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RESEARCH REPORT

Defining a Bobath clinical framework – A modified e-Delphi study

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ABSTRACT

Objective: To gain consensus within the expert International Bobath Instructors Training Association (IBITA) on a Bobath clinical framework on which future efficacy studies can be based. **Methods:** A three-round modified e-Delphi approach was used with 204 full members of the IBITA. Twenty-one initial statements were generated from the literature. Consensus was defined a priori as at least 80% of the respondents with a level of agreement on a Likert scale of 4 or 5. The Delphi questionnaire for each round was available online for two weeks. Summary reports and subsequent questionnaires were posted within four weeks. **Results:** Ninety-four IBITA members responded, forming the Delphi panel, of which 68 and 66 responded to Rounds Two and Three, respectively. The 21 initial statements were revised to 17 statements and five new statements in Round Two in which eight statements were accepted and two statements were eliminated. Round Three presented 12 revised statements, all reaching consensus. **Conclusion:** The Delphi was successful in gaining consensus on a Bobath clinical framework in a geographically diverse expert association, identifying the unique components of Bobath clinical practice. Discussion throughout all three Rounds revolved primarily around the terminology of atypical and compensatory motor behavior and balance.

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Bobath concept; clinical framework; e-Delphi

Introduction

Neurological conditions have significant personal, financial, and economic costs. Stroke, for example, is a major global health problem in terms of disability and socio-economic burden that will increase as the population ages (Wissel, Olver, and Stibrant Sunnerhagen, 2013). Therefore, access to effective and efficient neuro-rehabilitation services across the continuum of care is essential in order to optimize recovery and minimize disability (Duncan et al., 2002). The Bobath concept, referred to as “Neuro-Developmental Treatment (NDT)” in the American literature, is one of the most widely used approaches by therapists in neuro-rehabilitation (Vaughan-Graham, Cott, and Wright, 2015a). However, due to significant limitations in the evidence base, in particular study fidelity issues (Vaughan-Graham, Cott, and Wright, 2015b), the Bobath effectiveness literature is inconclusive (Kollen et al., 2009).

The operationalization and description of interventions, an aspect of study fidelity on which causality is dependent, has been identified as one of the major limitations in neuro-rehabilitation research (Hart and Bagiella, 2012; Hildebrand et al., 2012; Page, Schmid, and Harris, 2012). Additionally, operationalization and

description of interventions is essential for clinical replication as well as inclusion in quality systematic reviews and meta-analyses (Boutron et al., 2008). A recent scoping review of the Bobath (NDT) evidence base identified revised theoretical foundations and key aspects of clinical practice (Vaughan-Graham, Cott, and Wright, 2015b). However, no clear descriptions of Bobath clinical practice have been produced to date (Vaughan-Graham, Cott, and Wright, 2015b). Therefore for establishing a Bobath clinical framework, identifying the assumptions and principles that underpin Bobath clinical practice as a first step in the operationalization of Bobath treatments is required (Vaughan-Graham, Cott, and Wright, 2015b).

Background

The Bobath concept is an approach to neuro-rehabilitation, providing therapists with a conceptual framework for their clinical interventions (Raine, Meadows, and Lynch-Ellerington, 2009). Mrs. Bobath qualified as a physiotherapist in 1950 from the Chartered Society of Physiotherapists, UK (Schleichkorn, 1992), at a time when
conven-

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tional treatment post-stroke consisted of a “compensatory” approach focusing entirely on the use and strengthening of the “sound” side to regain functional independence (Bobath, 1978; Raine, Meadows, and Lynch-Ellerington, 2009). Mrs. Bobath recognized that movement post-neurological lesion was influenced by afferent input and she began to explore the “recovery potential” of the “affected” side despite no clinical evidence at the time for neuroplasticity and clearly deviating from the conventional compensatory approach (Bobath, 1978; Raine, Meadows, and Lynch-Ellerington, 2009; Schleichkorn, 1992). This was the beginning of a new treatment approach to adult hemiplegia (Schleichkorn, 1992), and revolutionized neuro-rehabilitation (Raine, 2007).

Since Mrs. Bobath’s last publication in 1990 (Bobath, 1990) until 2006, peer-reviewed documentation on the evolution of the concept has primarily been undertaken with practicing therapists with varying Bobath knowledge and skill levels gained through their professional practice and post-graduate Bobath education (Lennon, 1996; Lennon, 2001; Lennon and Ashburn, 2000; Lennon, Baxter, and Ashburn, 2001; Tyson, Connell, Busse, and Lennon, 2009; Tyson and Selley, 2007; Vaughan-Graham, Cott, and Wright, 2015b). The International Bobath Instructors Training Association (IBITA) is responsible for the training of Bobath instructors worldwide and endorsing Bobath continuing education courses disseminated by IBITA instructors.

IBITA was founded by a small group of Bobath (Adult) instructors with the Bobath’s in 1984 to enable the ongoing interaction of current instructors and training of future instructors. IBITA is the international expert Bobath association representing upward of 250 members in 29 countries worldwide. Since 2006 there have been four peer-reviewed publications authored and coauthored by members of the IBITA addressing theoretical aspects. Firstly Raine, utilizing British members of the IBITA, conducted a Delphi study (Raine, 2006; Raine, 2007) to identify the theoretical assumptions underpinning the contemporary Bobath concept. However, these expert Bobath instructors belonged to one country group, the UK (Raine, 2006; Raine, 2007), thus limiting the generalizability of the results to the IBITA. Vaughn-Graham et al. (2009) published a revised theoretical framework based on contemporary neuroscience and neurorehabilitation, as well as identifying key aspects of Bobath clinical practice. Lastly, Levin and Panturin (2011) focused their publication on a key principle of the Bobath concept, the role of sensory information in motor control.

Although the key aspects of clinical practice were identified in a recent scoping review of the Bobath evidence base 2007–2012, no clear descriptions of

Bobath interventions were available and only one publication addressed the issue of clinical reasoning (Vaughan-Graham, 2010; Vaughan-Graham, Cott, and Wright, 2015a; Vaughan-Graham, Cott, and Wright, 2015b). Practice epistemology has been described as the approach that clinicians take toward knowledge that frames their approach to decision-making and care (Shaw and DeForge, 2012). Practice epistemologies remain under-researched in the therapy professions (Shaw and DeForge, 2012), and the Bobath concept is no exception. Models or frameworks explicate the clinical rationale underlying the choice of intervention, therefore providing an understanding of the intervention content (Tyson and Desouza, 2003). Unless models or frameworks that are reflective of current clinical practice guide research design and implementation, misrepresentation of treatment approaches may be inadvertently reinforced (Vaughan-Graham, Cott, and Wright, 2015a).

Little to no attention has been given to the development of a Bobath clinical framework explicating the assumptions and principles the Bobath therapist holds with respect to movement analysis, problem identification, and recovery potential of an individual with a neurological diagnosis. In order for the Bobath concept to be appropriately researched, it is essential that a Bobath clinical framework be established to facilitate the description of Bobath interventions and to provide a conceptual underpinning to the clinical reasoning process (Pomeroy and Tallis, 2003; Wang et al., 2003). To date no studies involving IBITA members worldwide have been undertaken to document the theoretical and clinical evolution of the Bobath concept. The aim of the present study was to gain consensus within the IBITA on a Bobath clinical framework on which future efficacy studies can be based.

