Multimodal communication reported by familiar caregivers to build communication capacity in persons who are minimally conscious

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Abstract

Purpose: Limited clinical and research evidence is available to support healthcare practitioners in the communication assessment and intervention of persons who are minimally conscious. This study placed a specific focus on the multimodal communication strategies familiar caregivers of persons who are minimally conscious observed, as well as the verbal and the nonverbal communication strategies they employed to build communication capacity. This may inform clinical practice as it provides valuable autobiographical information as well as familiar stimuli that may elicit responses from persons in a minimally conscious state.
Method: A descriptive qualitative design employing in-depth semi-structured interviews with familiar caregivers was utilised to address the purpose of the study.
Result: Familiar caregivers reported that they used both nonverbal and verbal communication strategies to obtain a response from persons who are minimally conscious. These caregivers also reported that these persons appeared to rely on nonverbal communication strategies to express 36 different communication functions.
Conclusion: Based on the findings of this study, it is clear that caregivers can be beneficial to persons who are minimally conscious, if they are able to observe and capitalise on naturally occurring multimodal communication strategies and functions. This study emphasises that familiar caregivers respect and value the dignity of persons who are minimally conscious and want to improve their communication capacity, but often lack confidence in their own communication skills.

Keywords: *caregiver; familiar caregiver; minimally conscious; non-verbal communication strategies; multimodal communication*

Introduction

Disorders of consciousness (DOC) progress on a continuum from a coma to an unresponsive wakefulness syndrome and finally to a minimally conscious state (MCS), before being regarded as wakeful and alert (Martens, Bodien, Sheau, Christoforou, & Giacino, 2020). Persons with MCS present with fluctuating but reproducible signs of awareness and communication, including inconsistent following of commands and expressing limited intelligible speech (Lancioni, Singh, O'Reilly, Sigafoos, & Desideri, 2021). Such individuals can be divided into two groups, namely persons with MCS+ (those who present with steady behavioural responses and who can follow simple directions and answer yes/no questions) and persons with MCS- (those who present with low level behavioural responses, who give emotional responses to affective stimuli and can locate stimuli) (Rasmus, Góral-Półrola, Orłowska, Wiłkość-Dębczyńska, & Grzywniak, 2019).

Behavioural assessment and stimulation are widely regarded as the gold standard to assess the level of consciousness (such as wakefullness, self- and environmental awareness) in these persons. Assessment and stimulation can include behavioural (multi-sensory stimulation, environmental stimulation, and music) and non-behavioural (pharmacological agents [amantadine], transcranial direct current stimulation, repetitive transcranial magnetic stimulation, and brain computer interfaces) strategies to support optimal arousal (wakefulness, self- and environmental awareness) (Lancioni et al., 2021).

Despite the valuable information that healthcare practitioners could obtain regarding a person's level of consciousness through the evaluation of communication during behavioural assessment, a paucity of research evidence on nonverbal communication skills

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in these behavioural scales exists (Rasmus et al., 2019). Typically only eye contact, yes/no responses, and vocalisations are addressed, thus highlighting the necessity for a more comprehensive understanding of the different forms of nonverbal communication and its characteristics. Often, nonverbal communication can be subtle as well as ideosyncratic, and therefore healthcare practionioners who spend limited amounts of time with the person in a MCS might overlook these signs or misinterpret them. Familiar caregivers who spend extended amounts of time with these individuals might therefore be better positioned to observe and interpret nonverbal communication behaviours. This places familiar caregivers in a solid position to assist healthcare practitioners with the interpretation of nonverbal communciation

The word "communication" stems from the Latin word "*communicare*" and is defined as "to share" or "to impact" with the purpose of creating a shared meaning between the sender and the receiver of a message. To share meaning, language is typically required as it facilitates mutual understanding allowing communication to occur (Owens, 2016). The classic language model developed by Bloom and Lahey (1978) is effective for differentiating language form (i.e. the structure of language and includes phonology [sound units], morphology [prefixes and suffixes], and syntax [sentence structure], although this paper only focusses on the latter); language content (i.e. semantics, which refers to the meaning of messages), and language use (i.e. pragmatics, which refers to the social use of language). Pundole and Crawford (2018) reiterate that adjustments to language are often required when conducting a behavioural assessment to accurately determine the person's communication capacity. For example, adaptations could include simplifying the language stimuli that is used by reverting to less complex syntax and semantics. Research has shown that one of the signs of being in a minimally concious state (as opposed to being in a coma) is that these individuals are able to respond to verbal demands, despite the fact that they are unable to communicate functionally (Rasmus et al., 2019). During the MCS, these persons may also respond better to verbal instructions, and show a variety of emotional expression (signs of pain, anger, as well as smiling and even some vocalisations) when stimuli is presented by familiar caregivers (Van Erp et al., 2014). As a result, diagnostic accuracy (regarding both verbal and nonverbal communciation) is increased when healthcare practitioners involve familiar caregivers, who have spent extended periods of time with the person in a MCS, during assessment (Bruno et al., 2011).

However, when caregivers are first expected to interact with persons in a MCS, they might feel overwhelmed as familiar communication is now altered, placing new demands on them. For this reason, caregivers should be trained to not only listen for verbal communication attempts (i.e. which would more closely resemble their communication style prior to the person being in a MCS), but to also observe the smallest reactions of the person to environmental stimuli, as these could be indications of nonverbal communciation attempts (Pundole & Crawford, 2018). Creating this type of awareness of nonverbal communication attempts could also reduce the caregiver's initial anxiety around the loss of communication. Nonverbal communication could include using artefacts (physical objects in the environment familiar to the person), chronemics (increasing awareness and perception of time), haptics (using touch or reflexive behaviour such as fidgeting), kinesics (using eye movement, head, neck and body movement, gestures and sign language), proxemics (using space and distance to position the person), and vocalics (using vocalisations, which includes laughter, humming, singing as well as word approximations) (Keutchafo, Kerr, & Jarvis, 2020). Figure 1 includes a graphic representation of nonverbal and verbal communication.

