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CAN THE RONNIE GARDINER METHOD IMPROVE LANGUAGE, COMMUNICATION AND QUALITY OF LIFE FOR PEOPLE WITH APHASIA?

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ABSTRACT

Aim The aim with this study was to explore whether rhythm therapy in the form of the Ronnie Gardiner Method has a positive effect on language, communication and quality of life in patients with aphasia.

Methods A mixed method design was used with both quantitative measurements and qualitative interviews. Language skills, communication effectiveness and quality of life were assessed.

Participants A group of eight patients with chronic aphasia, defined as at least one year post-stroke onset, participated in this study. They attended a ten week course in the Ronnie Gardiner Method. Participants were tested twice before the intervention and once post intervention.

Intervention The purpose of this innovative group-based therapy is to stimulate the brain by a combination of colours, symbols, words, and sounds, with a sequence of movements performed to music and rhythm. In Gothenburg, Sweden, the musician and licenced practitioner Ole Moe has led rhythm therapy groups for stroke patients since 1999. The courses have been very popular and people usually attend for more than one year. Previous studies have shown improved motor function and improved verbal flow following this treatment procedure.

Results The results of the study showed significant improvements in verbal fluency after the intervention. No statistically significant changes in communicative effectiveness were found. The results of the interviews and the expressed wish of the participants to continue the program suggest that this therapy is also psychosocially stimulating for people suffering from aphasia.

1. INTRODUCTION

Almost one third of stroke patients suffer from aphasia at onset (Laska et al, 2001). Aphasia often brings a lifelong disability, requiring extensive health care and assistance. The lack of speech therapists creates few possibilities for long-standing rehabilitation.

The Stroke Forum in Gothenburg, Sweden, offers advice, support and activities for stroke patients and their families after the completion of initial hospital care and rehabilitation (Annual report from Stroke Forum, 2000). Since autumn 1999 the musician Ole Moe runs regular classes with the Ronnie Gardiner Method in cooperation with Stroke Forum and Folkuniversitetet (the 'Peoples' University'). From the outset this rhythm therapy has been popular, and many participants chose to continue for many semesters. The jazz drummer Ronnie Gardiner created his rhythm based method through his knowledge of rhythm and many years of intensive work with stroke patients, with the purpose to help people suffering from stroke, burn-out, dyslexia, Attention-deficit/Hyperactive disorder (ADHD) or motor impairments. According to the creator himself, the method aims at stimulating motor function, coordination, concentration, and rhythm skills in participants by enhancing communication between the two brain hemispheres, and improving coordination between hands and feet to the rhythm of music (Gardiner, 2000).

The Ronnie Gardiner Method has been scientifically evaluated on stroke patients on two previous occasions. These reports showed an improvement in coordination, motor skills, visuospatial function, verbal fluency and psychosocial stimulation (Vikström, 1996; Freinert & Svensson, 1999). The idea to assess the Ronnie Gardiner Method regarding possible communication and linguistic effects arose because speech therapists have found the method to be popular, but insufficiently scientifically evaluated. One previous report showed some improvements in verbal fluency, suggesting that the method may give linguistic enhancements in patients with aphasia (Vikström, 1996).

Most research on music therapy consists of qualitative studies performed by psychologists and music therapists. The use of music as therapy started to develop after the Second World War (Borchgrevink, 1993). Within the science of music medicine, the music's effects on humans are often studied quantitatively, but language and music are complex

phenomena, difficult to measure with figures (Aldrige, 1996). To optimize the chances to capture the complex nature of music therapy I decided to use a mixed method design with both quantitative linguistic tests in combination with qualitative interviews in an attempt to capture any improvements regarding language, communication skills and psychosocial aspects in patients with aphasia.

2. BACKGROUND

2.1 Music therapy and research

Historically, music has always been part of medicine. Even the ancient Greeks described how music was used as a force of healing. The Greek god Apollo, for instance, was both protector of medicine and music (Willis, 1999). In the Middle Ages, music was often used as part of healing procedures. It was only in the context of the classical epoch that music and medicine was separated (Ruud, 1980).

While medicine developed into an exact scientific discipline, music joined the aesthetic subjects. These separate disciplines share little communication (Myskja & Lindbaek, 2000a). Music's therapeutic effects have up until now mainly been evaluated with qualitative methods by psychologists and music therapists and not within the medical tradition (Borchgrevink, 2000). The qualitative research on music is process oriented and the therapeutic relationship is emphasized. Traditionally music as therapy has been used on people with schizophrenia and autism, and has been shown to improve social interaction (Myskja & Lindbaek, 2000 a).

Since the 50s the interest in music research within the field of medicine has increased steadily, and the concept of music medicine has evolved (Myskja & Lindbaek, 2000 a). The possible influences of music on variable neuropsychological and physiological structures are studied with quantitative methods within this particular discipline. Music medicine is symptom oriented, and music is used to give the desired biological effect. Already in the 1920s it was realized that music influences several central biological variables, such as blood pressure, pulse, breathing and muscle tone. These variables can be increased and decreased in such a predictable way, so that the effect of music may be classified as

relaxing, activating or stabilizing (Myskja & Lindbaek, 2000 b). Studies have shown that people react in different ways when listening to different music. Standley (1986) described how two groups of healthy young adults listened to rock music. The group that enjoyed the music had less activation (sympathomimetic reaction) than the group who did not enjoy the music.

Music therapists have criticized classic scientific methods for not capturing important aspects of their work. One aspect, for instance, is reliability; i.e., the same music therapy should be applicable to another group of matching patients with similar results. Music therapy is a transpersonal activity, which makes the effect inseparable from the therapist. Two therapists using the same method may achieve very different results. Creative therapies often expect the participants to have unique backgrounds and that the therapy in itself must be adapted to the taste of the individual. In creative therapies it is preferred to use a design where the patient is compared to the therapist, and not to a group norm (Aldrige, 1996). The boundary between qualitative music research and music medicine is of course fluid, and an interdisciplinary meeting between the humanistic and the scientific traditions may give many fruitful insights of music's potential and limitations as therapy.

2.2. Music and language

Comparison between music and language is nothing new. Jean-Jaques Rosseau writes in 1781 that language and music share a common origin and that music evolved first. Darwin, on the other hand, states the opposite: that language and music share a common origin, but that the language evolves first in humans (Besson & Friederici, 1998). To this day, there are representatives of the idea that music comes first, because it touches a deeper emotional level in humans. Menuhin and Davis (1979) write: "Music is our oldest form of expression, older than language or art, it begins with the voice, and with our overwhelming need to reach out to others, in fact music <u>is</u> man far more than words, for words are abstract symbols which convey factual meaning. Music touches our feelings more deeply than words and make us respond with our whole being." (page 1).

