Measurements to Application: Post Traumatic Stress Disorder (PTSD) on the Disasters in Thailand
การประยุกต์วิธีการวัดแนวใหม่กับโรคเครียดหลังประสบเหตุการณ์สะเทือนใจ (PTSD) ภัยพิบัติในประเทศไทย

Nittaya Suriyapan[1] Seree Chadcham[2] Somporn Sudhasani[3]

ABSTRACT

This article reviews research was to present investigated the modern applications andmeasurements of Post traumatic stress disorder (PTSD). Because, brain training of movement, increases cognitive ability, potential and cognitive skills. **Methods,** A literature review pertaining to brain training of eye-hand coordination activities and measurements to application with PTSD. Evidence for associated of the brain function and cognitive science. PTSD is presented, biological, psychological mechanisms, functional resonance imaging (fMRI) and cortisol hormone. Only articles in English or Thai were included, and only articles regarding eye hand coordination and PTSD were considered. **Main Outcome Measures,** This article review presents evidence of present investigated the modern applications and measurements of PTSD, and of the cognitive function, neurobiology, neuroendocrinology and brain training of eye-hand coordination of PTSD. **Results,** PTSD dysfunction following for health promotion may be rehabilitation for brain training of eye-hand coordination activities. It was found that the adrenal glands (Hypothalamic-pituitary adrenal) have secretion of cortisol level is abnormal. Then, due to the dictates of the brain functions abnormal of thalamus. **Conclusions,** Academic circles, new measurement methods, developed constantly, interested and has been expanded in research study. The authors establish innovative of the brain training with Eye-Hand Coordination Activity to helped people with PTSD.

Keywords: Brain Training, Eye-Hand Coordination, Measurements to application, Post traumatic stress disorder (PTSD), Disasters

บทคัดย่อ

บทความนี้นำเสนองานวิจัยที่ศึกษาการประยุกต์วิธีการวัดแนวใหม่กับโรคเครียดหลังประสบเหตุการณ์สะเทือนใจ (PTSD) เนื่องจากการฝึกสมองจากการเคลื่อนไหว ทำให้เพิ่มความสามารถทางปัญญา ศักยภาพและทักษะทางปัญญาด้านต่างๆ **ระเบียบวิธีการ** คือ การทบทวนวรรณกรรมที่เกี่ยวข้องกับการฝึกสมองของกิจกรรมการประสานระหว่างตาและมือและวิธีการวัดแนวใหม่ของโรคเครียด PTSD ซึ่งพบหลักฐานที่เกี่ยวข้องของการทำงานของสมองและด้านวิทยาการปัญญา โรคเครียดหลังประสบเหตุการณ์สะเทือนใจเป็นการแสดงทางชีวภาพ กลไกทางจิตวิทยา การตรวจทำงานด้วยเครื่องสแกนสมอง (fMRI) และฮอร์โมน Cortisol และบทความเฉพาะที่ได้รับการพิจารณา เป็นบทความภาษาอังกฤษหรือภาษาไทยถูกรวบรวมและเลือกเฉพาะบทความที่เกี่ยวกับการประสานระหว่างตาและมือและโรคเครียด PTSD **เครื่องมือวัด**

[1,2,3]College of Research Methodology and Cognitive Science, Burapha University, Thailand

บทความนี้แสดงหลักฐานการตรวจสอบวิธีการวัดแนวใหม่ของโรคเครียด PTSD ปัจจุบันและการทำงานของวิทยาการปัญญา, ชีววิทยา, neuroendocrinology และการฝึกสมองด้วยการประสานระหว่างตาและมือของผู้ป่วยโรคเครียด PTSD **ผล**ของความผิดปกติของโรคเครียด PTSD อาจต้องมีการส่งเสริมสุขภาพ และการฟื้นฟูสมรรถภาพสำหรับการฝึกสมองด้วยกิจกรรมการประสานระหว่างตาและมืออย่างต่อเนื่อง โดยพบว่าต่อมหมวกไต (Hypothalamic-pituitary adrenal) มีการหลั่ง Cortisol hormone ผิดปกติ นั้นเกิดจากการสั่งการและการทำหน้าที่ของสมองส่วน Thalamus ที่ผิดปกติ สรุปการศึกษาครอบคลุม วิธีการวัดแบบใหม่ มีการพัฒนาอย่างต่อเนื่องและมีความน่าสนใจและมีการศึกษาวิจัยอย่างกว้างขวาง ขณะเดียวกันผู้เขียนได้ทำการคิดค้นนวัตกรรมการฝึกสมองด้วยกิจกรรมการประสานระหว่างตาและมือเพื่อใช้ช่วยเหลือผู้ที่มีปัญหาโรคเครียด PTSD ต่อไป

INTRODUCTION

As widely known, Brain Training is beneficial for cognitive training and appears to be the process of rehabilitation of post traumatic stress disorder (PTSD). It is also a factor that has an influence on rehabilitation. It is very important for nurses and professional in Public Health (helper) and health care providers. Anyhow, psychiatric impact after the catastrophic tsunami event was found among the affected people rate ranging from 40% to 84%. This includes symptoms such as sadness, depression, worries, panic attacks, problems adapting with new living arrangement, physical complications due to elevated stress and Post Traumatic Stress Disorder (PTSD). Found that, an increase in drug addiction and usage has been observed among children, adolescents, and adults (American Psychiatric Association, 1994 & Ketuman, 2004).

Over the years, there has been dissatisfaction with the service and the assessment of the recovery in the mental health of people who have had a PTSD. As result, there have been many developments and applications of outcome measures; for example, the Stress Test (ST5) and of these measures, only the Posttraumatic Stress Disorder Screening Test (PTSD Screening Test) (Department of Mental Health Thailand, 2015). Existing measures have been criticized for the impairment of their contrived tasks that do not reflect real-life activities. The Eye-Hand Coordination Activity was, there for, developed in an attempt to overcome these shortcomings. The purpose of this article reviews research was to present investigated the modern applications and measurements of PTSD. Because, brain training of movement, increases cognitive ability, potential and cognitive skills.

METHODS

A literature review pertaining to brain training of eye-hand coordination activities and measurements to application with PTSD. Evidence for associated of the brain function and cognitive science. PTSD is presented, biological, psychological mechanisms, functional resonance imaging (fMRI) and cortisol hormone.Only articles in English or Thai were included, and only articles regarding eye hand coordination and PTSD were considered. PubMed was searched using the Health and Medicine terms and with a filter for English-only articles. Search terms were Eye-Hand coordination and Head, which reduced the results to 28 articles., and then PTSD, Working memory, Brain and Cognitive function, Physical activity, Spatial transformation, Psychological and Eye movement, which reduced the results to 42 articles. The EBSCO database and PsycINFO were searched following a similar strategy. These searches resulted in the addition of 28 articles.

RESULTS

Overall, only relatively few studies have investigated brain training of eye-hand coordination activities and measurements to application in PTSD. They have used very different methods and measurements involved varying participants and sample sizes, which mostly studies found that was experimental studies (Table 1).

