



Promoting Functional Outcome of Stroke Patients: The Effect of Regulatory Focus, Therapy Frequency and Message Framing

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The purpose of this study was to find out how stroke patients' chronic regulatory focus interacted with message framing had impact on the therapy frequency and functional outcome. A one factor (chronic regulatory focus) \times 2 (message framing: gain vs. loss) between-subject design was employed with questionnaire and evaluation form. Ninety-six stroke patients recruited from different medical units in Kaohsiung City, Taiwan were randomly assigned to read one of two messages. Therapy frequency and functional outcome, Barthel Index were used as dependent variables. One way ANOVA repeated measure, regression analyses and simple slope analysis were used to examine the effects. The results indicated that chronic regulatory focus had long term effects on the therapy frequency, and Barthel Index. The mediating effect of therapy frequency and the interaction effect between chronic regulatory focus and message framing were not supported, but the simple slope analysis showed that gain-framed message was more likely to prompt therapy frequency on patients with stroke. This study provided the practitioners guidelines to design the persuasive message to facilitate therapy and sustain the behavior.

Keywords: Stroke, regulatory focus, message framing, therapy frequency, Barthel Index

JEL: C91, I19

A stroke or cerebral vascular accident (CVA) is brain cell damage or death because of the lack of oxygen and nutrients caused by hemorrhage or ischemia. According to the US Department of Health, the prevalence of cerebral vascular accidents is 330 per 100,000 people. Moreover, the incidence rate increases as age increases. About two thirds of stroke patients have their stroke over the age of 65. The aging population of Taiwan (percentage > 65years old) in 2010 was 10.7 percent. If this number keeps increasing

at the same rate, it will reach 39.4 percent in 2060. This increasing trend means that there are likely to be more and more stroke patients, leading to major medical and societal problems (Council for Economic Planning and Development, 2010). Of these, one third will die, one third will return to normal condition, and one third would suffer functional inabilities, such as hemiplegia, hemiparesis, language impairment, cognitive dysfunction and dependence throughout their remaining life, the leading cause of adulthood disability (Chiou, 2008). It is, therefore, necessary for stroke patients who suffer functional difficulties to receive rehabilitation

training. Different kind of rehabilitation trainings have been applied to stroke patients. Functional electrical stimulation, aiming to stimulate the contraction of weakened muscles, is found positively related to the functional outcome (Vafadar, Côté and Archambault, 2015). Constraint induced movement therapy overcomes learned nonuse and produces substantial increase in the gray matter of brain motor areas is also found efficacious to improve stroke patients' functional outcome (Edward, Victor and Gitendra, 2014; Taub, 2012). Mirror therapy has consistent effects on the activities of daily living (Thieme *et al.*, 2013). The new technologies such as robot-based therapy (See Sicuri, Porcellini and Merolla, 2014) and virtual reality (See Wüest, van de Langenberg and de Bruin, 2014) have been proved useful tools to promote motor recovery and improve functional outcome. However, to attain the best training effects, it not only the therapists' professional skills and knowledge that matter, but is also dependent on patients' motivation and willingness to improve (Cooke *et al.*, 2010; Higgins, 2000; Kwakkel *et al.*, 2004).

Regulatory focus theory proposes that people's decision-making depends on their motivational orientations, and regulatory focus. People with promotion focus prefer to eagerly approach strategies that help them to attain positive outcomes or accomplishments. People with prevention focus tend to adopt vigilant avoidance strategies to avoid negative outcomes (Higgins, 1997, 2000; Keller, 2006; Zhao and Pechmann, 2007). However, most studies have been conducted in laboratory settings with

college students rather than the patient population with real treatment decisions. This paper intends to discuss whether stroke patients' regulatory focus influences their behavioral intention and behavioral frequency of rehabilitation training as the amount of volitional movement determines the training effects (Higgins, 1997, 1998; Klein and Jones, 2008; Wolf *et al.*, 2006).

In addition to the influence of individual characteristics, previous studies have been interested in examining the effects of contextual factors, such as message framing on health behavior decisions (McCormick and McElroy, 2009; Myers, 2010). The ability to frame a message that encourages patients to engage and sustain their rehabilitation training to improve their functions and reduce disability is very important. Research has showed that a gain-framed message is more persuasive for promotion-focused people, whereas a loss-framed message is more persuasive for prevention-focused people (Uskul, Sherman and Fitzgibbon, 2009). Very little research has discussed how the message presented and individual characteristics affect the persuasive effects of health behavior messages. It is now necessary to examine the interactive effects of message framing and regulatory focus on persuasion because of the increasing awareness of health communication (WHO, 2005a). This paper also intends to study the underlying mechanisms that may explain why behavioral frequency is enhanced when regulatory orientation and message framing work together.

Prior studies on health behavior decisions have used self-reporting measures, such as behavioral

intention and attitude (Gerend and Cullen, 2008; Uskul, Sherman and Fitzgibbon, 2009). This paper would combine objective measures (including behavioral frequency and the Barthel Index, measures for activities of daily living (ADL) and mobility), with subjective measures (including behavioral intention and attitude) to draw firmer conclusions of the causality effects. Moreover, prior studies focus more on short term effects or one time decisions (Maguire *et al*, 2010; Roberto *et al*, 2010). As stroke patients suffer chronic disability, they have to consistently engage in rehabilitation training. This paper intends to assess the behavioral frequency and Barthel Index at 1-month and 3-month follow-ups to see whether message framing and regulatory focus can maximize long-term behavioral changes.

LITERATURE REVIEW

Regulatory Focus

Between 55 percent and 75 percent of stroke patients may improve their functions within six months (Jorgensen *et al.*, 1995; Michielsen *et al.*, 2011). Research has shown that intensive and early rehabilitation can further enhance patients' motor functions and facilitate cortical reorganization (Askim *et al.*, 2010; Moore *et al.*, 2010). The major determinant of motor recovery is the amount of volitional motor activity (Klein and Jones, 2008; Wolf *et al.*, 2006). In other words, stroke patients have to perform training programs voluntarily and so a patient's motivation may play an important role. Studies have proved that people's decisions and actions can be influenced by their motivational

orientations, and chronic regulatory focus. According to regulatory focus theory, there are two types of regulatory focus. One is promotion focus, being motivated to approach a desired end-state, such as nurturance. The other is prevention focus, being motivated to avoid an undesired end-state, such as risk. Moreover, the major concern of people with promotion focus is aspiration and hope so they may seize any opportunity to accomplish their goals. Meanwhile, people with prevention focus are concerned more with duties and obligations that offer them opportunities to ensure their security needs, and they try to prevent mistakes, to be responsible and meet their obligations (Higgins, 1997, 1998).