Spoken language and music are the two main forms of systematic human communication that uses acoustic signals. The function of music is still not fully understood. Some people see music as pure entertainment. Others use music for relaxation or stimulation. Music is used in many cultures as a religious, magical agent. Risset (1991) describes music as a universal language. Slawson (1991) argues that the organized structure of a whole composition is *dissolved*, comparable to although not completely, analogue with the syntactic structure of a whole sentence. The literature that compares language and music (Besson & Frederici, 1998; Fagius, 2001) often finds the following divisions:

Music: what do we hear?

- Contour: melody, "Gestalt"
- Chords, harmonies
- Duration of notes, rhythm

Language: what is it?

- Phonologic prosody
- Lexicon
- Semantics
- Syntax
- Pragmatics

Researchers investigate if these structures have something in common. Different comparisons between different components are made and the results of those assessments varies greatly. Does music have syntax? Does music express meaning, etc? There is an ongoing (2002) study in Denmark investigating the connection between music and language. The hypothesis is that the brain structures responsible for syntax in language are the same as the ones responsible for processing musical rhythm – i.e., that language and music are two parallel processes (Östergaard & Vuust, 2002).

Music has other dimensions than language – pitch and rhythm have a temporal dimension, pitch has a spatial dimension, and chords involve the ability to perceive concurrency in a form of vertical dimension (Fagius, 2001). Music and language use

different units. Music does not have lexical units where shape and content is arbitrary. In language there is recognition what is spoken of, what an object is or what it does. Music does not have an equivalent to object, subject, predicate, adverb, or verb. Logical conclusions cannot be drawn in music, and the musical message is mainly built on emotions (Sigvard, 1991). One fascinating phenomenon is when persons suffering from global aphasia are able to sing along in familiar melodies despite having severe speech impairments.

2.3. Music and the brain

The classic issue heavily debated in neuroscience is which brain hemisphere is activated by music. Theories on brain hemispheres have shifted through years of research. Contemporary research demonstrates that the localisation of music in the brain is much more complex than limited to one specific hemisphere (Fagius, 2001).

Music listening and music performance are complex phenomena activating large parts of the brain. Listening to music in various ways at different times means that the brain is activated in different ways. You can listen to music as a wholeness. The right hemisphere is activated when you listen to the musical "gestalt" and the left hemisphere is activated when you analyse separate components of the music. First the right temporal lobe analyses the wholeness**,** the melody line and then forwards the task to the left hemisphere for processing the details (Bever & Chiarello, 1974). The left side is unable to fulfil its assignment without receiving correct information from the right hemisphere's perception of the musical contour. The sensitivity for rhythm and temporal intervals is therefore impaired if either the right or left hemisphere is injured. A cooperation between the hemispheres is necessary for a complete musical experience (Fagius, 2001). In infants a preference has been shown for activation in the right hemisphere when they listen to music, and in the left hemisphere when they listen to language (Bertonicini, Morais, Bijeljac-Babic, McAdams, Peretz & Mehler, 1989).

People with injury to the left hemisphere may have difficulty in recognizing music which they previously knew well, in identifying recently-heard music and difficulty with rhythm.

People with injury to the right hemisphere have impaired capacity for perceiving incoming impressions. The right side perceives and analyses and the left side compares with previously imprinted musical memories. The right side is specialized in analysing complex pitches and perceive the fundamental tone in a series of harmonics (Peretz, 1990). In more detailed studies, the most impaired music perception was shown when the superior part of the temporal lobe gyrus (gyrus temporalis superior) was surgically removed (Peretz, 1990).

Several studies indicate that rhythm perception is a left sided skill (Fagius, 2001). Rhythm is a time-related temporal sound structure. To be able to perceive rhythm, an ability to sequence incoming sound stimuli is required.

Amusia, i.e., the impaired ability to process music, occurs as an identified disability mainly in those with an active relationship to music. According to Fagius (2001) one can basically say that if amusia occurs combined with aphasia, there is left hemispheric injury. If there is only amusia, the injury is most probably located in the right hemisphere.

2.4. Rehabilitation of Aphasia

According to Taylor Sarno (1981) a critical factor in aphasia rehabilitation is that once the condition is stabilized there are very few patients who reach normal communication, with or without therapy. Group therapy is often used in patients with chronic aphasia. Group therapy is often most efficient after the acute phase, when patients are more aware of their difficulties, and maybe have become more interested in and capable of interacting with other people. Meeting others with similar experiences may be very supportive and reduce feelings of depression and loneliness. However, group therapy does not suit everyone. Other important factors are level of understanding, time since injury, and personality.

The majority of people with aphasia experience difficulties in returning to their old work and leisure activities, and they also have a hard time initiating new social contact or leisure activities. The lack of speech therapists in Sweden is significant, and few long-term therapies are offered in the country.

2.5. Music therapy

Many therapists use music in their everyday work with patients with physical and mental disabilities, but when is it appropriate to call it music therapy? Ruud (1981) defines music therapy as follows: "Educational, motor, social and psychological milestones, i.e., non-musical goals are prioritized before musical goals" (p.2). The power in music lies in that it reaches over all boundaries and limitations. It is not verbally, geographically or rationally bounded (Geck, 1977). Music can be used as an alternative to other rehabilitation methods and through music the participants may be given new possibilities to express emotions non-verbally, experience social interaction, and initiate other activities (Ruud, 1980).

A literature review shows that there is only one therapy specifically developed for patients with aphasia that uses music as a therapeutic tool: MIT (Melodic Intonation Therapy). In MIT the patients' uninjured right hemisphere is used to develop a functional language with rhythmical and melodic training of words and phrases (Albert, Sparks & Helm, 1974). This is done by purification of the intonation of normal speech. According to the creators of the therapy, it works best if the patient has good auditory understanding, ability to self-correct, non-fluent speech, impaired articulation ability, stereotypies, poor repetition ability, and are well motivated and emotionally stable (Helm-Estabrooks & Albert, 1991).

Research from 1999 into music therapies, using 21 studies and 336 patients was reviewed in 2001 (Fagius, 2001). The review showed that several music therapies had significant effect. However, large variations between the studies made it difficult to draw any general conclusions.