EFFECTS OF DISASTERS IN PTSD

On December 26th, 2004 a violent rupture on the sea floor along a 1,000 km fault line triggered a quake of magnitude 9 on the west coast of northern Sumatra in Indonesia (WHO, 2001). The aftershocks struck Thailand and affected thousands of people who faced one of the worst natural disasters on August 2011 in the North part, North- Eastern part, Eastern part and Central part (Polliution Central Department, 2011). Referring to the statistics in November 2011, 6,700 cases were found high-Stress and were found depression 8,317 case (Department of Mental Health, 2011). Traumatic experiences cause stress, which is often beyond the coping capacity of an individual. In such situations, body and mind react by measures of 'fight' or 'flight'(Sekar et al.,2005). Backgrounds of disasters are traumatic events that may result in a wide range of mental and physical health consequences. PTSD is probably the most commonly studied post-disaster psychiatric disorder. This review is aimed to systematically assess the evidence about PTSD following exposure to disasters (Neria et al., 2007).

Post-traumatic stress disorder (PTSD) is a mental health condition that is triggered by a terrifying event either experiencing it or witnessing it. Symptoms may include flashbacks, nightmares and severe anxiety, as well as uncontrollable thoughts about the events. Many people who go through traumatic events have difficulty adjusting and coping for a while, but they do not have PTSD when they have good self-care and they usually get better. However, if the symptoms get worse or last for months or even years and interfere with their functioning, they may have PTSD (Allen, 2015). PTSD is defined as a pathological anxiety that usually occurs after an individual experiences or witnesses severe trauma that constitutes a threat to the physical integrity or life of the individual or of another person. Symptoms of PTSD include the followings; to persistent reexperiencing of a traumatic event, resultant numbness, avoidance and hyperarousal, avoidance and negative thoughts and mood or feelings. Symptoms should be present for a minimum of 1 month following the initial traumatic event (Brauser, 2014), and including intrusive thoughts, hyperarousal, flashbacks, nightmares, and sleep disturbances, changes in memory and concentration, and startle responses. Symptoms of PTSD are hypothesized to represent the behavioral manifestation of stress-induced changes in brain structure and function. Stress results in acute and chronic changes in neurochemical systems and specific brain regions, which result in longterm changes in brain "circuits," involved in the stress response (Vermetten & Bremner, 2002). Brain regions that are felt to play an important role in PTSD include hippocampus, amygdala, and medial prefrontal cortex. Cortisol and norepinephrine are two neurochemical systems that are critical in the stress response as show in Figure 1.

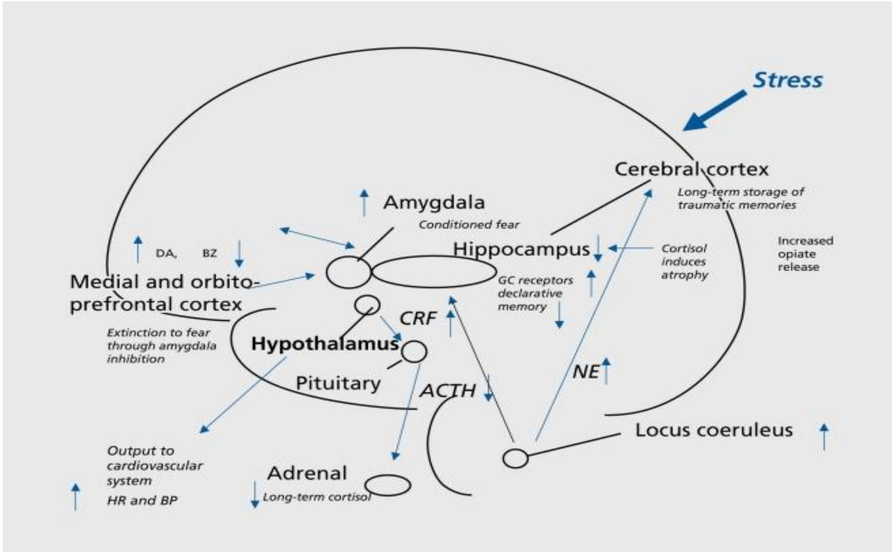

Figure 1 Lasting effects of trauma on the brain, showing long-term dysregulation of norepinephrine and Cortisol systems, and vulnerable areas of hippocampus, amygdala, and medial prefrontal cortex that are affected by trauma. GC, glucocorticoid; CRF, corticotropin-releasing factor; ACTH, adrenocorticotropin hormone; NE, norepinephrine; HR, heart rate; BP, blood pressure; DA, dopamine; BZ, benzodiazapine; GC, glucocorticoid

The corticotropin-releasing factor (CRF)/ hypothalamic-pituitary-adrenal (HPA) axis system plays an important role in the stress response. CRF is released from the hypothalamus, with stimulation of adrenocorticotropic hormone (ACTH) release from the pituitary, resulting in glucocorticoid (Cortisol in man) release from the adrenal, which in turn has a negative feedback effect on the axis at the level of the pituitary, as well as central brain sites including hypothalamus and hippocampus. Cortisol has a number of effects which facilitate survival. In addition to its role in triggering the HPA axis, CRF acts centrally to mediate fear-related behaviors (Arborelius, Owens, & Plotsky et al., 1999), and triggers other neurochemical responses to stress, such as the noradrenergic system via the brain stem locus coeruleus (Melia & Duman, 1991). Noradrenergic neurons release transmitter throughout the brain; this is associated with an increase in alerting and vigilance behaviors, critical for coping with acute threat (Bremner, Krystal, & Southwïck et al., 1996).

Eye-hand coordination

Eye-hand coordination could be defined as ability of the eye-hand coordination. By control the movement of the arm and hand, and the meticulous worker to goal (Siriluk & Chaithaya, 2006). Therefore, Eye-hand coordination (visual motor integration) is the capability of a correlation between eye and hand movement. It is a skill in movements that are associated with stimuli from visibility (Nonticha, 2013). Brain function, as such, has associated with the cognitive function to eye movement. Brain function is the manipulation of spatial information. Generality of what we do involves extracting spatial information from sensory input and then using that spatial information to direct a motor response. A simple example is reaching for something we have seen. This execution requires that spatial information be transformed from a retinal coordinate frame to the coordinate frame of the muscles or joints involved in moving the arm. The systems neuroscience has been to discover the algorithms and the sites at which such transformations are performed (Boussaoud & Bremmer ,1999).

Therefore, brain function to encoding the information from the knowledge and located of exposure movement. As an important perceptual-motor function, eye-hand coordination is not spared from the effects of aging; examples of age related modifications of this function include delays in reaction time and movement time, decreased accuracy in reaching aiming movement, decreased steadiness in the nonpreferred hand, decreased manual dexterity, and reduced speed in writing digits and words (Chaput & Proteau, 1996). Studies found that, one aspect of PTSD is a dysfunction of episodic memory, and then treatments that relieve PTSD symptoms may offer clues to memory function even in the absence of trauma. Eye movement desensitization (EMDR) and reprocessing is one such treatment that seemed promising for PTSD (Shapiro, 1989),and summary of the associated research in eye hand coordination as shown in table 1.

Table 1 Summary of the associated research in eye hand coordination and PTSD.

