LANGUAGE-RELATED HAND GESTURES IN CRIMINAL PSYCHOPATHS

By

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B.A., The University of British Columbia, 1984

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in

THE FACULTY OF GRADUATE STUDIES

(Department of Psychology)

We accept this thesis as conforming

to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

August, 1987

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ABSTRACT

Hand gestures were coded from videotaped interviews of male prison inmates divided into high (P), medium (M) and low (NP) groups based on the Psychopathy Checklist (Hare, 1980). Compared with other groups, psychopaths were found to make more beats (a type of nonreferential language-related gesture) when speaking about their family background but not when speaking about their criminal history. There were no group differences in the use of other language gestures or nonlanguage gestures. The results are discussed in terms of speech encoding difficulties that psychopaths may experience in relation to content that involves concepts or words that are abstract or emotion-laden. The results are consistent with language research, and suggest that psychopaths differ from others in the processing and use of language.

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ACKNOWLEDGEMENTS

I would like to acknowledge those who directly and indirectly aided in the completion of this project. Firstly, I thank those outside UBC, my parents, brothers and friends who have offered support and encouragement in all my academic endeavors. Secondly, I would like to thank those who contributed to this study: my committee members, Dr. Demetrios Papageorgis and Dr. Janet Werker, who showed interest in my research and offered helpful advice; Leslie McPherson, who planted the original seed; Karen Harlos, for her patience and skill in coding the gestures; all those who aided in collecting the videotapes; Adelle Forth, who was always willing to give me assistance; and Dr. John Yuille who has encouraged me through his interest in my ideas. Lastly, and most importantly, I would like to give special mention to my advisor, Dr. Robert Hare. I would like to thank him for his long term devotion to the area of psychopathy which in itself has been a source of inspiration for me and for his many contributions in this area, which make my research possible. I would also like to thank him for his continual support, encouragement and guidance with my research and my graduate training.

I. INTRODUCTION

> "... we are dealing here not with a complete man at all but with something that suggests a subtly constructed reflex machine that can mimic the human personality perfectly." (Cleckley, 1976).

There appears to exist among us a type of person who is devoid of the ability to feel love and concern for others and who acts without regard for societal rules and the rights of other human beings; this type of person is known as a psychopath.

As Cleckley points out in the above quotation, the psychopath mimics the human personality but yet is incomplete. He lacks elements that many of us feel make humankind so special, the elements through which most of us achieve fulfillment and happiness in life. Probably the most important of these elements is the ability to give and receive love. Undoubtedly, it is the common possession of such human "traits" that creates kinship and trust in society; it is also the perceived lack of such "traits" in the psychopath's character that makes him so alien and terrifying to others.

The psychopath, although somewhat alarming by character, does present as a fascinating clinical phenomenon and a growing body of research has been accumulating on the disorder. As a result of such research, there now exists a good descriptive understanding of psychopathy and also reliable means of assessing the disorder. However, although there has been great advancement in descriptive and

diagnostic areas, the etiological factors underlying the disorder continue to elude both researchers and clinicians.

Most would agree that the psychopath differs from other humans in a profound way. After encountering a number of psychopaths in his clinical work, Hervey Cleckley (1976) states, "I find it necessary first of all to postulate that the psychopath has a genuine and very serious disability, disorder, defect or deviation". Richard L. Jenkins (cited in Cleckley, 1976) feels "the defect relates to the most central element of the human personality: its social nature. The psychopath is simply a basically asocial or antisocial individual who has never developed the nature of homo domesticus". However, although the seriousness of the defect is realized, the causal mechanisms behind this disorder still remain a mystery. What factors, either inborn or encountered, serve to create such a personality?

One of the reasons why the etiological factors may be so difficult to uncover is the complexity of the disorder. Clearly, psychopathy is not a simple disease phenomenon which can be easily isolated and examined. As Jenkins points out, it involves the social nature of the individual, clearly a complicated area for study. The psychopath's social nature involves a cluster of personality and behavioral features, many of which hold their own mysteries.

The characterological deficits involve such phenomena as affect, conscience, and socialization, and at present our understanding of these is at best sketchy. Most would agree

that these phenomena are extremely complex, with a number of possible variables influencing and contributing to their development and maintanence. In addition, all of these variables bring with them multiple hypothetical models concerning how they operate and influence. Taken together, they form a rather large reservoir of possible etiological foundations for this disorder. Therefore, in investigating the etiology, there are a variety of aspects of the disorder that a researcher could focus on, as well as a variety of approaches that could be taken in focusing on any given area.