2.6. The Ronnie Gardiner Method (previously known as RGRM)

The Ronnie Gardiner Method is a rhythm and music therapy was developed by the jazz drummer Ronnie Gardiner. To date (2002) it is mainly used as rehabilitation method for people with stroke, but has also gained interest as therapy for patients with dementia, ADHD, Parkinson's Disease, dyslexia, autism and depression (www.rgrminternational.com). In 2002 in Sweden there were about 30 licenced practitioners (verbal information by Ole Moe April 2002). The musician and practitioner Ole Moe leads several groups in the Ronnie Gardiner Method. The Method is seen as a complement to traditional rehabilitation methods. It is a holistic group therapy with possibilities to varied, fun and challenging exercises for people at varied levels of complexity, using colours, symbols, words, sounds, and movements to rhythm and music. The method is simple, internationally applicable and easily adapted to the needs of the individual. The aim with the therapy is to stimulate as much of the brain as possible. The Method is adapted in order to stimulate and improve motor skill, memory, concentration, coordination, stamina, social interaction, and sense of rhythm, reading skills, speech skills, posture, balance and self-knowledge (Gardiner, 2001).

The practical exercises are based on following a 'choreoscore', a visual representation created by Ronnie Gardiner of the sequence of movements. It uses symbols shaped like hands and feet. The body is divided into right and left side, red for the left side and blue for the right. Each symbol has a direction (right or left) and placing upper or lower body which clarifies which hand or foot is to be used. The movements are combined with a sound code, originally derived from the sounds of the drums and adapted for people with articulation disabilities (http://viewzone.com/rhythm_therapy.html). The exercises are performed either standing up or sitting down, according to the participants' ability. No previous experiences of drumming or musical performance is necessary. The therapy contains in total 18 movements, and since they may be varied in order, performance, tempo and the use of different kinds of music, there are endless combination possibilities. The therapy is based on these 18 basic movements, but is executed very differently depending on group and practitioner. The rhythm therapy has been scientifically evaluated in stroke groups on two occasions. Freinert and Svensson (1999) showed

improvements on motor and coordination skills after the intervention. Vikström (1996) performed an occupational therapist's evaluation. This study showed significant improvements in motor skill and coordination in arm-hand as well as spatial function, verbal fluency and short-term memory. No improvements on concentration or ADL (Activity of Daily Living) activities were shown. The therapy also gave positive psychosocial effects. Vikström writes: "In summary, the participants consistently illuminated the avoidance of loneliness and isolation in itself, and the possibility to get more friends, as the greatest advantages in their positive reflections on the group based therapy."

3. AIM AND ISSUES

3.1. Aim

The aim with this study was to evaluate if the Ronnie Gardiner Method may improve or promote language, communication and/or quality of life in patients with aphasia.

3.2. Issues

- Can the Ronnie Gardiner Method improve verbal function in patients with aphasia?
- Can the therapy improve functional communication in patients with aphasia?
- Are the participants psychosocially affected?

4. METHODS AND MATERIAL

4.1. Participants and settings

Participants were recruited from Stroke Forum and the Unit for Rehabilitation Medicine at Sahlgrenska University hospital in Gothenburg, Sweden, by licenced speech therapists. Inclusion criterion for participating in the study was chronic aphasia, defined as at least one year post-stroke onset, diagnosed by a speech therapist. Exclusion criteria were dementia and severely impaired vision or hearing. No speech therapy was allowed during the study. Participants received a written invitation to participate. They were informed

that participation was voluntary, that they at any time had the option to discontinue participation in the study, and that all data would be anonymized prior to analysis. Eight patients participated in the intervention over 8-10 weeks. Those who were able to participate in an interview were interviewed after the intervention. Three participants were born abroad, but had lived in Sweden since their 20s. Background characteristics of participants are shown in table 1.

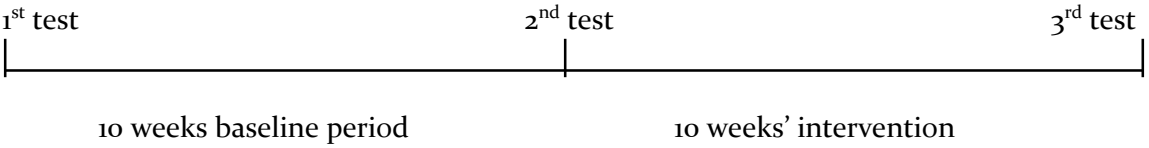
Table 1. Background characteristics for the eight participants.

P	**Sex**	**Age**	**Year of stroke onset**	**Type of aphasia and verbal difficulties** (data from patient records)	**Number of sessions participated**	**Experiences from instruments or singing**
A	W	65	1999	Global aphasia with stereotypic syllables pronounced with varying intonation. Impaired auditory comprehension and naming ability.	9	No
B	M	70	1995	Mixed aphasia with major problems initiating speech. Impaired naming ability.	10	No
C	W	65	1989	Severe mixed aphasia, impaired auditory comprehension and naming ability. Anomia.	9	Yes
D	M	61	1999	Global aphasia with stereotypic syllable formations. Good auditory comprehension. Inability to repeat or name.	10	No
E	M	58	2000	Moderate mixed aphasia with difficulties in word mobilization, anomia, able to repeat.	10	Yes
F	M	67	2000	Global aphasia with stereotypic sound solutions. Inability to repeat or name. Impaired auditory comprehension.	8	No
G	M	70	1992	Paraphasia sometimes occurs. At times slow spontaneous speech. Good understanding. Impaired reading skills. Severe writing difficulties.	9	No
H	M	65	1999	Moderate mixed aphasia, impaired auditory memory.	10	No

Abbreviations: P = Participant; M = Man; W = Woman

4.2. Methods

There are some inbuilt methodological difficulties when studying patients post stroke. The extent of the brain damage varies, and the reported localization is often rough. When suffering from aphasia, a person may have difficulties in assimilating instructions, which makes both testing and test results difficult to interpret (Peretz, 1990). This study consists of one experimental case study and one qualitative interview. Participants were tested on three occasions: 10 weeks prior to intervention, immediately before intervention, and post intervention. The two first tests were performed in order to determine the linguistic and communicative ability of the participants within a baseline period. Any differences between baseline period and post intervention may show possible effects from the intervention.



