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Nonverbal communication of trauma patients in a state of minimal consciousness

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Abstract

Introduction. In spite of the rapid development in various communication-support technologies for those waking up from a coma, studies describing the sole process of reconstructing communication in this group of patients are scarce.
Objective. The aim of this study was to analyze communication reactions in a minimal state of consciousness and describe the nonverbal behaviours characteristic for each stages significant for the therapy of communication.
Materials and method. 18 severely brain-injured patients in a minimal state of consciousness participated in the half-year observation study, which included people experiencing at least 4 weeks of consciousness disorder/coma. Age of patients 25±5 years. Psychological assessment included: observation of various attempts of communications undertaken by patients, caregivers and family interview, the Glasgow Coma Scale (GCS) and Individual Communication Sheet.
Results. Data analysis showed a significant increase in preverbal communication, both in primal and sensory areas when compared between Stage II (GCS=6–8 points) and Stage III (GCS=9–12 points). After a time, primary communication reached a high level. Patients produced communication attempts from the behaviour organization level, and an increase in the nonverbal communication level was noted. Based on observations, nonverbal communication profiles for each stage of waking up from a coma were introduced.
Conclusions. It was found that in the process of waking up from a coma the patients communicate with the use of the preverbal level of primal communication, the sensory and behaviour organization activities. The characteristics of the communication reactions show that in Stage III there is a significant increase in two preverbal communication areas: primal and sensory acts, when compared with Stage II.

Key words

traumatic brain injury, awareness, coma, microgenetic theory, body language

INTRODUCTION

Accurate classification of the disorders of consciousness and their severity/depth monitoring, as well as providing valid prognosis for a patient, still remain challenging issues in modern times. For a long time, a chronic vegetative state was diagnosed when a patient could not establish logical verbal contact. When this condition lasted for a period of time lasting longer than 6 months it was considered irreversible.

Neuroimagining technology development and its further refinement has allowed for the recent validation of knowledge on vegetative states. At present, it is believed that in the case of some patients this state can turn into a minimal consciousness state and improve further. Both vegetative and a minimal consciousness states can be temporary, chronic or permanent. Some research studies show an earlier misdiagnosed vegetative state condition rate can be higher than 40% [1, 2].

A minimally conscious state is the first stage of regaining awareness in a coma, when a patient shows primary and inconsistent signs of consciousness of self and the environment. Although patients are unable to communicate functionally, they can respond adequately to verbal commands. Clinical data proves that during the first stage of regaining consciousness, emotional expression variety increases.In addition to showing signs of pain or anger, the patient can also smile. Some patients cry, although their flowing tears are not always adequate to the situation. Sometimes during this stage a patient can even make understandable verbalizations. [3, 4, 5].

Observation is a major and significant diagnostic tool in minimal consciousness state assessment. It should be focused on the smallest patient's reactions to environment changes. When it comes to a consciousness evaluation, the observation of visual functions (e.g.eye fixation) and visual contact are crucial. Minimally conscious patients can spontaneously fixate their eyes on things or people from their surrounding and follow a person or object, as well as turn their sight in the speaker's direction [6].

In clinical practice, 2 types of minimally conscious state are usually distinguished [7, 8]:

1) minimal consciousness state plus (MSC+) – a person in this condition follows simple directions, gives yes or no answers;

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2) minimal consciousness state minus (MSC-) – a person in this condition shifts attention to negative stimuli, reacts to static or moving stimuli, gives an emotional response to affective stimuli and is able to locate them.

There is little data concerning communication analysis of minimally conscious patients in the Polish and international subject literature [9]. Available consciousness assessment scales mainly apply to physical and cognitive functioning. Although almost every scale includes some nonverbal communication assessment, this is usually very short and concerns establishing eye contact, vocalization, yes or no answers.

Clinical practice and observation in a hospital environment suggest, however, that altered consciousness patients send a full spectrum of signals carrying information regarding actual emotional states. Most reactions in response to external stimuli observed by medical staff are usually bracketed together as vegetative reactions. As such, those signals are not appreciated by family members as being equivalent with communication [10, 11].

OBJECTIVE

The main aim of this research is 1) to analyze communication reactions observed in a minimally conscious state; 2) to establish a nonverbal behaviour profile characteristic for altered consciousness state specific stages, and 3) to determinate those communication areas critical for therapy of severely brain injured patients facilitating communication reinstatement.

It is hoped that the results of this study will contribute to raising the quality of life both in altered consciousness patients and their family members.