One may also question the fruitfulness of a search for the root of psychopathy. With so many possible influencing factors, there may be an "infinite" number of causal routes that result in this type of personailty, that is, multiple causation. However, although each psychopath displays his own idiosyncratic personality, the core personality features that have earned him this label are very consistent across all psychopaths. This does at least suggest the possibility of a commom genesis.

The search may also be considered hopeless simply because of the complexities that are involved. However, although the 'defects' stem from the deeper aspects of man's nature, and, although there are many aspects that can be explored, this does not mean that the actual cause must be as complex as its effect. The symptom cluster may stem from a simple causal factor that has been thus far masked by our lack of understanding of the human mind.

It would also seem that the benefits of new discoveries in this area make the effort involved in finding the etiology worthwhile. Given estimates that as many as 15-20% of the inmates in our prisons are psychopaths (Hare, 1986), it is clear that these individuals pose a threat to the safety of others and also are a considerable financial burden to society. Any findings will help us to have a better understanding of the psychopath and possibly point to ways to deal with, treat, or prevent this disorder. Any discoveries may also have the added benefit of increasing our understanding of many other social and psychological phenomena (e.g., emotion, consience, and guilt).

It would appear that the best or perhaps only way to obtain information concerning the causal mechanisms involved with this disorder is to continue collecting pieces of information which will hopefully fit together to solve the etiological puzzle. This study attempts to explore language function in psychopaths through an analysis of language-related hand gestures. It is hoped that the results will provide one of the pieces to this puzzle.

II. PSYCHOPATHY AND LANGUAGE

A. Language and the Search for the Cause of Psychopathy

Dubrul (cited in Massagatani, 1973) calls language man's integrated modality. Undoubtedly language involves the participation of a number of systems in the human brain. Wundt (cited in Bluhmenthal, 1973) felt that the study of human language was the most efficient route to knowledge concerning the human mind. If language anomalies do exist in psychopaths (as is suggested by clinical and empirical findings discussed below), a clear understanding of this phenomenon may provide clues, either directly or indirectly, about the causal factors underlying psychopathy.

Whether the area of language functioning will provide direct or indirect clues regarding etiology is dependent on the relationship between the language anomalies and psychopathy. There are three possible links between abnormal language behavior and psychopathy, each of which could potentially offer new insights about etiology.

The first possiblity is that language abnormalities are either directly or indirectly the cause of psychopathy. A hypothetical example of indirect causation would be that differences in the cerebral organization of language in psychopaths (as demonstrated in empirical studies) may somehow prevent the normal development of other more

emotion-laden facilities. In a more direct way, if language somehow guides thought and/or behavior, a faulty language system could be directly responsible for the problems in psychological and social functioning evidenced by psychopaths.

The second possible link is that language differences are "sister" symptoms to the disorder. In this case, language problems would not be directly related to psychopathy but would stem from the same underlying "problem", that is, a third variable. In this case, knowledge about language processing could provide another route to access this more general causal factor.

Finally, it may be that the language abnormalities are the result of psychopathy, that is, a symptom of the "disease". This would mean that specific deficits involved with psychopathy have interfered with or changed either the development and/or function of the language system. A hypothetical example of how this would operate is that because of defects in the affective system learning of language or processing was/is not carried out in the "normal" way.

The first step in investigating language function in psychopaths is to ascertain if language differences do in fact exist. As will be discussed below, this step is already underway and studies are revealing that anomalies do exist in the language function of psychopaths. With more research, a good understanding of exactly what these

differences involve should be obtainable. The second step would be to try and integrate these findings with both the phenomenology of psychopathy and our knowledge concerning the aspects of language function that are found to be affected in psychopaths. This information could then be used to discover what mechanisms are contributing to the observed differences and also which of the above three possibile language/psychopathy relationships exist.

B. Clinical Observations

The clinical literature is full of descriptions about how the psychopath uses language to manipulate, to lie, to boast and to make promises he never keeps. Most of these descriptions project an image of the psychopath as somewhat of a master of words, spinning yarns and creatively covering his tracks with clever responses; however, it is this author's experience that although the psychopath is often loquacious, his speech is problematic. The psychopath does demonstrate fluency but more in terms of a continual 'babble' about various topics and experiences, with fancy jargon thrown in to impress the listener. At an auditory glance the psychopath comes across as intelligent, confident and well spoken; but upon closer inspection it becomes readily noticeable that his speech appears to be characterized by a number of short, poorly integrated phrases, often joined by colloquialisms such as "you know" and "right". Also, as Cleckley (1976) pointed out, the

psychopath seems to have difficulty keeping a logical train of thought. He tends to skip from topic to topic losing sight of the focus of the conversation or question at hand. It is also noteworthy that the psychopath tends to put words together in odd ways and sometimes makes unusual phonetic errors.