4.3. Measurements

All tests were performed by the author, and all interviews were recorded on MiniDisc to provide an opportunity to assess the data retrospectively. The following tests were used:

- A short version of Reinvangs aphasia test, developed at the hospital of Danderyd, Stockholm (Laska et al, 2001). The different linguistic areas that were assessed were auditory understanding, repetition ability, naming ability, writing ability, and reading ability. In order to give a more comprehensive picture of the participant's ability to communicate, the first part of the complete Reinvang (Reinvang & Engvik, 1980) was also used, assessing communication skill, speech quality and verbal fluency (word count per minute in spontaneous speech).

- ANELT (Amsterdam-Nijmegen Everyday Language Test), assessing oral communication skills in everyday situations (Blumert, 1987). The ANELT consists

of two parallel versions; version I was used on the first and third test occasions, and on the second test occasion version II was used.

- CETI (The Communicative Effectiveness Index), a questionnaire that was given to the proxies or personal assistant of the participants. The questions concern communication and verbal skills prior to the damage and present skills (Lomas et al, 1989).

- Self-reported quality of life on a Visual Analogue Scale (VAS).

Interview questions

Semi structured questions regarding the intervention were used in the form of conversation. Questions were asked about how they had felt about the intervention, had they felt any improvement, or got better? Did they have any criticism? Suggestions for improvements? How did they feel about the group?

4.4. Analysis of data

Participants were tested twice before the intervention and once post intervention. The results prior to and after the intervention were compared and are presented in diagrams and tables. The test results were also analysed on a group level and were analysed with paired samples T-test. For the interviews, a qualitative analysis was performed.

4.5. The intervention

The participants took part in the Ronnie Gardiner Method (RGM) 2-hour sessions once a week. The intervention was led by Ole Moe, licenced RGM practitioner since 1999. Each session began with a few minutes of relaxing music, and then continued with short

sequences of rhythm exercises varied with just listening to music. The rhythm exercises were performed in a group sitting down. The exercises consisted of hand claps and foot stomps with left and right hand or foot respectively. The actual task was to follow specific "notes" in shape of symbols with its specific sound code. The sound codes consist of onomatopoetic words that evoke the sound of drums. The symbols are in shape of a hand or a foot, or a combination of a hand and foot. They are coloured in red, symbolizing the left side of the body, or in blue, symbolizing the right side of the body. For example, the movement of clapping the left hand on the left thigh is accompanied by the sound code "BAAA", and is symbolized by a note in shape of a red hand. In the first session a few movements were tried out at a low speed (the tempo is held by a metronome or music), in order to gradually increase the level of difficulty as the participant's skill improves. After 45 minutes exercising the participants were offered a coffee break to rest for a while and to socialize with the other participants.

5. RESULTS

The results of the eight participants is presented in two ways: 1) separately with diagrams and tables, following a brief summery from the interviews; 2) a summary of all results and from the interviews, including a statistical analysis on group level.

5.1. Participant A

Participant A completed nine out of ten sessions of the intervention.

- **Short version of Reinvang: Auditory comprehension, repetition, naming, reading and writing, Reinvang verbal fluency, ANELT; CETI and perceived quality of life.**

Table 5.1.1. Test results from 3 assessments, participant A (scores).

		First assessment	Second assessment	Third assessment	Difference between 2 and 3
REINVANG	Auditory comprehension	8	14	10	- 4
	Repetition	8	8	8	No change
	Naming	0	0	0	No change
	Reading	0	0	0	No change
	Writing	1	1	2	+ 1
	Verbal fluency	26	31	45	+ 14
	ANELT	12	6 (incomplete)	29	Interpretation impossible
	CETI	29		20	- 2
	Perceived quality of life	Unable to fill out		87	Interpretation impossible

- **Results from interview**

Participant is unable to participate in an interview due to severe aphasia.

- **Reinvang, part 1 Communication and speech quality**

The testing of communication skill and speech quality showed no difference between the three test occasions. Table 5.1.2 from the first test occasion gives a clear picture of the participant's spontaneous speech.

Table 5.1.2. Test results from Reinvang: quantitative evaluation of communication skill and speech quality.

Participant A		***Great difficulties***	***No difficulties***
Communication	Interview		
Speech quality	Audio confusion		
	Complex paraphasia		
	Visible effort		
	Hesitant, pausing		
	Stereotyping		
	Articulation		
	Self-correction		

Summary of the results from participant A

Participant A very much wanted to continue with the rhythm therapy. A considerable improvement was noted in Reinvang verbal fluency. In this case the speech does not consist of words, but of syllable repetitions with various intonations. Writing ability improved by 1 score. The remaining parts of Reinvang showed no improvements. A relative of the participant evaluated a decrease in communication skill on the CETI over the three assessment occasions. The second test occasion regarding ANELT was interrupted because the participant was unable to participate in the test due to impaired auditory comprehension. Participant A did not fill out the VAS regarding perceived quality of life at test occasion 1 and 2. A qualitative interview was not possible to perform due to the participant's severe aphasia.

5.2. Participant B

Participant B completed all ten sessions of the intervention.

- **Short version of Reinvang: Auditory comprehension, repetition, naming, reading and writing, Reinvang verbal fluency, ANELT; CETI and perceived quality of life.**

Table 5.2.1 Test results from 3 assessments, participant B (scores).

		First assessment	Second assessment	Third assessment	Difference between 2 and 3
REINVANG	Auditory comprehension	25	28	27	- 1
	Repetition	13	14	14	No change
	Naming	11	14	15	+ 1
	Reading	10	10	10	No change
	Writing	4	5	5	No change
	Verbal fluency	11	11	14	+ 3
	ANELT	54	59	56	- 3
	CETI	40	39	46	+ 7
	Perceived quality of life	87	64	85	+ 21

- **Quote from the interview**

"I thought the intervention was good. It wasn't hard. They played my kind of music. The group was good. I haven't practiced at home. I very much want to continue with the rhythm therapy".

- **Reinvang, part 1 Communication and speech quality**

The testing of communication skill and speech quality showed no difference between the three test occasions. Table 5.2.2 from the first test occasion gives a clear picture of the participant's spontaneous speech.

Table 5.2.2. Test results from Reinvang: quantitative evaluation of communication skill and speech quality.