Author-Year	Objective	Subjects	Methods	Results
Coltekin et al. (2014)	Eye-hand coordination during visual search on geographic displays	37 voluntary participants (11 male, 26 female)	Visual search tasks is to calculate the distance from gaze position to the target position	Eye movement analysis can provide insights into the cognitive processes in human mind and have been successfully utilized to study visual tasks such as reading and exploration of digital displays. Studies, found that, the link between eye and mouse movements to understand the eye-hand coordination specically with visual search tasks in geographic displays.
Lionel Landré et al. (2012)	Working memory processing of traumatic material in women with posttraumatic stress disorder	17 women with PTSD and 17 controls participated	fMRI scan; n-back verbal working memory task in women with abuse-related PTSD	Studies found that, no behavioural working memory deficit for the PTSD group.
Hall et al. (2012)	To investigate the relationship between P300 amplitude and hippocampal asymmetry in the twin sample described above	70 male participants	Oddball paradigm, EEG, MRI	The hippocampus is clearly sensitive to the effects of trauma, with changes in both structure and function. Further, smaller hippocampal volume appears to be associated with vulnerability to developing PTSD when the person is exposed to trauma. The oddball P300 event related potential reflects the allocation of attentional resources during working memory processing, and hippocampal structures make a substantial contribution to P300 amplitude. Show that, in people with PTSD only, there is a positive correlation between hippocampal asymmetry and allocation of attentional resources.
Dean et al. (2011)	Reaction Time Correlations during Eye–Hand Coordination: Behavior and Modeling	3 adult male rhesus monkeys	Optical video eye tracker (ISCAN), Behavioral tasks	During coordinated eye– hand movements, saccade reaction times (SRTs) and reach reaction times (RRTs) are correlated in humans and monkeys. Reaction times (RTs) measure the degree of movement preparation and can correlate with

Table 1Continued

Author-Year	Objective	Subjects	Methods	Results
				movement speed and accuracy. So that, RT correlations are not simply attributable to motivation and arousal and are a signature of coordination.
Landré et al. (2011)	To investigate the direct effect of trauma-related material on an n-back verbal working memory task in women with abuse-related PTSD compared with healthy controls.	17 women with PTSD, 17 control	fMRI, 3-back task	The results broadly confirm frontal and parietal functional variations in women with PTSD and suggest a compensatory nature of these variations with regard to the retrieval of traumatic memories and global attentional deficits, respectively, during cognitively challenging tasks.
Thomaes et al. 2009	Increased activation of the left hippocampus region in complex PTSD during encoding and recognition of emotional word: a pilot study	9 PTSDa; 9 HCb	Verbal declarative memory task with neutral/negative words	PTSD patients exhibited enhanced BOLD response in left hippocampus during deep encoding of negative words and during correct recognition of negative words compared with HC
Wener et al. 2009	Hippocampal function during associative learning in patients with posttraumatic stress disorder	12 PTSD; 12 HC	Associative learning paradigm (encoding/retrieval)	Relative to HC, PTSD patients showed increased hippocampal and decreased prefrontal activation during encoding and reduced left parahippocampal gyrus activation during retrieval
Blohm et al. (2008)	Spatial Transformations for Eye–Hand Coordination	Review literature	Gaze-Centered Encoding of Reach Targets	Visually guided reaching involves the transformation of sensory information from the eyes and hand into movement commands for the arm. However, this framework in turn is necessary to explain what goes wrong in patients with neurological disorders affecting visually guided reaching. Furthermore, the field of visuomotor neuroscience is now at a point where we can begin to tackle more complex problems, such as the influence of other sensory modalities, mechanisms engaged when reaching to targets in movement, decision making, target selection, and the role of attention.
Woodward et al. (2007)	To examine the independent and joint influences of PTSD in combination with known associates of adult cerebral structural variation	86 PTSD; PTSD+ 38 Vietnam, 25 Gulf War ; PTSD – 13vVietnam, 23 Gulf War	MRI, WAIS vocabulary scores, PTSD Scale, DSM-IV, Beck Depression Inventory, Michigan Alcohol Screening Test–Short	Children and adolescents with maltreatment-related posttraumatic stress disorder (PTSD) exhibit smaller intracranial tissue volume than controls. PTSD was associated cerebrospinal fluid (CSF) and cranial volumes, and effects of alcoholism in aging.
Tchalenko and Miall (2007)	Investigations to eye–hand strategies in copying complex lines	10 students, 4 copying conditions mimicking real-world drawing situations were tested	Direct copying Direct Blind copying, Memory copying and Non-specific Memory copying	Found that, observed four very different eye–hand interaction strategies which provide evidence for the eye's dual role in the copying process: acquiring visual information in order to activate the visuomotor transformation and guiding the hand on the paper. The overall behavioural mechanism can be considered as a double just-in-time strategy which minimizes, or avoids altogether, the use of working memory.
Yehuda et al. (2007)	To examined several different aspects of memory performance, including both episodic and working memory, and related differences in performance to the biological activity of cortisol, indexed by suppression of adrenocorticotropin hormone (ACTH).	30 male veterans	Cortisol challenge test, battery lasting, WMS-III, Digit Span Backwards (DSB), and the letter number sequencing (LNS)	The preferential effect of cortisol administration on working memory in PTSD may be related to the superimposition of PTSD and age, as cortisol had impairing effects on this task in a previously studied, younger cohort. and found, has be importance to examine neural correlates of cortisol administration in PTSD at baseline, in response to cognitive challenges, and to treatment.

Table 1Continued

Author-Year	Objective	Subjects	Methods	Results
Shin et al. 2005	A functional magnetic resonance imaging study of amygdale and medial prefrontal cortex responses to overtly presented fearful faces in posttraumatic stress disorder	26 males (veterans or firefighters); 13 PTSD; 13 HC	Affective task: picture presentation of fearful, happy, and neutral facial expression	Compared to HC, PTSD patients showed exaggerated amygdale response and decreased mPFCc response to fearful faces compared to happy faces. Amygdala activity was negatively correlated with BOLD changes in mPFC
Protopopescu et al. 2005	Differential time courses and specificity of amygdala activity in posttraumatic stress disorder subjects and normal control subjects	9 PTSD; 14 HC	Participants presented with 48 negative/anxiety word, 48 positive safety word, and 48 neutral word	Increased amygdale response to trauma-related negative words but not to non-trauma negative words in PTSD patients compared to HC
Crawford et al. (2004)	Review the behavioral aspects of eye–hand coordination and the relative roles of visual feedback and feedforward mechanisms in arm control.	Review literature	Spatial Transformations, Eye–Hand Coordination	This eye–hand visuomotor system incorporates closed-loop visual feedback but here we focus on early feedforward mechanisms that allow primates to make spatially accurate reaches. The parietal cortex might store and update gaze-centered representations of reach targets during a sequence of gaze shifts and fixations. These transformations are modeled as a series of vector displacement commands, rotated by eye and head orientation, and implemented between parietal and frontal cortex through efficient parallel neuronal architectures.
Crawford et al. (2003)	To summarize our own work in this area, and to show how this work has motivated our thinking about eye-hand coordination	Review literature	Eye–Hand Coordination, eye movements, spatial updating; ocular dominance; reference frames	Finding are framed in terms of our conversion-on demand model, in which only those representations selected for action are put through the complex visuomotor transformations required for interaction with objects in personal space, thus providing a virtual on-line map of visuomotor space. In this sense, this is a sparse virtural map of space, similar to ideas that have been proposed for visual perception.
Snyder LH.(2000)	Investigation of animals to coordinate transformation for eye and arm movements in the brain	Review literature	The brain function, Eye-centered	Found that, the discovery of eye-centered representations of ongoing or intended arm movements has changed the way we think about the order of operations in the sensory to motor coordinate transformation. An eye-centered representation as a working memory of spatial location is problematic, and in which the brain solves this problem are beginning to emerge.
Rauch et al. 2000	Neurocircuitry model of posttraumatic stress disorder and extinction: human neuroimaging research-past, present, and future	8 PTSD (Vietnam veterans); 8 HC (Vietnam veterans)	Masked faces; Pictures of faces (fearful, happy, and neutral) masked by neutral faces	PTSD patients exhibited greater amygdale response than HC; PTSD patients showed exaggerated amygdale response to masked-fear faces compared to masked-happy faces
Carey (2000)	Eye–hand coordination: Eye to hand or hand to eye?	Review literature in animals	Eye movement, reaction time	If eye-centred coding is used only to derive target position in egocentric coordinates, then that coding should be most prominent in early visual and visuomotor regions and less prominent in 'downstream' areas related to execution of arm movements. So 'where the action is' in eye–hand coordination is not restricted to processes completed before we begin to move.