Familiar caregivers should therefore preferably employ both verbal and nonverbal behaviour to support persons who are minimally conscious by eliciting communication as a form of enacting their human

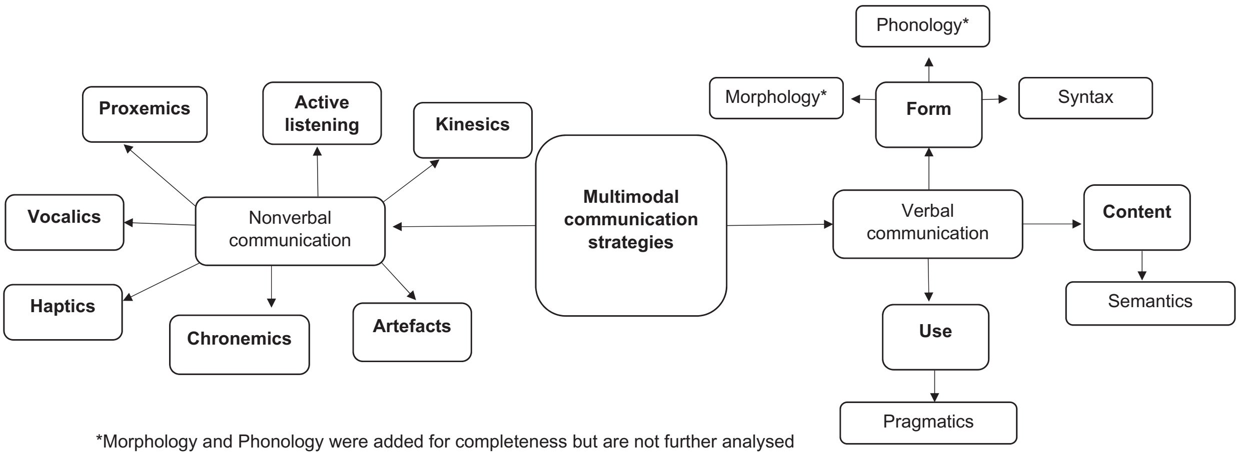

Figure 1. Classification of multimodal communication strategies conceptualised from Keutchafo et al., (2020) and Van Manen et al. (2021). *Morphology and phonology were added for completeness but are not further analysed.

rights and their need to communicate in order to have a voice in issues that affect them. However, these familiar caregivers can either be a facilitator or a barrier to participations as caregivers may lack knowledge, confidence, and skills to augment verbal communication with nonverbal communication to facilitate communication capacity in persons who are minimally conscious. The familiar caregiver may attempt interaction, but due to inconsistent responses from the person and missed subtle communication attempts, familiar caregivers may feel uncomfortable around persons who are minimally conscious (Cruice, Blom Johansson, Isaksen, & Horton, 2018). This may result in missed opportunities regarding interaction or for facilitating consistent responses in persons who are minimally conscious but who are starting to demonstrate environmental awareness (Pundole & Crawford, 2018).

Currently, there are limited data available that analyse the communication attempts of individuals in a minimally consious state as well as the strategies employed by their caregivers to elicit interaction. Therefore, this study aims to:

i. Identify the multimodal communication behaviours used by familiar caregivers of persons who are minimally conscious to facilitate interaction.
ii. Identify partner observations of the nonverbal responses that were noticed in persons who are minimally conscious.
iii. Include partner reports regarding perceived communication functions conveyed though the nonverbal communication responses of persons who are minimally conscious.

Method

Research design

A descriptive qualitative design employing in-depth, semi-structured interviews is used to address the main aim of this study while also allowing flexibility for participants to report on aspects which are important to them (Creswell & Creswell, 2018). As a result, participants felt that their voices were heard, which led them to have a sense of empowerment (Creswell & Creswell, 2018). The semi-structured interviews thus regarded the participants as the experts which allowed the development of a comprehensive picture of their communication with persons who are minimally conscious (Creswell & Creswell, 2018). The Consolidated Criteria for Reporting Qualitative Studies (COREQ) checklist was used to guide the reporting of the study methodology (Tong, Sainsbury, & Craig, 2007).

Participants

Recruitment and selection

Ethics approval was obtained from the research ethics committee of the relevant institution (HUM029/0720). Thereafter, the author (first author) contacted the practice manager of a private medical practice telephonically to request their participation in the study. The manager provided written permission and identified a nurse to assist with the identification and recruitment of participants, based on the specific selection criteria. Once potential participants had been identified, the nurse contacted them and informed them about the nature of the study and requested verbal consent to provide their contact details to the first author. Once written consent was given, a convenient time and date was arranged to conduct the interview (Janghorban, Roudsari, & Taghipour, 2014).

Sampling

Purposive sampling was used to identify potential participants from a private medical facility situated in the Gauteng province in South Africa which treats persons in a MCS due to diverse acquired neurological conditions. These conditions include diagnoses such as Dementia, severe Traumatic Brain Injury (TBI) and severe Cerebrovascular Accidents (CVA). Specific selection criteria were used to identify potential participants (Creswell & Creswell, 2018). All familiar caregivers had to: (1) be/have been actively involved in the care of the person who is/was minimally conscious for at least two months; (2) be older than 18 years themselves; (3) (have) fulfil(led) their caregiving role for at least two consecutive hours a day; and (4) be literate and proficient in English. Furthermore, a criterion was set that the person with the acquired neurological injury should have been in a MCS for at least two to six months prior to the interview. Familiar caregivers of both living and deceased persons who are or were minimally conscious were included in this study. This allowed the participants to self-reflect on the process, accessing their extensive knowledge and skills as well as give valuable advice to other familiar caregivers in similar situations, while not having the time pressure of still actively participating in caregiving activities. The familiar caregivers and persons in their care who were minimally conscious are described in Table I.

Table I illustrates that the familiar caregivers were all female whose ages ranged from 40- to 63 years old with an average age of 53.6 years. The familiar caregivers were all related to the persons with acquired neurological conditions and included four daughters, two wives and one mother.

Five participants were working full-time while also caring for the persons who were minimally conscious, while two participants were retired. Three of the familiar caregivers cared for relatives residing in advanced home care facilities and four of the familiar caregivers cared for the person at home. All seven caregivers cared for these minimally conscious persons daily, between 2 to 24 hours (daily average of 8.3 hours). As some of the caregivers had full-time jobs and had other responsibilities at home (caring

Table I. Demographic information of participants (n = 7).

Familiar caregiver							Person who is minimally conscious				
Participant number	Age in years	Sex	Relationship to person	Home language	Additional language	Qualification	Duration of care (hours per day) received	Age in years	Sex	Reason for minimally conscious state	Duration of minimally conscious state
P1	63	F	Wife	E	A	Diploma	2	66	M	Abscesses on the brain	7.7 years
P2*	40	F	Daughter	E	A	Master's degree	2	69	F	CVA	2 years
P3	62	F	Mother	E	A	Diploma	24	31	M	TBI	5 years
P4*	54	F	Daughter	A	E	Diploma	2	80	M	Alzheimer's Disease	6 months
P5*	57	F	Daughter	E	A	Diploma	2	76	F	Alzheimer's Disease	4.5 years
P6*	54	F	Daughter	A	E	Diploma	2	83	M	Alzheimer's Disease	71 days
P7	45	F	Wife	A	E	Bachelor's Degree	24	41	M	TBI	1 year

F: female; E: English; A: Afrikaans; TBI: traumatic brain injury; CVA: cerebrovascular accident.
*Indicates that person who was minimally conscious was deceased.

for children, cooking etc.) this impacted the amount of time they had available daily to care for and visit their relative at the care facility. While other caregivers caring for the person at home spent more time caring for the person on a daily basis.

The diagnoses of MCS of the persons were diverse and included three with Dementia, two with severe TBI, one with a severe CVA and one with abscesses in the brain due to septicaemia.

