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Dhwani Kamlesh Doshi

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Perception of Healthcare Providers on Mirror Therapy for Stroke

Dhwani Kamlesh Doshi

Harrisburg University of Science and Technology

Submitted in partial fulfilment of the requirements for the Masters Degree

HCIN 699 Professor Glenn Mitchell

April 17, 2020

Abstract

Stroke is a very important health problem faced worldwide with high mortality and incidence. The majority of stroke survivors suffer temporary or permanent disabilities of which hemiparesis is one of the most common. Hemiparesis makes it difficult for patients to perform their activities of daily living and often they have declining quality of life. Mirror therapy (MT) is a an inexpensive, easy and safe intervention which has been proven to be very effective to improve the motor function in hemiparetic stroke. Despite this, it is not often employed. Hence, the purpose of this study was to explore the awareness and perception of the various healthcare providers of MT for stroke and to define the value of MT in their opinion. The study was conducted using an anonymous online survey, and the data was collected and analysed using Microsoft Excel. It was found that a majority of the responding health care providers are aware of MT and some find it of value as an effective intervention.

Keywords: Perception, healthcare providers, mirror therapy, hemiparetic stroke, stroke therapy

Introduction

Worldwide almost 15 million people suffer from Stroke every year according to the World Health Organization (WHO) out of which almost 5 million people die and 5 million are permanently disabled. (“World Health Report”, 2002) Stroke not only has a very high incidence and mortality rate but also often causes temporary and/or life-long disabilities in stroke survivors. Almost 85% of these survivors develop hemiplegia i.e. weakness or partial paralysis on one side of the body (usually affecting facial, legs and arms muscles) (Bin Song & Cho Park, 2015) causing limitations in the functional movements which affects the activities of daily living (ADLs) of these patients making them partially or fully dependent on assisted devices or others. (Gurbuz et al, 2016)

One of the major goals of stroke rehabilitation is to help the patients achieve the highest level of independence functionally so that their quality of life is better despite of all the existing limitations by focusing on their physical, emotional and cognitive functions. (Gurbuz et al, 2016) Although the new advances in the stroke rehabilitation have helped in increasing the life expectancy, it is insufficient to use the conventional methods only to achieve a complete well-being of stroke survivors. (Langhorne, 2009)

Mirror therapy (MT) is a very simple, cost-effective, cheap and most importantly patient- oriented treatment approach. (Gurbuz et al, 2016) In this therapy the patient is made to sit in a chair and a mirror is placed in their mid-sagittal plane. The affected side limb (upper or lower) is placed on the other side of the mirror so that the patient is unable to see it and the normal limb is placed opposite to the mirror so that its reflection is seen in the mirror. The patient is then instructed to watch the mirror while performing various movements with the normal limb and to simultaneously try to perform the same movements using the affected limb. (Ramachandran, 1996) In order to ensure that the affected limb is properly covered it can be covered by a screen or inserted in an enclosed box (Hains, n.d.).

Clinically, MT is administered by Physical Therapists (PT), Physical Therapy Assistants (PTAs) , Occupational Therapists (OT) and Occupational Therapy Assistants (OTAs), but can be given by a caregiver or even self- administered at home after proper training from a PT or OT followed by a regular follow- up. There are no side effects of MT reported in any of the studies published to date. (Hains, n.d.) MT can be performed in all kinds of settings such as hospitals, in-patient or out-patient rehab centres, at home, etc. and can be administered either individually or in group, but the latter is avoided in case of hemispatial neglect cases or cases with attention deficits. This therapy can be administered on its own or in conjunction with various other interventions like with Electrical Stimulation (Lee et al, 2016), treadmill (Broderick,2019), or activity- based therapy (Arya et al, 2019). Most studies gave MT for 30-60 mins/day, 5 days/week for 6 weeks continuously. (Dohle et al, ; Yavuzer et al, ; Michielsen et al,)

MT was first suggested by Ramachandran in 1995 to reduce phantom limb pain and later with Altschuler et al in 2009 for stroke patients. MT is used to treat all acute (Thieme et al, 2013), sub- acute (Yavuzer et al, 2008) and chronic (Bin Song & Cho Park, 2015) types of stroke, but it is best to start it as early as possible. The human brain is capable of substantially modifying its connections or re-wiring itself due to its characteristic of neuroplasticity. This characteristic can help in regaining the brain functions that are lost or help in maintaining the functions that are still present. Thus, repeated muscle activity can help in modifying the damaged motor cortex.