Each regulatory focus leads to different behavioral strategies in pursuit of their end-states (goals). People with promotion focus may use an approach strategy to increase the probability of a positive outcome, such as taking part in sport or efforts to have a perfect body. On the other hand, people with prevention focus prefer an avoidance strategy that avoids any negative outcomes, such as eating less and controlling weight (Higgins, 2000). Empirical studies have further proved these characteristics. In a signal-detection task, participants with promotion focus tend to hit more than miss, whereas participants with prevention focus prefer a correct rejection more than a false alarm (Crowe and Higgins, 1997). Another study uses trade-off tasks to examine participants' responses between speed and accuracy. The results show that speed is superior to accuracy for participants with promotion focus, whereas accuracy is the major

concern for participants with prevention focus (Foster, Higgins and Bianco, 2003).

Research has shown that rehabilitation can help stroke patients increase function recovery, improve self-care ability, and increase quality of life (Chaiyawat and Kulkantrakorn, 2012; Gjellesvik *et al.*, 2012; Guttman *et al.*, 2012; Treger *et al.*, 2012). According to the Taiwan stroke registry system, the Barthel Index of stroke patients shows that patients make progress from hospitalization to three months after discharge. The total independence levels, $90 \leq$ Barthel Index, increase from 32.2 percent to 47.6 percent. For those with severe symptoms, their independence levels, $60 \leq$ Barthel Index ≤ 90 , decrease from 23.4 percent to 16.8 percent three months after discharge (Chiou, 2008). Meanwhile, patients with promotion focus hope they can recover their functions as usual and they have aspirations to become normal. Since rehabilitation can help them achieve their ideal self, reducing disability and improving function, they are motivated to receive rehabilitation training to maximize positive outcomes. In other words, they seize the opportunity and are eager to engage in a training program to achieve their goals, regaining their functions as normal as possible (Boesen-Mariani, Gomez and Gavard-Perret, 2010; Higgins, 2000). Hence, stroke patients with promotion focus make efforts to participate in a rehabilitation program to increase their functional ability, leading to improvements in the Barthel index.

Among stroke patients, about a third may suffer a second stroke, and 10 percent may suffer a stroke three times or more (Burn *et al.*,

1994; Mohan *et al.*, 2009). Studies have suggested that rehabilitation can prevent stroke patients suffering a recurrent stroke (Putala *et al.*, 2011; Wu *et al.*, 2010). For patients with prevention focus, a recurrent stroke is not the desired goal. Moreover, hospitals may arrange for patients to receive rehabilitation, which is an obligation for patients after stroke. Rehabilitation gives them the opportunity to decrease negative outcomes, such as recurrent stroke and disability so they are motivated to participate in the training program, not just to prevent non-desired state but to meet their obligations (Boesen-Mariani *et al.*, 2010). After stroke, patients' ADL supposed to be personal responsibilities, may mean patients are dependent on their families. Patients may be worried that they cannot meet their responsibilities and will become a burden to their family. This can trigger their vigilance level to avoid any problems, such as ADL dependence (Pam and Chang, 2010). Rehabilitation can lead to the rapid improvement in their functional activity, which decreases their dependence on their families, and patients with prevention focus may be motivated to become involved in a training program to meet the needs of their ought to self. Moreover, whether patients are aware their illness and motivated to engage in the therapy may be influenced by their cognition level, often damaged after stroke (Cho *et al.*, 2014). However, some of them appear to have normal cognition with Mini-Mental State Examination Score (MMSE) above 24 (Folstein, Folstein and McHugh, 1975). In sum, we expect that stroke patient's involvement in training

program to improve their Barthel Index which is based on their chronic regulatory focus.

H₁: Chronic regulatory focus has positive effect on the Barthel Index.

Therapy Frequency

Stroke patients with promotion focus are motivated to engage in rehabilitation training because they want to attain positive outcomes, regain their functions as normal as possible or accomplish their aspirations. Meanwhile, patients with prevention focus are motivated to engage in rehabilitation training because they want to avoid negative outcomes, such as a recurrent stroke, or to meet their obligations. In addition to motivational orientation, systematic review articles have suggested that there are several factors, such as the type of therapy, motor disability level, brain lesion site, time since stroke and therapy frequency, that influence the rehabilitation training effects. Therapy frequency or movement repetitions may have a greater impact on motor function, balance ability and the Barthel Index score because intensive training or the repetition of volitional movement can facilitate cortical reorganization and reintegration, enhancing the speed of functional improvement (Cooke *et al.*, 2010; Kwakkel *et al.*, 2004; van Peppen *et al.*, 2004).

Empirical studies have supported that the Barthel Index is positively related to the frequency of rehabilitation. For example, intensive training for six months after a stroke has beneficial effects on the Barthel index (Kwakkel *et al.*, 2004). The increased duration of physical therapy has also been found to have positive effects on the Barthel Index and the effects can be

maintained for as long as six months (Galvin *et al.*, 2008). One study investigated the dosage effects of learning-based sensorimotor training on functional outcomes. The results show that stroke patients with training four times a week have greater improvements in functional independence than patients training only once a week (Byl, Pitsch and Abrams, 2008). Other studies have also shown consistent results (Askim *et al.*, 2010; Bernhardt *et al.*, 2008; Kwakkel, 2006).