[a]Posttruamatic stress disorder, [b]Healthy controls, [c]Medial prefrontal cortex, and [d]Anterior cingulated cortex

Therefore, Therapeutic and rehabilitation is important to people who suffer from PTSD. EHCA is a benefit in the brain training the development of physical activity and music therapy. Furthermore, EHCA is associated with cognitive function and cortisol hormone and thus help revive the symptoms of victims who suffer from PTSD decreased symptoms.

EFFECTS OF NEURAL ACTIVITY

Studies in PTSD are consistent with changes in cognition and brain structure. Multiple studies have demonstrated verbal declarative memory deficits in PTSD (Elzinga & Bremner, 2002). The hippocampus demonstrates an unusual capacity for neuronal plasticity and regeneration. In addition to findings noted above related to the negative effects of stress on neurogenesis, it has recently been demonstrated that changes in the environment, eg, social enrichment or learning, can modulate neurogenesis in the dentate gyrus of the hippocampus, and slow the normal age-related decline in neurogenesis (Gould E et al., 1999).

Studies in adult rape survivors showed that verbal declarative memory deficits are specifically associated with PTSD, and are not a nonspecific effect of trauma exposure (Jenkins et al., 1998). Another study of women with early childhood sexual abuse in which some, but not all, of the patients had PTSD, showed no difference between abused and non abused women (Stein et al., 1999). Other types of memory disturbances studied in PTSD include gaps in memory for everyday events (dissociative amnesia) (Bremner et al., 1993), deficits in autobiographical memory, (McNally et al., 1994) an attentional bias for trauma-related material (Golier JA. et al. (2003), and frontal lobe-related impairments (Beckham, 1998). The meaning of findings related to deficits in memory and the hippocampus in PTSD, and questions related to the relative contribution of genetic and environmental factors, has become an important topic in the field of PTSD and stress research. There are three possible models, taking into account genetic or environmental factors, which have been proposed to explain smaller hippocampal volume in PTSD: Model A (Environment), Model B (Environment and Genetic), and Model C (Genetic). (Sapolsky, 2001). In Model C (Genetic), smaller hippocampal volume represents a premorbid risk factor for PTSD. In support of this model Pitman and colleagues have demonstrated that lower premilitary IQ is associated with combat-related PTSD, as well as finding a correlation between PTSD symptoms and hippocampal volume in twin brothers(acklin, 1998). The amygdala is involved in memory for the emotional valence of events, and plays a critical role in the acquisition of fear responses. The medial prefrontal cortex includes the anterior cingulate gyrus (Brodmann's area [BA] 32) and subcallosal gyrus (area 25) as well as orbitofrontal cortex. Lesion studies demonstrated that the medial prefrontal cortex modulates emotional responsiveness through inhibition of amygdala function. Conditioned fear responses are extinguished following repeated exposure to the conditioned stimulus in the absence of the unconditioned (aversive, eg, electric shock) stimulus. This inhibition appears to be mediated by medial prefrontal cortical inhibition of amygdala responsiveness (Gilbertson, 2002).

BRAIN TRAINING

Brain training refers to the engagement in a specific program or activity that aims to enhance a cognitive skill or general cognitive ability which is results from repetition over a circumscribed timeframe. Many forms of brain training appear to improve cognitive function and emotional control, particularly programs that exercise attention (Rueda, Posner & Rothbart, 2005). By practicing games or tasks that require choosing between two competing responses, the training of attention aims to strengthen the neural networks underlying control processes (Raz & Buhle, 2006). A strong modulator of cognition affecting attention refers to the selective focus on specific aspects of our environment or to the concentration on specific mental thoughts and operations as shown in figure 2 (Raz & Buhle, 2006). A study of exercise (Kubesch et al., 2009), and musical training (Kraus, N. & Chandrasekaran, 2010) can also improve cognitive ability and emotional control. Increasing training programs foster the putative promise of enhancing or rehabilitating behavior and brain function. This trend comprises a market of products alleged to enhance cognition, emotion, thought and action, catering to individuals of all ages but targeting young children and the elderly. Broadly defined, brain training refers to the engagement in a specific program or activity that aims to enhance a cognitive skill or general cognitive ability with results from repetition over a circumscribed timeframe. In the human brain, one of the most powerful sources of auditory stimulation is provided by music (Sacks, O., 2006).

The generalizability of brain training represents one of the major claims-to-fame of publicly distributed programs. With scarce data to support advertised claims, however, patrons of brain training often invest considerable resources pursuing programs that promote unsupported, and arguably unrealistic and outcomes. Previous studies have demonstrated that combination exercise training, which combines exercise training of different types (e.g., aerobic and strength exercise training), can also facilitate improvement of cognitive functions (Snowden et al. 2011; Smith et al. 2010; Tseng, Gau & Lou, 2011). Therefore, the brain training is physical activity to enhance a cognitive skill or general cognitive ability, increased neuronal plasticity, and cortisol level. Brain training affected to psychopathology, cognitive functional, emotional, ADHD, chronic disease, diabetes, hypertension,

Cognitive Process

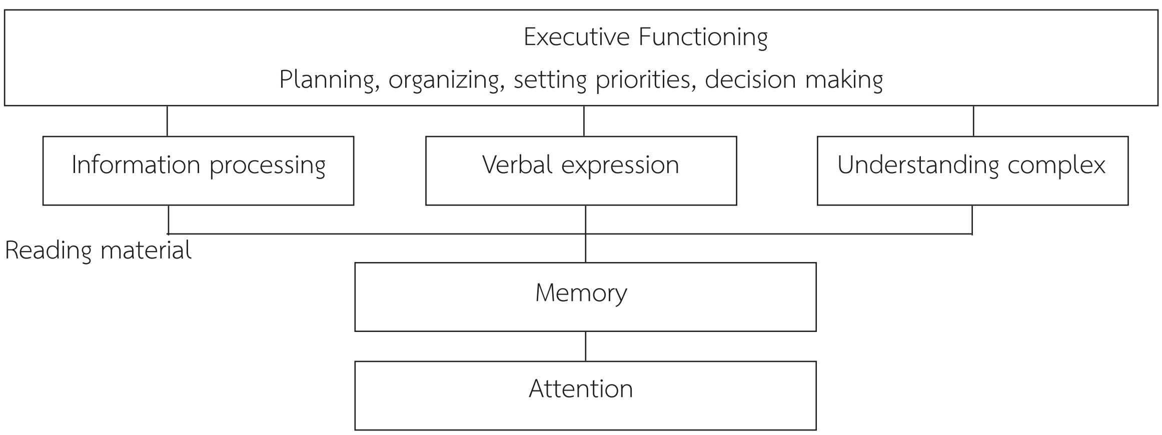

Figure 2 Cognitive processes

stroke, stress and PTSD.