According to the current hypothesis, motor recovery seen in the affected limb by seeing the reflections of repeated movements of the unaffected limb is due to the triggering of the neuronal connections in the primary motor cortex by activation of the mirror neurons present in the brain and their simultaneous interaction with the motor neurons. (Gurbuz et al, 2016) Basically, MT is a visually managed motor illusion of a movement performed mentally

without a clear application (Stevens and Stoykov, 2003) where there is superimposition of reflections of movements of unaffected limb on the projections of affected limb (Toh et al, 2012) creating a visual illusion of an increase in the movement ability of the weak or paralyzed limb (Stevens and Stoykov, 2003) compensating for the lost or decreased proprioceptive input post-stroke. (Altschuler et al, 1999)

This hypothesis is supported by the observations made from functional brain imaging studies showing increase in the excitability of primary cortex of the affected side while observing the movements in the mirror. (Garry et al, 2005;Michielsen et al, 2011) Significant improvement in the superficial touch sensation was also observed post-MT when used in combination with standard therapy in comparison to control group which received only standard therapy showing that MT also activates changes in somatosensorial representation. (Dohle et al, 2009; Arya et al, 2018)

Currently a number of studies conclude that MT is very effective in post-stroke rehabilitation due to the significant differences observed in the motor functions and outcomes post-MT such as in scores on the Fugl-Meyer Assessment (Dohle et al, 2009; Michielsen et al,2011; Thieme et al, 2012), Brunnstorm stages and Functional Independence Measure self-care scores (Yavuzer et al, 2008). In addition, it was noted that the improvement and difference was still evident in post 6- months follow-up. (Yavuzer et al, 2008; Thieme et al, 2012) Thus, MT is used to improve the following deficits caused due to stroke UE motor functions (Bin Song & Cho Park, 2015) (Thieme et al, 2012), manual skills (Cristina et all, 2015), LE motor functions (Broderick et al, 2019), ADLs performance (Bin Song & Cho Park, 2015; Thieme et al, 2012), Superficial touch sensation (Dohle et al, 2009), Pain (Thieme et al, 2012), Reducing muscle tone (Broderick et al, 2019), Posture and Gait deviations (Hioka et al, 2019), Motor learning (Harmsen et al, 2015), etc.

There were studies that found no significant difference in the improvements between the two groups of patients. (Antoniotti et al, 2019). One of the major problems is that it's not specific when exactly will the plasticity dependent on repeated muscle activity may appear as it may take days, months or years for cortico- motor reorganization. (Bütefisch et al, 2000) Also, the major limitations seen in the literature reviewed included inadequate sample size, treatment for shorter duration, different treatment protocols used for control groups, shorter follow- up (Gurbuz et al, 2016) , lack of long-term follow- up (Dohle et al, 2009), certain methodological limitations (Thieme et al, 2012) and lack of the use of imaging technique to evaluate post- MT brain re-organization. (Gurbuz et al, 2016).

The current study evaluates the awareness and the perception of healthcare providers on MT for stroke rehabilitation and to understand whether or not they find it an important and valuable intervention.

Personal Relevance

I have a Master's Degree in Neuromuscular Rehabilitation and hence, I am and will be working with many stroke cases in future and after reading all the mixed literature I came across , it makes me wonder that although there is a lot of literature out there on effectiveness of MT, personally I have never come across a referral for MT from a Neurologist yet and also have never seen MT being practiced in any of the Rehabilitation settings I've worked before. Also, I have not heard any of my colleagues or friends practicing it in their clinics either. MT is inexpensive, easy and most importantly a safe intervention without any side- effects than it's important to know why it is not being referred. It is because of this that I believe it is important to know the awareness and perception of MT amongst healthcare providers and understand what are the reasons behind them.

Methodology

Participants

In order to assess the perception of MT, participants in the study included the healthcare providers who are responsible for referring or administering MT; i.e., Neurologists, Residents in Neurology, PTs, PTAs, OTs and OTAs.