Participant B		***Great difficulties***								***No difficulties***	
Communication	Interview										
Speech quality	Audio confusion										
	Complex paraphasia										
	Visible effort										
	Hesitant, pausing										
	Stereotyping										
	Articulation										
	Self-correction										

Summary of the results from participant B

Participant B wanted very much to continue with the rhythm therapy. Verbal fluency according to Reinvang was slightly improved after the intervention. The results from the CETI shows that the participant's relative evaluated some improvement in communication skill. Participant B evaluated perceived quality of life considerably lower on measurement 2 than measurement 1 and 3. The remaining results showed no significant improvements. According to the results from the interview, participant B enjoyed the intervention, the music, and the group. He did not think the movements were difficult to learn.

5.3. Participant C

Participant C completed nine out of ten sessions of the intervention.

- **Short version of Reinvang: Auditory comprehension, repetition, naming, reading and writing, Reinvang verbal fluency, ANELT; CETI and perceived quality of life.**

Table 5.3.1. Test results from 3 assessments, participant C (scores).

		First assessment	Second assessment	Third assessment	Difference between 2 and 3
REINVANG	Auditory comprehension	13	10	14	+ 4
	Repetition	12	14	12	- 2
	Naming	6	6	4	- 2
	Reading	0	2	6	+ 4
	Writing	0	0	2	+ 2
	Verbal fluency	10	11	13	+ 2
	ANELT	39	38	42	+ 4
	CETI	28	35	63	+ 28
	Perceived quality of life	Unable to fill out	Unable to fill out	Unable to fill out	

Quote from interview

"It was great fun, I did some practicing at home initially. I love music. Excellent practitioner. Too many chairs and tables in the room, it was crowded with all the wheelchairs".

- **Reinvang, part 1 Communication and speech quality**

The testing of communication skill and speech quality showed no difference between the three test occasions. Table 5.3.2 from the first test occasion gives a clear picture of the participant's spontaneous speech.

Table 5.3.2. Test results from Reinvang: quantitative evaluation of communication skill and speech quality.

Participant C		***Great difficulties***										***No difficulties***
Communication	Interview											
Speech quality	Audio confusion											
	Complex paraphasia											
	Visible effort											
	Hesitant, pausing											
	Stereotyping											
	Articulation											
	Self-correction											

Summary of the results from participant C

Participant C very much wanted to continue with the rhythm therapy. The results from auditory comprehension and repetition were somewhat uneven from the three test occasions. A considerable improvement was seen in reading ability. Improvement on writing from 0 to 2 points. Verbal fluency improved slightly. ANELT showed some improvement. CETI was evaluated by the personal assistant as having improved to almost double on communication skill. Participant C failed to fill out the VAS scale correctly regarding perceived quality of life. According to the qualitative interview the participant enjoyed the therapy because she loves music. She appreciated both the exercises and the practitioner.

5.4. Participant D

Participant D completed ten out of ten sessions of the intervention.

- **Short version of Reinvang: Auditory comprehension, repetition, naming, reading and writing, Reinvang verbal fluency, ANELT; CETI and perceived quality of life.**

Table 5.4.1. Test results from 3 assessments, participant D (scores).

		First assessment	Second assessment	Third assessment	Difference between 2 and 3
R	Auditory comprehension	25	24	27	+ 3
E	Repetition	2	0	2	+ 2
I	Naming	0	0	0	No change
N	Reading	8	7	9	+ 2
V	Writing	1	1	1	No change
A	Verbal fluency	7	5	7	+ 2
N					
G					
	ANELT	37	42	46	+ 4
	CETI	72	53	56	+ 3
	Perceived quality of life	84	93	96	+ 3

- **Quote from interview**

"The group was good, and so was the practitioner. The speed was too fast, would have been easier if it had been slower. I would like to continue. The symbols were difficult".

- **Reinvang, part 1 Communication and speech quality**

The testing of communication skill and speech quality showed no difference between the three test occasions. Table 5.4.2 from the first test occasion gives a clear picture of the participant's spontaneous speech.

Table 5.4.2. Test results from Reinvang: quantitative evaluation of communication skill and speech quality.

Participant D		***Great difficulties***											***No difficulties***
Communication	Interview												
Speech quality	Audio confusion												
	Complex paraphasia												
	Visible effort												
	Hesitant, pausing												
	Stereotyping												
	Articulation												
	Self-correction												

Summary of the results from participant D

Participant D very much wanted to continue with the rhythm therapy. Auditory comprehension, repetition, reading, verbal fluency and ANELT had all improved post intervention. The results from the second test occasion were somewhat lower compared to the first occasion on auditory comprehension, repetition, reading and verbal fluency. The personal assistant evaluated participant D's communication skill as much lower at test occasion 2 and 3 compared to test occasion 1. The quality of life of the participant increased steadily at all occasions. The tests on communication skill and speech quality showed no difference over the three test occasions. According to the qualitative interview participant D thought the group and the practitioner was good. He felt the note system was difficult and the teaching speed of new movements was too quick.

5.5. Participant E

Participant E completed ten out of ten sessions of the intervention.

- **Short version of Reinvang: Auditory comprehension, repetition, naming, reading and writing, Reinvang verbal fluency, ANELT; CETI and perceived quality of life.**

Table 5.5.1. Test results from 3 assessments, participant E (scores).

		First assessment	Second assessment	Third assessment	Difference between 2 and 3
R E I N V A N G	Auditory comprehension	29	29	29	No change
	Repetition	14	15	15	No change
	Naming	13	13	14	+ 1
	Reading	10	10	10	No change
	Writing	5	5	5	No change
	Verbal fluency	39	32	50	+ 18
	ANELT	87	79	88	+ 9
	CETI	68	87	91	+ 4
	Perceived quality of life	76	72	71	- 1

- **Quote from interview**

"It was good, I liked the therapy. While I was there I understood everything, but when I came home I forgot most of it. Difficult to repeat the exercises at home. It's difficult, but it's working while you're there. The tempo was not too fast. Good for the memory, refreshing. Good for the body sensation. Need drums, the rhythms, to make it work at home. When you only listen, you forget soon, not so many that are able to write. Would like to continue, the course was short, the level of difficulty is increasing".

- **Reinvang, part 1 Communication and speech quality**

The testing of communication skill and speech quality showed no difference between the three test occasions. Table 5.5.2 from the first test occasion gives a clear picture of the participant's spontaneous speech.

Table 5.5.2. Test results from Reinvang: quantitative evaluation of communication skill and speech quality.