Material

An interview script was developed based on information obtained from an earlier scoping review that focussed on the communication strategies used by persons with CVA with little to no functional speech (Kuyler, Johnson & Bornman, 2022). Both open- and closed-ended content-driven questions were used to obtain answers of a factual nature, but also include the participant's opinions, beliefs and judgements (Creswell & Creswell, 2018). Probing techniques as well as recasting questions were used to obtain additional information or to accommodate for the misunderstanding of questions (Josselson, 2013).

Ethical considerations

This study aimed to respect the autonomy of the participants through voluntary participation (Ketefian, 2015). Additionally, beneficence and non-maleficence were upheld as all procedures aimed to ensure that no harm came from participation in the study (Ketefian, 2015). Due to the nature of the information conveyed during the interviews, participants at times became emotional. The researcher used supportive responses and gave participants time to recollect themselves before continuing with the interview questions. Justice was also upheld as an interview protocol was used to ensure that all participants were treated fairly and equally (Ketefian, 2015).

Procedures

Data collection procedures. Seven semi-structured in-depth interviews were conducted with familiar partners of persons who were minimally conscious (Creswell & Creswell, 2018). An interview script was used to guide the process. Interviews were specifically selected as opposed to alternative measures such as observations, as literature indicates that familiar caregivers who spend extensive periods of time with persons in a MCS are able to offer in-depth information of their behaviour as opposed to healthcare practitioners who typically spend shorter periods of time during assessment. Furthermore, clinical data has shown that a greater variety of behaviours are seen in the presence of familiar caregivers (Lancioni et al., 2013). Four interviews were conducted virtually using Google Meet and three were conducted face-to-face. This was done depending on participant preference, as data were collected during different levels of lockdown during the Covid-19 pandemic. Google Meet was selected as it is a free platform suited to conduct synchronous online interviews, allowing the reach of a wider sample not precluded by time, locations and social barriers in a feasible and convenient manner.

The Google Meet online application allowed for audio recordings and the face-to-face interviews were also audio recorded. The duration of the semistructured interviews ranged from 29 to 90 minutes with a mean time of 54 minutes. Although the author confirmed with the participants that they were correctly understood throughout the online interview to ensure that the findings are trustworthy, formal member checking was done with each of the participants once the recorded interviews had been transcribed by the first author (Josselson, 2013). All participants confirmed the correctness of the transcripts.

Data analysis. Upon receiving feedback from the participants, a qualitative content analysis consisting of three phases, namely: immersion; reduction; and interpretation was used to analyse the data (Braun & Clarke, 2021). During immersion, the authors independently engaged with data in order to obtain a holistic view. The immersion phase served as a motivation for the author to reread the transcripts and relisten the audio-recordings to gain a deeper understanding of the participants perspectives (Braun & Clarke, 2021). This phase concluded with the authors identifying preliminary codes (Forman & Damschroder, 2007) and was followed by the reduction phase which included a systematic approach that was initiated by reducing the amount of raw data to only include relevant information which addressed the aim of the research. Thereafter, the data were fragmented into manageable codes (e.g. facial expressions), then reorganised into themes (e.g. nonverbal communication) and sub-themes (e.g. kinesics) to address the aims of the research (Forman & Damschroder, 2007). Codes provided a means to exhaustively identify and retrieve data from the transcripts (Forman & Damschroder, 2007). The first and second author coded information independently during the first two phases, after which a meeting was scheduled to compare codes and to collectively complete phase 3. During this meeting the first two authors collaborated and developed inductive codes (to address sub-aim i and ii).

To address sub-aim iii, the first two authors met and used deductive coding based on a pre-existing codebook which was developed from an earlier scoping review (Kuyler, Johnson, & Bornman, 2022) and included definitions for codes such as the recovery of consciousness, intent to communicate and initiate interaction. The communication functions were analysed according to the seven levels and categories mentioned in the Communication Matrix (Rowland, 2011).

The final data analysis phase focussed on interpretation and included the reorganisation and reassembly of the codes into themes and sub-themes to promote a coherent and revised understanding or explanation (Forman & Damschroder, 2007). The findings thus provide evidence of the identified themes by reporting compelling examples and relating these themes to the aims of the research.

Trustworthiness

The trustworthiness of the studies was sought to be enhanced in several ways. Credibility (i.e. data that truthfully represents the study population) (Sarvimaki, 2018) was increased through member checking to ensure that the findings were accurate and reflective of the participant's experiences (Josselson, 2013). Minimal clarification or additions were needed as participants agreed that the transcripts reflected their answers. Furthermore, an interview script was used to ensure consistency. The second and third author provided peer debriefing to the first author in order to give an external review of the research process and to increase referential adequacy (Nowell, Norris, White, & Moules, 2017). Transferability (i.e. applicability of information representative of a larger population) (Sarvimaki, 2018) was enhanced by thick and rich descriptions provided by the heterogenous participants who described different settings (e.g. home care and care facilities). Conformability (i.e. clarity of data collection procedures and documentation) (Sarvimaki, 2018) was addressed by employing field notes, audio-recordings and an interview script, small group discussions and author consensus during coding to ensure that personal bias and possible assumptions were addressed as to not influence findings.

Result

Findings are set out in three sections according to the sub-aims of the study.

Communication strategies used by familiar caregivers

Familiar caregivers used multimodal communication (including both verbal and nonverbal strategies) when communicating with persons who are minimally conscious, as shown in Table II.

Nonverbal communication strategies

Nonverbal communication strategies included modalities such as kinesics, active listening, proxemics, vocalics, haptics, chronemics, and artefacts, as was unpacked in Figure 1 (Keutchafo et al., 2020). Kinesics was mentioned by three participants and included facial expressions ("*We used to smile at my dad" [P6]*), expressing positive affect and using body language to facilitate conversation. Facilitative body language included the caregivers facing the person,

Table II. Multimodal communication strategies used by familiar caregivers.