Physical activity

Physical activity is apparently beneficial for health. This role is increasingly supported by data from a variety of epidemiologic, health outcomes, and experimental studies. Physical activity not only lowers the risk of mortality (Fried et al.,1998) but is also associated with decreased morbidity from many chronic diseases like cardiovascular disease, stroke, coronary heart disease, cancer (Blair et al., 2001; Bean et al.,2004), depression (Barbour et al., 2005), and diabetes (Tuomilehto et al., 2001; La Monte et al.,2005). Research has shown appositive association between physical activity and both cognitive function (Colcombe et al., 2003; Weuve et al., 2004) and physical function (Brach et al., 2003). Physical activity is beneficial for healthy aging and can improve cognitive function in the elderly and reduces as the same time cognitive impairment (Angevaren et al., 2008). Aerobic exercise in particular has a robust effect on improving cognition in sedentary older adults (Colcombe & Kramer, 2003).

Several animal studies have shown a strong influence of physical activity on synaptic plasticity and in particular on the genesis of new neurons in the adult mammalian brain (Kempermann, 2002; Praag, 2008; Vega et al., 2006; Uda et al., 2006). Furthermore, there was cumulating evidence on a biochemical level that physical exercise leads to an increased release of several neurotrophic factors (Christ, 2008; Fabel, 2008). The fact that physical activities and exercising can improve the cognition is not only found in animal studies, but it has also been proved in humans. Thus, the effects of physical activity on cognition can be categorized in two main streams. On one hand, short term acute bouts of physical activity can a) increase in cerebral blood flow, b) cause change in neurotransmitters, c) increase norepinephrine and permanent structural changes in the brain (Coles & Tomporowski, 2008; Hillman et al., 2009; Hillman, Snook, & Jerome, 2003; Gold et al., 2003; Winter et al., 2007). On the other hand, long-term moderate intensity physical activity also can improve cognitive (Davis et al., 2007, 2011), including memory (Floel et al., 2010). P300 and mental reaction time are considered as valuable tools for the measurement of cognitive function because they are thought to reflect neural activity underlying basic aspects of cognition (Kutlu et al., 2014). The use of P300 as a clinical evaluation tool should be revisited with contemporary theory, methods, and analysis procedures because a reliable neuroelectric measure of mental function would redefine the assessment of cognitive disorders (Polich, 2004). There are many researches showing that physical activity affects memory (Domes, Heinrichs, Rimmele, Reichwald, & Hautzinger, 2004; Falls, Fox, & MacAulay, 2010; Hillman, Erickson, & Kramer, 2008). Exercise has been associated with increases in overall brain volume (Colcombe, Erickson, Scalf, Kim, Prakash, & McAuley et al.,2006) and may contribute to increased density in brain white matter (Gordon, Rykhlevskaia, Brumback, Lee, Elavsky, & Konopack et al., 2008) and preserved gray matter density (Colcombe, Erickson, Raz, Webb, Cohen, & McAuley et al., 2003).

Therefore, it has concluded to importance for physical activity. Physical activity is beneficial for the growth of physical, hormone, cardiovascular system and mental health. The brain is stimulated physical activity, increasing blood flow to the brain, reduce fat accumulation in the physical, enhance the cardiovascular system and respiratory system, lower blood pressure and insulin, prevent allergies and asthma, reduce anxiety, depression and stress, increased self-confidence and self-efficacy, sleep and meditation, potential of memory, understanding the emotions and the ability to decisions and stimulate learning.

Music Training

Listening to music is a complex process for the brain, since it triggers a sequel of cognitive and emotional components with distinct neural substrates (Peretz & Zatorre, 2005). Recent brain imaging studies have shown that neural activity associated with music listening extends well beyond the auditory cortex involving a widespread bilateral network of frontal, temporal, parietal and subcortical areas related to attention, semantic and music-syntactic processing, memory and motor functions (Bhattacharya et al., 2001; Janata et al., 2002; Koelsch et al., 2004; Popescu et al., 2004), as well as limbic and paralimbic regions related to emotional processing (Blood et al., 1999; Blood and Zatorre, 2001; Brown et al., 2004; Koelsch et al., 2006; Menon and Levitin, 2005). Music has a well-documented effect on alleviating anxiety, depression and pain in patients with a somatic illness (Cassileth et al., 2003; Cepeda et al., 2006; Siedliecki and Good, 2006).

These musician auditory perceptual advantages are supported by functional and structural changes seen both cortically and subcortically for the processing of sound (Wong el at., 2007b) and specifically for processing speech in noise (Parbery-Clark, Skoe, Lam & Kraus, 2009). Musicians are further noted to have enhancements for auditory-specific cognitive abilities, such as auditory working memory (Parbery-Clark, Skoe , Lam & Kraus, 2009; Strait el at., 2010; Chan el at., 1998; Ho el at., 2003), and auditory attention, which may reflect the necessary integration of auditory perceptual and cognitive skills for learning a musical instrument. Due to the cognitive demands of musical practice, music training may facilitate changes that enhance the functionality of regions related to auditory perception as executive attention. The behavioral benefits of music training are accompanied by structural modifications within specific brain regions, as changes in gray matter volume (Gaser & Schlaug, 2003; Munte, Altenmuller & Jancke, 2002). Furthermore, a recent cognitive and neuropsychological studies suggest that it may also enhance a variety of cognitive functions, such as attention, learning, communication and memory, both in healthy subjects (Wallace, 1994; Thompson et al., 2001; Thompson et al., 2005; Schellenberg et al., 2007) and in clinical conditions, such as dyslexia (Overy, 2003), autism (Gold et al., 2006), schizophrenia (Talwar et al., 2006), multiple sclerosis (Thaut et al., 2005), coronary artery disease (Emery et al., 2003) and dementia (Brotons and Koger, 2000; Foster and Valentine, 2001; Van de Winckel et al., 2004). Several functional imaging studies have shown differences between musicians and non-musicians while performing motor, auditory, or somatosensory tasks (Elbertetal.,1995; Pantevetal., 1998; Schlaug, 2001).

The Cortisol Hormone

Cortisol is a stress hormone and causes with stress-related mental health problems. Cortisol is an end product of the hypothalamic-pituitary-adrenal (HPA) axis, one of the main endocrine stress axes (Dettenborn et al., 2012b). Gow et al. (2010) found that Cortisol has a wide influence on the physical function regulation of other including gluconeogenesis, lipolysis, insulin resistance, blood pressure regulation, immunity, wound healing, neural survival neurogenesis, sleep regulation, and cognitive performance. Having acute psychological or physical challenges, the metabolic, behavioral, cognitive and immunological effects of cortisol have adaptive functions allowing the human organism to maintain a state of homeostasis.

Therefore, Cortisol have adaptive functions allowing the human organism to maintain a state of homeostasis of during acute psychological or physical challenges, the metabolic, behavioral, cognitive and immunological effects (Chrousos, 2009).

Cortisol hormone have many functions and one is to maintain blood pressure and plasma volume. Generally, the rise of cortisol secretion follows the ACTH release with a lag of 15 to 30 minutes (Borer, 2003). Hill et al. (2008) According to prior studies, before to after exercise showed that acute bouts of high intensity exercise (above ~70% VO2max) result in a substantial increase in salivary and plasma cortisol. Steudte et al. (2011b) demonstrated that traumatized individuals from the Ugandan civil war (diagnosed with post-traumatic stress disorder, or PTSD) had higher hair cortisol levels than traumatized controls without PTSD. Moreover, the number of lifetime traumatic events was positively correlated with hair cortisol levels in this study. Higher hair cortisol concentrations were found in long-term unemployed than employed individuals, with hair cortisol explaining considerable variance (7.1-8.5%) (Dettenborn et al., 2010). Furthermore, it was reported that shift workers had higher hair cortisol than day workers, (Manenschijn et al.,2011b) and Stalder et al. (2010) found that alcoholics in acute withdrawal had substantially elevated hair cortisol levels compared to abstinent alcoholics or controls. Cortisol level changes in individuals who were exposed to major life events or severe stressful circumstances. Hair cortisol levels are associated with concern self perceived stress and stress-related mental disorders. Furthermore, hair cortisol levels in individuals with diseases are associated with disturbed HPA activity or altered cortisol levels due to biological changes. (Gerber et al., 2012).