Materials

An anonymous online survey was designed that attempted to consider the perspective of all the potential participants. The survey was made available on Survey Monkey so that it was inexpensive and easily accessible to all. It consisted of a brief explanation of the mechanism of action of MT and a total of nine questions. A sample of the survey used is in the Appendix.

Study design

This was a cross-sectional study with purposive sampling. The inclusion criteria were all healthcare providers related to MT. There were no exclusion criteria.

Procedure

IRB approval was obtained from the Harrisburg University of Science and Technology. Next, the link to the online survey was distributed to the healthcare providers via various social media apps such as Facebook, WhatsApp and Instagram. Additional participants were contacted via e-mail. A total of 85 responses were collected. The survey data were then analysed graphically, and a Chi-Square test was performed using Microsoft Excel to test whether the type of respondent was significant or not.

Results

There were 85 responses of the survey collected over the span of 2 months. From the entire sample almost 86% of the responses were from the PTs/PTAs, 7% from OTs/OTAs and only 3.53% responses each from Neurologists and Residents of Neurology as shown in Figure 1. None of the survey responses have any missing values. On performing a Chi- square test in

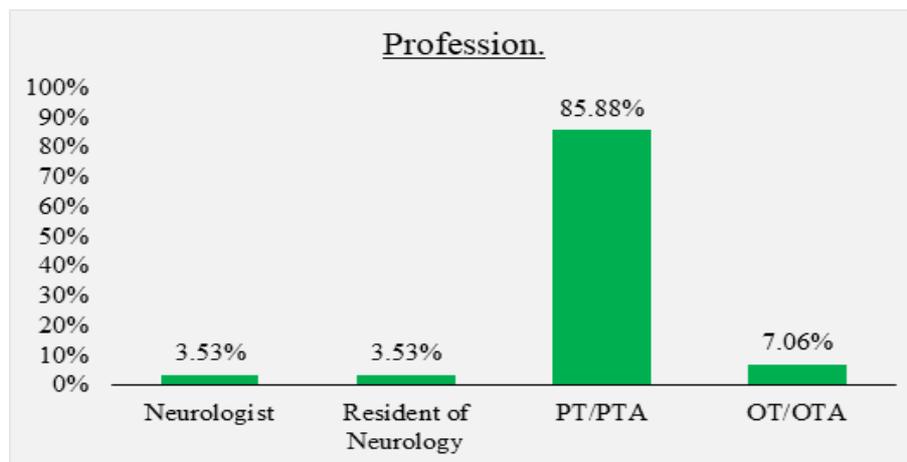


Figure 1.

Microsoft Excel, the p-value = $1.138e-42$. Which means p is <0.05 making it statistically significant. Thus, rejecting the Null Hypothesis of the distribution of respondent types being uniform and accepting the alternate hypothesis. This means the distribution across the type of respondents was not uniform. It should also be noted that almost 63% of the responses were from India and 2% were from Canada and South Korea (Figure 2).

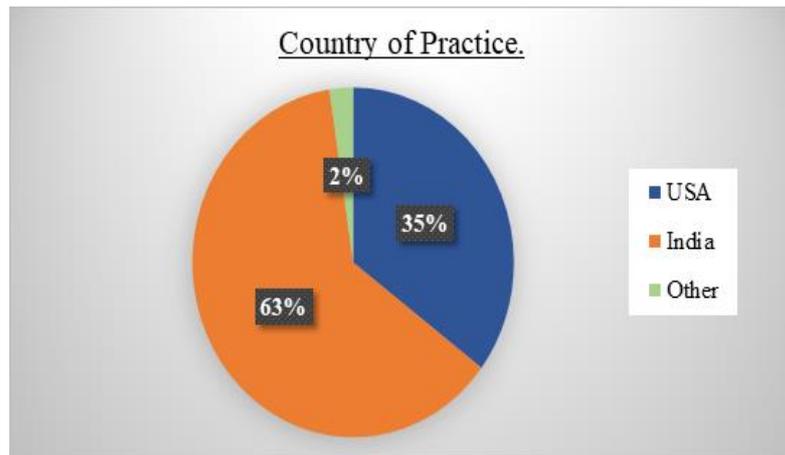


Figure 2.

