damage, primarily due to increased intracranial pressure from blood vessel rupture. The FAST intervention has shown promise in improving consciousness levels in stroke patients, suggesting that auditory stimulation can be a valuable tool in stroke management. Understanding these dynamics helps in developing targeted treatment strategies and improving patient care.

The Effectiveness of FAST on Level Consciousness of Stroke Patients

The test results for the difference between pretest and post-test GCS scores yielded a p-value of 0.001 ($p < 0.05$), indicating a significant change in the average GCS scores. This suggests that the FAST intervention had a notable impact on improving the GCS scores of stroke patients with decreased consciousness.

When a patient is exposed to auditory stimulation through FAST, sound waves pass through the ossicles in the middle ear and travel to the auditory nerve via the cochlear fluid. This process triggers the release of endorphins, which promote relaxation. As a result, the sympathetic nervous system's activity is reduced, neuromuscular tension decreases, and the threshold of consciousness is elevated. These effects can be monitored through changes in Heart Rate, Respiratory Rate, and Blood Pressure. Additionally, the stimulation from music or sound waves can activate dopamine, which is known to enhance alertness physiologically (Gebreyohanns, 2015).

FAST induces a calming effect by stimulating the release of opioids (such as morphine) and serotonin, leading to physiological changes that reduce tension in the autonomic nervous system. This increased dopamine release activates the reticular activating system, enhancing the patient's awareness of their surroundings. Lowering blood pressure helps prevent recurrent brain bleeding, as hypertension can contribute to cerebrovascular hemorrhage. Additionally, sound stimulation like FAST can influence the physiological system by activating the cerebral hemispheres, providing a calming effect, engaging the limbic system, and preventing vasospasm, which improves blood perfusion. It also offers emotional engagement for patients who are unable to communicate verbally, affecting physical, psychological, spiritual, and social levels of awareness (Bender Pape *et al.*, 2020).

FAST can serve as a cost-effective, non-pharmacological alternative for aiding consciousness recovery in stroke patients (Aripratiwi, Sutawardana and Hakam, 2020). The procedure is straightforward and inexpensive, and it can be administered by nurses or with the involvement of the patient's family.

The data demonstrate that FAST significantly improves GCS scores by leveraging auditory stimulation to enhance consciousness. This non-pharmacological intervention effectively reduces autonomic nervous system tension, engages emotional and physiological systems, and offers a practical solution for stroke recovery.

CONCLUSION

The study findings demonstrate that Familiar Auditory Sensory Training (FAST) effectively enhances the level of consciousness in stroke patients. To maximize the benefits of FAST, it is crucial to provide specialized training for the patient's immediate family and healthcare professionals, particularly nurses. This training will enable more personnel to administer FAST, addressing the issue of decreased consciousness in stroke patients and helping to prevent complications and reduce mortality rates associated with stroke.

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