Dettenborn et al. (2012b) found that hair cortisol is associated with stress-related mental health problems. A comparison of 23 depressed individuals and 64 controls revealed that depressed individuals had higher cortisol levels in near scalp and adjacent hair segments. Significant relationships were found between hair cortisol and psychological disorder. Similarly, It was reported in a study with young adults that two participants with very high hair cortisol levels had serious psychological problems (including depressive symptoms) (Karlen et al.,2011). Moreover, Steudte and colleagues (2011a; 2011b) found that patients suffering from generalised anxiety disorder had significantly lower (50-60%), with showed that hair cortisol concentrations compared by age and gender matched healthy controls. Furthermore, this study corroborates that decreased levels of cortisol could be related to pathological situations. In summary, Evidence has accumulated over the last decade to confirm that hair cortisol levels are increased among individuals who have been exposed to stressful life events or who are expected to have high cortisol levels due to disturbed cortisol secretion, which is in line with research on salivary cortisol (Kristensen et al., 2012). Most studies showed, at best, a weak association between hair cortisol and perceived stress. Finally, findings indicated two points: in physical stress have high level cortisol is hypercortisolism and in mental health is hypocortisolism (Gerber et al., 2012).

MEASUREMENTS

Application of fMRI to PTSD

Over the last decade it has provided new insight to the investigation of how memories are formed, language, pain, learning and emotion to name but a few areas of research. Functional resonance imaging (fMRI) is also being applied in clinical and commercial settings. The development of fMRI in the 1990s, generally credited to Seiji Ogawa and Ken Kwong, is the latest in long line of innovations, including positron emission tomography (PET) and near infrared spectroscopy (NIRS), which use blood flow and oxygen metabolism to infer brain activity. As a brain imaging technique fMRI has several significant advantages:1) It is non-invasive and doesn't involve radiation, making it safe for the subject. 2) It has excellent spatial and good temporal resolution. 3) It is easy for the experimenter to use. Therefore, fMRI a popular tool for imaging normal brain function especially for psychologists (Devlin, 2013). fMRI of the brain suggests features in common between post traumatic stress disorder and obsessive compulsive disorder (Marshall et al., 2014). An advantage of fMRI over EEG is its spatial resolution and its ability to detect changes in neural activity deep in the brain (e.g., neural activity in the basal ganglia, cerebellum, and hippocampus). However, the fact for BOLD signal to develop and be detected implies that fMRI brain-computer interface (BCIs) can only be used for high-level, coarse-grained control (Rao, 2013). Evidence has shown that patterns of motor-related neural activity in older adults may also be altered by regular engagement in physical exercise (Voelcker Rehage, Godde, & Staudinger, 2010).

These studies point to a neurotoxic role for corticosteroids that cause atrophy and cell death in hippocampal neurons. Several structural MRI studies have reported smaller hippocampal volume in chronic unremitting PTSD (Wignall et al., 2004). Examination of trauma memory or encoding of trauma-related information provides evidence of diminished hippocampal activation in PTSD (Geuze, Vermetten, Ruf, de Kloet, & Westenberg, 2008b). Prior studies have shown that increased hippocampal activity is associated with successful encoding and retrieval of item-specific and detailed memories (Eichenbaum, Yonelinas, & Ranganath, 2007). Study Reduced hippocampal and amygdala activity predicts memory distortions for trauma reminders in combat-related PTSD; found that, a neural account of distorted trauma memory represent actions in PTSD. Conclude that, reduced activity in the amygdala and hippocampus during successful encoding of trauma memories may reflect encoding of gist-based trauma representations in lieu of detailed trauma memories (Hayes et al., 2011).Therefore, importance is strategies on the fact that in general, focal changes in neuronal activity are coupled closely to changes in CBF, CBV and mental illness; developed of disorders, schizophrenia, major depression, bipolar disorder, substance abuse, and anxiety disorders (e.g., post traumatic stress disorders).

Methods used to analyze cortisol

While hair is still a relatively new means of measuring cortisol, several human studies have shown its ability to identify important pathophysiological sources of stress (Gerber et al.,2012). Kalra et al. (2007) were the first to correlate cortisol levels in hair with self reported stress using the Perceived Stress Scale (PSS) and Cohen et al. (1983) found a validated self-report questionnaire of an individual's stress level over the past month. A frequently raised question is the mechanism by which cortisol enters the hair. Hair has a fairly predictable growth rate of approximately 1 cm/month. Therefore the most proximal 1 cm segment to the scalp approximates the last month's cortisol production, the second most proximal 1 cm segment approximates the production during the month before that and so on (Wennig, 2000). This phenomenon enables researchers to retrospectively examine cortisol production at the times when a stressor was most salient, without needing to take a sample right at that time. Recently, and investigation found the role of chronic stress as measured by hair cortisol, in the development of an acute myocardial infarction (AMI). Chronic psychosocial stressors (e.g. financial concerns, marital stress, job stress) are frequently listed as risk factors for AMIs, by the hypothesis that hair cortisol analysis could potentially be a useful tool to quantify these stressors. Hair samples representing the past 3 months of cortisol production were obtained from patients within 2 days of admission to a hospital for chest pain. Therefore, this study suggests that chronic stress plays a causative role in the pathophysiology of AMI (Vogelzangs et al., 2010).

Dowlati et al. (2010) found that hair cortisol analysis can assess its potential to predict depressive symptoms in patients suffering from coronary artery disease (CAD), and people who are at risk of depression. Depressive symptoms were demonstrated in 34 of the 121 patients with CAD. The most proximal 3 cm of hair were obtained from each patient and hair cortisol concentrations were determined. When comparing depressed and non-depressed CAD patients, no significant difference in hair cortisol concentration was observed between these two groups. It was postulated that the general psychosocial stress associated with CAD, irrespective of the presence of depression, may have masked any actual differences in cortisol production between these two groups. Similarly, Van Rossum et al. (2011) employed hair cortisol analysis to investigate patients with bipolar disorder, a condition in which HPA dysregulation may play an etiological role. However, when the bipolar group was split into subgroups in which onset occurred before or after the age of 30, significant differences were noted. Patients with bipolar disorder diagnosed after 30 had significantly higher cortisol concentrations than those diagnosed before 30 or the healthy controls ($p = 0.004$). The researchers thus, suggested that HPA dysregulation may berelevant in older onset patients, and this maybe represent a different disease entity altogether. A summary of the different properties of existing matrices for cortisol measurement is presented in Table 2 (Russell et al.,2012).