Participant E		***Great difficulties***								***No difficulties***			
Communication	Interview												
Speech quality	Audio confusion												
	Complex paraphasia												
	Visible effort												
	Hesitant, pausing												
	Stereotyping												
	Articulation												
	Self-correction												

Summary of the results from participant E

Participant E very much wanted to continue with the rhythm therapy. Significant improvement on verbal fluency post intervention. The participant showed good linguistic skill and received maximum score on auditory comprehension, repetition, reading, and writing. Small improvement on naming. Participant scored lower on ANELT on test occasions 2 compared to 1 and 3. On CETI the evaluation of a relative showed the largest improvement between test occasion 1 and 2. Participant E evaluated quality of life

somewhat lower over the three test occasions. Participant E enjoyed the therapy according to the qualitative interview. He felt it was good for memory and body sensation.

5.6. Participant F

Participant F completed eight out of ten sessions of the intervention.

- **Short version of Reinvang: Auditory comprehension, repetition, naming, reading and writing, Reinvang verbal fluency, ANELT; CETI and perceived quality of life.**

Table 5.6.1. Test results from 3 assessments, participant F (scores).

		First assessment	Second assessment	Third assessment	Difference between 2 and 3
R E I N V A N G	Auditory comprehension	12	15	11	- 4
	Repetition	0	0	0	No change
	Naming	0	0	0	No change
	Reading	0	0	0	No change
	Writing	1	0	1	+ 1
	Verbal fluency	11	8	8	No change
	ANELT	Participant unable to complete the test			
	CETI	54	32	28	- 4
	Perceived quality of life	No answer	68	87	+ 19

- **Results from interview**

Participant F is unable to participate in an interview due to severe aphasia.

- **Reinvang, part 1 Communication and speech quality**

The testing of communication skill and speech quality showed no difference between the three test occasions. Table 5.6.2 from the first test occasion gives a clear picture of the participant's spontaneous speech.

Table 5.6.2. Test results from Reinvang: quantitative evaluation of communication skill and speech quality.

Participant F		***Great difficulties***											***No difficulties***
Communication	Interview												
Speech quality	Audio confusion												
	Complex paraphasia												
	Visible effort												
	Hesitant, pausing												
	Stereotyping												
	Articulation												
	Self-correction												

Summary of the results from participant F

Participant D wanted to continue with the rhythm therapy. No improvement was found on repetition, naming, reading or verbal fluency. Decrease on auditory comprehension and CETI was found. The perceived quality of life improved between test occasion 2 and 3, participant F did not answer on the first occasion. There was no difference on communication skill or speech quality over the three test occasions. The ANELT and qualitative interview was not performed due to the severe aphasia of participant F.

5.7. Participant G

Participant G completed nine out of ten sessions of the intervention.

- **Short version of Reinvang: Auditory comprehension, repetition, naming, reading and writing, Reinvang verbal fluency, ANELT; CETI and perceived quality of life.**

Table 5.7.1. Test results from 3 assessments, participant G (scores).

		First assessment	Second assessment	Third assessment	Difference between 2 and 3
R E I N V A N G	Auditory comprehension	28	29	29	No change
	Repetition	10	13	14	+ 1
	Naming	14	15	14	- 1
	Reading	10	10	10	No change
	Writing	2	2	2	No change
	Verbal fluency	42	43	50	+ 7
	ANELT	68	75	73	- 2
	CETI	35	39	No answer	
	Perceived quality of life	79	87	69	- 18

- **Quote from interview**

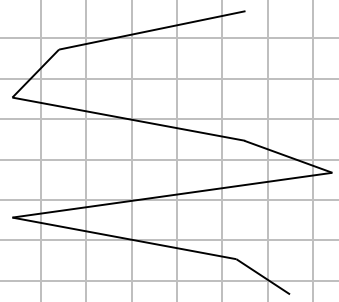
"Great! The therapy was good, especially the practitioner and his guitar. Good with the mixed group: 5 wheelchairs and 3 who could speak, I think the practitioner managed that well. I want to try more exercises. I liked the group and that people from different nationalities participated. I enjoyed the others in the group very much. The practitioner knew all sorts of songs. The movements were easy. I'd love to continue".

- **Reinvang, part 1 Communication and speech quality**

The testing of communication skill and speech quality showed no difference between the three test occasions. Table 5.7.2 from the first test occasion gives a clear picture of the participant's spontaneous speech.

Table 5.7.2. Test results from Reinvang: quantitative evaluation of communication skill and speech quality.

Participant G		***Great difficulties***										***No difficulties***
Communication	Interview											
Speech quality	Audio confusion											
	Complex paraphasia											
	Visible effort											
	Hesitant, pausing											
	Stereotyping											
	Articulation											
	Self-correction											



Summary of the results from participant G

Participant G wished to continue with the rhythm therapy. Auditory comprehension, reading and writing were unchanged post intervention. Verbal fluency was improved at third test occasion. The testing of communication skill and speech quality showed no difference between the three test occasions. The results on ANELT was best on the second test occasion. Overall, the test results were very high except on CETI, where a relative evaluated communication skill as low at the first two test occasions. No answer was received on the third test occasion. Participant G scored remarkably lower on perceived quality of life on the third test occasion due to personal grief. According to the qualitative interview participant G thought the therapy was very good. He highly appreciated the practitioner, the mixed group of participants, and the exercises.

5.8. Participant H

Participant H completed ten out of ten sessions of the intervention.

- **Short version of Reinvang: Auditory comprehension, repetition, naming, reading and writing, Reinvang verbal fluency, ANELT; CETI and perceived quality of life.**

Table 5.8.1. Test results from 3 assessments, participant H (scores).

		First assessment	Second assessment	Third assessment	Difference between 2 and 3
R	Auditory comprehension	29	29	28	- 1
E	Repetition	14	14	14	No change
I	Naming	15	15	15	No change
N	Reading	10	10	10	No change
V	Writing	1	2	2	No change
A	Verbal fluency	58	48	55	+ 7
N					
G					
	ANELT	87	91	90	- 1
	CETI	84	81	77	- 4
	Perceived quality of life	100	82	79	- 3

- **Quote from interview**

"This therapy didn't suit me so well. I would have preferred to have an audio tape to practice at home".

- **Reinvang, part 1 Communication and speech quality**

The testing of communication skill and speech quality showed no difference between the three test occasions. Table 5.8.2 from the first test occasion gives a clear picture of the participant's spontaneous speech.

Table 5.8.2. Test results from Reinvang: quantitative evaluation of communication skill and speech quality.