Although the above descriptions of language use in psychopaths are based on clinical observations and are in need of empirical testing, they suggest that these individuals may be showing differences and/or difficulties in speech processing.

C. Empirical Studies

There does not appear to be any published research investigating speech processing in psychopaths, but Eichler (1965) did examine speech content in these individuals. In so doing he happened upon a finding that seems to bear some relationship to the above clinical observations. Psychopaths were found to use more retractions (putting two incongruent statements together) than did nonpsychopaths. An example of a retraction is, "My life has been boring, but I have had some pretty exciting things happen to me." This seems similar to the above description of the psychopath juxtaposing ideas and phrases together that are unrelated, only in this case they are incongruent. What the two phenomena point to is a lack of connectedness between thoughts or phrases of speech. Although

speculative, it may be that the psychopath lacks the ability to integrate " chunks" of language output. This may reflect an inability to retain the significance of what has gone before and/or an inability to move to a higher level of abstraction, to access and grasp the consistency, flow, and wholeness of the "storyline".

Although there is a lack of research on language production in psychopaths, areas such as language lateralization and the processing of language tasks have received some attention. The results of these studies, in line with the clinical observations, continue to point to anomalies in the language systems of psychopathic individuals. Hare and McPherson (1984), using a dichotic listening task, found evidence to suggest that language processes are less lateralized in criminal psychopaths in comparison which other criminals and noncriminals. Research employing a tachistoscopic procedure further revealed that psychopaths also show hemispheric differences in the processing of certain semantic tasks (Hare & Jutai, in press). The differences seem to emerge with more complex language tasks, such as semantic categorization, as opposed to simple word recognition. A study by Jutai, Hare, and Connolly (1987) investigating event-related brain potentials to speech stimuli again found that criminal psychopaths, in comparison to other criminals, show unusual linguistic processing, but again only during more complex linguistic tasks. Hare and Jutai (in press) outline a hypothesis

based on the above findings: they argue that the results indicate that psychopaths possess limited left hemisphere resources and that perhaps their left hemisphere is not as specialized for language processing as it is in the majority of individuals. We could surmise that limited left hemisphere resources could also be responsible for the aberrant speech characteristics of psychopaths.

There has also been some research looking at the affective and semantic aspects of language. Hare, Williamson and Harpur (in press) report a study that suggests that psychopaths may be more responsive to the denotative meanings of words than to the connotative aspects than is the case with other criminals. Williamson, Harpur, and Hare (1987) found that, unlike nonpsychopaths, psychopaths do not show behavioral (reaction time) or electrocortical (event-related potentials) differentiation between neutral and affective words during a lexical decision task. These results suggest that affective words do not have the same significance for psychopaths as they do for normal individuals. This hypothesis is consistent with the general lack of affective depth found in the psychopath. Although the psychopath "seems to experience petty states of pleasure, vexation, and animosity" he "fails to know all those more serious and deeply moving affective states which make up the tragedy and triumph of ordinary life..." (Cleckley, 1976, p. 230). The results of these two studies provide further evidence that psychopaths process language

differently than do other people. In relation to speech, the differences in processing of semantic and affective components of words in psychopaths may cause them to process speech differently or less adequately.

For a more extensive review of the language and psychopathy research see Hare et al. (in press.)

D. Summary

There are reasons to suggest that information on the language processes of psychopaths, in addition to creating a better descriptive understanding of the disorder, may provide clues concerning etiology. Clinical observation suggests that the psychopath exhibits differences and/or difficulties with the production of language. Although there is little empirical literature to back up this hypothesis directly, there is a growing body of language-oriented studies of pychopathy that are showing that psychopaths exhibit anomalies in many areas of language function, possibly because of limited left hemisphere resources. These studies suggest that there may be validity to the clinical observations and that the study of language production in psychopaths is worthwhile. The study reported herein was designed to investigate the clinical observations empirically, that is, to investigate if psychopaths do evidence differences and/or dificulties in the production of speech.