The study explored the awareness of MT among healthcare providers and almost 98% of the respondents were aware of MT (Figure 3). Also, a majority of the respondents said that the source of their awareness regarding MT was at Schools/University (62%), Peer-review articles or journals (17%) and workplace (9%). Only a few said that their source of awareness is Others (2%) consisting of workshop and internet and magazines (1%). (Figure 4)

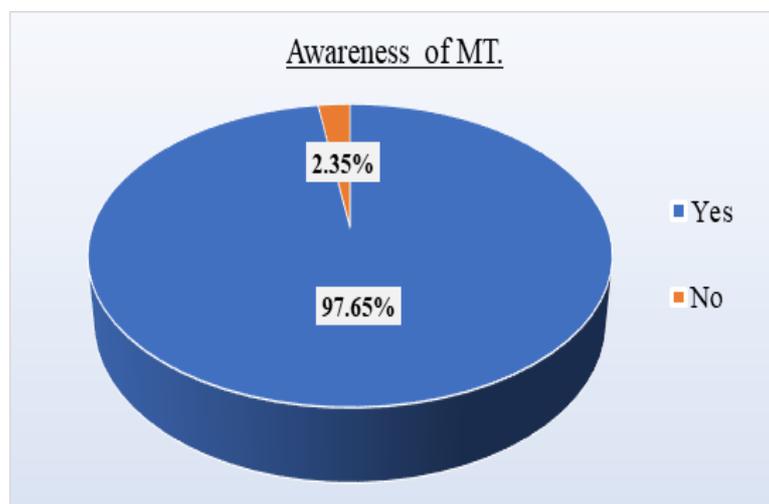


Figure 3.

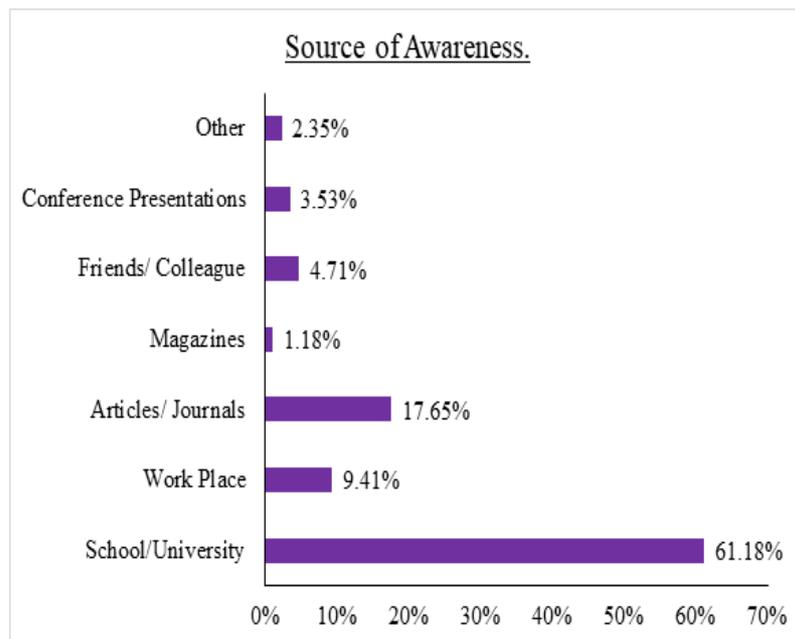


Figure 4.

Checking level of awareness to evaluate perception was not enough and therefore, the healthcare providers' opinions on the effectiveness of MT was also explored and almost 86% of them feel that MT is effective with about 14% saying that they are uncertain regarding the effectiveness of MT. (Figure 5)