As discussed above, intensive training or augmented practice enhances the recovery of functional outcomes, the Barthel Index, because they can promote neuroplasticity, leading to movement control and motor recovery. In other words, increasing repetitions or the frequency of rehabilitation training has positive effects on the Barthel Index and functional outcomes (Galvin *et al.*, 2008; Kwakkel *et al.*, 2004). For stroke patients with promotion focus, rehabilitation can help them attain positive outcomes, such as functional independence and the accomplishment of their aspirations, as normal as possible prior to their stroke, increasing their tendency to engage in rehabilitation so as to make progress and approach their desired goals (Boesen-Mariani *et al.*, 2010; Shah, Higgins and Friedman, 1998). Since the Barthel Index and functional outcomes are positively correlated with the repetition of rehabilitation training, therapy frequency will mediate the relationship between promotion focus and the Barthel Index. For stroke patients with prevention focus who are receiving rehabilitation after a stroke, it is their obligation to follow doctors' or therapists' arrangements.

Also, rehabilitation training can help them decrease dependence on their family members and prevent a recurrent stroke so they will try to participate in rehabilitation to avoid those negative outcomes. Since increasing the therapy frequency is positively related to functional independence and the Barthel Index, which in turn decreases the level of dependence, patients with prevention focus are more likely to follow a rehabilitation training program to prevent those undesired end-states (Cooke *et al.*, 2010; Higgins, 2000; Putaala *et al.*, 2011). Consequently, the therapy frequency also mediates the relationship between prevention focus and the Barthel Index.

H₂: Therapy frequency mediates the relationship between chronic regulatory focus and the Barthel Index.

Message Framing

Since intensive training has beneficial effects on stroke patients' progress, it is necessary to persuade patients to increase their behavioral intention and actual behavior. In addition to the influence of individual characteristic like regulatory focus, the contexts, such as temporal context (Gerend and Cullen, 2008), and framing method (Kim, 2006) may play an important role. The World Health Organization (WHO, 2005a) report addresses the need for health communication between healthcare providers and patients to help patients make changes to their health related behavior and self-management. Among health communication strategies, message framing is a useful method that has been empirically studied and theoretically tested in the literature. Healthcare providers have to not

only be aware of the influential factors of the persuasive effects but be competent in designing and delivering messages to promote recommended behavior (Myers, 2010).

Research has found that the persuasive effects of message framing may be related to the receivers' dispositional motivation styles, such as regulatory focus, suggesting that if the health message can be matched to the regulatory focus, it can produce the most persuasive effects (Carver, Sutton and Scheier, 2000; Keller, 2006; Kim, 2006; Mann, Sherman and Updegraff, 2004). The receivers use two matching principles to evaluate the persuasion of the message: regulatory relevance and regulatory fit (Aaker and Lee, 2006; Avnett and Higgins, 2006; Higgins, 2000). Regulatory relevance indicates whether the behavioral outcomes revealed by the message are consistent with the receivers' regulatory focus. For people with promotion focus, a promotional message about fruit and vegetable consumption induce more behavioral change than a prevention message, whereas the reverse occurs for people with prevention focus (Latimer *et al.*, 2005). A gain-framed message is more persuasive for people with promotion focus. On the other hand, a loss-framed message is more persuasive for people with prevention focus (Mann *et al.*, 2004).

In terms of regulatory fit, it is conceptualized as to whether the goal pursuit matches the goal orientation. If people feel right or are between the goal pursuit and regulatory focus, it increases the value of the behavior, leading to favorable attitudes and increases the behavior frequency (Aaker and Lee, 2006; Higgins, 2000). Uskul,

Keller and Oyserman (2008) manipulated the likelihood of engaging in eager or vigilant health related behavior. Their results show that individuals with prevention fit engage in more cancer detection behavior to reach their security needs, whereas individuals with promotion fit prefer stimulants to overcome physical weakness. Gerend and Shepherd (2007) manipulated gain and loss-framed messages with regulatory focus to test the persuasive effects of vaccination. A loss-framed message was found to produce stronger vaccination intentions for participants with prevention focus than people with promotion focus. Other health behavior studies also support the theory that there are more persuasive effects if the message framing fits the regulatory focus, such as smoking cessation (Zhao and Pechmann, 2007), sunscreen use (Keller, 2006), and dental flossing (Uskul, Sherman and Fitzgibbon, 2009).

Both regulatory focus and regulatory relevance reveal that if the message framing matches individuals' regulatory focus, there is a positive influence on behavioral intention, leading to increasing behavioral frequency. Hence, for stroke patients with promotion focus, a gain-framed message, emphasizing positive outcomes or benefits, such as improving function and recovery, has a strong effect on persuading patients to engage in rehabilitation training in pursuit of their goals because they are eager to

achieve positive outcomes. On the contrary, for patients with prevention focus, a loss-framed message stressing the costs or negative outcomes, such as a recurrent stroke and functional dependence, has a significant impact on encouraging patients to engage in rehabilitation training because they want to avoid any negative outcomes. To increase stroke patients' motivation, behavioral tendency and actual behavior, therapists have to act according to their patient's regulatory focus and design a tailored message to take into account regulatory fit and relevance.

H₃: Message framing interacts with stroke patients' regulatory focuses, such that patients with promotion focus have higher behavioral frequency when exposed to a gain-framed message rather than a loss-framed message.

To the best of our knowledge, this is the first study investigating whether message framing has a moderating effect on the relationship between regulatory focus, real treatment decision and therapy frequency. Moreover, whether the regulatory focus has a direct impact on the Barthel Index or whether the regulatory focus has to go through frequent therapy in order to affect the Barthel Index is still unknown. The present study has sought to address these questions. The theoretical framework of this study is shown in Figure 1.

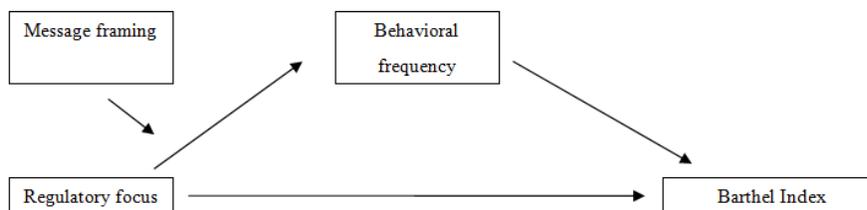


Figure 1: Theoretical Framework

METHODOLOGY

This study used a between-subject design to examine the relationship between regulatory focus and the Barthel Index, the mediating effect of therapy frequency and the moderating effect of message framing. Participants were randomly assigned to a message framing condition.