Study design

The Delphi is a popular research method that has been successfully used in the allied health professions with large numbers of experts across diverse locations (Mackway-Jones and Carley, 2012; Manca et al., 2007; Yeung et al., 2015). The Delphi has been defined as an iterative process designed to combine expert opinion into group consensus (Keeney, Hasson, and McKenna, 2001). Expert opinion is elicited and refined using a series of questionnaires interspersed with controlled opinion feedback (Gupta and Clarke, 1996). Establishing a panel of experts is an important aspect of the Delphi study design aiming to maintain member participation in subsequent survey rounds (Hasson, Keeney, and McKenna, 2000). The Delphi has been used successfully in a previous Bobath consensus study (Raine, 2006;

Raine, 2007), but as noted earlier, the expert sample was limited to the British members of IBITA.

The study design utilized a three-round web-based modified Delphi approach. A secure study web-site was developed where all study information and study access to all Delphi questionnaires and reports were located. This removed geographic challenges and time boundaries whilst allowing an international expert group to be surveyed relatively inexpensively, quickly but broadly (Hasson and Keeney, 2011). All study information including the Delphi questionnaires and summary reports were presented in English as this is the designated correspondence language for IBITA. Ethical approval was granted for this study from the Health Sciences Research Ethics Board, University of Toronto (Protocol Reference # 29915).

Development of the questionnaire

Round one comprised 21 statements, rather than open-ended questions, as per a modified Delphi procedure (Hasson and Keeney, 2011; Hasson, Keeney, and McKenna, 2000). These statements were identified from a recent scoping review of the Bobath literature conducted by the first author and were representative of the theoretical foundations and key aspects of clinical practice over the period 2007–2012 (Vaughan-Graham, Cott, and Wright, 2015b). Seven statements represented overarching conceptual aspects whilst 14 statements represented key aspects of clinical practice and were organized as four assumptions and 10 related principles (Table 1).

The respondents in all three survey rounds were asked to rank their level of agreement with each statement on a 5-point Likert scale ranging from “strongly disagree” to “strongly agree”. Each participant was asked to complete demographic information on completion of the survey identifying their instructor category and if English was their second language to determine the range in IBITA member participation (Table 2).

A comment box was provided after each statement to collect respondent’s qualitative comments to allow for the identification of any missed items requiring the generation of additional statements, as well as suggestions for alternative wording. This is an important aspect of the Delphi design to increase respondent ownership (Hasson, Keeney, and McKenna, 2000). All respondents provided comments and suggestions during all three Delphi Rounds irrespective of whether English was their second language.

Pilot testing of the initial questionnaire and study website was undertaken with a group of seven Bobath trained physiotherapists and was revised accordingly based on feedback.

Sampling and recruitment

IBITA unites approximately 265 Bobath instructors in 29 countries worldwide, with three member categories: full, associate, and retired. Full members are those members who are currently practicing and instructing the Bobath concept worldwide in the context of continuing education courses and fulfill specific membership requirements. There are three instructor categories of “full” members: senior, advanced, and basic. A total of 204 IBITA “full” members were identified comprising 13 senior instructors, 28 advanced course instructors, and 163 basic course instructors. The inclusion of all full member instructor categories provided a range in Bobath instructor experience.

Access to the “full” members of IBITA was negotiated by the first author through the IBITA Executive committee. Recruitment occurred via email invitation from the Chair of the IBITA Executive committee to the membership requesting their voluntary participation. All study details were provided with the initial email invitation, followed by a reminder one week later. Study information was also posted on the members’ side of the IBITA website. Responses were handled confidentially by the first author through the study website; therefore, participants were unknown to the IBITA Executive Committee. Those “full” members who responded to the initial email invitation formed the “Delphi panel”. Only the “Delphi panel” received subsequent email reminders and notices for Rounds Two and Three.

Study procedure

A password-protected study website was used to ensure secure access for invited full members of IBITA. The website presented in English the study description, ethical and contact information, calendar of events, informed consent, access to each questionnaire, and respective reports. The Delphi questionnaires, including demographic questionnaires, were password protected. Respondents could not access other participant’s responses. The Delphi questionnaire for each round was available online for two weeks. Email reminders were sent at one week, and two days prior to the questionnaire deadline. Summary reports for each round and subsequent questionnaire were posted online within four weeks of the previous round (Figure 1).

Feedback to respondents

Each respondent had the option to save their completed responses as a function of the survey software (FluidSurveys™). A report was posted to the study website following each round providing the number of

Table 1. Round One – initial statements.

Overarching statements The Bobath concept is ...		Mean	Coefficient of variation	Consensus score %
1.	An inclusive, individualized, remediation focused problem-solving approach	4.51	0.2	91.01
2.	Based on the contemporary theories of motor control, neuromuscular plasticity, and motor learning	4.64	0.16	95.51
3.	Based on an understanding that neurological pathology affects the whole body, and that current movement control is influenced by movement experiences pre and post the neurological lesion	4.56	0.19	92.13
4.	Focused on the recovery potential of the individual to regain typical motor behavior	4.21	0.2	82.01
5.	<i>Not focused on the development of compensatory strategies for functional independence</i>	4.17	0.25	78.41
6.	Goal oriented to remediate impairments, minimize activity limitations, improve participation, thereby promoting independence and enhancing the quality of the person's daily activities	4.69	0.16	94.38
7.	Not exclusive, such that additional therapies (e.g. BWST/CIMT) are selectively incorporated into the intervention plan to enhance the potential recovery of the individual	4.3	0.2	82.02
Key aspects of clinical practice				
(a)	Assumption: Movement analysis and treatment are based upon the integration of postural control and task performance, and the control of selective movement for the production of coordinated sequences of movement	4.69	0.16	95.45
Principles:				
(a)(i)	Movement deficits are limitations in the variety of motor patterns normally available to healthy individuals	4.23	0.19	83.91
(a)(ii)	Intervention is a skillful, logical, analytical, step-by-step progression, individual to individual, to achieve efficient muscle activation for success in a given activity or task	4.51	0.16	93.18
(a)(iii)	Task practice, repetition, and velocity are used selectively to augment the intervention plan when these strategies maximize the potential of the individual with respect to improving postural control and selective voluntary movement	4.55	0.17	90.80
(b)	Assumption: Recovery of trunk and head control is as equally important as recovery of upper and lower limb function	4.6	0.18	91.95
Principles:				
(b)(i)	<i>Posture and movement are separate, but interactive</i>	3.97	0.3	73.86
(b)(ii)	Postural control is the organization of stability and mobility of the multi-joint kinetic chain in order to maintain, achieve, or restore a state of balance during any posture or activity	4.66	0.15	95.45
(c)	Assumption: Sensory information from multiple sources plays a fundamental role in motor control	4.76	0.14	95.40
Principles:				
(c)(i)	Sensation, vision, action, perception, and cognition are interlinked and interactive	4.65	0.15	95.35
(c)(ii)	Facilitation, including therapeutic handling, manipulation of the environment, and appropriate use of verbal cues, is a skilled aspect of intervention	4.74	0.14	94.25
(c)(iii)	The interaction of the body segment/s with a base of support (i.e. the segments of the person's body that is in contact with the supporting surface) is a critical component of the clinical presentation as it provides information on the ability of the individual to receive, integrate, and respond appropriately to relevant afferent information	4.47	0.18	90.80
(d)	Assumption: Favors motor solutions that optimize quality/efficiency of movement while minimizing/discouraging the ability/tendency of the system to find movement solutions that involve movement compensations	4.45	0.17	89.41
Principles:				
(d)(i)	<i>Movement quality should be a determinant of effectiveness</i>	4.16	0.23	77.91
(d)(ii)	<u><i>The efficiency /quality of the movement should not deteriorate with increasing speed or frequency of the movement/activity</i></u>	<u>3.853.85</u>	<u>0.29</u>	<u>61.63</u>

Note. *Italicized* statement and consensus scores identify those statements that did not reach consensus. *Italicized* and underlined statement indicates that this statement was eliminated.

respondents, Likert-scale response frequency (%), consensus score for each statement, and respondent aggregate data.