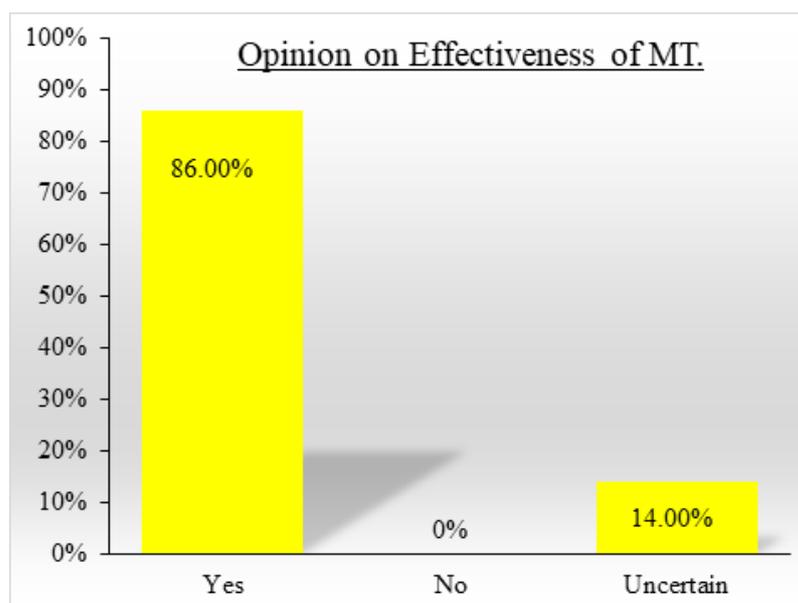


Figure 5.

On asking their perception on the value of MT, majority of them found it of either some value (49.41%) or substantial value (49.41%). None of them said they think that MT is harmful. (Figure 6)

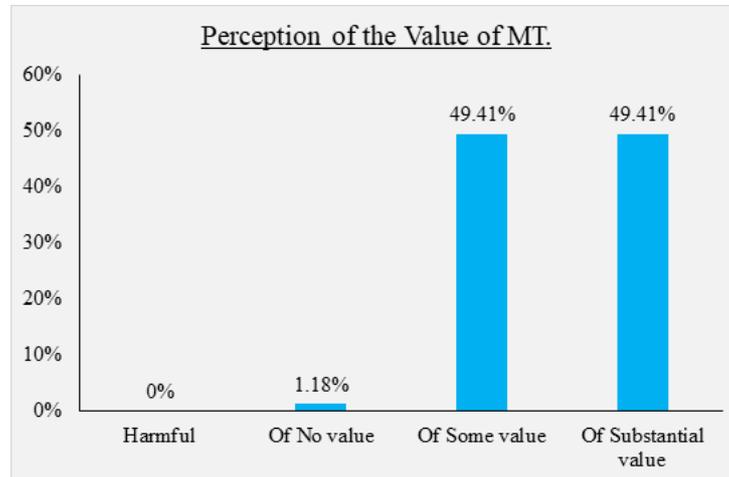


Figure 6.

Hence, after determining how they feel about MT, this study explored whether or not the healthcare providers have in past or currently refer their patients for MT or used it for their Stroke patients. It was observed that almost 66% respondents use MT. (Figure 7) On asking how often they prefer to use it, almost 56% respondents said Seldom/Occasionally and only 10% said Never. (Figure 8)

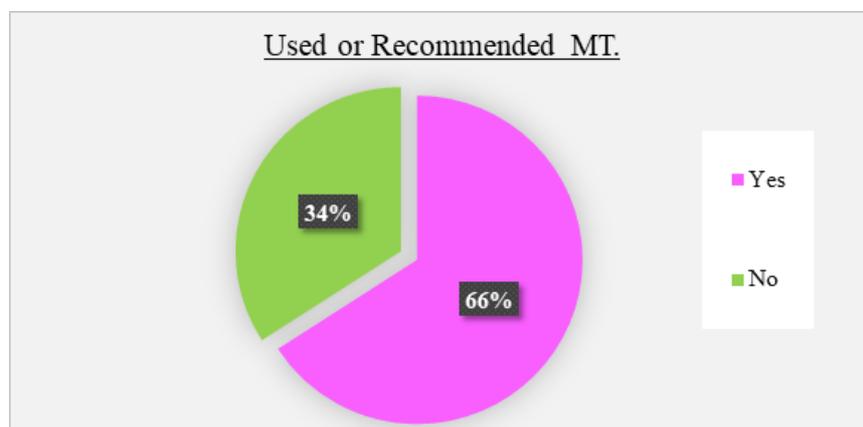


Figure 7.