Theme	Sub-theme	Codes	Examples of verbatim quotations from participants with participant numbers
Nonverbal Communication	Kinesics (i.e. body movement)	Facial expressions	We used to smile at my dad. (*My dad couldn't speak but he would try to joke with gestures*)(P6)
		Body language	Body language is important when you communicate with them (P7).
	Active listening (silences)	Using expectant delay	If you couldn't understand what she said you would observe her to try and understand what she wanted (P2).
	Proxemics (i.e. distance and space)	Presence of familiar persons	We would sit around her bed/wheelchair and talk to her (P2). If she didn't respond we would talk around her (P2, P6). We used to organise family functions at our home to ensure that they interact with the family (P4, P5, P6). The whole family would go and visit him at the care facility (P7). We used to organise outings with the family to a tea garden and take him with us (P3).
		Fellow persons in the facility	He would share a room with someone else and they would not talk to each other (P6). The other people would lay across from my husband and make a lot of noise (P1). The place where my mom was had a large room with many beds and so the other people at the care facility would often talk to my mom (P5).
		Positioning	They would often put her in the wheelchair or in an upright position in bed (P6). This made her respond better during interaction (P6). I would say that she/he responded better when she/he was upright as was more awake (P2, P3, P4, P5, P6, P7). It didn't really matter in which position we had him he was minimally conscious (P1).
	Vocalics (i.e. prosody)	Familiar voice	He recognised my voice. (*He would move his eyes and his eyes would light up* (P1)). I could see that he recognised my voice. (*You could see in his eyes that he was happy to see me* (P3)).
		Singing	My dad would sing to my mom (*She would smile at him*) (P2). I would sing to him to get his attention (P1). My daughter used to sing hymns to him and you could see that he relaxed (P4). I used to sing to my mom as she used to love singing. (*Later on as the disease progressed it was easy for her as it became automatic and she didn't have to remember the words)* (P5).
	Haptics (i.e. touch)	Orientation to touch	I kissed him to regain his attention (P1).… and I pulled his ear to irritate him (P1).
		Affectionate touch	I held his hand to comfort him (P1). I touched him to let him know I am there (P1, P4).I used to hold his hand and then start to talk to him about my day (P4). I used to touch him to let him know I wanted to communicate with him (P3). I also touched him to reassure him (P1).
		Massage	I used to massage him from top to toe (P3). When I used to visit her, I would put cream on her skin while stretching her (P5). I used to put cream on her hands and she used to smell her hands afterwards (P5)
	Chronemics (i.e. time and communication behaviour)	Active engagement	I always engaged with him even though he didn't respond (P4). I would hold her/his hand and try to engage with her/him. (*My mom/dad would lay with her/his eyes closed*) (P1, P2, P6). I really wanted to engage with my son and I used to do my own speech therapy (P3). You have to talk to him even if you just tell them about your day even though they don't respond. (*Months after he finally regained his consciousness, he would mention things that I told him while he was in a minimally conscious state*) (P7).
		Personhood	I wanted to treat him as a person as he would do this for me if I was in the situation (P4). I was patient with her (P2, P5).

(*Continued*)

Table II. (*Continued*).

Theme	Sub-theme	Codes	Examples of verbatim quotations from participants with participant numbers	
		Familiar activities	I used to let him assist in activities of daily living such as peeling potatoes to help him regain his independence (P6). It was about my husband and not me and I wanted to do my best for him (P1, P3).	My mom really enjoyed eating and my dad really just wanted to please her and therefore gave her some treats (P2). My dad used to love to eat fruit and we always gave him some fruit (P6). I really wanted to do things for him that he enjoyed (P3, P4, P5).
		Activities of daily living	I used to help feed her, comb her hair and help her to drink tea (P5). I used to help my dad by washing his feet, cutting his toenails and putting cream on him (P4, P6).	
		Communication opportunities	You need to create time to communicate with the person because there are various other things that take up your time during daily life (P7). You need to make time to spend with her (P2).	
	Artefacts (i.e. physical and environmental objects)	*Physical objects (person specific):*	Communication aid	I used a book to show photos or a picture of family and friends (P1, P2, P3).
			Phone (WhatsApp)	I showed him videos and photos of where I went and I who I was talking to (P1) and I played voice messages of friends and his brother (P3). We would also do video calls on WhatsApp with familiar people such as relatives and friends (P2).
		Familiar environmental objects that facilitate responsiveness:	Television	There was a television in the room to see if we could get a response from my son. (*He used to hate the television and got such a fright because of the light)* (P3). My husband was in a minimally conscious state and I used to put the television on as he used to love watching sports (e.g. rugby, cricket and Formula 1 racing) and I thought he would enjoy it (P1). My mom used to put on the television for my dad as it calmed him down. It was also something that he used to do with my mom while he was able to walk (P4). They would put the TV on to provide environmental stimulation to the patients. (*Nobody would be watching as everyone would just stare at each other*) (P5, P6). My mom wasn't interested in watching television she preferred interaction with people (P2).
			Music on radio	Music was provided as a means of providing familiar environmental stimulation based on the preference of the person to facilitate responsiveness: (*My mom used to love the music of Vera*

(*Continued*)

Table II. (*Continued*).

Theme	Sub-theme	Codes	Examples of verbatim quotations from participants with participant numbers
			Lynn) (P5). *(My dad loved country music and he would become very nostalgic when he heard Don Williams music)* (P4). *(My dad didn't really have a great appreciation for music)* (P6).
		Entertainment groups	Once a month there was a group of people who came to do activities with them for example playing music, holding birthday parties or just playing games with them (P5).
Verbal communication	Language content Semantics)	Discussion topics *Naturalistic everyday conversations*	I used to talk about what happened at home (P1, P3, P6) I told him/her about his/her friends that came to visit (P1, P3, P4) We used to talk about someone who is worried about him/her (P1–P7) The responsibility fell on me to tell him that his mother and my mother and father passed away (P1) I reassured him/her that I loved him/her and enjoyed being there (P1–P7) I also used to talk about everyday things (P1–P7) When talking to my mom I used to also mention the other people at the care facility (e.g. Did you see that lady's hair and did you notice that lady shouting? (P6)) I talked to my mom/dad about my children (P4, P5, P6, P7) Sharing familiar positive memories was very important to me (e.g. Do you still remember this and that….? (P1–P7))
		Environment	I explained to him what happened and how he ended up in the hospital (P7) I used to tell him his name and age, where he is, the time, day of the week and date. (P7) I would name all his body parts while massaging him (P3). I would tell him about the trees, flowers and how the lawn has gone green (P1). I used to talk to him about things in his environment that were familiar to him (P4). I would comment on her physical appearance (P5). I would talk about the terrace and the home where he obtained care (P6).
		Passing on	I know you are tired; we will be ok if you leave (P4). You don't need to hold on anymore (P4). I want you to rest (P4).
	Language form (Syntax)	Using simple subject-object-verb sentences	I used to use simple sentences to communicate with him for example I saw your brother today (P1–P7). I used to comment on how she looked e.g. Your hands are so dry today (P5). I used to inform him on how my week was, e.g. Yesterday, I went to the shop and I saw this person (P1). The language of communication was either English ($n = 4$) and Afrikaans ($n = 3$) when familiar caregivers spoke to the persons with acquired neurological disorders. Familiar caregivers used sound structure characteristics of these languages.
	Language use (pragmatics)	Anticipating communication	I used to guess what he wanted to say (P1). I used to guess what she wanted to say and only got it right half of the time (P2). She would get so frustrated when I couldn't guess what she wanted (P6). Sometimes I couldn't understand what he wanted and we would go around talking in circles (P4, P5, P7).
		Including person in interaction	I would always include him in conversations and prepare unfamiliar partners on communicating with him (P1). I used to include him in normal daily activities (e.g. taking him outside to eat lunch with us at home) (P3). I would invite my parents-in-law over for dinner to include my mom in family life (P2). We would braai at our home and he would be present during the interaction even though he didn't contribute we wanted to include him (P6).

(*Continued*)

Table II. (*Continued*).