Analysis of data

Responses were exported to MS Excel, and descriptive statistics including central tendencies (mode, median, mean), level of dispersion (coefficient of variation), Likert frequency scores (%), and consensus score (%) were reported for each survey item within each round.

Consensus was defined a priori as at least 80% of the respondents ranking 4 or 5 for a statement. Qualitative comments were collected for each statement and underwent content analysis by the first author (Hsieh and Shannon, 2005). Similar issues were grouped together in order to identify consistent themes and these were then used to revise, reorder, and generate new statements whilst aiming to use the wording of the respondents as closely as possible. Three new statements were generated following Round One and were therefore only considered in Rounds Two and Three (Table 3).

Table 2. Respondent and statement summary.

	Round One	Round Two	Round Three
Number of respondents	89 of 204 Full members (44%)	68 of 94 Delphi panel (72%)	66 of 94 Delphi panel (70%)
Instructor category: Basic	64 of 163	48	47
Instructor category: Advanced	14 of 28	12	13
Instructor category: Senior	7 of 13	7	6
English second language (ESL)	61 of 89	48	47
Conceptual statements underpinning Bobath interventions	7 statements	11 statements	7 statements
Statements identifying key aspects of clinical practice	4 assumptions 10 principles	3 assumptions 8 principles	2 assumptions 3 principles
Statement summary	21 statements, 4 did not reach consensus. 1 statement was eliminated.	22 statements, 2 statements did not reach consensus. 8 statements were accepted.	12 statements. All statements reached consensus with respect to level of agreement, but one statement (balance statement) did not reach consensus for inclusion in the clinical framework.

Defining a Bobath Clinical Framework: A total of 19 statements reached consensus.

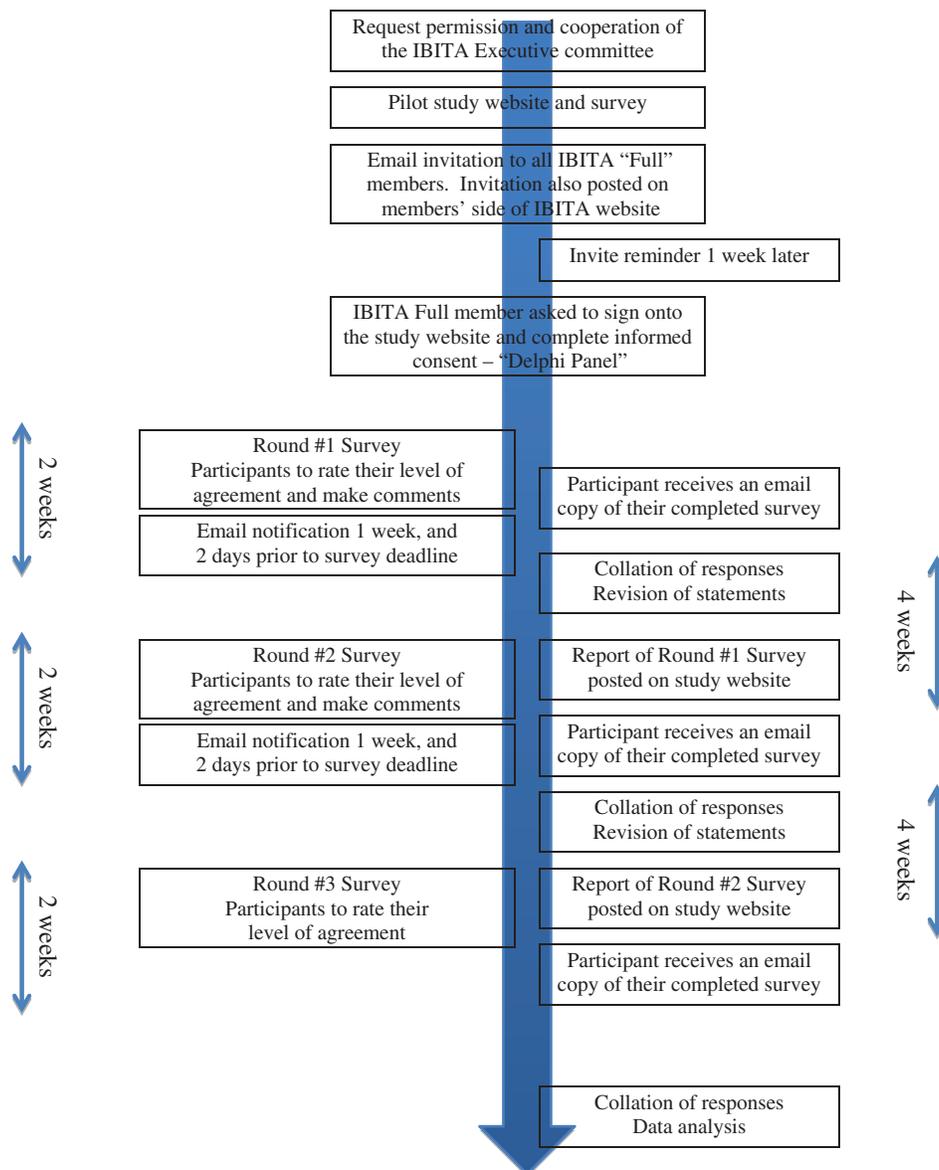


Figure 1. Study procedure.

Statements that produced significant discussion were identified and informal literature review was used to facilitate structured debate around specific issues (Hasson, Keeney, and McKenna, 2000). The first and second authors met after each round of data collection to discuss the analysis and plan the next round.

Results

Round One

Eighty-nine out of 204 “full” members (44%) responded to the initial invitation. Sixty-one members identified English as a second language (ESL) (Table 1). An additional five members emailed the first author following Round One specifically requesting to participate identifying that they were unable to participate in Round One due to teaching commitments or internet access difficulties. This study sought to be as inclusive as possible of all IBITA “Full” members and none of the additional five members identified any concerns with the summary report of Round One. Therefore the first and second authors agreed to include any “Full” member who requested to participate after the initial invitation. Therefore the initial 89 respondents, plus the additional five members, formed the “Delphi panel” (Table 1).

One overarching statement (item 5 – Table 2) discussing the role of compensatory strategies in function (78.4%), and three statements with respect to the key aspects of clinical practice discussing the interactive nature of posture and movement ((73.9%) (item b) (i) – Table 2), and movement quality ((78%)(items d) (i) (ii) – Table 2) did not reach consensus (Table 2).