Participants

Participants following their first stroke were recruited from different medical units in Kaohsiung City. The other inclusion criteria consisted of: (1) MMSE > 24; and (2) enrolled therapy programs. The exclusion criteria included the presence of cardiovascular instability, severe joint contracture, significant osteoporosis, previous peripheral or central nervous injury and the inability to adhere to a therapist's requirements.

Measures

Message Framing. This study adopted the educational materials promoted by the Taiwan Stroke Association (2008) and the American Stroke Association (2012) to design the messages. Either advantage or disadvantage of receiving rehabilitation was highlighted in the message to manipulate the framing. Each message was about 120 words in length. Equivalent information about receiving therapy was presented in semantically different ways, emphasizing the positive consequences of receiving therapy training. Examples include 'If you receive therapy training, your chance to be totally independent will increase by 15 percent', and a message highlighting negative consequences 'If you do not receive therapy

training, your chance of total independence would decrease by 15 percent'.

Manipulation Check. The manipulation check was immediately undertaken after the message. This study adopted four items from previous research with a 7-point Likert scale to assess whether participants perceived if the message tendency was gain or loss-framed (1 = totally disagree, 7 = totally agree) (Maguire *et al.*, 2010). Whether participants perceived the tone of message as negative versus positive was assessed by two items such as 'The message tells me the advantages of rehabilitation' and 'The message tells me the disadvantages of not doing rehabilitation' ($\alpha = .81$).

Regulatory Focus. This study adopted the instrument developed by Lockwood, Jordan and Kunda (2002) to design 18 items to assess participants' regulatory focus. Instead of 9-point scale, this study used a 7-point Likert scale to be aligned with other measures. Example item for prevention focus was 'I am anxious that I will fall short of my therapy responsibilities' and 'I frequently think about how I can prevent recurrent stroke' ($\alpha = .86$), whereas for promotion focus it was 'I frequently imagine my pre-stroke condition' and 'I am focused on achieving positive outcomes in my rehabilitation' ($\alpha = .80$).

Demographic Information. Participants were asked to complete their personal information, including gender, age, educational level, and income. This study followed previous research using demographic information as control variables (Maguire *et al.*, 2010; van't Riet *et al.*, 2008). To ensure that gender, age, educational

level and income didn't have impact on Barthel Index and therapy frequency, regression analyses/ANOVA was performed to check the relationship. The results revealed that neither Barthel Index [$F(4, 83) = 1.56, p = .19 > .10$] nor therapy frequency [$F(4, 83) = 1.05, p = .38 > .10$] was influenced by demographic information.

Therapy Frequency. In Taiwan, when stroke patients went to receive therapy, the medical units had to log the patient's National Health Insurance Card for the National Health Insurance payment. Hence, every time they show up, the computer records their presence and keeps the data. Therapy frequency was collected by accounting logging days for a week. For example, if the participants went to receive therapy from Monday to Saturday, the therapy frequency was recorded as 6. As one month follow-up, therapy frequency would be accumulated for a month and then divided by 4 weeks. Three month follow-up was accounted as one month follow-up procedure.

Medical Evaluation. The therapists evaluated the participants' performance with a mini-mental state score, and the Barthel Index. Barthel Index is a ten items scale to assess basic activities of daily living, including dressing, toileting and walking etc. The score of Barthel Index ranged from 0 to 100; higher scores indicated that participants had higher ability of independent daily living (Chaiyawat and Kulkantrakorn, 2012). The patients' medical history, including disease, episodes of stroke, date of the current stroke, and date of the first therapy session, were also recorded by the therapists.

Procedures

All participants received the booklets, questionnaire and evaluation forms, from their therapists. Each participant was randomly assigned to receive one of two message conditions: gain and loss-framed and informed that the purpose of the study is to investigate their views about engaging in therapy. Since chronic regulatory focus was defined as a personal trait, it would be preferable to obtain it prior to reading the message. After reading the messages, participants were asked to complete the questionnaires containing a manipulation check and demographic information. Evaluation forms, including medical history, MMSE, and the Barthel Index, were administered individually by the therapists at the participating clinics within three time periods: pre-message, and a month/three months after receiving message. In previous studies, therapy frequency was usually collected from participants who might be contaminated by emotional or situational factors. To be more reliable, this study used the National Health Insurance Card to record their therapy frequency within three time periods: pre-message, and a month/three months after receiving the message.

RESULTS

Participants' Characteristics

Ninety-six participants fulfilled the criteria for participation in the study but seven didn't complete the study because of transport problems ($n = 2$), orthopedic injury ($n = 1$), heart attack ($n = 2$) and a recurrent stroke ($n = 2$). There were 48 females (54%) and 41 males

(46%) with ages ranging from 22 to 88 years ($M = 55.26$, $S.D = 12.97$). Participants' income ranged from 0 to 100000 NT dollars ($M = 22471$, $S.D = 26736.28$). Most participants' education levels were below senior high school ($n = 68$, 76%); only four had graduated from graduate school (4%).

Manipulation Check

This study used a paired-sample t test to make sure there was a difference between the gain and the loss-framed message. The results showed that participants perceived the message as gain-framed ($n = 40$, $t = 12.20$, $S.D = 2.91$, $p < .001$) and loss-framed ($n = 49$, $t = 7.79$, $S.D = 2.99$, $p < .001$). The manipulation was successful.

Hypotheses test

Participants' chronic regulatory focus scores were calculated by separately averaging their prevention and promotion scores. The mean promotion score was then subtracted from the mean prevention score as a measure of the predominant chronic regulatory focus. A positive score represented a predominant prevention focus, whereas a negative score indicated a predominant promotion focus. This study used a paired-sample t test to test whether the participants had predominant chronic regulatory focus inclination. The results revealed that two focus groups were almost equal with the participants (prevention focus: $M = 5.17$, promotion focus: $M = 4.92$, $t(88) = -.98$, $p = .33 > .001$).

Whether chronic regulatory focus had impact on the Barthel Index was analyzed by regression analysis. The result, as depicted in Table 1,

indicated that Barthel Index was influenced by chronic regulatory focus ($\beta = .24$, $p = .03 < .05$).

