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Event triggered observation as a method for the study of gestural behaviour

Event triggered observation as a method for the study of gestural behaviour. This method is proposed for the investigation of gestural behaviour. Thus, within fuzzily defined time boundaries around a critical event, a fine analysis is made of the verbal and nonverbal behavioural components together with the gestural behaviour in question. Using this approach, a coordination between gestural hand movements and looking and speaking behaviour has been observed, indicating an integrated functional control of these behaviours.

L'observation commandée par un événement en tant que méthode d'investigation du comportement gestuel. Dans un espace de temps flexible situé autour d'un événement critique, on enregistre par une analyse subtile les divers comportements verbaux et non-verbaux et on les relie au comportement gestuel en question. A l'aide de ce processus, on a constaté une coordination entre les mouvements gestuels de la main d'une part et le regard et le langage d'autre part, ce qui indique une commande intégrée de ces comportements.

Ereignisgesteuerte Beobachtung als Untersuchungsmethode gestischen Verhaltens. In einem flexiblen Zeitbereich um ein kritisches Ereignis herum werden durch Feinanalyse verschiedene sprachliche und nichtsprachliche Verhaltensweisen registriert und ihr Zusammenhang mit dem in Frage stehenden gestischen Verhalten bestimmt. Mit Hilfe dieses Vorgehens wurde eine Koordination zwischen gestischen Handbewegungen einerseits und Blickverhalten und Sprache andererseits festgestellt, die auf eine integrierte Steuerung dieser Verhaltensweisen hindeutet.

Introduction

The study of communicative behaviour and its disorders is of considerable importance for the understanding of psychopathological states. These are associated in many instances with some degree of disorganisation of behaviour during social interaction [10]. Many investigations of verbal and nonverbal behaviour during mental illness have been reported in the literature.

Of the nonverbal components involved, micromomentary changes of facial expression [8], for example, have been shown to indicate intrapsychic changes during psychotherapy. Other nonverbal components of behaviour have been reported as indicating psychotic states [7], [6].

In this paper an approach will be presented to the problem of analysing gestural movements during the course of depression. The work has been carried out in connection with an exhaustive longitudinal study of depressive patients. The study of gestural movements is related to the general investigation of the social interactive behaviour of the patients. The basis for these investigations is provided by video recordings of a standardised interview situation which is performed at regular intervals during clinical stay [4].

In particular, the structural coordination of hand movements with other components of behaviour is treated here. Of interest for the investigation of depression are changes which may occur in the coordination of behaviour, and the type and intensity of movement associated with changes in depressive state. The clinical observation, whereby it is maintained that motor retardation be a major symptom, may thus be checked within the general framework of communicative behaviour. In order to investigate these questions adequately it is necessary to secure information on the following three aspects:

- a) The structure of the gestural behaviour as it is related to other behavioural components.
- b) The behavioural repertoire of the individual during a given situation. This is required in order to establish the variability of this type of behaviour and its dependency on the psychological state at any given time.
- c) The change in behavioural repertoire during the course of the illness.

The acquisition of this information requires the use of observational methods which are adequate to the subject material. The description of the general methodological approach is therefore given most attention here.

Methodological Approach

Systematic observation is essentially a procedure which should yield a representative sample of the behaviour in question through reduction of the behavioural stream by some form of condensation or selection. The level of organisation at which this reduction is carried out must be chosen in accordance with the aspects of the behavioural processes which are of interest. For example, a first selection is made by choosing the situation in which the observation is to take place.

In the case of gestural movement during dyadic interaction, the level of organisation could be chosen so that exact measurement of the movement using some type of coordinate system is made, indeed the associated electrophysiology could be analysed by deriving the EMG. For our investigation it has been chosen so that the coordination to the other observable components of behaviour can be assessed. The level was selected so that the socially meaningful content, if at all present, could be determined.

To this end, event-triggered observation has been used. Event-triggered observation may be described as a procedure involving continuous observation of the behavioural situation until the occurrence of the preselected behavioural event, whereupon a fine analysis of the various components involved with this event is performed if necessary, on a frame-to-frame basis. A prerequisite for this procedure is the facility for repeated observation at various speeds i. e. film or video recording, and is therefore not possible with direct observation techniques.

The task of the observer thus involves the protocolling of the various components of interest before, during and after the actual gestural movement. In this way the temporal organisation of a behavioural pattern in terms of its various components

is obtained. Since the structural coordination of the behavioural components is of interest here, a certain coarseness in the setting of temporal limits can be tolerated. (In the case of gestural movements, for example, the accuracy can easily be held to ± 2 video frames i.e. ± 80 msec).