Theme	Sub-theme	Codes	Examples of verbatim quotations from participants with participant numbers
		Taking communication turns	I provided opportunities for him to communicate (P3). I just responded to what my dad was talking about at the time even when it didn't make sense (P4).
		Maintaining conversational topics	When my mom used to think I was her sister I used to just go with it (P5). Because you can't reason with her (P5).
	Communication functions	Social	• When I came into the room I used to greet him (P7) • I asked him/her yes/no questions (e.g. is your name … …) (P1–P7)
		Obtain	• I used to ask her/him about her/his basic needs and wants (e.g. what did you eat today) (P1–P7) • When I spoke to him/her I always provided choices (e.g. would you like to wear the red of blue shirt) (P1–P7)
		Information	• I always waited for him/her to confirm his/her answer (P1–P7) • I asked him if what he wanted to communicate is more important than the task I am busy with (P7). • I used to explain the procedure to him (e.g. I am going to change you, bath you, comb your hair etc.) (P7) • Asking easy everyday questions(P1–P7)

Note: Phonology and morphology are not included in this table as caregivers did not mention altering their spoken language in this way.

maintaining eye contact and nodding to indicate active listening and engagement *("Body language is important when you communicate with them" [P7]).* Active listening was also mentioned by two participants who used expectant delay to actively facilitate listening behaviour.

All seven participants mentioned proxemics, which included being physically present, the physical presence of other familiar people in the persons care facility as well as positioning both persons in the dyad in such a way that it would facilitate communication (*"We used to organise outings with the family to a tea garden and take him with us" [P3]).* Moreover, all of the participants explained that positioning the person in an upright sitting position tended to increase their responsiveness during interaction.

The specific vocalics mentioned by participants were that upon hearing familiar voices the person would show increased responsiveness or attempt to locate the source of the voice. Another component associated with vocalics included the participant singing to the person who is minimally conscious (*"I would sing to him to get his attention" [P1]).*

Haptics (touch) was used to gain the persons attention (Orientation Touch), to provide comfort (Affectionate Touch) *("I held his hand to comfort him" [P1])* and also using massaging to prevent contractures through stretching.

Chronemics were mentioned by all seven of the participants and included showing an active interest or engagement when interacting with the person and acknowledgement of the person's personhood (*"I always engaged with him even though he didn't respond" [P4]).* Furthermore, all participants mentioned that they felt that treating the person with human dignity and valuing their livelihood was important. Five participants mentioned that they assisted the person in activities of daily living such as feeding, bathing, and grooming. Two participants mentioned that they wanted to perform familiar activities which increased the person's attentiveness or responsiveness *("I used to help feed her, comb her hair and help her to drink tea" [P5]).* These experiences, however, required the two participants to create a specific time in their daily schedules to perform these activities.

Two types of artefacts, namely physical objects and environmental objects were mentioned by the participants. The physical objects were specific and familiar to the person who is minimally conscious and included a communication aid such as a book with photos of family and friends. Three participants mentioned using their mobile phones to show the person pictures or photos of loved ones, playing voice messages of familiar people and performing video calls on WhatsApp *("We would also do video calls on WhatsApp with familiar people such as relatives and friends" [P2]).* However, although these three participants use these activities such as communication books and showing digital photos to the person, they mentioned that they lacked confidence when implementing these components as the person could not initially recall the people in the photo.

Six participants reported that familiar environmental objects such as a television increased responsiveness in persons who are minimally conscious. However, these participants reported that the persons had varying reactions to the television with one showing increased awareness, four remaining lethargic and one displaying a negative reaction *("He became anxious due to the light of the television" [P3])*. One participant mentioned entertainment arranged for the person by outside volunteers. Two participants specifically referred to familiar music on the radio leading to increased responses in one person ("*My mom used to love the music of Vera Lynn" [P5])*, while the other person showed no interest in the music.

Verbal communication

Verbal communication (spoken language) was divided into language form, content and use as per the classification by Owens (2016). The linguistic form used by participants portrayed the first language of the participants, namely Afrikaans ($n = 3$) and English ($n = 4$). All of the participants used simple subject-object-verb sentences (e.g. syntax) and simple vocabulary which were scaffolded according to the perceived linguistic and cognitive level of the person who is minimally conscious. These simple sentences were used to convey familiar discussion topics *("I told him/her about his/her friends that came to visit" [P1, P3, P4])*, with four of them attempting to create awareness of the person's environment by either conversing about the person's physical appearance or about familiar objects, such as a phone.

Due to the complex communication needs of the person who is minimally conscious, all seven participants mentioned that they wished they knew what the person wanted to communicate about. According to caregiver perceptions they often lacked confidence in their own communication attempts as they did not understand the person. They perceived themselves to anticipate what the person wanted with only 50% accuracy which led to increased frustration for both the person and the participant. Four participants mentioned that even though the person showed minimal responses in conversation, they still attempted to include them in the interaction *("I would always include him in conversations and prepare unfamiliar caregivers on communicating with him" [P1])*. Only two participants mentioned that they attempted to create opportunities for the person to communicate and maintained the topic of conversation which they perceived the person had initiated. Five participants continued conversing with the person while performing stretching exercises or massaging the person.

Four participants felt that their questions remained unanswered – specifically whether the person was in pain, why the person did not laugh anymore or why they did not appear to have a desire to communicate. All seven participants assumed certain things they thought the person would want to communicate about. For example, that the person might want to tell them that they are doing okay, that they love them, that they miss their family and that they understood what was being said but that they did not know how to respond. One participant mentioned that she thinks the person would want to tell his family that he was mad at them for putting him in the care facility and that he wanted to put an end to his life. Another participant thought the person wanted to speak to the family and tell them that he did not have any news, whilst another participant mentioned that she thought that her husband wanted to know what happened to him, to ask her questions about the incident, to mention that nobody understands him, to understand why he is in the specific facility, and why he cannot talk as well as certain practical aspects such as what he had for breakfast.

Communication strategies used by persons who are minimally conscious

This section focusses on the information pertaining to the caregiver's perception of the nonverbal communication behaviours that the person who is minimally conscious displayed. Figure 2 includes a layout of the communication behaviours of persons who are minimally conscious as perceived by their caregivers.

The perceived communication behaviours of the persons who were minimally conscious were classified according to the communication strategies previously mentioned in Figure 1 (Keutchafo et al., 2020).