Predictors	B	Barthel Index	
		R ²	ΔR ²
Regression analysis			
Step 1			
Control variable ^b		.07	
Step 2			
Chronic regulatory focus	.23*	.12	.06*

^a n = 89; ^b Control variables (Age, Gender, Education, Income)

* $p < .05$

Table 1: Results of Regression Analysis for Barthel Index^a

Two regulatory focuses were further analyzed with a three time period ANOVA to examine how the Barthel Index changed over time. The results indicated that regulatory focus had an impact on the Barthel Index [$F(1, 39) = .46$, $p = .05 < .10$]. Moreover, as depicted in Figure 2, the

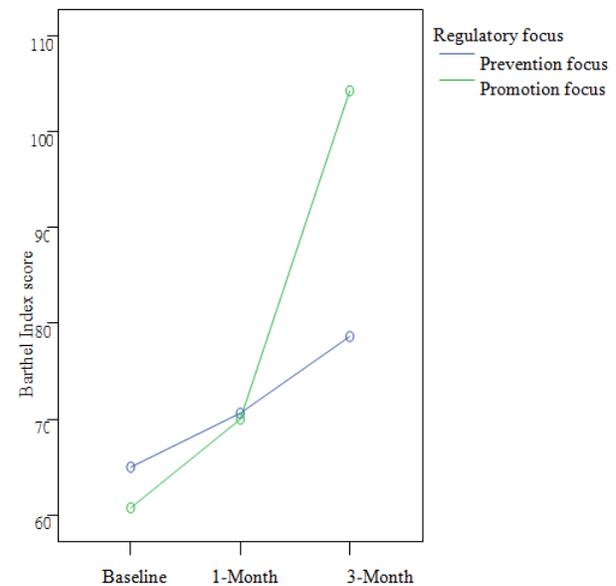


Figure 2: Barthel Index Scores for the Three Time Periods.

participants' Barthel Index increased consistently, suggesting that their daily living activities were improving [$F(1.003, 39.13) = 4.89$, $p = .03 < .05$]. A post hoc test with the

Bonferroni correction revealed that the 1-month ($p = .001 < .01$) and 3-month ($p = .05 < .10$) Barthel Index scores were higher than the initial score. The Barthel Index score for participants with promotion focus increased significantly from 1-month to 3-months and was higher than those with prevention focus. This supported the hypothesis that chronic regulatory focus has positive effect on the Barthel Index.

Research shows that the Barthel Index is positively related to the therapy frequency so this study hypothesized that therapy frequency would mediate the relationship between chronic regulatory focus and the Barthel Index. According to Baron and Kenny (1986), mediation existed with three criteria: (1) The independent variable (IV) affected the dependent variable DV; (2) The mediator affected the DV; (3) When the mediator was included in the model, the effects of the IV on the DV were weakened. Through a hierarchical regression analysis, as Table 2 depicted, chronic regulatory focus had a significant influence on the Barthel Index ($\beta = .23, p = .03 < .05$), meeting the first criterion. The therapy frequency didn't have much effect on the Barthel Index ($\beta = .09, p = .35 > .05$) so the second criterion was not supported.

Predictors	Barthel Index ^a		
	B	R ²	ΔR^2
Mediator analysis			
Step 1			
Control variable ^b		.07	
Step 2			
Chronic regulatory focus	.23*	.12	.06*
Step 3			
Therapy frequency	.09	.13	.06

^a n = 89; ^b Control variables (Age, Gender, Education, Income)

* $p < .05$

Table 2: Results of Mediator Analysis for Barthel Index

Although the mediation effect of the therapy frequency didn't exist, the relationship between chronic regulatory focus and the Barthel Index was weakened when therapy frequency was included as a covariate ($\beta = .23, p = .03 < .05$).

The regression analysis was used to test the moderating effects of message framing. In Table 3, both chronic regulatory focus ($\beta = .74, p = .02 < .01$) and message framing had major effects ($\beta = .75, p = .003 < .01$) on the therapy frequency. However, the chronic regulatory focus \times message framing interaction term was not significant ($\beta = .15, p = .55 > .10$), indicating that message framing didn't moderate the relationship between regulatory focus and therapy frequency.

Predictors	Therapy frequency		
	B	R ²	ΔR^2
Moderator analysis			
Step 1			
Control variable ^b		.07	
Step 2			
Chronic regulatory focus	.74*	.21	.14**
Message framing	.75**		
Step 3			
Chronic regulatory focus \times Message framing	.15	.21	.004

^a n = 89; ^b Control variables (Age, Gender, Education, Income)

* $p < .05$

** $p < .01$

Table 3: Results of Moderator Analysis for Therapy Frequency^a

However, in the simple slope analysis, as Figure 3 shows, the gain-framed message had a stronger effect for increased therapy frequency than the loss-framed message for participants. Participants with promotion focus had higher therapy frequency than those with prevention focus. It seemed that a gain-framed message was more effective for increasing therapy

frequency and participants with chronic promotion focus were more likely to engage in therapy.

threats to their safety. Since therapy gave them opportunities to decrease negative outcomes,

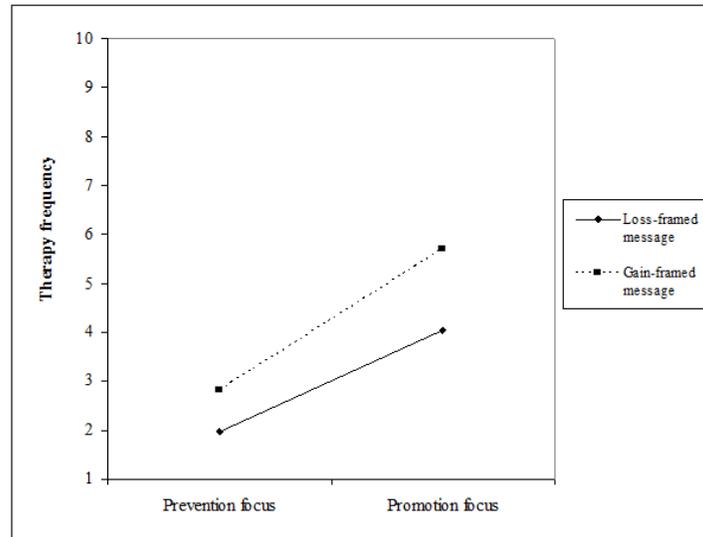


Figure 3: Mean Therapy Frequency by Chronic Regulatory Focus

DISCUSSION

As far as the researchers are aware, this was the first randomized trial evaluating the effects of chronic regulatory focus combined with message framing on real treatment decisions, therapy frequency and functional outcome, and the Barthel Index. The result of this study supported the hypothesis that both chronic promotion focus and chronic prevention focus have a positive influence on the Barthel Index and therapy frequency. However, the moderating effect of message framing and the mediating effect were not supported.