There was a lively debate in the open-ended comments around the role of compensation in functional independence. Several respondents commented that the Bobath concept does not focus on teaching stereotypical compensatory strategies (e.g. emphasizing the use of the less-affected limbs), but that compensatory strategies should complement the ongoing recovery of motor control but not interfere with it, for instance, the use of a cane to enable community ambulation rather than self-propelling a wheelchair. Many of the respondents stated that it was a role of the Bobath therapist to manage compensatory strategies. As one respondent states:

“We are not focused on compensatory training, but if necessary we help develop compensatory strategies that minimize the development of secondary impairments for long term functional performance”.

Respondents agreed that posture and movement, and movement quality were key features of the Bobath concept. One respondent commented:

“Posture and movement are separate in terms of systems (neurophysiology). However, Berta and Karel Bobath said in the last edition of their book, “Thinking of posture as separate from movement is very artificial””.

Numerous rewording suggestions were provided by participants for these statements ((refer to items 9, 10, 11, a) – Table 3).

One statement discussing the interplay of speed or repetition on movement quality was eliminated ((61.6%)(item d)(ii) – Table 2) in Round One due to consistent comments received that this statement did not reflect actual Bobath practice. One respondent stated:

“I think the quality of movement will deteriorate when the difficulty increases BUT one must challenge the system and keep facilitating until the quality of movement recovers...which it will!”

Although the remainder of the statements reached consensus, the respondents provided thoughtful and consistent suggestions for all statements to improve statement clarity, besides suggesting the inclusion of a statement with respect to balance (item 5 – Table 3) in addition to postural control (item 6 – Table 3). In response to suggestions all statements were revised, in some cases reordered, a new statement with respect to balance (item 5 – Table 3), and two new statements with respect to quality of movement were introduced in Round Two ((items a)(i), b) (i) – Table 3).

Round Two

Sixty-eight members of the 94 respondents (72%) forming the Delphi panel responded to Round Two, of whom 48 were ESL (Table 1). Round Two comprised 22 statements. Eleven statements were presented as providing the conceptual framework on which a Bobath therapist bases clinical interventions, of which six statements were revised from Round One (items 1, 2, 3, 7, 8, 10 – Table 3), four statements were revised and reordered (items 4, 6, 9, 11 – Table 3), and one new statement with respect to balance (items 5 – Table 3). The remaining 11 statements represented key aspects of clinical practice organized as three assumptions (items a) b) c)) and eight related principles (a(i)(ii)(iii) b(i)(ii)(iii) c(i)(ii)). Nine of these statements were revised (items a) a)(ii) a)(iii) b) b)

Table 3. Round Two.

	Conceptual framework underpinning Bobath clinical interventions	Mean	Coefficient of variation	Consensus score %
1.	The Bobath concept is an individualized problem-solving treatment approach. It provides a unique set of skills particularly with respect to movement analysis and the use of sensory input, can be applied to a broad range of clients, and can be combined with other interventions.	4.69	0.13	98.53
2.	The Bobath concept is goal oriented to minimize activity limitations and impairments within the context of the individual's environment and participation goals.	4.71	0.14	95.59
3.	The Bobath concept is informed by contemporary theories of motor control, neuromuscular plasticity, biomechanics and motor learning providing the theoretical basis for the interpretation of posture, functional human movement analysis, and recovery post CNS lesion.	4.75	0.14	94.03
4.	Clinical practice of the Bobath concept is based on the understanding that somatosensation, vision, vestibular, action, perception, cognition, and emotion are interlinked and interactive.	4.73	0.14	95.45
5.	NEW STATEMENT The Bobath concept views balance as: (i) a complex, multidimensional concept requiring the integration of the vestibular, visual, somatosensory, musculoskeletal, and cognitive systems; (ii) this system integration enables the planning and execution of movement patterns, postural control strategies, quickly and efficiently in anticipation of, and in response to, destabilizing forces in order to maintain equilibrium; and (iii) is dependent upon the individual's goals and environmental context.	4.51	0.2	89.71
6.	The Bobath concept views postural control as the organization of stability, mobility, and orientation of the multi-joint kinetic chain, which is dependent on an appropriate body schema in order to maintain, achieve, or restore a state of balance during any posture or activity.	4.5	0.2	89.71
7.	The Bobath concept is based on the understanding that neurological pathology affects the whole person and the resulting movement problems are influenced by that person's lived experiences pre and post the neurological lesion.	4.69	0.15	94.12
8.	The Bobath concept views "typical motor behavior" as the motor behavior normally available to healthy individuals	4.33	0.2	83.33
9.	<i>The Bobath concept views "atypical motor behavior" as disco-ordinated /invariable /and inefficient motor behavior of the more-affected limb/s and body segments post CNS lesion.</i>	3.67	0.3	61.19
10.	<i>The Bobath concept views "compensation" as the motor behavior an individual uses to achieve a task with their less-affected limb/s and body segments. This is not a primary focus of treatment using the Bobath concept.</i>	3.26	0.42	53.03
11.	The Bobath concept seeks to optimize functional independence by: (i) potentiating the reacquisition of as close as possible typical motor behavior; and (ii) minimizing atypical and compensatory motor behavior and thus the development of secondary impairments, whilst recognizing the limitation of the CNS lesion, context-based to the individual.	4.44	0.18	91.18
	Key aspects of clinical practice	Mean	Coefficient of variation	Consensus score %
(a)	<i>Assumption:</i> The Bobath concept views movement analysis of task performance within a specific environment from the perspective of the integration of posture and movement through the lens of movement patterns, not as isolated movements. <i>Principles:</i> NEW STATEMENT	4.44	0.16	83.39
(a)(i)	A goal of the Bobath concept is to improve movement strategies such that aspects of ease, rhythm, coordination, specificity, variability, repeatability, and speed are addressed in task performance.	4.70	0.11	96.97
(a)(ii)	Intervention is a skillful, logical, analytical process, individual to the client, therapist, and environment to improve the quality of movement such that all body segments cooperate harmoniously with one another in the context of the task/s.	4.71	0.12	96.67
(a)(iii)	Task selection in the Bobath concept must be meaningful to the client, and is specifically chosen and manipulated with respect to velocity, direction, load, and magnitude in order to optimize the client's postural control and selective voluntary movement.	4.67	0.14	95.45
(b)	<i>Assumption:</i> Clinically, within the Bobath concept posture and movement are viewed as inseparable and interdependent. <i>Principles:</i> NEW STATEMENT	4.82	0.09	97.01
(b)(i)	Quality of movement and the ability to co-ordinate movement whilst maintaining an appropriate postural background during a specific activity are a core focus of the Bobath concept.	4.74	0.09	100.00
(b)(ii)	The Bobath concept seeks to achieve the greatest level of integration of trunk and head control with upper- and lower-limb function in order to optimize the efficiency of functional movement.	4.56	0.13	93.94
(b)(iii)	Movement quality, "how" a client completes a task, not just if they can complete a task, should be one determinant of effectiveness of Bobath interventions.	4.57	0.14	94.03
(c)	<i>Assumption:</i> The Bobath concept considers the role of sensory information in motor control, including the role of sensation in perception, a key aspect of clinical practice.	4.79	0.09	98.48

(Continued)

Table 3. (Continued).