In order to examine the behavioural repertoire, those events which have been defined in this way have to be assembled. By assembling, or editing, on to a second videotape, a condensed form of the entire situation is obtained which facilitates the visual comparison of the selected behaviours.

These procedures can only be carried out efficiently when a) the videotape is timecoded and b) when a video editing facility is available. Both of these requirements are realised with the PRAVDA system (CLARKE und ELLGRING, this issue) which was used for the present analysis.

Observed Material

The material for the analysis reported here was taken from a series of interviews, video-recorded at regular intervals during the clinical stay of a depressive patient. The interviews involved a number of standard questions [4] and were of eight to twelve minutes in length.

One interview was selected from, respectively, the beginning, the middle and the end of the clinical stay. A further interview, recorded during a follow-up examination, was also taken for analysis. All hand movements recognised during event-triggered observation were registered, together with the associated looking and speaking behaviour, and finally edited together for each of the four interviews. Those hand movements defined as illustrators [5] were more closely examined.

Some Preliminary Results

The repeated observation of the single hand movements which were selected yielded the following structural coordination amongst the observed behavioural components: Starting from the condition where the patient is looking at the interviewer, the patient looks away from the interviewer, begins to speak and initiates a hand movement. After the climax of the movement, he again looks at the interviewer while completing the utterance.

This structure appears to be maintained during all observed stages of the depression.

The series of photographs demonstrate the typical behavioural pattern (Fig. 1).

After video assembling of all of the hand movements during each interview, the stability of the behavioural repertoire could be evaluated. It appears that the demonstrated pattern structure is maintained both within each interview and across the clinical stay.

However, the intensity and nature of the observed movements, although remaining constant during one interview, do alter remarkably during the course of the illness. Furthermore the frequency of occurrence of such hand movements was found to change from situation to situation.



Figure 1: Behavioural sequence of an illustrator hand movement (Patient right and in close up). A) Patient not speaking, looking at interviewer, no hand movement, B) utterance started, but no longer looking at interviewer, still no hand movement, C) during utterance, looking away from interviewer, hand movement initialised, D) climax of hand movement, E) end of utterance, again looking at interviewer, hand movement terminated. Note: To ensure anonymity the picture series technically has been modified.

Discussion

The structure of the behavioural patterns demonstrates on the one hand, the close relationship between gestural movement and speaking behaviour. KENDON [9], in his analysis of an example, gives a detailed description of this relationship. On the other hand, the gestural movement occurs synchronously with looking away from partner; the return to looking at the partner occurs after the climax of the movement.

This observations lend support to an attentional model whereby the coordination of looking and speaking behaviour is governed by the momentary cognitive loading [3]. Looking away is most likely to occur at those moments when excessive internal loading through speech preparation or speaking activity is present. Similarly, the preparation of a speech-related gesture would increase this loading, thus increasing the likelihood of looking away.

It might be supposed that the capacity for cognitive loading is related for example, to the depth of depression, so that although the described structure is maintained, the course of the behavioural sequence may be retarded and the likelihood of occurrence effected.

The observed stability of the behavioural repertoire within each situation suggests that, for the dyadic interaction described, the gestural activity is somehow related to the psychological state of the participants and to the immediate social environment, in particular, to different partners. For the level of organisation chosen, the similarity in the dynamic quality and intensity of the illustrator hand movements during the situation together with the frequency of occurrence would appear to be the most relevant factors for an adequate description of the gestural activity. Comparative measurements over a longitudinal study using this type of description, should yield more information on the relationships amongst internal psychological state, immediate social environment and observable behaviour.

The event-triggered observation technique employed was found to be the most efficient and most economic in terms of time and effort. The application of time or event sampling [2], although of interest in many situations, would have proved inadequate for the type of analysis described here. The basic principle behind time and event sampling, namely the measurement of frequency of preselected behaviours, would have yielded data largely irrelevant to the point of interest, and would have failed to obtain much of the necessary information.

The problem of defining onset and offset points is, in the present analysis, reduced to the choice of a time interval which includes with certainty the behavioural components of interest. For the analysis of the temporal organisation of the structure of the behaviour patterns, the concept of "fuzzy boundaries" in the sense of ZADEH (1973) has been drawn on. Accordingly an arbitrary tolerance in the definition of points in time can be accommodated. The video protocolling and retrieval system (PRAVDA) was a prerequisite for this investigation. This system enables the efficient and economic handling of video software and the associated behavioural data.

In the work reported here, the application of event-triggered observation with the aid of the PRAVDA system has proved to be a suitable procedure for the recognition of various aspects of gestural behaviour, particularly in its relationship to other behavioural components. The facilities for repeated observation and visual comparison enable the human observer to exploit more fully his ability for pattern recognition.

Literature

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