MATERIALS AND METHOD

The research involved the observation of 18 severely brain-injured patients with their subsequent coma lasting approximately 4 weeks. The subjects were aged was between 25±5 (M±SD) years. The first assessment took place about one month after the brain trauma. All patients submitted to a half-year observation procedure and were committed to rehabilitation centres where they underwent therapy, including: physical therapy, physiotherapy exercises and neuropsychological and speech therapy. The extent of the therapy differed depending on the resources of each rehabilitation centre.

In order to assess the consciousness state and analyze the communication display of brain-injured patients the following methods were used:

1) **Observation** procedure conducted during attempts at establishing communication, including physiological changes, minimal body movements, eye movements.
2) **Family interview** involving: available communication options, mimic expression, observed face contortion, body restlessness or physiological reactions.
3) **Glasgow Coma Scale (GCS):** a tool measuring the consciousness level, which provides a reliable and objective way of recording the conscious state of a person for initial as well as subsequent assessment. This method was initially introduced by neurosurgeons in 1974 [10, 11].
   - According to the theoretical assumptions underlying this method, consciousness is a state of reactivity – central nervous system readiness to react to external stimuli. The consciousness concept as such is used to indicate a patient's orientation in time and in space, self-awareness, awareness of surroundings and trauma circumstances.
4) **Individual Communication Skills Scale** [12]: this method is an appendix to the "Communication as a key to integration" pedagogical innovation programme, which was especially developed to support therapists working with people with speech and language impairment. This screening sheet is used to diagnose communication abilities in 5 different areas: preverbal, verbal and interpersonal communication, as well as creative expression. Additionally, each area of communication ability is evaluated with reference to 3 basic levels of mental functioning:
   - emotional level;
   - language and cognitive level;
   - social level.

On the basis of the GCS scale, 3 stages of coma recovery have been distinguished:

- I Stage – GCS 3–6 points;
- II Stage – GCS 6–8 points;
- III Stage – GCS 9–12 points.

The gathered data involved scores from a double assessment of patients with GCS and Individual Communication Skills Scale. The first assessment took place around one month after the brain trauma, when according to GCS, the patient was in Stage II – lack of consciousness state (a patient scored not less than 6 and no more than 8 points).

The second assessment was conducted when a patient reached 9 points or higher, but no more than 12, on the GCS. This score is interpreted as a moderately lowered consciousness state – Stage III. At this stage, a patients usually spontaneously open their eyes, can locate stimuli, verbal reactions involve making sounds and moaning.

As in some subscales of the Individual Communication Skills Scale, subjects in Stages II and III reached minimal scores indicating a lack of evaluated functions, those scores were not included in further statistical analysis. Those scores concern more organized functioning and, as such, were unavailable for those stages of regaining awareness. Therefore, a further statistical procedure was run on the following preverbal communications subscales: primal, sensory, organized behaviour, sound, verbal, and intra-psychic communication.

RESULTS

In order to analyze and interpret the raw scores from each subscale, these was converted into a 100 point scale, where 100 points indicated the highest possible communication level and 20 points indicated the lowest.

Further investigation supports the authors' assumption that each stage of regaining awareness can be matched with characteristic communication features.

In general, a concise evaluation of communication during Stage II, the subjects' average score reached 29.68 points, which placed communication within the margin of

minimal results. In Stage III communication, the quality was significantly higher and reached an average of 45.63 points.

The t student for dependent tests with 0.1% significance level ($p \leq 0.001$) was used to examine the differences between Stage II and Stage III communication profiles. Results indicate significantly higher scores for every communication subscale in Stage III (Tab. 1).

Table 1. Differences between scores in Individual Nonverbal Communication Rating Scale obtained by the patients in Stage II and Stage III

Behaviour/Communication	Stage II (GCS 6–8 points)	Stage III (GCS 9–12 points)	Significance level (p)
Primal communication	48.53 (SD 12.45)	73.87 (SD 7.07)	p<0.001
Sensory communication	30.67 (SD 7.99)	52.67 (SD 19.80)	p<0.001
Organised behaviour (preverbal) communication	29.6 (SD 7.97)	48.53 (SD 10.01)	p<0.001
Sound communication	24.18 (SD 4.18)	40.89 (SD 8.41)	p<0.001
Verbal communication – level I	20.70 (SD 1.07)	24.62 (SD 2.86)	p<0.001
Intrapsychic communication	24.44 (SD 1.49)	33.22 (SD 4.78)	p<0.001

Detailed analysis of the observation data regarding communication in Stage II showed that subjects most often used elements of preverbal communication (prelanguage forms) on the primal level. The mean for this stage was 48.53 points with a quite high standard derivation, which indicates a high differentiation in the communication levels presented by patients at this stage.