Table 2 A comparison of properties of the various matrices for cortisol measurement

Property	Serum	Saliva	Urine	Hair
Subjective level of invasiveness associated with sample collection	High	Low	Moderate	Low
Cortisol affected by stress of sampling procedure?	Possibly	Possibly	Possibly	No
Storage requirements	Spinning and refrigeration followed by freezing	Refrigeration or freezing	Refrigeration or freezing	Room temperature; stable for year
Time periods of cortisol production represented	Single point measure	Single point measure	12-24 h; integral of exposure	Months to years; integral of exposure
Affeced by changes in cortisol binding globulin?	Yes; total cortisol measured	No; only free cortisol measured	No; only free cortisol measured	No; only free cortisol measured
Clinically relevant reference ranges established?	Yes	Yes	Yes	No

Methods used to others

Normally, and study found the measurement to application of PTSD divided into; The first, psychological test; PDS (posttraumatic diagnostic scale) by Edna Foa (1999) 49 item; PCL-C (The PTSD Checklist-civilian Version) by Weathers FW, Huska JA, Keane TM (1991) 17 item; PHQ9 (Patient health questionnaire-9) (Manote Lotrakul, 2009) 9 item. The Second, working memory task; WAIS III (Wechsler, David (1997)) Subtest Working memory 2 subtest; Digit span (backward 8 item, forward 7 item), Arithmetic 20 item. Third, behavioral; WHOQOL (The World Health Organization Quality of Life (WHOQOL) -BREF, World Health Organization, 2004) 26 item. Finally, visual perception; DTVP-3 is the most recent revision of Marianne Frostig's popular Developmental Test of Visual Perception. Of all the tests of visual perception and visual-motor integration, the DTVP-3 is unique in that its scores are reliable at the .80 level or above for all subtests and .90 or above for the composites for all age groups; its scores are validated by many studies.

DISCUSSION

This study was to studies of measurements to application: Post traumatic Stress Disorder. This article reviews research was to present investigated the modern applications and measurements of Post traumatic stress disorder. The population has been dissatisfaction with the service and the assessment of the recovery in the mental health of people who have had a PTSD. The methods to importance of service quality in hospital and the researches of Devlin (2013), Lionel Landré et al. (2012), Landré et al. (2011), Thomaes et al. (2009), Siriluk & Chaithaya (2006), Similarly, Peretz & Zatorre (2005), Rueda, Posner & Rothbart (2005), World Health Organization (2004), Shapiro (1989), Edna Foa (1999), Wechsler, David (1997), Cohen et al. (1983) and Fried et al. (1998) These conclusions show that measurements to Brain training Eye-hand coordination, Physical activity, Music Training, fMRI, Methods used to analyze cortisol, psychological test, working memory task and behavior assessment.

CONCLUSION

However, effect on rehabilitation has been addressed from different point of views. Since there are differences in individual rehabilitation, psychosocial care, crisis impacts, emotion and mechanisms, Exploring the effective way to improve the rehabilitation is very important for individuals. However, a few previous researches provided evidence that physical exercising appears to have a beneficial impact on cognitive function, particularly in children (Hillman, Erickson, & Kramer, 2008) and in the elderly (Colcombe & Kramer, 2003). Thus, the importance of Eye-Hand Coordination Activity is to improve the quality of life and happiness. Additionally, the study may be carried out with innovative methodologies by providing combined biological (brain training) and behavioral (rehabilitation and psychosocial care outcomes) data.

ACKNOWLEDGEMENTS

The study of the measurement to applications for PTSD. The strength and both healthy of people in both mental health, physical aspect, higher quality of life and well being.The findings will be useful for nurses and professional Public Health and health care providers to develop realistic goals in nursing activities for populations to achieve wellness and the ability to live together with their families in the community with a higher strength and quality of life and happiness.

REFERENCES

Amir N., Stafford J., Freshman M, and Foa E. (1998). Relationship between trauma narratives and trauma pathology. *Journal of Traumatic Stress,11,* 385-392.

Allen Gore T. (2015). Posttraumatic Stress Disorder. *Medscape Medical News.* Retrieved on January 1, 2015. Retrived from: http://www.medscape.com/viewarticle/822456.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of ental disorders.* 4th ed. (DSM IV). Washington DC: American Psychiatric mPress.

Angevaren M. et al. (2008). Physical activity and enhanced fitness to improve cognitive Function in older people without known cognitive impairment. *Cochrane Data base Syst Rev,* 2, CD005381.

Arborelius L. et al. (1999).The role of corticotropinreleasing factor in depression and anxiety disorders. *J Endocrinol,160,* 1–12.

Barbour KA., Blumenthal JA. (2005).Exercise training and depression in Older adults. *Neurobiol Aging, 26,* S23-119.

Bean JF., Vora A., Frontera WR. (2004). Benefits of exercise for community dwelling older adults. *Arch Phys Med Rehabil. 85,* S31–42.

Blair SN., Cheng Y., Holder JS. (2001). Is physical activity or physical fitness more important in defining health benefits? *Med Sci Sports Exerc, 33,* S379–99.

Brach JS. et al. (2003). Physical activity and functional status in community Dwelling older women: a 14-year prospective study. *ArchIntern Med, 163,* 71-2565.

Brauser D. (2014). Late-life PTSD linked to specific types of vascular disease. *Medscape Medical News.* Retrieved on March 28, 2014. Retrived from:http://www.medscape.com.

Bremner JD. et al. (1993). Use of the Structured Clinical Interview for DSMIV-Dissociative Disorders for systematic assessment of dissociative symptoms in posttraumatic stress disorder. *Am J Psychiatry. 150,* 1011–1014.

Boussaoud D., and Bremmer F. (1999). Gaze effects in the cerebral cortex: reference frames for space coding and action. *Exp Brain Res, 128:* 170-180.

Carey DP. (2000). Eye–hand coordination: Eye to hand or hand to eye? *Current Biology, 10:* 416–419.

Colcombe S., Kramer AF. (2003). Fitness effects on the cognitive function of Older adults: a meta-analytic study. *Psychol Sci, 14,* 30-125.

Coltekin A. et al. (2014). Eye-hand coordination during visual search on geographic displays In: Proceedings of the 2nd International Workshop on Eye Tracking for *Spatial Research,* Vienna, Austria, 12-16.

Crawford et al. (2004). Spatial Transformations for Eye–Hand Coordination. *J Neurophysiol, 92:* 10–19.

Crawford et al. (2003). Ocular kinematics and eye–Hand Coordination. *Strabismus, 2:* 33-47.

Dean H L. et al. (2011). Reaction Time Correlations during Eye–Hand Coordination: Behavior and Modeling. *The Journal of Neuroscience, 31(7):* 2399 –2412.

Department of Mental Health. (2009). *Journal of Conference of Mental Health* International : “Power Mental Health Crisis Change to Opportunity”, 8, 42.

Department of Mental Health. (2011). Information. Retrieved on January 2, 2015. Retrived from http//www.dmh.co.th.

Devlin, H. (2013). What is Functional Magnetic Resonance Imaging (fMRI)?. *Psych Central.* Retrieved on May 21, 2015, from http://psychcentral.com/lib/what-is-functional-magnetic-resonance-imaging-fmri/.

Dickie E., Brunet A., Akerib V,and Armony J. (2008). An fMRI investigation of memory encoding in PTSD: influence of symptom severity. *Neuropsychologie, 46,* 1522-1531.

Eichenbaum H., Yonelinas A, and Ranganath C. (2007).The medial temporal lobe and recognition memory. *Annual Review of Neuroscience, 30,* 123-152.

Elzinga BM., Bremner JD. (2002). Are the neural substrates of memory the final common pathway in PTSD? *J Affect Disord. 70,* 1–17.

Fried LP. et al. (1998). Risk factors for 5-year mortality in older adults: the Cardiovascular Health Study. *JAMA, 279,* 92-585.