Participant H		***Great difficulties***	***No difficulties***
Communication	Interview		
Speech quality	Audio confusion		
	Complex paraphasia		
	Visible effort		
	Hesitant, pausing		
	Stereotyping		
	Articulation		
	Self-correction		

Summary of the results from participant H

Participant H did not want to continue with the rhythm therapy. The participant scored high on all tests. Marginal changes occurred regarding language. The results from verbal fluency was highest on test occasion 1 and 3. The testing of communication skill and speech quality showed no difference between the three test occasions. A relative evaluated the participant's communication skill as somewhat decreased. The perceived quality of life sank over the three test occasions. According to the interview this therapy did not suit participant H at all.

5.9. Summary of test results

Comparisons between measurements 2 and 3 are shown in Table 5.9.1. Significant improvements were found on five occasions: in participant C in writing ability and CETI; and in participant A, E and G in verbal fluency. This variable was the most frequently improved in participants: 7 out of 8 participants showed improvements in verbal fluency, three of which improved considerably. Participant C and D showed the greatest improvements post intervention: 6 out of 10 variables had improved.

Table 5.9.1. Summary of participant's results regarding language tests.

P	Reinvang Auditory compre-hension	Reinvang Repetion	Reinvang Naming	Reinvang Reading	Reinvang Writing	Reinvang Verbal fluency	Reinvang Communi-cation skill and quality of speech	ANELT	CETI	Perceived quality of life
A	-	No change	No change	No change	No change	+ *	No change	-	-	No answer on test 1 and 2
B	-	No change	+	No change	No change	+	No change	-	+	+
C	+	-	-	+ *	+	+	No change	+	+ *	No answer
D	+	+	No change	+	No change	+	No change	+	-	+
E	No change	No change	+	No change	No change	+ *	No change	+	+	-
F	-	No change	No change	No change	+	No change	No change	Not tested	-	+
G	No change	+	No change	No change	No change	+	No change	-	No an-swer	-
H	-	No change	No change	No change	No change	+	No change	-	-	-

Abbreviations: P = Participant.

+* = considerable improvement (more than 45%)

5.10. Summary of the interviews

Most participants were happy with the intervention. They thought the practitioner and the music was good. They felt they were not able to do any exercises at home; they managed to perform the movements in the group sessions, but not on their own. Some of the participants thought that the intervention was quite difficult but nevertheless felt motivated to continue. Several of the participants enjoyed the group dynamics, and felt it was positive to meet others with different sorts of aphasia and severity of speech impairment. Several participants were motivated to continue the sessions and wanted to learn more movements.

The criticism related to the intervention was mainly related to the choice of music. One participant thought the music was old fashioned, another participant stated that the intervention did not suit him because he lacked interest in music. One participant mistrusted the concept of the Method; he did not believe that the intervention would have a positive impact on his speech.

5.11. Statistical analysis

The statistical analysis (Student's t-test for dependent variables) was performed on group level. The results from measurement 1 and 2 were merged and the mean value was compared with the results from measurement 3 (Table 5.11.1). Most mean values were somewhat improved post intervention, significant improvement was only reached in verbal fluency ($t_{(7)} = 2.45$; $p < .05$). Writing ability almost reached level of significance ($p < .051$).

Analysis of correlation showed good correlation (correlation coefficient r between .93 and .99) between the measurements on comprehension, repetition, naming, reading, writing, verbal fluency, and ANELT within the variables. CETI, the relative's evaluation of participant's communication skill, showed a lower correlation coefficient ($r = .75$) between measurements. The lowest correlation coefficient was shown on the perceived quality of life ($r = .49$) between all three test occasions, which makes the results more difficult to interpret.

Table 5.11.1. Statistical analysis of participant's results on group level.

Variables	Mean value pre intervention	Mean value post intervention	Standard deviation	Correlation coefficient	t	df	*p*-value (2-tailed)
Comprehension	21.7	21.9	1.7	.98	.3	7	.768
Repetition	9.4	9.9	1.0	.99	1.2	7	.262
Naming	7.6	7.8	1.3	.99	.3	7	.790
Reading	6.1	6.9	1.8	.93	1.3	7	.236
Writing	1.9	2.5	0.7	.96	2.3	7	.051
Verbal fluency	24.6	30.3	6.6	.96	2.4	7	.044*
ANELT	48-4	50.1	9.3	.93	.6	7	.597
CETI	50.0	55.4	15.7	.75	1.0	7	.631
Perceive quality of life	55.8	48.3	35.5	.49	1.3	7	.844

Abbreviations: df = degrees of freedom; p-value = level of significance; * = significant.

6. DISCUSSION

6.1. Linguistic ability

The statistical analysis showed significant improvements in verbal fluency after the intervention. This corresponds with the results from Vikström (1996) showing a significant improvement in stroke patients regarding verbal fluency according to FAS – Functional Assessment of Speech. The results from the quantitative tests of speech quality showed no differences over the three test occasions in any of the participants. This may be due to the wide range of the variables, and that a large improvement is required before the improvement is measureable. The two participants who had improved post intervention in most language tests (4 out of 7) showed improvements in auditory comprehension, reading and verbal fluency. Both participants equally suffered from severe aphasia with non-fluent speech. Three of the participants scored high on all tests, even maximum score in several variables, and there is a big risk that improvements were missed because of the test design. All three showed improvements on verbal fluency, two even considerably. Verbal fluency differs from the other variables in that there is no maximum score limit,

therefore it may detect actual improvements better. The participants who suffered from global aphasia, i.e., impaired auditory comprehension and stereotyped syllabus buildings, showed little improvement. One reason may be their severely impaired auditory comprehension *per se*, which probably makes it more difficult to benefit from therapy.

6.2. Functional communication skill

The results from the CETI, i.e., relative's or personal assistant's evaluation of participant's ability to communicate, had a somewhat low correlation (r = .75) between measurements. This makes the results difficult to interpret. There may be several reasons for the large variations between the measurements: the evaluation of the VAS is not as exact as an interval scale, because the mark on the scale is set based on a "feeling". A negative trend in the evaluation may also be caused by the personal assistant's lack of knowledge about the participant's speech impairments due to the short amount of time they had been working with the person. It may take some time to fully understand the level of severity of a person's speech impairment. In contrast, a positive trend may be caused by the relative's or personal assistant's high expectations of the effects from the therapy. The evaluation of communication skill in one of the participants was almost doubled on the third test occasion. This evaluation is somewhat high, but in line with the rest of test results of the participant. This is not the case in all participants, but in some. The reason for this may be the varying expectations the relative or the personal assistant has of the participant. The personal assistant did not know the participant before the brain damage and might have a more positive attitude towards the person's current communication skill. On the other hand, the relative knows the person better. They might therefore communicate more easily with the participant and may evaluate the communication skill as higher, compared to how an outsider would have evaluated the same person. If the person had been verbally very skilled before the damage, the difference may seem larger before and after the damage, than if they had been a person of few words, not as verbal. The results from one of the participants may suggest this: the person scored high on the linguistic test, but the relative evaluated the communication skill very low.