III. HAND GESTURES AND LANGUAGE PROCESSING

"Darwin had long ago observed that motor movements constitute a fertile and significant field of study" (Krout, 1935). One particular type of movement, hand gestures, has been used quite extensively to help unravel the mysteries of a wide variety of human phenomena. Hand gestures have been used to study such areas as psychopathology, communication, and culture, but probably their most widespread usage has been in the study of language processing. Hand gestures occurring during speech are believed by many to be related to the lateralization, encoding and planning of speech. These movements generally go unnoticed in our daily conversations, but they may provide important clues to the mechanisms underlying spoken language. This study employs hand gestures to aid in investigating spoken language processes in psychopaths. A review of some of the gesture/language literature will help to clarify why gestures are believed to be related to verbal processing and why they may be a useful tool to probe these processes in psychopaths.

A. Operational Definition of Hand Gesture

The term "gesture" has been applied to a wide variety of phenomena. In this paper the term will be operationalized as all hand movements that occur

spontaneously during conversation. Gestures occurring during speech can be categorized as language-related or nonlanguage-related based on whether or not they are judged to be associated with speech content and/or processing. For convenience the term 'gesture' alone will be used to refer to language-related hand gestures. Those gestures that are not language related will be referred to as 'nonlanguage gestures'.

B. The Link Between Gesture and Language

The most obvious reasons suggesting a link between language and hand gestures are that the majority of gestures occur during speech (Kimura, 1973a; Lickiss & Wellens, 1978) and that most gestures appear to be related in various ways to the discourse (McNeill & Levy, 1982). Kimura (1973a) also determined that hand gestures were not related to vocal activity in general, only to speech behavior. McNeill (1985) argues that gestures occurring during speech should be viewed as verbal as opposed to nonverbal behavior. He argues this point by discussing the close temporal, semantic, pragmatic, pathological, and developmental parallels between speech and gesture. Many researchers in the area feel that hand gestures stem from the same "internal processing system" as spoken language (Cicone, Wapner, Foldi, Zurif, & Garder, 1979; Dalby, Gibson, Grossi, & Schneider, 1980; McNeill & Levy, 1982) and therefore may provide a visual representation of internal language

(speech) processing. If this is indeed the case, hand gestures would provide an easily accessible route to an otherwise difficult domain. Whether or not speech and gesture are in fact this intimately tied together is still a matter of debate. Although research has not provided enough information to arrive at a firm conclusion concerning the exact nature of the relationship, all studies do support the notion that there is a strong link between speech and gesture. The following sections outline some of the research done in a variety of language-related areas.

1. Gestures and communication

Hand gestures are often classed as a type of nonverbal communication. Clearly, many hand gestures, particularly those that have representational value, do appear to have a communicative function. Several studies have found that subjects use more gestures when they are face to face with the listener than when they are not (Cohen, 1977; Cohen & Harrison, 1973; Mahl, 1961). However, evidence that the listener actually benefits from the addition of gesture has only been found for shape information (Graham and Argyle, 1975). Lickiss & Wellens (1978) investigated the communicative value of gestures for other descriptive information and found that the listeners who had access to both the verbal message and the accompanying hand gestures did no better at using the information to identify pictures than did subjects who had only access to the verbal

component of the message. If it is indeed the case that gestures do not actually improve the verbal message (with the exception of spatial information), there are two reasons why they may increase in face to face conversation. 1) It may be that speakers believe they are improving their message by gesturing and therefore intentionally increase their use of gesture when the listener is present; or 2) perhaps being face to face with the listener somehow creates the need for gestures to help relay the message. Lickiss & Wellens (1978) found that speech errors tend to increase in face to face conversation. Although speculative, this finding may suggest that the increases in gesture could be related to encoding difficulties induced by having a listener present.

It is worth noting that the above communication studies either did not specify the exact type of gestures studied or only looked at gestures with representational value. It is therefore not known if all speech-related gestures increase in face to face interactions. There are many gestures (e.g., beats) that occur during speech that do not have any clear communicative value, suggesting that gestures reflect more than simply an alternate communication channel.

There are also studies that have looked at additional communicative functions associated with gesturing, that is, functions of a more social/interpersonal nature. Rosenfeld (1966) found that gestures, along with smiling, increased

when subjects were instructed to try and seek approval from the listener in comparison to seeking disapproval. These results suggest that gestures may serve affiliative functions; however, the second part of his study did not confirm this. In part two Rosenfeld examined nonverbal behavior in relation to scores on an approval-seeking scale. He found that only smiling was significantly correlated with high 'approval seeking' scores. The lack of association between gestural use and high "approval seekers" implies that some other factor may have caused the increase in gestures in the first part of his study. Perhaps it was not that trying to gain approval increased gestures but that the trying for disapproval decreased gestural use through decreased language output. More research will be needed to determine if gestures do in fact serve affiliative functions.