Geuze E., Vermetten E., Ruf M., de Kloet CS, and Westenberg HGM. (2008b). Neural correlates of associative learning and memory in veterans with post traumatic stress disorder. *Journal of Psychiatric Research, 42,* 659-669.

Gould E et al. (1999). Learning enhances adult neurogenesis in the hippocampal formation. *Nat Neurosci, 2,* 260–265.

Golier JA. et al. (2003). Memory for trauma-related information in Holocaust survivors with PTSD. *Psychiatry Res. 121,* 133–143.

Guido Dornhege JD RM et al. (2007). Toward Brain-Computer Interfacing. United States of America, Massachusetts institute of technology.

Hassett LM., Moseley AM., Tate R., Harmer AR. (2008). Fitness training for cardio respiratory conditioning after traumatic brain injury. *Cochrane Data base Syst Rev, 2,* CD006123.

Hall T. et al. (2012). The relationship between Hippocampal asymmetry and working memory processing in combat-related PTSD – a monozygotic twin study. *Biology of Mood & Anxiety Disorders,* 2-21.

Hayes JP. et al. (2011). Reduced hippocampal and amygdala activity predicts memory distortions for trauma reminders in combat-related PTSD. *Journal of Psychiatric Research, 45,* 660-669.

Kennedy PR et al. (2000). Direct control of a computer from the human central nervous system. Rehabilitation Engineering, *IEEE Transactions, 8(2),* 198-202.

Ketuman P. (2004). Post traumatic stress disorder. Bangkok: Preteam Marketing. *Medical handbook.*

Kutlu N. et al. (2014). Examination of P300 in Veteran Males: Aging, Physical Activity and Cognitive Processing. *Medical Science and Discovery, 1(1),* 9-15.

La Monte MJ., Blair SN., Church TS. (2005). Physical activity and diabetes prevention. *J Appl Physiol, 99,* 1205.

Landré L. et al. (2011). Working memory processing of traumatic material in women with posttraumatic stress disorder. *J Psychiatry Neurosci,* 37(2):87-94.

Lauterbur PC. (1973). Image formation by induced local interactions examples employing nuclear magnetic resonance. *Nature, 242,* 190-191.

Jenkins MA. et al. (1998). Learning and memory in rape victims with posttraumatic stress patients. *Arch Phys Med Rehabil, 82,* 84-879.

Marshall et al. (2014). Clinical biochemistry: Metabolic and clinical aspects. *Elsevier, 3,* 679.

Melia KR.,& Duman RS. (1991). Involvement of corticotropin-releasing factor in chronic stress regulation of the brain noradrenergic system. *Proc Natl Acad sci US A,88,* 8382–8386.

McNally RJ. et al. (1994). Emotional priming of autobiographical memory in posttraumatic stress disorder. *Cogn Emot. 8,* 351–367.

Neria Y., Nandi A. and Galea S. (2008). Post-traumatic stress disorder following disasters: a systematic review. *Psychological Medicine, 38(4),* 467-480.

National Institute of Mental Health and Neuro Sciences. (2004). Psychosocial Care for Earthquate Survivors. Retrieved on January 2, 2015. Retrived from: http//www.nimhans.kar.nic.in/bro_disasearth.

National Institute of Mental Health and Neuro Sciences. (2004). Tsunami Psychosocial Care for Children. Information Manual 1. Retrieved on January 2, 2015. Retrived from http//www.nimhans.kar.nic.in/dis_man_tsu 3.

National Institute of Mental Health and Neuro Sciences. (2007). Summary and Recommendation of the National Conference on Psychosocial Care and Mental Health Services in Disasters. Retrieved on January 2, 2015. Retrived from: http// www.nimhans.conf_sum 1.

Nonticha Thavompaiboonbud. (2013).Visual Perception Frame of Reference, *The Journal of Occupational,17(3):* 25-29.

Protopopescu X. et al. (2005). Differential time courses and specificity of amygdala activity in posttraumatic stress disorder subjects and normal control subjects. *Biological Psychiatry, 57(5):* 464–473.

Polich J. (2004). Clinical application of the P300 event-related brain potential. *Physical medicine and rehabilitation clinics of North America. 15(1),* 133-161.

Polich J and Kok A. (1995). Cognitive and biological determinants of P300: an integrative review. *Biological psychology, 41(2),* 103-146.

Polliution Central Department. (2011). Natural Disasters of way, p 1.

Rao R PN. (2013). Brain-Computer Interfacing: An Introduction. Cambridge University Press. New York, 1, 205.

Rauch SL., Shin LM, and Phelps EA. (2006). Neurocircuitry model of posttraumatic stress disorder and extinction: human neuroimaging research-past, present, and future. *Biol Psychiatry, 60(4),* 376-382.

Sapolsky RM.. (2001). Atrophy of the hippocampus in posttraumatic stress disorder: how and when? *Hippocampus, 11,* 90–91.

Sekar K. et al. (2005). Tsunami Disaster: Psychosocial care by Community Level workers. Information Manual 2. Nimhans,Bangalore: Vizhigal Pathippagam.

Sekar K. et al. (2005). Tsunami. Psychosocial care for individuals & familes. Information Manual1. Nimhans,Bangalore: Vizhigal Pathippagam.

Shin LM. et al. (2005). A functional magnetic resonance imaging study of amygdale and medial prefrontal cortex responses to overtly presented fearful faces in posttraumatic stress disorder. *Arch Gen Psychiatry, 62(3),* 273-281.

Siriluk Udomchat, and Chaithaya Phiraban. (2006). Development of Eye-Hand Coordination Test Using Computer Program for Normal Children Aged 6-9 Years. *Bull Chiang Mai Assoc Med Sci, 39:* 79-84.

Snyder L H. (2000). Coordinate transformations for eye and arm movements in the brain. *Current Opinion in Neurobiology, 10,* 747–754

Stein MB. et al. (1999). Memory functioning in adult women traumatized by childhood sexual abuse. *J Trauma Stress, 12,* 527–534.

Tchalenko J. and Miall R C. (2007). Eye–hand strategies in copying complex lines. Elsevier, 4 5: 368 – 376

Tuomilehto J. et al. (2001). Prevention of type 2 diabetes mellitus by changes in life style among subjects with impaired glucose tolerance. *NEng U Med, 344,* 50-1345.

Ullsperger M, and Debener S. (2010). Simultaneous EEG and fMRI: Recording, Analysis and Application. Oxford University Press, 1, 21.

Vermetten E., & Bremner JD. (2002). Circuits and systems in stress. II. Applications to neurobiology and treatment of PTSD. *Depress Anxiety. , 16,* 14–38.

Wignall et al. (2004). Smaller hippocampal volume in patients with recent-onset posttraumatic stress disorder. *Biological Psychiatry, 56,* 832-836.

Werner, N.S., Meindl, T., Engel, R.R., et al. (2009). Hippocampal function during associative learning in patients with posttraumatic stress disorder. *Journal of Psychiatric Research, 43,* 309–18.

Weuve J, et al. (2004). Physical activity, including walking, and cognitive function in Older women. *JAMA, 292,* 1454.

Woodward SH. et al. (2007). Brain, Skull, and Cerebrospinal Fluid Volumes in Adult Posttraumatic Stress Disorder. *Journal of Traumatic Stress, 20(5),* 763–774.

Yehuda R. et al. (2007). Enhanced Effects of Cortisol Administration on Episodic and Working Memory in Aging Veterans with PTSD. *Neuropsychopharmacology,* 32, 2581–2591.