Conceptual framework underpinning Bobath clinical interventions		Mean	Coefficient of variation	Consensus score %
(c)(i)	Principles: Facilitation is the skilled interaction (verbal and nonverbal) between the therapist, the client, and the client's body. Facilitation includes therapeutic handling, manipulation of the environment, task selection, and appropriate use of verbal and nonverbal cues in order to potentiate self-initiation of movement and/or create the necessary conditions for a movement experience that the client can not yet do alone. It is the art of therapeutic intervention.	4.75	0.11	97.01
(c)(ii)	The Bobath concept considers that the ability of the individual to selectively adapt motor activity and alignment of body segments with respect to a supporting surface and gravity provides critical information on the ability of the individual to receive, integrate, and respond appropriately to relevant information and is fundamental to the acquisition and development of postural control	4.51	0.18	91.04

Note. Statements **bolded** were accepted.
Statements *italicized* were eliminated.

(ii) b)(iii) c) c)(i) c)(ii) – Table 3) and two were new statements (items a)(i) b)(i) – Table 3). Although the two principles (items a)(i) b)(i) – Table 3) were only introduced in Round Two, they both received high consensus scores, 97% and 100%, respectively, and so were accepted in this Round (Table 3).

Consensus was reached in Round Two on two fundamental components: 1) the theoretical underpinnings of the Bobath concept are consistent with the current literature on the Bobath theoretical assumptions represented by item #3 (Table 3) achieving a consensus score of 94%. It states: “The Bobath concept is informed by contemporary theories of motor control, neuromuscular plasticity, biomechanics and motor learning providing the theoretical basis for the interpretation of posture, functional human movement analysis and recovery post CNS lesion”; and 2) that the Bobath concept considers the whole person within their individual context represented by item #7 (Table 3) achieving a consensus score of 94%. It states: “The Bobath concept is based on the understanding that neurological pathology affects the whole person and the resulting movement problems are influenced by that person's lived experiences pre and post the neurological lesion”.

Two statements did not reach consensus (items 9, 10 – Table 3), and were related to the discussion of “atypical motor behavior” (61.2%) and “compensation” (53%).

All three assumptions and eight principles related to the key aspects of clinical practice reached consensus, of which six (items a)(i) a)(ii) a)(iii) b) b)(i), c)(ii) – Table 3) received minimal comments, achieved high levels of consensus, and were therefore accepted in this round (Table 3).

In Round Two, two primary areas of discussion emerged from the respondent's comments: 1) atypical motor behavior and compensation; and 2) balance.

Atypical motor behavior and compensation

Respondents had difficulty limiting the description of atypical motor behavior to the more affected limb/s and body segments as well as the use of the terms “inefficient and invariable”. One respondent commented:

“If atypical motor behavior, because of the extent of the lesion, allows the individual to be active and independent, it may be ‘efficient’ for that person. Sometimes the damage does not allow for more ‘efficient’ movement”.

While another respondent commented:

“I would change invariable for stereotyped, since typical motor behavior can be quite invariable sometimes.”

Another respondent stated:

“Not only the affected limbs... a unique aspect of the Bobath concept is the consideration of the whole body and analysis of movement of the whole body”.

To facilitate an informed and structured debate in Round Three, clarification was provided on the terminologies “compensation” and “atypical” from the literature.

Bobath (1978) p.17 states:

“...how much of any activity is done with the affected side; of whether trick or abnormal movements are used, or the extent to which the sound side is compensating for the affected side”

Bobath (1978) p.21 states:

“One should find out how much he compensates with his sound side; whether he really needs as much compensation as he uses; whether he could learn to compensate less or in better ways”

Levin et al. (2009) define compensation at the activity level as:

“Successful task accomplishment using alternate limbs or end effectors. For example opening a package of chips using 1 hand and the mouth instead of 2 hands”

Respondents were asked to consider this information before responding to a revised statement in Round Three (item 11 – Table 4).

Table 4. Round Three.

	Conceptual framework underpinning Bobath clinical interventions	Mean	Coefficient of variation	Consensus score %
1	The Bobath concept is an individualized problem-solving treatment approach. It provides the therapist with a unique set of skills particularly with respect to movement analysis and the use of sensory input, can be applied to a broad range of clients with movement disorders, and can be combined with other interventions	4.81	0.90	98.41
2	The goal of the Bobath concept is to minimize activity limitations and impairments within the context of the individual's environment and participation goals.	4.76	0.10	96.83
4	Clinical practice of the Bobath concept is based on the understanding that sensation, action, perception, cognition, and emotion are interlinked and interactive	4.8	0.11	96.92
5	<i>Within the Bobath concept balance is viewed as:</i> (i) <i>a complex, multidimensional concept;</i> (ii) <i>requiring multi-system integration enabling the planning and execution of movement patterns, postural control strategies, quickly and efficiently in anticipation of, and in response to, destabilizing forces in order to maintain equilibrium; and</i> (iii) <i>is dependent upon the individual's goals and environmental context</i>	4.52	0.15	92.31
	<i>Should the statement with respect to balance be included in a Bobath clinical framework?</i>			
	<i>Yes</i>			75.41
	<i>No</i>			24.59
6	Within the Bobath concept postural control is viewed as the organization of stability, mobility, and orientation of the multi-joint kinetic chain, which is reflective of the individual's body schema in order to maintain, achieve, or restore a state of equilibrium during any posture or activity	4.58	0.15	95.16
8	Within the Bobath concept "typical motor behavior" is viewed as representative of the range of motor behavior available to individuals without a CNS lesion	4.32	0.18	87.69
11	The Bobath concept seeks to optimize functional independence by: (i) <i>potentiating the reacquisition of as close as possible typical motor behavior; and,</i> (ii) <i>minimizing atypical motor behavior (of the more-affected body segments/limbs) and compensatory motor behavior (of the less-affected body segments/limbs) and thus the development of secondary impairments, whilst recognizing the limitation of the CNS lesion context-based to the individual</i>	4.34	0.18	92.19
	Key aspects of clinical practice	Mean	Coefficient of variation	Consensus score %
	<i>Assumption:</i>			
(a)	Movement analysis of task performance within a specific environment is viewed by the Bobath concept from the perspective of the integration of posture and movement	4.71	0.12	98.48
	<i>Principles:</i>			
(b)(ii)	The Bobath concept seeks to achieve integration of trunk and head control with upper and lower limb function to improve the efficiency of functional movement	4.74	0.10	98.48
(b)(iii)	Movement quality, "how" a client completes a task, should be one determinant of effectiveness of Bobath interventions	4.55	0.15	92.42
	<i>Assumption:</i>			
(c)	Within the Bobath concept the role of sensory information in motor control and perception is considered a key aspect of clinical practice	4.77	0.13	93.85
	<i>Principles:</i>			
(c)(i)	Facilitation is the skilled interaction between the therapist, the client, and the client's body. Facilitation includes therapeutic handling, manipulation of the environment, task selection, and appropriate use of verbal and nonverbal cues in order to potentiate self-initiation/termination of movement and/or create the necessary conditions for a movement experience that the client can not yet do alone	4.66	0.17	93.85

Note. Statements **bolded** reached consensus.

Statement *italicized* did not reach consensus to be included in a Bobath clinical framework.

Balance

The statement with respect to balance (item 5 – Table 3) generated a wide range of views. For some respondents the statement was too broad, for others it was too narrow, others commented that it should be defined by the (neuro)science as it is common to all rehabilitation, whereas others responded that balance is fundamental to the Bobath concept. Based on respondents' feedback, the balance statement underwent minor wording revisions and was re-presented in Round Three (item 5 – Table 4). In response to the wide range of views expressed, and that this statement was introduced in Round Two, respondents

were asked in Round Three to rate their level of agreement with the balance statement plus vote on whether the statement should be included in a Bobath clinical framework.