In summary, evidence indicates that gesturing serves a communicative function but that gestures may also occur for other reasons.

2. Gestures and laterality of language function

Kimura (1973 a,b) observed that gestures were primarily made with the hand contralateral to the hemisphere dominant for language (as assessed by a dichotic listening task). This finding has been replicated by other researchers using larger samples of right-handed people (Dalby, 1980) and samples of young children (Ingram, 1975). All of these

studies found hand preference to be confined to language-related gestures; movements such as body manipulations (eg.scratching) were equally likely to be executed with either hand.

The hand preference findings have been interpreted in various ways. Kimura (1973a) feels that the dominance of the left hemisphere is probably not restricted to verbal processing but also includes "the execution of some classes of motor acts, to which symbolic meaning can be easily attached". Other authors, who see language and gesture as stemming from the same "central organizer" - an organizer that controls communicative functions (Dalby et. al, 1980)- suggest that this "organizer" exists in the left hemisphere and governs both speech and gesture. Kinsbourne and Hicks (1978) postulate a model based on the evolutionary development of communication in man. In this model, verbal communication was superimposed on the cerebral hemisphere that was first specialized for gestural communication, resulting in an identical cerebral basis for both speech and gesture.

Although studies of "normal" individuals have revealed a laterality effect, a number of researchers studying other types of populations have either not found this effect or have found differing patterns. However, these authors do not feel that these finding contradict the laterality results discussed above. They feel the differences reside in the type of subject studied. Urich (1980) reports that

in all manic-depressive patient groups that he has studied, including patients who were in symptom-free periods, he has found no evidence of a laterality effect for hand gestures. He suggests that these patients may have been predisposed to depression through irregular hemisphere organization. Feyereisen (1983), in a study of hand gestures in aphasics, found that only the anterior aphasics showed a hand preference; however, contrary to other findings, this preference was in favor of the left hand. This could be evidence of the right brain becoming more active in the linguistic process due to left hemisphere damage.

Adding to the complications in this area, some studies have shown that laterality of gestures is affected by cognitive style. Sousa-Poza, Rohrberg and Mercure (1979) found that subjects scoring high on field-dependence had a greater right-hand asymmetry for language gestures than did those scoring high on field-independence. They feel that there may be a relationship between "movement asymmetry and the use of visual imagery in the verbal encoding process".

There is also some evidence to suggest that only certain kinds of language-related hand gestures are lateralized. Sousa-Poza et al. (1979) found that right hand preference was limited to gestures they termed "representational" (relating to the content of the narrative). These authors feel that if laterality is limited to gestures that are symbolic, this would offer strong support for Kimura's theory that the left hemisphere

is specialized for motor movements to which symbolic meaning can be attached. However, the laterality/symbolism findings also could be interpreted to support theories that state that it is not the motor behavior per se that is lateralized but symbolic functions. McNeill and Levy (1982) have also found evidence for a less generalized laterality effect. They found that "iconic" gestures (their term for representational gestures) were made with either both hands simultaneously or with the right hand; they also found that "beats" (small rapid movements) occurred most often with the left hand. Although much more research on larger samples is needed, these findings show that future studies of laterality should perhaps employ a finer categorization of gestures.

In summary, although results are still inconclusive, there is some evidence that hand gestures (or at least some of them), like language, are cerebrally lateralized in the left hemisphere, suggesting a biological relationship between speech and gesture.

3. Gestures and aphasia

The study of gestural use in aphasics provides an opportunity to examine gestures in subjects who are known to have language deficits due to brain damage. As mentioned earlier, there is still much debate concerning the neurological tie between gesture and language. In the aphasia literature this debate centers around the

relationship between apraxic and aphasia disorders. Basically, there are two positions 1) That aphasia is a disorder of symbolic ability and therefore affects both nonverbal and verbal communication or 2) the association between aphasia and apraxia arises because the left hemisphere governs all complex motor movement and therefore damage to this area affect both types of motor behavior, speech and hand movement. The literature and theoretical interpretations covering these areas are beyond the scope of this study; however, it is realized that this line of research should be considered if one is going to formulate conclusions concerning neurological relationships between aphasia and gestures. (For a review of the apraxia/aphasia literature see Feyereisen & Seron, 1982).