The kinesics category most commonly mentioned by all seven participants, included eye movement as a means to communicate. For example, participant 7 mentioned that her husband would use eye blinking to answer yes/no questions. The most prevalent eye movements observed by participants were prolonged gaze ("*My father would stare at me for a long time as if he wanted to ask for something*" [P6]) and prolonged eye closure ("*My son would close his eyes to tell me he wanted to be alone*" [P3]). These eye movements were followed by head, neck, and shoulder movements which consisted of nodding and shaking the head ("*My mom would nod her head to answer affirmative to questions*" [P2]). Gestures used by persons who are minimally conscious included using mostly the upper limbs (hand, arm, and shoulder) to point and tap ("*My dad would tap his finger to follow the rhythm of the music he liked*" [P4]) with the index finger and to squeeze the caregiver's hand. One participant also mentioned the use of sign language ("*My husband and I would use sign language to gossip about people*" [P7]). Facial expression as a component of kinesics was the least mentioned means of communications by participants, with only two participants mentioning that facial expression were used to express either positive or negative affect (e.g. crying) ("*My dad*

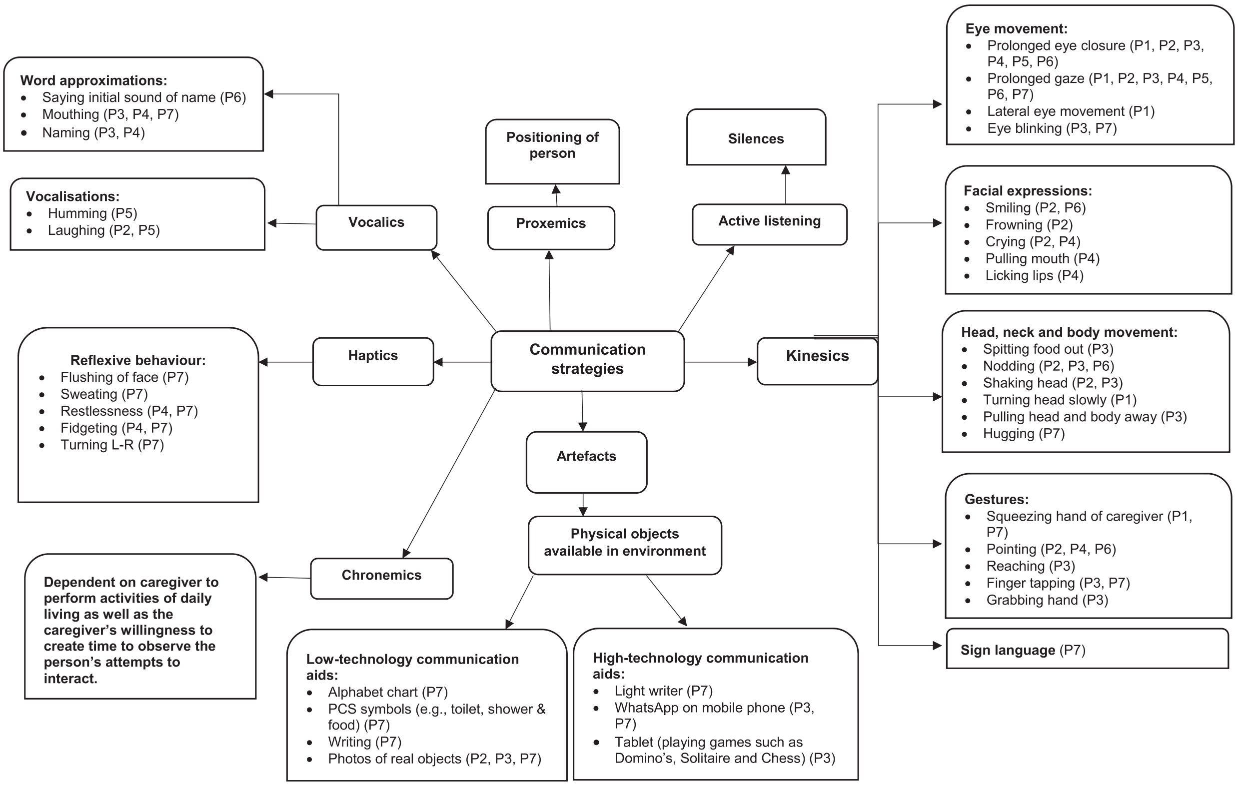

Figure 2. Communication strategies displayed by persons who are minimally conscious as reported by participants (Participant 1 (P1)–Participant 7 (P7)).

would get very emotional and cry when we played country music for him" [P4]).

For both proxemics and chronemics, the persons who are minimally conscious were totally dependent on the participants in all seven cases to position them and to perform activities of daily living for them. For example, participant 5 mentioned that she had to help her mother to wash her hair and so forth.

The vocalics observed by participants included both vocalisations such as laughing ("*My mom would laugh at my dad when he started singing*" [P2]) and humming ("*My mom loved singing and would hum to the music*" [P5]), as well as word approximations such as mouthing and attempts at naming or labelling people and objects ("*My mom couldn't remember my name in the late stages of her disease and would only say the first letter of my name*" [P5]).

Haptics mostly comprised of reflexive behaviour such as fidgeting and restlessness ("*My dad used to get very restless and then my daughter would sing hymns to him as it would help him relax* [P4]), while the artefacts mentioned by participants included physical objects. These physical objects were categorised according to low- and high-technology communication aids. The low-technology communication aids included alphabet charts, Picture Communication Symbols, writing and real photos of objects and people ("*The speech therapist worked really hard but my mom just couldn't understand any symbol form*" [P2]). The high-technology aids mentioned by participants who are familiar caregivers, were an eye gaze system ("*We tried everything even an eye gaze system but even that didn't work due to my son's nystagmus*" [P3]), Lightwriter ("*Initially, we started simple but later my husband progressed to typing a message on the Lightwriter*" [P7]) and applications on tablets ("*My son used to love playing chess and Solitaire on his tablet*" [P3]). Solitaire, an application on the high technology aid, was included as this was a leisure activity and provided a conversational topic for caregivers. Although the persons were exposed to both high and low technology communication aids, caregivers lacked confidence when implementing both forms of communication due to the low level of responsiveness of the person, the inconsistency of responses as well as the significant cognitive, motor, linguistic and sensory difficulties of the person.

Communication functions conveyed through nonverbal communication behaviours by persons who are minimally conscious

Table III includes a description of the communication functions that persons who are minimally conscious conveyed through nonverbal communication as perceived by familiar caregivers. The communication functions reported were classified according to the communication function categories in the Communication Matrix (Rowland, 2011).

According to familiar caregivers, persons who are minimally conscious conveyed a total of 36 communication functions through their nonverbal communication. Level 1 (pre-intentional communication) included six communication functions with the

Table III . Communication functions displayed by persons who are minimally conscious as perceived by familiar caregivers (application to Communication Matrix, Rowland, 2011).