In summary, in Round Two 19 statements underwent wording revisions based on feedback, three new statements were introduced, eight statements were accepted, and two statements were eliminated.

Round Three

Round Three consisted of the 12 revised statements from Round Two. Seven statements (items 1, 2, 4, 5, 6, 8, 11 –

Table 4) were presented as providing the conceptual framework on which a Bobath therapist bases clinical interventions. The remaining five statements were presented as two assumptions (items a) c) – Table 4) and three principles (items b)(ii) b)(iii) c)(i) – Table 4) representing the key aspects of clinical practice. Sixty-six members of the 94 respondents (70%) forming the Delphi panel responded to Round Three, of whom 47 were ESL (Table 1).

All statements reached consensus, including the statement with respect to balance. However, when respondents were asked to vote on whether the balance statement should be included in a Bobath clinical framework, only 75% responded “yes”. Therefore, although agreement was reached on a balance statement, this statement did not reach consensus to be included in the clinical framework (item 5 – Table 4).

The majority of comments continued to focus around the issues of compensation, atypical motor behavior, and balance; however, all statements achieved a high level of consensus and were therefore accepted in this round (Tables 5 and 6).

Discussion

This study is the first of its kind to seek consensus from international expert members of IBITA with respect to a Bobath clinical framework. A satisfactory response rate for Round One, which was maintained for Rounds Two and Three, was achieved. IBITA members for whom English was a second language responded consistently through all three Delphi rounds, indicating that the developed framework was not dominated by members for whom English was their first language. The high level of consensus, and the small coefficient of variation reported on a per item basis through all three rounds, indicates that the amount of variation among the responses of the experts was generally small (Kalaian and Kasim, 2012) (Tables 2–4). The present study did not either encourage or attempt to control communication between IBITA members in the periods between the study rounds. However, the thoughtful and consistent comments received with respect to all statements resulted in subtle changes to the wording and therefore subsequent meaning, thus facilitating consensus.

Statements representative of the conceptual framework underpinning Bobath clinical interventions

The members of the international expert Bobath association agree that the Bobath concept is now: founded on a systems-based model of motor control; no longer

subscribes to a hierarchical control model; and that the individuality of movement dysfunction is critical to the application of the Bobath concept. The experts were also in agreement that the Bobath concept is an individualized problem-solving treatment concept, can be applied to a broad range of clients, and is not exclusive of other interventions (Table 5).

Mrs. Bobath recognized and understood that posture and movement were not separate entities (Bobath, 1978). This is now supported by increasing scientific knowledge on “Early Postural Adjustments (EPAs)”, “Anticipatory Postural Adjustments (APAs)”, and Compensatory Postural Adjustments (CPAs) (Lee and Aruin, 2013; Mohapatra, Krishnan, and Aruin, 2012). Consensus was achieved on a unique aspect of the concept, movement analysis with respect to postural control, stating: “Within the Bobath concept, postural control is viewed as the organization of stability, mobility and orientation of the multi-joint kinetic chain, which is reflective of the individual’s body schema in order to maintain, achieve or restore a state of equilibrium during any posture or activity”. Thus the Bobath therapist throughout movement analysis is at all times considering sensory integration, postural control, and selective movement of the individual. For example, the clinical question may be, “Can this person not perform this activity due to a loss of specific selective movement, body schema, and/or because they have insufficient postural control on which to base selective movement?”

For neuro-rehabilitation research to be clinically applicable, and for clinical practice to be replicable, a shared understanding of specific terminology with respect to the clinical presentation is essential. Although the Bobath experts agreed on the statement describing “typical motor behavior” as representative of the range of motor behavior available to individuals without a central nervous system (CNS) lesion, there was considerable discussion with respect to the statements describing motor behavior post CNS lesion, as well as which motor behavior should be the focus of intervention, recovery, or compensation. Although some discussion of the terms “recovery” and “compensation” has occurred in the literature (Levin, Kleim, and Wolf, 2009), clear descriptions of motor behavior post CNS lesion are lacking. Additionally, how a therapist understands and describes motor behavior is reflective of their theoretical framework and underpins their clinical reasoning (Tyson and Desouza, 2003). The neuro-rehabilitation research to date categorizes clients by their medical diagnosis (Kollen et al., 2009), whereas clinical neurological rehabilitation addresses the movement problems that arise from the underlying medical diagnosis. Clearer descriptions and categorization of



Table 5. Statements representative of the conceptual framework underpinning Bobath clinical interventions.

Round One	Round Two	Round Three
<p>An inclusive, individualized, remediation-focused problem-solving approach.</p> <p>Based on contemporary theories of motor control, neuromuscular plasticity, and motor learning.</p> <p>Based on an understanding that neurological pathology affects the whole body, and that current movement control is influenced by movement experiences pre and post the neurological lesion.</p> <p>Focused on the recovery potential of the individual to regain typical motor behavior.</p> <p>Not focused on the development of compensatory strategies for functional independence.</p> <p>Goal oriented to remediate impairments, minimize activity limitations, improve participation, thereby promoting independence and enhancing the quality of the person's daily activities.</p> <p>Not exclusive, such that additional therapies (e.g. BWST/CIMT) are selectively incorporated into the intervention plan to enhance the potential recovery of the individual.</p>	<p>The Bobath concept is an individualized problem-solving treatment approach. It provides a unique set of skills particularly with respect to movement analysis and the use of sensory input, can be applied to a broad range of clients, and can be combined with other interventions. The Bobath concept is informed by contemporary theories of motor control, neuromuscular plasticity, biomechanics, and motor learning providing the theoretical basis for the interpretation of posture, functional human movement analysis, and recovery post CNS lesion.</p> <p>The Bobath concept is based on the understanding that neurological pathology affects the whole person and the resulting movement problems are influenced by that person's lived experiences pre and post the neurological lesion.</p> <p>The Bobath concept views "atypical motor behavior" as disco-ordinated /invariable /and inefficient motor behavior of the more-affected limb/s and body segments post CNS lesion.</p> <p>The Bobath concept views "compensation" as the motor behavior an individual uses to achieve a task with their less-affected limb/s and body segments. This is not a primary focus of treatment using the Bobath concept.</p> <p>The Bobath concept is goal oriented to minimize activity limitations and impairments within the context of the individual's environment and participation goals.</p> <p>Clinical practice of the Bobath concept is based on the understanding that somatosensation, vision, vestibular, action, perception, cognition, and emotion are interlinked and interactive.</p> <p>The Bobath concept views balance as:</p> <ul style="list-style-type: none"> (i) a complex, multidimensional concept requiring the integration of the vestibular, visual, somatosensory, musculoskeletal, and cognitive systems; (ii) this system integration enables the planning and execution of movement patterns, postural control strategies, quickly and efficiently in anticipation of, and in response to, destabilizing forces in order to maintain equilibrium; and (iii) is dependent upon the individual's goals and environmental context. <p>The Bobath concept views postural control as the organization of stability, mobility, and orientation of the multi-joint kinetic chain, which is dependent on an appropriate body schema in order to maintain, achieve, or restore a state of balance during any posture or activity.</p> <p>The Bobath concept seeks to optimize functional independence by:</p> <ul style="list-style-type: none"> (i) potentiating the reacquisition of as close as possible typical motor behavior; and (ii) minimizing atypical and compensatory motor behavior and thus the development of secondary impairments, whilst recognizing the limitation of the CNS lesion, context-based to the individual. 	<p>The Bobath concept is an individualized problem-solving treatment approach. It provides the therapist with a unique set of skills particularly with respect to movement analysis and the use of sensory input, can be applied to a broad range of clients with movement disorders, and can be combined with other interventions.</p> <p>Within the Bobath concept, "typical motor behavior" is viewed as representative of the range of motor behavior available to individuals without a CNS lesion.</p> <p>The goal of the Bobath concept is to minimize activity limitations and impairments within the context of the individual's environment and participation goals.</p> <p>Clinical practice of the Bobath concept is based on the understanding that sensation, action, perception, cognition, and emotion are interlinked and interactive.</p> <p>Within the Bobath concept, balance is viewed as:</p> <ul style="list-style-type: none"> (iv) a complex, multidimensional concept; (v) requiring multi-system integration enabling the planning and execution of movement patterns, postural control strategies, quickly and efficiently in anticipation of, and in response to, destabilizing forces in order to maintain equilibrium; and (vi) is dependent upon the individual's goals and environmental context <p><i>[This statement reached consensus but did not reach consensus to be included in the Bobath clinical framework]</i></p> <p>Within the Bobath concept, postural control is viewed as the organization of stability, mobility, and orientation of the multi-joint kinetic chain, which is reflective of the individual's body schema in order to maintain, achieve, or restore a state of equilibrium during any posture or activity.</p> <p>The Bobath concept seeks to optimize functional independence by:</p> <ul style="list-style-type: none"> (ii) potentiating the reacquisition of as close as possible typical motor behavior; and (iv) minimizing atypical motor behavior (of the more-affected body segments/limbs) and compensatory motor behavior (of the less-affected body segments/limbs) and thus the development of secondary impairments, whilst recognizing the limitation of the CNS lesion context-based to the individual.