The results of this study not only showed that chronic regulatory focus had an impact on the Barthel Index but that participants with chronic promotion focus showed a greater improvement than those with chronic prevention focus. According to regulatory focus theory, patients with prevention focus were motivated to avoid

such as recurrent stroke and disability, they were motivated to participate in the training program, not just to prevent the non-desired state but to meet their obligations. People with promotion focus were motivated to realize achievements and were sensitive to opportunities. They hoped, they can recover their function as usual and they had aspirations to return to normal. In other words, they wanted to maximize the positive outcome (Boesen-Mariani *et al.*, 2010; Higgins, 2000). Moreover, during the training program, every time they performed, they had successful feedback which increased their motivation and performance (Foster *et al.*, 2001). Hence, they were more likely to engage in the training program, leading to improvements in the Barthel Index.

Stroke patients understood that therapy could help them reach their desired goals so they would participate in the training programs. Increasing repetitions or the frequency of rehabilitation

training had positive effects on the Barthel Index and functional outcomes (Galvin *et al.*, 2008; Kwakkel *et al.*, 2004). Since the Barthel Index and functional outcome are positively correlated with the repetition of rehabilitation training, this study hypothesized that the therapy frequency would mediate the relationship between chronic regulatory focus and the Barthel Index. However, the result was not supported. The Barthel Index was mainly composed of daily living activities, such as eating and dressing. Patients with a stroke often practice a lot in their daily life. When patients are engaged in their daily life, their Barthel Index scores improved insidiously. Therefore, the increasing scores might be partly due to daily practice, causing a small therapeutic effect.

As the moderating effect of message framing, the study result was also not supported. This study tried to measure the real behavior rather than the intention to engage in therapy. It would be difficult to ascertain the effects because a one-time exposure usually had a relatively small behavioral impact (Wolburg, 2006). However, attaining a positive outcome needs direct behavioral change. From the simple slope analysis, a gain-framed message was more beneficial for prompting therapy frequency for both groups than a loss-framed message. Practitioners might consider allowing stroke patients to be intensively and consistently exposed to a gain-framed message to attain the persuasive effects.

CONCLUSION

For stroke patients, whether engaging in the training program was helpful with their future

performance and outcome was unknown. However, participating in the therapy was beneficial to attaining a positive outcome and decreasing functional dependence. The present study gave practitioners the behavioral implications of such choices by demonstrating that predominant chronic regulatory focus was an important motivational orientation. Compared to a loss-framed message, a gain-framed message might be better for persuading stroke patients to increase their therapy frequency.

IMPLICATIONS

Self-regulatory focus theory proposed that people with different chronic regulatory focus would lead to different behavioral strategies in pursuit of their goals. For people with prevention focus, they were more concern about negative outcomes and responsibilities, where as people with promotion focus focused on positive outcomes and accomplishments (Higgins, 1997). Previous studies with regulatory focus mainly focus on public campaign such as smoking and their dependent variable were general intentions. The finding of this study added the evidence of chronic regulatory focus on the real treatment decision and long-term behavioral change.

The result of this study showed that chronic regulatory focus and message framing were useful to facilitate long-term behavioral change. Even though message framing didn't have moderating influence on the relationship between chronic regulatory focus, simple slope analyses indicated that gain-framed message had better effect to increase behavioral frequency. This provided the practitioners guidelines to design

low-cost and persuasive messages to increase stroke patients' behavioral intention and behavioral frequency.

LIMITATIONS AND FUTURE DIRECTIONS

Although the findings suggested that chronic regulatory focus could serve as an important motivational orientation, it was limited with stroke patients. Whether the results could be generalized to other patients is questionable. Researchers might wish to examine patients with different kinds of injury, such as brain injury and spinal cord injury. The dependent variable in this study only focused on functional outcome, the Barthel Index. Future research might include other measurements, such as balance scores, to test the effect of therapy frequency.