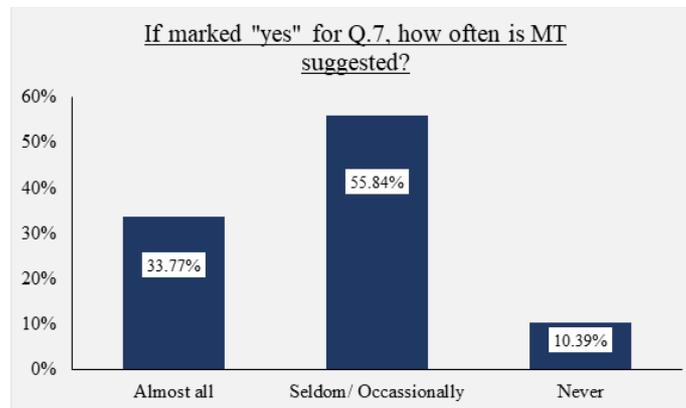


Figure 8.

Lastly, when asked to mark all the reasons for not using or recommending MT, Lack of training (39%), Lack of appropriate knowledge (31%), other preferred interventions (17.65%) and time-consuming (11.76%) were most common responses. (Figure 9) The results are more broadly discussed in the discussion section below.

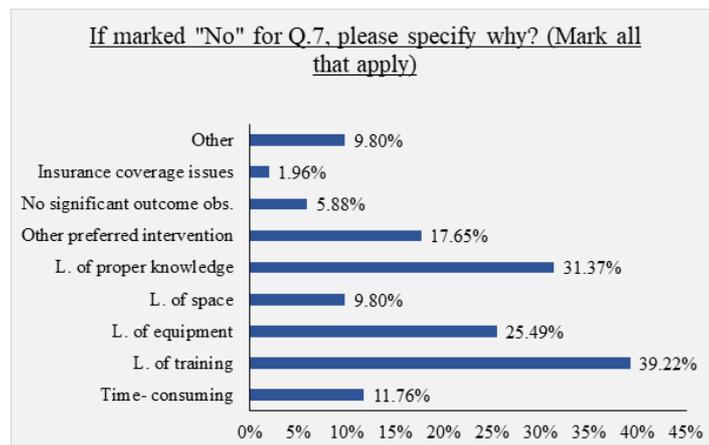


Figure 9.

Discussion

MT therapy has been discovered to be useful to treat stroke cases in the year 2009 by Altschuler et al. Since then there has been a body of literature which demonstrates that Mirror

therapy (MT) is a very simple, cost-effective, inexpensive, and most importantly patient-oriented treatment approach (Gurbuz et al, 2016). However, with this support, it is not being practiced much in the clinical settings yet. There has not been much literature on the perception of healthcare providers on MT found. Therefore, this study was conducted to begin to explore the awareness and perception of healthcare providers regarding MT and its effectiveness.

From the data analyzed, almost 98% of the respondents were aware of MT (Figure 3) and a majority of respondents said that the source of their awareness regarding MT was Schools/Universities (62%), peer-review articles or journals (17%) and the workplace (9%) (Figure 4). With a majority of providers aware of MT and its presence at important places of learning, it becomes even more important to explore as to why it is not very seen in practice.

On analysing healthcare providers' opinions on the effectiveness of MT, almost 86% feel that MT is effective which is aligned with literature but still almost 14% report that they are uncertain regarding the effectiveness of MT. (Figure 5). Perhaps a reason for this uncertainty is that although the brain can modify its connections, each person has a unique ability to do so. This makes it uncertain as to how and when the neuroplasticity in a specific person will occur. (Bütefisch et al, 2000)

None of the respondents thought that MT is harmful. (Figure 6) which is supported by the literature. (Hains, n.d.) On exploring how often healthcare providers prefer to use it, almost 56% said "Seldom/Occasionally" and only 33% said "always". This implies that after observing the data from Figures 5, 6, and 7, there is still something stopping them from employing this therapy with all their patients. One reason can be that the exact parts of body and brain affected during a stroke differ and some stroke patients may not have significant weakness in their extremities. This may not trigger the use of MT in their therapy.

Lastly, the reasons for not using or recommending MT (Figure 9) were lack of training (39%), lack of appropriate knowledge (31%), other preferred interventions (17.65%) and time-

consuming (11.76%). This implies that although MT and its effectiveness is taught and discussed, there is not sufficient clinical training given to healthcare providers.

In conclusion, a majority of healthcare providers are aware of MT and judge it effective to treat hemiplegic stroke, but it may require additional training opportunities before MT can be used more extensively and effectively.