Note. Statements bolded were accepted in the respective round.



Table 6. Statements representing key aspects of Bobath clinical practice.

Round One	Round Two	Round Three
<p>Assumption: Movement analysis and treatment is based upon the integration of postural control and task performance, and the control of selective movement for the production of coordinated sequences of movement.</p> <p>Principles: Movement deficits are limitations in the variety of motor patterns normally available to healthy individuals</p> <p>Intervention is a skillful, logical, analytical, step-by-step progression, individual to individual, to achieve efficient muscle activation for success in a given activity or task</p> <p>Task practice, repetition, and velocity are used selectively to augment the intervention plan when these strategies maximize the potential of the individual with respect to improving postural control and selective voluntary movement</p> <p>Assumption: Recovery of trunk and head control is as equally important as recovery of upper and lower limb function</p> <p>Principles: Posture and movement are separate, but interactive</p> <p>Postural control is the organization of stability and mobility of the multi-joint kinetic chain in order to maintain, achieve, or restore a state of balance during any posture or activity</p> <p>Assumption: Sensory information from multiple sources plays a fundamental role in motor control</p> <p>Principles: c(i)(ii) Sensation, vision, action, perception, and cognition are interlinked and interactive</p> <p>Facilitation, including therapeutic handling, manipulation of the environment, and appropriate use of verbal cues, is a skilled aspect of intervention</p> <p>The interaction of the body segment/s with a base of support (i.e. the segments of the person's body that is in contact with the supporting surface) is a critical component of the clinical presentation as it provides information on the ability of the individual to receive, integrate, and respond appropriately to relevant afferent information</p> <p>Favors motor solutions that optimize quality/efficiency of movement while minimizing/discouraging the ability/tendency of the system to find movement solutions that involve movement compensations</p> <p>Movement quality should be a determinant of effectiveness. The efficiency /quality of the movement should not deteriorate with increasing speed or frequency of the movement/activity.</p>	<p>The Bobath concept views movement analysis of task performance within a specific environment from the perspective of the integration of posture and movement through the lens of movement patterns, not as isolated movements.</p> <p>a(i) A goal of the Bobath concept is to improve movement strategies such that aspects of ease, rhythm, coordination, specificity, variability, repeatability, and speed are addressed in task performance.</p> <p>a(ii) Intervention is a skillful, logical, analytical process, individual to the client, therapist, and environment to improve the quality of movement such that all body segments cooperate harmoniously with one another in the context of the task/s.</p> <p>a(iii) Task selection in the Bobath concept must be meaningful to the client, and is specifically chosen and manipulated with respect to velocity, direction, load, and magnitude in order to optimize the client's postural control and selective voluntary movement.</p> <p>b) Clinically, within the Bobath concept posture and movement are viewed as inseparable and interdependent.</p> <p>b(i) Quality of movement and the ability to co-ordinate movement whilst maintaining an appropriate postural background during a specific activity are a core focus of the Bobath concept.</p> <p>The Bobath concept seeks to achieve the greatest level of integration of trunk and head control with upper and lower limb function in order to optimize the efficiency of functional movement.</p> <p>Movement quality, "how" a client completes a task, not just if they can complete a task, should be one determinant of effectiveness of Bobath interventions.</p> <p>The Bobath concept considers the role of sensory information in motor control, including the role of sensation in perception, a key aspect of clinical practice.</p> <p>Facilitation is the skilled interaction (verbal and nonverbal) between the therapist, the client, and the client's body. Facilitation includes therapeutic handling, manipulation of the environment, task selection, and appropriate use of verbal and nonverbal cues in order to potentiate self-initiation of movement and/or create the necessary conditions for a movement experience that the client can not yet do alone. It is the art of therapeutic intervention.</p> <p>c(ii) The Bobath concept considers that the ability of the individual to selectively adapt motor activity and alignment of body segments with respect to a supporting surface and gravity provides critical information on the ability of the individual to receive, integrate, and respond appropriately to relevant information and is fundamental to the acquisition and development of postural control.</p>	<p>(a) Movement analysis of task performance within a specific environment is viewed by the Bobath concept from the perspective of the integration of posture and movement.</p> <p>b(i) The Bobath concept seeks to achieve integration of trunk and head control with upper and lower limb function to improve the efficiency of functional movement.</p> <p>b(ii) Movement quality, "how" a client completes a task, should be one determinant of effectiveness of Bobath interventions.</p> <p>(c) Within the Bobath concept the role of sensory information in motor control and perception are considered a key aspect of clinical practice.</p> <p>c(i) Facilitation is the skilled interaction between the therapist, the client, and the client's body. Facilitation includes therapeutic handling, manipulation of the environment, task selection, and appropriate use of verbal and nonverbal cues in order to potentiate self-initiation/termination of movement and/or create the necessary conditions for a movement experience that the client can not yet do alone.</p>

Note: Statements bolded were accepted in the respective round.

movement problems have the potential to enhance the clinical relevance of neuro-rehabilitation research.

In Round Two, the lack of agreement with the statement with respect to compensation (item 10 – Table 3) (53%) may have been due to either the description of compensatory movement or whether compensation is a primary focus of treatment using the Bobath concept. Likewise lack of agreement with the statement with respect to “atypical motor behavior” (item 9 – Table 3) may have been due to the movement descriptors and/or reference to the more affected body segments/limbs. An associated statement on optimizing functional independence by potentiating typical motor behavior while minimizing atypical and compensatory motor behavior did reach consensus (item 11 – Table 3) (91%).