Matrix **level**	Nr	Communication function		Definition	Behaviour observed by caregiver	Mentioned by (Part nr)
Level 1: Pre-intentional behaviour	1	Wakefulness and alertness		Displaying signs of coma recovery coma/regaining consciousness.	Prolonged eye gaze	P3, P7
	2	Disorientation		Disorientation of person, place and time.		P3, P7
	3	No recognition		Not recognising familiar objects or people.	Prolonged eye gaze, eye blinking or frowning	P5, P6
	4	Searching behaviour	Object	Searching for an object in the environment.	Lateral eye movement or prolonged gaze	P7
			Person	Searching for a person in the environment.	Lateral eye movement, reaching, turning head slowly	P1, P4, P5
	5	Expressing components related to physical functioning		Communication regarding the physical functioning of the person.	Reflexive behaviours (see Figure 2)	P2, P3, P4, P5, P6
	6	Expressing	Pain	Physiological expression of pain.		P3
			Discomfort	Expressing components related to discomfort.		P2, P3, P4
Level 2: Intentional behaviour	7	Recognition	Object	Recognising an object such as a photo of a past event or a book.	Smiling, laughing, photos of real objects and people	P1
			Familiar person	Recognising a familiar person such as a friend, relative or corporate connection.		P1, P2
	8	Drawing attention		Focussing the communication partner's attention on a specific object, person or event.	Prolonged eye gaze, pointing, reaching, saying the initial sound or naming the object/ person or event	P2
	9	Expressing affect	Positive	Communicates positive emotions (e.g. happy).	Smiling, laughing	P1, P2, P6
			Negative	Communicates negative emotions and feelings (e.g. anger, stress, fear, frustration).	Frowning, crying, pulling mouth, prolonged eye closure	P1, P2, P3, P4, P5, P6, P7
Level 3: Unconven-tional communi-cation	10	Communication intent (basic)		Indicating an intent to communicate.	Reaching, grabbing hand, pulling head and body	P1, P2, P3, P4, P5, P6, P7
	11	Refusing to communicate		Indicating no desire to communicate despite having communication intent.	Prolonged eye closure, pulling mouth, sign language, shaking head	P7
	12	Comprehending messages (basic)		Understanding the intent of a message produced by a communication partner.	Eye blinking, nodding, vocalizations	P7
	13	Choice making		Conveying personal preferences to the communication partner.	Eye blinking, nodding, shaking head, pointing, vocalizations	P1, P2, P3, P4, P5, P6, P7
	14	Expressing basic wants and needs		Expressing wants and needs.		P1, P2, P3, P4, P5, P6, P7
	15	Beginning communication support		Using unaided communication to represent basic messages.		P1, P2, P3
Level 4: Conventio-nal communi-cation	16	Greeting		Following social etiquette rules, e.g. saying "hello" or "goodbye".		P4, P5, P6
	17	Engagement in interaction	Active	Attending to the communication partner through active listening and body engagement.	Prolonged eye gaze, nodding, vocalizations, silences	P1, P2, P3, P4, P5, P6, P7
			Passive	Being physically present during communication but not actively engaged (i.e. disinterested in communication).	Prolonged eye closure	P1, P4, P5, P6

(*Continued*)

Table III (*Continued*).

Matrix level	Nr	Communication function		Definition	Behaviour observed by caregiver	Mentioned by (Part nr)
	18	Turn taking		Displaying turn-taking (i.e. reciprocity) with communication partners.	Prolonged eye closure, nodding	P4, P5, P6, P7
	19	Following of instructions		Understanding an instruction by a communication partner.	Gestures	P1, P2, P3, P4, P5, P6, P7
	20	Functional use of objects		Knowing the function of an object (e.g. using a comb).	Gestures functional use of object	P7
	21	Requesting	Object	Requiring the communication partner to provide an object (e.g. toothbrush or comb).	Pointing, turning head slowly, prolonged eye gaze, reaching, licking lips, PCS symbols, alphabet chart	P4
			Action	Requiring the communication partner to fulfil a task (e.g. pointing to the light-requesting the light on/off).		P4
			Physical presence	Requiring physical closeness from the communication partner.	Reaching, grabbing hand, prolonged eye gaze	P1, P2, P3, P4, P7
			Information	Requiring the communication partner to provide more information.		P7
	22	Responding (basic)		This refers to a voluntary response to a communication partner's initiation to communicate.	Nodding, vocalizations and word approximations	P1, P3
	23	Refusing	Object	Requiring the communication partner to provide an object (e.g. food, toothbrush or comb).	Prolonged eye closure, shaking head	P3, P4
			Action	Requesting partner to fulfil a task (e.g. take food away).	Spitting food out, pulling mouth, pulling head and body away, reflexive behaviours	P5
			Physical presence	Requiring a lack of physical closeness from the communication partner (e.g. requesting the partner to leave).	Prolonged eye closure	P1, P2, P3, P4
			Information	Requiring the communication partner to provide no information.		P7
Level 5: Concrete communi-cation	24	Imitating/Repeating		Imitating or repeating an action, object or person.		P7
	25	Naming		Labelling an object, person or event in the person's environment.	Word approximations, vocalisation, gestures	P2, P5
	26	Commenting		Providing comments during the conversation.		P7
	27	Answering	Yes/no questions	Responding to the communication partner's questions (yes/no).	Word approximations, vocalizations, eye blinking, nodding, shaking head, smiling, frowning, squeezing hand.	P1

(*Continued*)

Table III (*Continued*).

Matrix level	Nr	Communication function	Definition	Behaviour observed by caregiver	Mentioned by (Part nr)
		Concrete questions	Responding to general contextual questions focussing on the current environment (e.g. “What are you doing?”).		P4, P5, P6
		Abstract questions	Responding to simple abstract questions from the communication partner (e.g. “How do you feel today?”).	Lightwriter, WhatsApp, writing, tablet	P2
	28	Requesting a turn	Initiating interaction or requesting to participate in the conversation.	Grab hand, prolonged eye gaze, silences	P7
	29	Initiate conversation	Requesting reciprocal interaction from a communication partner.		P4, P7
Level 6: Abstract	30	Modelling	Using simple gestures to demonstrate what is required of the communication partner (e.g. “I am hungry”).	Gestures	P2
Level 7: Linguistic	31	Narrative	Telling a story.	Word approximations, vocalizations, sign language, Lightwriter, alphabet board, writing, WhatsApp	P4, P5, P6, P7
	32	Arguing	Debating the person’s point of view.		P7
	33	Leading the conversation	Leading the conversation by discussing topics related to the person’s concerns or interests (e.g. humour and gossip).	Physical objects such as Lightwriter, writing, WhatsApp	P6, P7
	34	Observing social etiquette	Using words that are socially appropriate or inappropriate.	Alphabet chart	P4, P5, P6
	35	Termination/disengagement	Withdrawing from the conversation.	Prolonged eye closure	P1, P2, P6
	36	Conversational pause	The speaker takes a rest, hesitates, or temporarily stops.	Silences or gesture	P4, P5, P6

majority of participants mentioning that persons who were minimally conscious expressed components related to physical functioning with reflexive behaviours ("*I could see my dad was uncomfortable as he used to turn L-R in his bed and fidget a lot*" [P4]). Level 2 (intentional behaviour) also included three communication functions, of which the ability of persons who are minimally conscious to convey positive affect was mentioned by three participants while expressing negative affect was mentioned by all seven of the participants ("*My husband used to get irritated with me when I pulled his ear and he would just close his eyes and not respond*" [P1]). All the familiar caregiver participants mentioned that persons who are minimally conscious conveyed communication functions on Level 3 (unconventional communication) which focussed on the person indicating intent to communicate, choice-making and expressing wants and needs. One participant mentioned that her son would grab her hand to indicate to her that he didn't want her to leave and that he wanted her to talk to him (P3).