Recommendations

The respondent type in this study was not uniformly distributed, so a more extensive study in future should be carried out with a more representative sample. Another recommendation is that a study including only those healthcare providers directly working in stroke treatment settings should be included since some respondents did not work in a clinical stroke treatment setting. The data collected was also potentially biased by a preponderance of respondents from India, hence healthcare providers from specific countries can also be explored. Lastly, the possible relationship between perception of MT and years of experience can be explored since more experience could change opinions based on clinical experience.

AppendixOnline Survey.TITLE: PERCEPTION OF HEALTHCARE PROVIDERS ON MIRROR THERAPY FOR
STROKE.

(Mirror therapy helps in improving the motor and sensory functions in Stroke cases by increasing neuroplasticity of the brain and activating the primary cortex.)

1. Please mark your Profession:

- a. Neurologist.
- b. Resident of Neurology.
- c. Physical Therapist.
- d. Occupational Therapist
- e. Other. Please specify _____.

2. Please mark the country you are practicing in currently.

- a. United States of America
- b. India
- c. Other. Please specify _____.

3. Are you aware of Mirror therapy for management of Stroke patients?

- a. Yes.
- b. No.

4. If yes, where did you learn about it?

- a. School/ University
- b. Work
- c. Peer- reviewed Articles/ Journals

- d. Magazines
 - e. Friend/ Colleague
 - f. Conference presentation
 - g. Others Please specify _____.
5. In your opinion, is mirror therapy effective for Stroke Patients?
- a. Yes
 - b. Uncertain
 - c. No
6. Please rate your perception of the value of mirror therapy in the management of stroke patients.
- a. Harmful
 - b. Of no value
 - c. Of some value
 - d. Of substantial value
7. Have you or do you refer/ treat your patients with mirror therapy?
- a. Yes
 - b. No
8. If you marked “yes” for Q.6, how often do you suggest or use mirror therapy on Stroke Patients?
- a. Almost all
 - b. Seldom
 - c. Never
9. If you marked “No” for question Q.6, please specify Why? (Mark all that apply)
- a. Time- consuming

- b. Lack of training
- c. Lack of appropriate equipment
- d. Lack of enough space in the work setting
- e. Lack of proper knowledge
- f. Other Preferred Interventions
- g. No significant outcomes observed
- h. Insurance coverage issues
- i. Others. Please specify _____.

Thank you.

References

- Altschuler, E. L., Wisdom, S. B., Stone, L., Foster, C., Galasko, D., Llewellyn, D. M. E., & Ramachandran, V. S. (1999). Rehabilitation of hemiparesis after stroke with a mirror. *The Lancet*, 353(9169), 2035-2036.
- Antoniotti, P., Veronelli, L., Caronni, A., Monti, A., Aristidou, E., Montesano, M., & Corbo, M. (2019). No evidence of effectiveness of mirror therapy early after stroke: an assessor-blinded randomized controlled trial. *Clinical rehabilitation*, 33(5), 885-893.
- Arya, K. N., Pandian, S., & Puri, V. (2018). Mirror Illusion for Sensori-Motor Training in Stroke: A Randomized Controlled Trial. *Journal of Stroke and Cerebrovascular Diseases*, 27(11), 3236-3246.
- Arya, K.N., Pandian, S., & Kumar, V. (2019). Effect of activity- based mirror therapy on lower limb motor- recovery and gait in Stroke: a randomised controlled trial. *Neuropsychological rehabilitation*, 29(8), 1193-1210.
- Bhasin, A., Srivastava, M. P., Kumaran, S. S., Bhatia, R., & Mohanty, S. (2012). Neural interface of mirror therapy in chronic stroke patients: a functional magnetic resonance imaging study. *Neurology India*, 60(6), 570.
- Bin Song, G., & Cho Park, E. (2015). Effect of virtual reality games on stroke patients' balance, gait, depression, and interpersonal relationships. *Journal of physical therapy science*, 27(7), 2057-2060.
- Broderick, P., Horgan, F., Blake, C., Hickey, P., O'Reilly, J., et al. (2019). Mirror therapy and treadmill training for a patient with chronic stroke: A case report. *Physiotherapy theory and practice*, 35(5), 478-488.
- Bütefisch, C. M., Davis, B. C., Wise, S. P., Sawaki, L., Kopylev, L., Classen, J., & Cohen, L. G. (2000). Mechanisms of use-dependent plasticity in the human motor cortex. *Proceedings of the national academy of sciences*, 97(7), 3661-3665.