Three of the participants showed improvement on the third test occasion regarding ANELT. Two of them were also evaluated as having improved communication skills on CETI. Two of these participants (not those with improvements on CETI) were part of the group that had improved in most variables. Two parallel versions of ANELT were used. Some of the participants showed deviations in the scores on version II, compared to more stable scores on version I, over two test occasions. ANELT gives a clear picture of a person's ability to handle oral communication skills in everyday life. In contrast it does not measure non-verbal communication skills. Several of the participants with severe aphasia had difficulties in cooperating in this particular test, because it demands an oral production skill.

6.3. Interest in continuing the therapy

Most participants, 7 out of 8, wanted to continue with the therapy.

6.4. Psychosocial aspects

The perceived quality of life was enhanced in three participants according to their own evaluations. Three participants evaluated their perceived quality of life as somewhat worse on the last test occasion. Two of the participants with impaired auditory comprehension did not fully understand the question, or how to fill out the VAS scale. The correlation of this test was low (r = .49). Perceived quality of life may be influenced by many factors. Even if the rhythm therapy has a positive psychosocial impact on the participant, many other factors influence the perceived quality of life. The evaluation may be influenced by how the person is feeling on that particular day and depend on general living conditions including joys and sorrows. One of the participants, for example, showed a negative trend in perceived quality of life, which according to this person was because of personal grief. It may be challenging to capture a person's perceived quality of life, especially if the person is unable to verbalize their feelings. Because of the many factors that influence perceived

quality of life, it is not possible to conclude whether improved quality of life is caused by the rhythm therapy itself.

6.5. Ronnie Gardiner Method

The practitioner plays an important role in the Ronnie Gardiner Method. The practitioner needs to have a sense of rhythm, since the Method is based on rhythm. The practitioner also needs to have a good sense of which music to choose for the specific group. Several participants reported that they enjoyed the music, that it was "their" kind of music. One of them felt that the music was old fashioned. The practitioner also needs to have some knowledge about the participants' disabilities. A group of people with aphasia have special needs. The practitioner needs to understand that slow and clear instructions may be needed. One of the participants thought that the tempo of the exercises was too fast. Others did not find it difficult to follow the exercises. The participants with the severest disabilities were not able to participate in the interviews, and this makes it difficult to evaluate how they felt about the tempo and clarity of the instructions. My own reflections about the Ronnie Gardiner Method are that people with severe aphasia are in need of support in the form of personal assistance or a relative, in order to fully assimilate the therapy. According to the interview questions the participants were happy with the varied levels of disability among the participants, but improved results may have been accomplished if the group had been similar in levels of disability. There is a risk that the people with the most severe disabilities are unable to follow the exercises. One participant suggested that it would be better to be seated in a circle instead of in straight lines; this would give better opportunities for eye contact and enhancing group cohesion. The majority mentioned that the group itself was a positive factor in the therapy. Many participants reported that it was difficult to practice at home. The practitioner Ole Moe thinks that homework is a good thing. There may be a need for structured homework or exercise tapes in order to facilitate the participants practicing at home. Previous experience of musical performance did in most cases not affect the motivation or wish to continue the therapy. One participant stated that the lack of interest in music was the reason why he felt that the therapy did not suit him; while another participant stated that

it was their great interest in music that was the driving force. One advantage of the therapy is that it easy to vary and make stimulating for a long time. Several of the participants wanted to continue with the therapy and were eager to learn more movements. The therapy contains relaxation and exercises as well as listening to music together in a group. Language or lack of language is not the focus of these activities. Being part of a group activity that is not built on speech but instead focuses on rhythm and music may be perceived as a relief for a person with aphasia.

6.6. Study limitations

The test battery was constructed to capture a very heterogeneous group. This means that the test material was general but possibly not specific enough, to capture improvements in all participants. Three of the participants reached maximum scores on several of the tasks. This means that possible improvements were not captured. Some of the participants suffered from such a severe aphasia that they were unable to participate in certain tests.

Four test occasions would be preferred if one wishes to compare the results over time. The study design, with intervention sessions once weekly for ten weeks, might have been too short time period and not intensive enough to show any effects from the intervention. This study contains only eight participants, a higher number of participants may have given a better base for statistical analyses. A field study containing systematic observations of the participants may have worked as a complement to the quantitative measurements and interview questions.

6.7. Conclusions

Significant improvements were shown in verbal fluency. Writing ability was near significance (p = .051). The other variables showed slight improvements in mean value post intervention, however not significant. Speech quality did not show any improvements over the three test occasions. This indicates that the Ronnie Gardiner Method may improve verbal fluency in persons with aphasia.

The mean value on CETI and ANELT showed some improvements, but not significant. Two participants showed improvements in both CETI and ANELT. Significant improvements in functional communication skills post intervention were not found.

The perceived quality of life was enhanced in three of the participants, based on their own evaluations. Three participants evaluated their perceived quality of life as somewhat lower on the last test occasion. According to the statistical analysis the perceived quality of life had decreased on a group level. However, there are many factors that may have an impact on perceived quality of life. According to the interview questions, several of the participants enjoyed the group. They felt it was good to meet others with similar or more severe aphasia. The majority of participants, 7 out of 8, wanted to continue with the rhythm therapy. The answers from the interviews and the participant's will to continue, indicate that the Ronnie Gardiner Method may be psychosocially stimulating to people with aphasia.

6.8. Suggestions for future research

The group continues and this give the possibility to study whether a longer intervention period shows positive effects on the participant's language and communication skills. It would be interesting to study a group of participants with similar and more equal disabilities in order to investigate if the therapy is more effective in a more homogeneous group. One could also complement the design with a field observation, systematic observations may be an efficient tool to capture certain effects that are hard to measure when studying the rehabilitation for persons with aphasia. It would also be of interest to investigate if there is a certain profile of aphasia that is more suited to this kind of therapy.

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