REFERENCES

- Aaker, J. L. & Lee, A. J. (2006). Understanding regulatory fit. *Journal of Marketing Research*, 43(1): 15–19.
- American Stroke Association (2012). Let's talk about stroke and rehabilitation. Retrieved June 21, 2012, from <http://www.strokeassociation.org/STROKEORG>.
- Askim, T., Mørkved, S., Engen, A., Roos, K., Aas, T. & Indredavik, B. (2010). Effects of a community-based intensive motor training program combined with early supported discharge after treatment in a comprehensive stroke unit: A randomized, controlled trial. *Stroke*, 41(8): 1697–1703.
- Avnett, J. J. & Higgins, E. T. (2006). How regulatory fit affects value in consumer choices and opinions. *Journal of Marketing Research*, 43(1): 1–10.
- Baron, R. M. & Kenny, D. A. (1986). The moderator–mediator distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality & Social Psychology*, 51(8): 1173–1182.
- Bernhardt, J., Chitras, N., Meslo, I. L., Thrift, A. G. & Indredavik, B. (2008). Not all stroke units are the same: a comparison of physical activity patterns in Melbourne, Australia, and Trondheim, Norway. *Stroke*, 39(7): 2059–2065.
- Boesen–Mariani, S., Gomez, P. & Gavard–Perret, M. (2010). Regulatory focus: A promising concept for marketing research. *Recherche et Applications en Marketing*, 25(1): 88–106.
- Burn, J., Dennis, M., Bamford, J. Sandercock, P., Wade, D. & Warlow, C. (1994). Long term risk of recurrent stroke after a first ever stroke. The Oxford Shire Community stroke project. *Stroke*, 25(2): 333–337.
- Byl, N. N., Pitsch, E. A. & Abrams, G. M. (2008). Functional outcomes can vary by dose: Learning–based sensorimotor training for patients stable poststroke. *Neurorehabilitation & Neural Repair*, 22(5): 494–504.
- Carver, C. S., Sutton, S. K. & Scheier, M. F. (2000). Action, emotion, and personality: Emerging conceptual integration. *Personality & Social Psychology Bulletin*, 26(6): 741–751.
- Chaiyawat, P. & Kulkantrakorn, K. (2012). Effectiveness of home rehabilitation program for ischemic stroke upon disability and quality of life: A randomized controlled trial. *Clinical Neurology & Neurosurgery*, 114(7): 886–870.
- Chiou, H.Y. (2008). Epidemiology and current condition of stroke. Retrieved July 7, 2012, from http://www.stroke.org.tw/newpaper/2008Sep/paper_2.asp.
- Cho, K. H., Lee, J. Y., Lee, K. J. & Kang, E. K. (2014). Factors related to gait function in post-stroke patients. *Journal of Physical Therapy Science*, 26(12): 1941–1944.
- Council for Economic Planning and Development (2010). Population projections for R.O.C (Taiwan): 2010–2060. Retrieved July 7, 2012, from [BMC Medicine, 8: 60, Retrieved July 7, 2012, from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC29664466/?tool=pubmed>.](http://www.cepd.gov.tw/m1.aspx?sNo=0000455&key=&ex=)
- Crowe, E. & Higgins, E. T. (1997). Regulatory focus and strategic inclinations: promotion and prevention in decision-making. *Organizational Behavior & Human Decision Processes*, 69(2): 117–132.
- Edward, T., Victor, W. M. & Gitendra, U. (2014). Implications of CI therapy for visual deficit training. *Frontiers in Integrative Neuroscience*, 9(8): 78 Retrieved July 12, 2014, from <http://journal.frontiersin.org/article/10.3389/fnint.2014.00078/full>.
- Folstein, M. F., Folstein, S. E. & McHugh, P. R. (1975). Mini-mental state: A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, 12(3): 189–198.
- Forster, J., Higgins, E. T. & Bianco, A. T. (2003). Speed/accuracy decisions in task performance: Built-in tradeoff or separate strategic concerns? *Organizational Behavior & Human Decision Processes*, 90(1): 148–164.
- Forster, J., Grant, H., Idson, L. C. & Higgins, E. T. (2001). Success/failure feedback, expectancies, and approach/avoidance motivation: How regulatory focus moderates classic relations. *Journal of Experimental Social Psychology*, 37(3): 253–260.
- Galvin, R., Murphy, B., Cusack, T. & Stokes, E. (2008). The impact of increased duration of exercise therapy on functional recovery after stroke – what is the evidence? *Topics in Stroke Rehabilitation*, 15(4): 365–377.
- Gerend, M. A. & Cullen, M. (2008). Effects of message framing and temporal context on college students drinking behavior. *Journal of Experimental Social Psychology*, 44(4): 1167–1173.
- Gjellesvik, T. K., Brurok, B., Tørrhaug, T. & Helgerud, J. (2012). Effect of high aerobic intensity interval treadmill walking in people with chronic stroke: A pilot study with one year follow-up. *Topics in Stroke Rehabilitation*, 19(4): 353–360.
- Gerend, M. A. & Shepherd, J. E. (2007). Using message framing to promote acceptance of the human papillomavirus vaccine. *Health Psychology*, 26(6): 745–752.
- Guttman, A., Burstin, A., Brown, R., Bril, S. & Dickstein, R. (2012). Motor imagery practice for improving sit to stand