Sensory communication, which corresponds with reactions to external stimuli registered by the senses (mostly hearing and sight) was scored lower. Similarly, this area also presented a high differentiation in results. Patients in Stage II did not react to sound stimuli at all or had low reactions.

Preverbal communication relating to behaviour organization, sound communication as well as verbal and intra-psychic communication were practically never observed in Stage II.

In the profile analysis of the behaviour of the investigated patients, the result showed periodical characteristics of communication display. Some behaviours were rarely or occasionally observed, which can indicate a high variability of activation state and alertness among the subjects.

Data analysis concerning Stage III indicates a significant increase of communication level when compared with Stage II in two preverbal communication areas: primal and sensory aspect. At this stage, some communication display was observed from the behaviour organization level, such as more conscious attempts and sound communication. There was also an increase in the intra-psychic communication level.

Nonverbal communication attempts were noted. It should be emphasized that primal communication reached a high score of 73.85 points. Other preverbal communication areas were far more diversified and fluctuated between a very low score to a medium score (40 points). The characteristics of this stage show higher stability and frequency of the observed communication behaviours.

DISCUSSION

There are very few studies on nonverbal communication of minimally conscious patients described in the Polish subject literature. However, there are some case reports on specific technology applications, such as: brain-computer interface or cyber-eye [13, 14]. The authors believe that natural methods which build human-human relations and nonverbal communication observation, which even amongst healthy represents up to 90% of all communication [3, 5, 17], are neglected in the light of the recent technology-focused approach. Among patients who do not show any signs of verbal contact, body language is the only channel available in order to convey personal information and needs.

The results of the presented show that patients coming out of a coma, but still lingering on the borders of awareness/consciousness, send a lot of information using their bodies. Those messages, though initially nonspecific, are a rich source of knowledge on their current state. With time, and over the next stages of coming out of coma, more conscious and deliberate messages involving information not only about their state but also sporadically leading to relation establishment, come into view. The gathered results allow one to set down profiles characteristic for each stage of waking up from coma.

STAGE I – was determined by reaching from 3 – 5 points on the GCS, and can be described by: being able to use only vegetative reactions mainly carrying information about human physical functions (temperature rise, sweating, heart beat and heart rate changes). Studies proved those reactions can be disturbed [1].

STAGE II – was determined by reaching from 6 – 8 points on the GCS. This is a preverbal communication stage defined by nonspecific reactions in response to external stimuli. Among the observed behaviours with communication quality, the most often reported was expressing unspecific emotions from the body. At this stage, mimical expression in response to pain or discomfort can be observed, as well as nonspecific body movements in response to external stimulation: muscle tension in a stressful situation and relaxing muscles in the presence of a person close to the patient, turning the head or closing eyes in discomfort, cheek and neck reddening when satisfying physiological needs.

STAGE III – was determined by reaching from 9 – 12 points on the GCS. It can be described as primal preverbal communication with sensory and behaviour organization and sound elements. At this stage, specific and repeatable reactions in response to specific external stimuli can be observed. In addition to behaviour typical for the previous stage, patients show a high level of preverbal sensory communication (patients react to their name or search for the sound source).

Preverbal communication at the behaviour organization level is connected with showing a response to simple messages connected with surroundings and situations (everyday routine like brushing one's teeth – opening one's mouth, flexing or deflating muscles when putting on clothes)

Some patients indicate their needs connected with everyday routines, for example, increased restlessness when bath or feeding time is near; they react with tension and body movement noticing a nurse with a syringe.

During this stage sound communication is present. Though babbling or derivate vocalization does not occur, vocalization

in order to summon a person or establishing contact could be noticed. Patients also follow heard conversations and react with crying or laughter in response.

STAGE IV – was determined by reaching from 12 – 15 points on the GCS. Nonverbal communication typical for this stage is specific as generally known and socially accepted gestures appear (for example. OK or reaching a hand for greetings). At this stage, verbal communication further develops, and is well defined and characterized in the subject literature [10, 15, 16].

The results collected during the observation proved vegetative reactions and body language to be most vital signs of communication in severely brain-injured patients. These processes are present before other forms of communication are manifest. Other studies also suggest that the vocal channel is the most severely impaired aspect of communication during the process of communication reinstatement. When it eventually emerges again, it initiates the development of all the remaining communication channels (e.g. reading and writing) [17, 18, 19].

On analyzing the stages of communication restoration it becomes evident that its phases are comparable to the stages of ontogenetic speech development.

Similarly to child development, patients first show an erratic and nonspecific response to deprivation which, in time and over the process of brain structures development, becomes specific. The first signs of communication are usually vegetative and with brain maturation change into socially-accepted specific gestures [20, 21, 3].