Mrs. Bobath used the terminology normal, abnormal, and compensation to describe the clinical presentation throughout her publications (Bobath, 1970; Bobath, 1978; Bobath, 1990). Today, it is recognized that there is no “normal” movement, but a range of typical motor behaviors (i.e. similar characteristics of age and gender-matched motor behavior) (Levin and Panturin, 2011). In contrast, those persons who present with dissimilar movement characteristics, or atypical motor behavior, are no longer referred to as having “abnormal” movement. Expert consensus was gained on the movement descriptors: compensation (i.e. use of less-affected body segments/limbs to perform a task); and atypical motor behavior (i.e. movement of the more-affected body segments/limbs), with respect to optimizing functional independence context-based to the individual. For example, should the therapist address the compensatory movement of the less-affected body segment/limbs as this is contributing to the learned nonuse of the more-affected body segments/limbs? Or, should the therapist address the atypical movement of the more-affected shoulder girdle as this is negatively impacting on the development of the reach pattern of the more-affected upper limb? Or, are both scenarios occurring simultaneously?

Lastly, it would seem that the variability in the experts’ opinions with respect to balance is reflected in the literature as balance definitions vary widely (Mancini and Horak, 2010; Tyson and Connell, 2009). Although the balance statement reached consensus in Round Three, the experts agreed that this statement should remain within the domain of neuroscience for its definition as it is common to all rehabilitation. It is how the therapist interprets balance within the context of motor recovery post CNS lesion that makes it specific to a particular concept. Further discussion and investigation of how balance is viewed, interpreted, and clinically applied within the Bobath concept is required.

Statements representative of key aspects of Bobath clinical practice

Through the process of consensus building with expert Bobath clinicians, the key aspects of Bobath clinical practice became focused into three primary areas: 1) movement analysis of task performance; 2) the interdependence of posture and movement; and 3) the role of sensory information in motor control, all of which are reflected in the consensus statements representative of the conceptual framework (Table 6).

The Bobath experts agreed that task selection is individualized and specifically chosen to optimize postural control and selective movement, and that aspects such as ease, rhythm, coordination, specificity, variability, repeatability, and speed all should be addressed and evaluated in task performance. This is in contrast to treatment approaches such as the Motor Relearning Program (Langhammer and Stanghelle, 2011) or Task Specific Training (Arya et al., 2012), where task completion is the goal of intervention rather than task performance. Since its inception the Bobath concept has always been concerned with “how” a client performs a task, the quality of task performance. But Mrs. Bobath recognized that the assessment of functional ability is limited by its quantitative nature as it does not provide any information on the quality of improvement of function, specifically how the activity was performed such as how much movement of the affected side was used, how atypical was this movement, or how much compensatory movement of the less-affected side was used (Bobath, 1978). Unfortunately, the focus of neuro-rehabilitation continues to be primarily on task accomplishment (Harkema et al., 2012; Levin, Kleim, and Wolf, 2009), as also the basis of the majority of outcome measures, where the differentiation between compensation, typical, and atypical motor behavior is lacking (e.g. walking faster is not necessarily the same as walking “better”) (Tansey, McKay, and Kakulas, 2012). The challenge for those in neuro-rehabilitation practice and research is how to quantify these qualitative aspects of movement in order for effectiveness research to be more clinically relevant.

Consideration of the whole person including their lived experiences pre and post a CNS lesion within the Bobath concept is in contrast to some treatment interventions that consider one aspect of the individual such as Constraint Induced Movement Therapy (CIMT) for upper limb recovery and Body-Weight Support Treadmill training (BWST) for recovery of locomotion. Whilst these interventions are based on current neuroscience and recovery mechanisms post CNS lesion they fail to recognize the role of the trunk, head, and

posture in motor control, and more importantly the role of the person in functional recovery. Perhaps the lack of consideration of reach to grasp and walking as whole-person activities, and thus requiring the integration of posture and movement, may be one reason why BWST training has had difficulty demonstrating clinical effectiveness (Dobkin and Duncan, 2012) or as to why the integration of CIMT into routine clinical practice has been problematic (Viana and Teasell, 2012).

The role of sensory information in motor control and perception has been a core tenet of the Bobath concept since its inception, and remains so today (Vaughan-Graham, Cott, and Wright, 2015b). Understanding the interaction between the client's body segments, supporting surface, and gravity was identified as a fundamental clinical principle by the experts providing critical information on the client's perceptual abilities as well as their ability to generate appropriate postural control. Mrs. Bobath recognized she could influence a client's movement through her handling, namely facilitation, and that facilitation was a skill, stating: "... it may not necessarily be the technique or the pattern which is unsuitable, it may be the way it is used which fails to produce the desired response" (Bobath, 1978, p. 64).

Facilitation, or therapeutic handling, is a clinical skill the therapist develops including manipulation of the environment and somatosensory information, task selection part or whole, as well as verbal cues to optimize the client's movement experience. Facilitation is a skill acquired through reflective professional practice, but unfortunately it is an aspect of clinical practice that has received little attention to date (Nicholls and Holmes, 2012; Vaughan-Graham, Cott, and Wright, 2015b). This is compounded by poor attention to the methodologic aspects of experimental study designs such as intervention description, therapist adherence, and expertise, on which causality determinations are dependent (Boutron et al., 2008; Hart and Bagiella, 2012; Hildebrand et al., 2012; Vaughan-Graham, Cott, and Wright, 2015a), despite the introduction of the mandatory use of reporting guidelines to improve rehabilitation research quality (Chan, Heinemann, and Roberts, 2014). Even though on the ground all clinicians know that to optimize a client's recovery post neurological lesion a good physiotherapist is key, the value of the art of neuro-rehabilitation, and physiotherapy professional practice as a whole, is yet to be realized (Nicholls and Holmes, 2012; Tansey, McKay, and Kakulas, 2012; Vaughan-Graham, Cott, and Wright, 2015a).

Conclusions

Using a Three-Round secure web-based survey, the Delphi technique was successfully used to gain consensus

in a geographically dispersed expert association (IBITA). All statements went through a process of rewording and reordering to gain consensus of the Bobath experts. Eight statements gained consensus of being representative of the conceptual framework underpinning Bobath clinical interventions (Table 5). Through structured debate consensus was gained on movement descriptors, typical, atypical, and compensatory, which will assist in clarifying the client's movement problems. Further investigation is required with respect to how "Balance" is viewed, interpreted, and applied within the Bobath concept. Three key assumptions and an accompanying eight principles were identified as representing the key aspects of Bobath clinical practice (Table 6). In summary these are: (a)i)ii)iii) the integration of postural control and task performance with a specific focus on the quality of task performance; (b)i)ii)iii) the equal importance of recovery of the trunk, head, and limbs to optimize movement efficiency and quality; and (c)i)ii) the integration of sensory information in motor control and perception specifically with respect to facilitation, supporting surface, and gravity. These statements identify what is unique to the Bobath concept in terms of clinical application and should form the basis of future effectiveness research.

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Declaration of interest

Julie Vaughan-Graham is an Advanced Bobath instructor and member of IBITA. Cheryl Cott reports no declarations of interest.

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