- and reaching to grasp in individuals with poststroke hemiparesis. *Topics in Stroke Rehabilitation*, 19(4): 306–319.
- Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist*, 52(12): 1280–1300.
- Higgins, E. T. (1998). Promotion and prevention: Regulatory focus as a motivation principle. In M. P. Zanna (Ed.), *Advances in experimental social psychology*: 1–46. New York: Academic Press.
- Higgins, E. T. (2000). Making a good decision: Value from fit. *American Psychologist*, 51(11): 1217–1230.
- Jorgensen, H. S., Nakayama, H., Raaschou, H. O., Vive-Larsen, J., Stoier, M. & Olsen, T. S. (1995). Outcome and time course of recovery in stroke. Part II: time course of recovery. The Copenhagen stroke study. *Archives of Physical Medicine & Rehabilitation*, 76(5): 406–412.
- Keller, P. A. (2006). Regulatory focus and efficacy of health messages. *Journal of Consumer Research*, 32(1): 109–114.
- Kim, Y. (2006). The role of regulatory focus in message framing in anti-smoking advertisements for adolescents. *Journal of Advertising*, 35(1): 143–151.
- Klein, J. A. & Jones, T. A. (2008). Principles of experience-dependent neural plasticity: Implications for rehabilitation after brain damage. *Journal of Speech, Language & Hearing Research*, 51, S225–S239.
- Kwakkel, G. (2006). Impact of intensity of practice after stroke: Issues for consideration. *Disability & Rehabilitation*, 28(13–14): 823–830.
- Kwakkel, G., van Peppen, R. & Wagenaar, R.C. (2004). Effects of augmented exercise therapy time after stroke. A meta-analysis. *Stroke*, 35(11): 2529–2536.
- Latimer, A. M., Katulak, N. A., Mowad, L. & Salovey, P. (2005). Motivating cancer prevention and early detection behaviors using psychologically tailored messages. *Journal of Health Communication*, 10, 137–155.
- Lockwood, P., Jordan, C. H. & Kunda, Z. (2002). Motivation by positive or negative role models: Regulatory focus determines who will best inspire us. *Journal of Personality & Social Psychology*, 83, 854–864.
- Maguire, K. C., Gardner, J., Sopory, P., Jian, G., Roach, M., Amschlenger, J., Moreno, M., Pettey, G. & Piccone, G., (2010). Formative research regarding kidney disease health information in a Latino American sample: Associations among message, frame, threat, efficacy, message effectiveness, and behavioral intentions. *Communication Education*, 59(3): 344–359.
- Mann, T., Sherman, D. & Updegraff, J. (2004). Dispositional motivations and message framing: A test of the congruency hypothesis in college students. *Health Psychology*, 23(3): 330–334.
- McCormick, M. & McElroy, T. (2009). Healthy choices in context: How contextual cues can influence the persuasiveness of framed health messages. *Judgment & Decision Making*, 4(3): 248–255.
- Michielsen, M. E., Selles, R. W., van der Geest, J. N., Stam, H. J., Smits, M., Ribbers, G. M. & Bussmann, J. B. J. (2011). Motor recovery and cortical reorganization after mirror therapy in chronic stroke patients: A phase II randomized controlled trial. *Neurorehabilitation & Neural Repair*, 25(3): 223–233.
- Mohan, K. M., Crichton, S. L., Grieve, A. P., Rudd, A. G., Wolfe, C. D. & Heuschmann, P. U. (2009). Frequency and predictors for the risk of stroke recurrence up to 10 years after stroke: the South London Stroke Register. *Journal of Neurology, neurosurgery & Psychiatry*, 80(9): 1012–1018.
- Moore, J. L., Roth, E. J., Killian, C. & Hornby, T. G. (2010). Locomotor training improves daily stepping activity and gait efficiency in individuals poststroke who have reached a “plateau” in recovery. *Stroke*, 41(1): 129–135.
- Myers, R. E. (2010). Promoting healthy behaviors: How do we get the message across? *International Journal of Nursing Studies*, 47(4): 500–512.
- Pam, M. T. & Chang, H. H. (2010). Regulatory focus, regulatory fit, and the search and consideration of choice alternatives. *Journal of Consumer Research*, 37(4): 626–640.
- Putala, J., Haapaniemi, E., Kurkinen, M., Salonen, O., Kaste, M. & Tatlisumak, T. (2011). Silent brain infarcts, leukoaraiosis, and long-term prognosis in young ischemic stroke patients. *Neurology*, 76(20): 1742–1749.
- Roberto, A. J., Goodall, C. E., West, P. M. & Mahan, J. D. (2010). Persuading physicians to test their patients’ level of kidney functioning: The effects of message frame and point of view. *Health Communication*, 25, 107–118.
- Shah, J., Higgins, E. T. & Friedman, R. S. (1998). Performance incentives and means: How regulatory focus influences goal attainment. *Journal of Personality & Social Psychology*, 74(2): 285–293.
- Sicuri, C., Porcellini, G. & Merolla, G. (2014). Robotics in shoulder rehabilitation. *Muscles, Ligaments & Tendons Journal*, 4(2): 207–213.
- Taiwan Stroke Association (2008). Taiwan guidelines for the management of stroke. Retrieved March 18, 2012, from <http://www.stroke.org.tw/guideline/guideline/file/台灣腦中風防治指引2008.pdf>.
- Taub, E. (2012). Parallels between use of constraint-induced movement therapy to treat neurological motor disorders and amblyopia training. *Developmental Psychobiology*, 54(3): 274–292.
- Thieme, H., Mehrholz, J., Pohl, M., Behrens, J. & Dohle, C. (2013). Mirror therapy for improving motor function after stroke. *Stroke*, 44(1): e1–e2.
- Treger, I., Aidinof, L., Lehrer, H. & Kalichman, L. (2012). Modified constraint-induced movement therapy improved upper limb function in subacute poststroke patients: a small-scale clinical trial. *Topics in Stroke Rehabilitation*, 19(4): 287–293.
- Uskul, A. K., Keller, J. & Oyserman, D. (2008). Regulatory fit and health behavior. *Psychology & Health*, 23, 327–346.
- Uskul, A. K., Sherman, D. K. & Fitzgibbon, J. (2009). The cultural congruency effect: Culture, regulatory focus, and the effectiveness of gain- and loss-framed health messages. *Journal of Experimental Social Psychology*, 45(3): 535–541.
- Vafadar, A. K., Côté, J. N. & Archambault, P. S. (2015). Effectiveness of functional electrical stimulation in improving clinical outcomes in the upper arm following stroke: A systematic review and meta-analysis. *BioMed Research International*, Epub 2015 Jan 22 Retrieved Feb 12, 2015 from <http://www.hindawi.com/journals/bmri/2015/729768/>.van Peppen, R. P. S., Kwakkel, G., Wood-dauphinee, S., Hendricks, H. J. M., van der Wees P. H. J. & Dekker, J. (2004). The impact of physical therapy on functional outcomes after stroke. What’s the evidence? *Clinical Rehabilitation*, 18(8): 833–862. van’t Riet, J., Ruiter, R. A. C., Werrij, M. Q. & de Vries, H. (2008). The influence of self-efficacy on the effects of framed health messages. *European Journal of Social Psychology*, 38(5): 800–809.
- Wolburg, J. M. (2006). College students’ responses to

- antismoking messages: Denial, defiance, and other boomerang effects. *Journal of Consumer Affairs*, 40(2): 294–323.
- Wolf, S. L., Winstein, C. J., Miller, J. P., Taub, E., Uswatte, G., Morris, D., Giuliani, C., Light, K. E. & Nichols-Larsen D. (2006). Effect of constraint-induced movement therapy on upper extremity function 3 to 9 months after stroke: The EXCITE randomized clinical trial. *JAMA*, 296(17): 2095–2104.
- World Health Organization (2005a). Preparing a health care workforce for the 21st century: The challenge of chronic conditions. World Health Organization, Geneva.
- Wu, B., Lin, S., Hao, Z., Yang, J., Xu, Y., Zhang, S. & Liu, M. (2010). Proportion, risk factors and outcome of lacunar infarction: A hospital-based study in a Chinese population. *Cerebrovascular Disease*, 29(2): 181–187.
- Wüest, S., van de Langenberg, R. & de Bruin, E. D. (2014). Design considerations for a theory-driven exergame-based rehabilitation program to improve walking of persons with stroke. *European Review of Aging & Physical Activity*, 11, 119–129.
- Zhao, G. & Pechmann, C. (2007). The impact of regulatory focus on adolescents' response to antismoking advertising campaigns. *Journal of Marketing Research*, 44(4): 671–687.