This interesting relationship between ontogenetic development and brain-injured patients' rehabilitation process is well explained by Jason Brown's microgenetic theory [22], which has been introduced into clinical practice, and expanded by Maria Pąchalska [3, 5, 17]. It states that in both normal and pathological behaviour, microgeny deposits a cognition in the same way as phylogeny and ontogeny in the human mind/brain. The microgeny of an adult's cognition and a child's cognitive development differ mostly because the latter process is definitely slower. Microgeny can be as fast as fractions of seconds. This theory offers an alternative understanding of the human brain, which is described as dynamic and undergoing constant changes in the system, including different, often distant from each other structures.

Reaching each stage of development is seen rather as a fluent process and an accomplishment in specification, than as preprocess distinctive phases [20, 23].

In every behaviour an accumulation of a process can be seen and this process:

- started here and now in the human brain and its progress can be measured in milliseconds;
- at the same time, it started with conception and developed during life up till this moment.

In this theory, a symptom is a crucial concept which is understood as "an unexpected deviation from normal behaviour, a sample of an early phase in the microgenesis of a percept or a behavior, which as a result of damage surfaces prematurely revealing that which is ordinarily concealed" [23]. "Pathology does not expose stages in the reverse of the acquisitional sequence, but rather the process leading to the stages" [23]. Therefore, an error or a symptom is an uncommon deviation from normal behaviour, which actually in many ways proceeds quite normally. A sample of behaviour is seen as pathological only when it diverges from the developmental course and/or hinders everyday functioning.

Focal brain damage exposes earlier stages of each mental process because its later phases are usually suppressed or inhibited. Therefore, brain injury changes the course of a process and exposes its earlier stages in their often disturbed form. Consequently, communication attempts in earlier stages of coming out of a coma are prematurely ended processes.

The microgenetic approach to communication depicts the act of speech moving on through all the brain parts from the bottom (brain stem with midbrain) through the middle (limbic system) up to the highest part (cerebral cortex). This process runs from the lowest to the highest level of complexity and specification [10, 3].

In a fully developed act of communication, understood as sending information, along with linguistic processes present, there are also those un-linguistic (including paralinguistic and extra-linguistic codes), which complement the whole content.

Evolution and ontogeny theories indicate that nonverbal communication precedes communicating with words. The microgenetic approach allows one to understand the act of communication as a process continually developing in microgeny. At first, it starts with an organism rousing, then an unconscious nonverbal reaction, next, a conscious verbal reaction, which then develops into verbalization, and finally ends with linguistic communication [20, 24].

RESULTS

The results obtained in this study show that minimally-conscious patients communicate on the preverbal level in the primal, sensory and behaviour organization aspects. Communication attempts were observed in the behaviour of all subjects, which allows one to assume that there are constant features of communication characteristic for a lowered consciousness state. As such, those features should be amplified and used in order to reestablish communication with the social environment.

Relating those characteristics to ontogenetic development in corresponding communications levels can hint at the crucial role of a patient's social activity in speech and neuropsychological rehabilitation planning. It seems noteworthy that during ontogenesis a child gains competence in this area in relations and contact with others. This suggests that this element is also essential in the case of minimally-conscious patients.

Nevertheless, in order for an act of communication to be effective, an observational training for the patient's family members in characteristic and nonspecific, nonverbal behaviour is needed. Caregivers are usually burdened with many tasks and responsibilities, and typically do not interpret small mimic expression changes, accelerated breathing or skin reddening to be an act of communication and consequently do not react to them. In clinical practice, implementing educational training programmes related to behaviour observation of a minimally-conscious patient, learning to register their emotions and consequently their reaction to communication signals, appears to be crucial.

Based on analysis of the results obtained, the following can be concluded:

- nonverbal communications is a phylogenetically older process than verbal communication and, as such, is connected with communication attempts observed at each stage of waking up from a coma [25];
- verbal communication is an end effect of phylo and ontogenesis and the microgenetic process of communication which starts with body language. It is a more complex, evolved and detailed form of conveying information [10,3].

Because gaining communication competence in ontogenesis is only possible with interaction with other people, it can be assumed that in order to recreate communication after brain injury, interactions with other people, especially family members, are needed.

CONCLUSIONS

It was found that in a minimal state of consciousness the patients communicate with the use of the preverbal level of primal communication, the sensory and behaviour organization level. The characteristic of the communication reactions show that in Stage III there is a significant increase in 2 preverbal communication areas: primal and sensory aspects, compared with Stage II. At this stage, more conscious attempts and sound communication were observed, together with an increase in the intra-psychic communication level.

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