

Mirror Visual Feedback for Phantom Pain: International Experience on Modalities and Adverse Effects Discussed by an Expert Panel: A Delphi Study

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Background: Mirror visual feedback (mirror therapy) is practiced worldwide in very different ways to alleviate phantom pain; no study has compared these variations yet or researched the associated risk and harm.

Objectives: To establish use and justification of a generally accepted mirror visual feedback treatment plan after amputation; to explore the occurrence and handling of adverse effects; and to increase knowledge about contributing factors.

Methods: Experiential knowledge of 13 experienced practitioners from 6 countries and 5 professions was explored with a 3-round Delphi technique.

Results: Experience with the use of 5 different treatment plans was described, of which 1 has never been mentioned in the literature: an intense 1-off plan in which the illusion was carefully set up before the patient was left to the experience with no interference, resolving pain as well as adverse effects. In the 4 known treatment plans, the expectations of response time varied, which influenced the definition of responders/nonresponders; the set-ups, control, and use of material reflected the professional background of the practitioners. Contraindications also were defined according to the professional confidence to deal with the adverse effects. Adverse effects were reported, including emotional reactions, pain increase, sensory changes, freezing of the phantom limb, dizziness, and sweating. The attitude toward, and the handling of, adverse effects varied in patients as in practitioners according to their professional background. A tool to fine tune the experience was reported with covering of the limb during therapy. Full consensus was reached on several treatment modalities.

Conclusion: Analysis of the results suggests that the different treatment plans suit different patients and practitioners. Matching these could enhance effectiveness and compliance. Knowledge about adverse effects needs to inform treatment decisions. These findings triggered the development of a mirror visual feedback gateway to guide patients to the treatment plan for their needs, and to collect data from the practitioners to enhance neuroscientific understanding and inform practice.

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INTRODUCTION

Phantom pain is a well-known and frequently experienced problem after amputation, and often occurs in connection to altered or nonexistent movement abilities of the phantom limb [1-3]. In 1993, Ramachandran and Altschuler [3] first discovered mirror visual feedback (MVF) to be able to address the issue of phantom pain by creating an illusion with a mirror in a box that was placed in front of the patient in such a way that the missing limb could be seen as a reflection of the remaining limb. This visual input resulted in pain relief. Twenty years later, a number of professions use the principles of MVF (also known as mirror therapy or mirror box therapy) in treating chronic pain and learned nonuse. Research has been conducted on the effectiveness of MVF with the identified problem of heterogeneous study designs [4-6]. The treatment plans vary to a great extent (Table 1) [7-14]. These have never been compared and researched. Adverse effects are only rarely mentioned (Table 2) [7,10,11,14-16] and are by no means thoroughly researched [4]. Only

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Table 1. Treatment plans of mirror visual feedback in the literature

Author	Type of Study	Name of Treatment Plan	Structure	Frequency and Duration
Moseley, 2006 (9)	RCT	Graded Motor Imagery	Three phases: limb laterality recognition, imagined movements, mirror therapy	2 wk each phase, with hourly home exercise program
Grünert-Plüss et al, 2008 (7)	Review, protocol, and case series of 52 patients	St Gallen protocol	Looking first, then individual program	5-6 times a day, not more than 5-10 min
McCabe, 2011 (11)	Background and protocol	Bath MVF treatment protocol	Body schema, imagining movements first	5-6 times a day, not more than 5-10 min
MacLachlan et al, 2004 (8)	Case study	No specified	Fading out of therapist-mediated intervention over 3 wk	Practicing 2-4 times a day, 10 exercises, 10 repetitions each
Chan et al, 2007 (10)	RCT	Not specified	Movements, not specified	15 min/d for 8 wk
Darnall and Li, 2012 (14)		Self-delivered mirror therapy	7-min DVD and written instructions, diary	25 min/d for 8 wk
Mercier and Sirigu, 2009 (12)	8 Case studies	Visual virtual feedback	10 unilateral movements, 10 repetitions each	2 sessions/wk for 8 wk, lasting 30-60 min
Kawashima and Mita, 2009 (11)	Case study	Not specified	Synchronic and periodic wrist movements, smoothly and in as large a range as possible	1 h/wk for 3 mo

RCT = randomized controlled trial; MVF = mirror visual feed.

1 article based on retrospective evaluation of patient records specifically discusses the frequent adverse effects of MVF experienced during treatment, which resulted in withdrawal from MVF [16].

Thus, the questions about adverse effects of MVF, at which point in the treatment do they occur and why, and how to resolve these, remain unanswered in the current literature. Overall, there is considerable interest and clinical support for the use of MVF in treating phantom pain, and this treatment approach is practiced and taught in numerous countries in many different, possibly contradictory ways and without informing on risk and harm. This study sought to address the question, "How is MVF best practiced in treating phantom pain and what are the risks?" Secondary objectives included exploration of how MVF is used, the rationale underpinning clinical decision making, and the occurrence and management of adverse effects.

Research has been very limited, and we decided to perform a Delphi Study to further define the area. This study design can access the experiential knowledge of those who have seen and managed the patients to identify underlying principles. Three rounds of consecutive questionnaires are conducted with an expert panel of experienced practitioners.

Practitioners' experience represents 1 of the 3 components of evidence-based practice, namely, clinical expertise [17]. The outcome can then guide further research and practical application.

METHOD

The Delphi Method is defined as "a systematic and interactive research technique for obtaining the judgment of a panel of independent experts on a specific topic" [18]. It follows an iterative process of data collection, analysis, and feedback, and is particularly useful when there is a lack of empirical evidence or conflicting evidence [19]. A panel of experts are selected according to the criteria for expertise defined within the study context, and asked to participate in 2 or more rounds of structured questionnaires that progress to more specifically focused questions. After each round, the researcher provides an anonymous summary of the experts' input from the previous questionnaire, which also forms part of the subsequent questionnaire content [18,19]. The aim of the Delphi Method, through a process of initially open-ended questions to more specifically focused questions, is to decrease the variability of responses and to achieve a

Table 2. Adverse effects of mirror visual feedback in the literature

Study	Adverse Effects
Ramachandran and Rogers-Ramachandran, 1996 (15)	Telescoping (perceived as beneficial, as pain disappeared together with phantom limb)
Chan et al, 2007 (10)	Two brief grief reactions
Grünert-Plüss et al, 2008 (7)	Pain increase possible
Casale et al, 2009 (16)	Dizziness, irritation, uneasiness
Kawashima and Mita, 2009 (11)	Client vomited after an increasing feeling of nausea during the first session
Darnall and Li, 2012 (14)	Boredom, increased depression, increase in phantom limb awareness, and phantom limb pain

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