- Cantero-Téllez, R., Naughton, N., Algar, L., & Valdes, K. (2018). Outcome measurement of hand function following mirror therapy for stroke rehabilitation: A systematic review. *Journal of Hand Therapy*.
- Cristina, L. M., Matei, D., Ignat, B., & Popescu, C. D. (2015). Mirror therapy enhances upper extremity motor recovery in stroke patients. *Acta neurologica belgica*, *115*(4), 597-603.
- Dohle, C., Püllen, J., Nakaten, A., Küst, J., Rietz, C., & Karbe, H. (2009). Mirror therapy promotes recovery from severe hemiparesis: a randomized controlled trial. *Neurorehabilitation and neural repair*, *23*(3), 209-217.
- Garry, M. I., Loftus, A., & Summers, J. J. (2005). Mirror, mirror on the wall: viewing a mirror reflection of unilateral hand movements facilitates ipsilateral M1 excitability. *Experimental brain research*, *163*(1), 118-122.
- Gurbuz, N., Afsar, S. I., Ayaş, S., & Cosar, S. N. S. (2016). Effect of mirror therapy on upper extremity motor function in stroke patients: a randomized controlled trial. *Journal of physical therapy science*, *28*(9), 2501-2506.
- Hains, Rachel. (n.d.) Mirror therapy- Upper Extremity. *Heart and Stroke Foundation Canadian Partnership for Stroke Recovery*. Retrieved from: https://www.strokengine.ca/en/how_to/mirror-therapy-how-to/
- Harmsen, W. J., Bussmann, J. B., Selles, R. W., Hurkmans, H. L., & Ribbers, G. M. (2015). A mirror therapy-based action observation protocol to improve motor learning after stroke. *Neurorehabilitation and neural repair*, *29*(6), 509-516.
- Hioka, A., Tada, Y., Kitazato, K., Kanematsu, Y., Mizobuchi, Y., Mure, H., ... & Matsumoto, Y. (2019). Activation of mirror neuron system during gait observation in sub-acute stroke patients and healthy persons. *Journal of Clinical Neuroscience*, *60*, 79-83.

- Langhorne, P., Coupar, F., & Pollock, A. (2009). Motor recovery after stroke: a systematic review. *The Lancet Neurology*, 8(8), 741-754.
- Lee, D., Lee, G., & Jeong, J. (2016). Mirror therapy with neuromuscular electrical stimulation for improving motor function of stroke survivors: a pilot randomized clinical study. *Technology and Health Care*, 24(4), 503-511.
- Ramachandran, V. S., & Rogers-Ramachandran, D. (1996, April 22). Synaesthesia in phantom limbs induced with mirrors. *Proceedings of the Royal Society of London. Series B: Biological Sciences*, 263(1369), 377-386.
- Stevens, J. A., & Stoykov, M. E. P. (2003). Using motor imagery in the rehabilitation of hemiparesis. *Archives of physical medicine and rehabilitation*, 84(7), 1090-1092.
- The World Health Report. (2002) World Health Organization. Retrieved from: <https://www.who.int/whr/2002/en/>
- Thieme, H., Bayn, M., Wurg, M., Zange, C., Pohl, M., & Behrens, J. (2013). Mirror therapy for patients with severe arm paresis after stroke—a randomized controlled trial. *Clinical rehabilitation*, 27(4), 314-324.
- Thieme, H., Mehrholz, J., Pohl, M., Behrens, J., & Dohle, C. (2012). Mirror therapy for improving motor function after stroke. *Stroke*, 44(1), e1-e2.
- Toh, S. F. M., & Fong, K. N. (2012). Systematic review on the effectiveness of mirror therapy in training upper limb hemiparesis after stroke. *Hong Kong Journal of Occupational Therapy*, 22(2), 84-95.
- Yavuzer, G., Selles, R., Sezer, N., Sütbeyaz, S., Bussmann, J. B., Köseoğlu, F., ... & Stam, H. J. (2008). Mirror therapy improves hand function in subacute stroke: a randomized controlled trial. *Archives of physical medicine and rehabilitation*, 89(3), 393-398.