Level 4 (conventional communication) included eight communication functions with active engagement in interaction and following instructions being mentioned by all of the participants ("*We would always organise family gatherings and my mom would smile and look at us*" [P2]). Communication functions included in Level 5 (concrete communication) were mentioned by less than half of the participants referring to persons who are minimally conscious answering concrete questions with word approximations, while Level 6 (abstract communication) included only one communication function, specifically that the person modelled what they required from the partner. Lastly, Level 7 (linguistic communication) included six communication functions observed by participants. The communication function mentioned by more than half of the participants included narratives for which persons who were minimally conscious used word approximations, vocalisations, sign language, a Lightwriter and WhatsApp.

Discussion

From the findings of this study, familiar caregivers are willing and eager to interact with persons who are minimally conscious, despite the challenges related to restricted interaction. The communication attempts (both initiation and responses) of familiar caregivers typically includes both verbal and nonverbal communication during interaction with persons who are minimally conscious. These caregivers naturally use some form of multimodal communication and attempt to adapt to these communication strategies. However, these caregivers are often unsure whether they are implementing and integrating these strategies appropriately. This may be due to the caregivers attempting communication with the person but perceiving the person who is minimally conscious as not responding. Alternatively, they may focus on specific communication strategies which they are familiar with (e.g. verbal communication) and may receive limited healthcare practitioner support to provide them with the confidence to effectively integrate multiple modes of communication during interaction with these persons (Wallace, Purdy, & Skidmore, 2014). Healthcare practitioners therefore have an important role to play to support familiar caregivers during the initial and extended phases of caring. When supporting caregivers during the extended care phases healthcare practitioners may learn which communication strategies caregivers perceive as successful and provide them with the support and confidence to effectively implement these strategies. Additionally, healthcare practitioners can utilise these strategies of caregivers in the extended care phase and teach them to caregivers in the initial care phase to reduce caregiver anxiety. Preisig et al. (2018) mention that although verbal and nonverbal communication is produced through different channels, they originate from a shared communication intention. Therefore, by integrating multimodal strategies, the opportunity of having successful interaction is increased, because if a communication breakdown occurs in one modality the partner can switch to another, thereby allowing greater communication capacity (Wallace et al., 2014). This study supports the notion that caregivers use multimodal communication and that they learn this skill over time, but often do not know how to observe and identify subtle communication attempts from the person who is minimally conscious during the initial/early stages. If caregivers are supported during the initial phases, early rehabilitation can take place which results in improved emergence of consciousness (Eapen, Georgekutty, Subbarao, Bavishi, & Cifu, 2017).

The caregivers in this study did identify some communication attempts of persons in a MCS such as kinesics; specifically, eye movement was identified as the most prominent means to communicate – specifically prolonged gaze and prolonged eye closure. Eye movement is often present during all stages of recovery and is the first sign that the person is recovering consciousness (Ting, Perez Velazquez, & Cusimano, 2014). Visual tracking is characteristic of both the MCS- and MCS + subcategories of the MCS (Giacino, Fins, Laureys, & Schiff, 2014). Eye movement was the most prevalent strategy displayed by persons who are minimally conscious; but a discrepancy exists as only three familiar caregivers mentioned that their own facial expressions and body language are important when communicating with these persons. This may be that familiar caregivers have limited knowledge and skills on how to effectively observe and respond to this communication form in persons who are minimally conscious (Wallace et al., 2014). This implies that even although they are regarded as "expert" partners – they might not be aware of the full bouquet of possible forms of communication.

Another communication means displayed by persons who are minimally conscious was vocalics. All the participants mentioned that vocalics such as using a familiar voice and singing to the person were some of the communication strategies they used. Singing in particular was displayed by the familiar partner and humming by the person as a communication means. According to Lancioni et al. (2021), this is beneficial as it increases neural activity, accelerates brain plasticity, and avoids sensory deprivation. Music stimulation of the auditory area (which is mostly unaffected) also increases the person's recovery process and increases the wellbeing and general functioning of the person (Lancioni et al., 2021). Additionally, a familiar voice provides personally relevant stimuli (i.e. with emotional, autobiographical, or self-related characteristics) which increases the chance of observing behavioural or brain responses compared to neutral stimuli (Sautet et al., 2022).

Artefacts were also mentioned as both a means of communication displayed by the person who is minimally conscious as well as a communication strategy of the familiar caregivers. However, participants mostly mentioned environmental objects as a communication strategy as opposed to physical objects. Physical objects were important to the person as perceived by familiar caregivers as it often included a communication aid. The person may have perceived these objects as important as it allowed them a means to communicate and also provided familiar stimuli which may have increased their level of responsiveness. However, familiar caregivers lacked confidence when implementing these communication aids. This may be due to their decreased awareness of scaffolding their communication intervention focussing on the residual language functioning of the person (Gillespie & Hald, 2017).

Communication attempts of persons in a MCS were mostly interpreted as conventional communication which included greeting, turn taking, functional use of objects, following instructions, requesting, responding and refusing. These observations of caregivers provide valuable diagnostic information for the classification of persons in a MCS. Behaviour observation remains the most frequently used method of differential diagnosis in DOC (Carrière et al., 2022). Therefore, by including caregivers in the assessment and intervention of persons who are minimally conscious can assist healthcare practitioners in obtaining information on familiar stimuli that the person responds best to, how the person responds to the stimuli and what the response could indicate. Including caregivers in a team approach may also assist healthcare practitioners to support both familiar caregivers in the initial and extended phases of care. Firstly by providing information on naturally occurring multimodal communication strategies to communicate with persons who are minimally conscious in the initial care phase and secondly, supporting extended care phase familiar caregivers to communicate with confidence. Additionally, healthcare practitioners can equip familiar caregivers with the skills to observe, identify, and respond to subtle communication attempts as this may improve the psychological state and confidence when interacting with persons who are minimally conscious (Ting et al., 2014).

Limitations of study

The small sample size limits the generalisability of the findings. However, the procedure used allowed for comprehensive and in-depth data on the participants' perspectives. Furthermore, the study included persons in a MCS due to various aetiologies (e.g. TBI, CVA, and Alzheimer's disease). Various aetiologies were included as the main focus was on a diagnosis of a MCS and not on the aetiology of the disorder. Additionally, these aetiologies assisted in including more caregivers who could recount their experiences based on the severity of the persons' communication capacity challenges. These caregivers were also selected as they have had long term exposure to the MCS and could reflect on the process. Future research could include retrospective interviews with persons who have recovered from a MCS to include their perceptions and experiences.

Conclusion

From the findings of this study, it is clear that familiar caregivers of persons who are minimally conscious realise the importance of communicating with these persons and over time acquire the skill to observe which stimuli elicit what response. Despite this, they appear to be unaware of this knowledge that they possess, and often remain unsure how to interpret subtle communication attempts. In this study, this caused the familiar caregivers to lack confidence when communicating with these persons as they were unsure how to scaffold their multimodal communication attempts to meet the persons needs and to adequately support the person. Furthermore, emphasis is placed on the inclusion of caregivers within the assessment and intervention of persons in a MCS by healthcare practitioners from the earliest possible stages to facilitate improved emergence of consciousness. This study also identifies areas of support that familiar caregivers require in the initial care phase and which can be remediated by healthcare practitioners.

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