Even without an understanding of the particular mechanisms involved, evidence that aphasics differ from others in gestural production would provide an initial clue to problems in language processing in normal individuals. In addition, such evidence may help to clarify the type of neurological relationship that exists between speech and gesture.

The aphasia/gesture literature consistently indicates that gestures occurring during speech are affected in aphasics, although the nature of the effects is not always consistent. Researchers have found that gestures decrease, increase or mimic the language defects evidenced by the patient.

Feyereison (1983) found that aphasics produced more language-related hand gestures than did nonaphasics. He argued against the interpretation that these additional gestures serve to aid in communicating the message; he pointed out that a number of gestures occurring during speech have no clear representational meaning. He feels that the increase in gestural activity is a sign of difficulties in the verbal encoding process.

There are some reports that effects on gestural activity depend on the type of aphasia suffered by the patient. Goldblum (1978; cited in Feyereisen & Seron, 1982) found that anterior (Broca's) aphasics had a higher gesture to word ratio than did other aphasics, other brain damaged patients, and normals. In contrast, Cicone et al. (1979) found that anterior aphasics produced less gestures than normals and that posterior (Wernicke's) aphasics produced more gestures than did either of these groups. Cicone et al. (1979) also examined the communicative value of the gestures and found that they closely paralleled the speech output abilities of the individual; that is, the gestures appeared to be as clear or unclear as the speech. They interpreted this as evidence for a "central organizer" for both spoken language and hand gestures.

The Cicone group also noted that the two groups of aphasics demonstrated different patterns of gestures. Posterior aphasic patients tended to use a lot of representational (or iconic) gestures, whereas anterior

aphasics tended to use a lot of nonreferential types of gestures. The use of referential gestures by anterior aphasics might suggest they rely on gesture to aid in communicating the meaning of their speech. The posterior patients may employ gestures for other reasons. Their gestures tended to occur at the initial boundaries of subordinate clauses; they may "bracket and preserve the integrity of conceptual planning units underlying sentence production" (Cicone et al., 1979). To further investigate this idea, Delis et al. (1979) examined temporal relationships between gestural initiation and speech in a group of posterior aphasics. They found that gestures "were more likely to arise at the initial boundaries of embedded clauses when they were semantically discontinuous with the main clause than when related to the main clause". Posterior patients were also noted by Cicone et al. (1979) to have difficulty carrying an idea across syntactic boundaries. They concluded that "gestures may signal underlying shifts in semantic intention, thereby reflecting difficulties encountered by the aphasics in maintaining a coherent stream of thought across syntactic boundaries".

In summary, the aphasia literature suggests that gestures provide important information about language behavior. It also suggests that with more research gestures may not only be able to act as a marker for underlying language problems but may also point to specific types of deficit. At this point in time the research is suggestive

of a link between language-related hand gestures and various aspects of the speech encoding process.

4. Gestures and speech planning and encoding

Many researchers have tried to obtain clues concerning the link between gestures and speech by examining where and when the hand movements occur. The findings suggest that gestures may be linked to rhythmical and/or cognitive aspects of the speech process.

i. Hesitation phenomena: A number of studies find a highly significant relationship between hesitations or pauses in speech and body movement (sometimes termed kinetic phenomena). Dittman and Llewellyn (1969) found that gestures reliably coincide with speech hesitation and generally follow the hesitation. These authors feel that hesitation phenomena are a signal of encoding difficulties. These difficulties create cognitive tension in the individual that builds and "spills over to the motor sphere". Ragsdale & Silvia (1982) also found a close relationship between vocal hesitations and kinetic phenomena but found that the gestures tended to occur just before a nonfluency as "if to telegraph a vocal hesitation", or simultaneously with the hesitation. They argue that this goes against the theory of a spillover into the motor sphere and supports the notion of parallel types of behavior stemming from a similar source with perhaps different controlling and operating features.

Clues to why gestures may be associated with pauses and hesitations can be found by examining studies that have looked into the function and/or reasons for hesitations. Many authors feel that pauses are a normal part of the speech process and they have used such phenomena to investigate how language is planned and processed (eg. Boomer & Dittman, 1962; Butterworth, 1975; Goldman-Eisler, 1958; Henderson et al., 1966; Maclay & Osgood, 1959). Hesitations are seen by some as the marking of encoded units of speech, and have been found to be associated with semantic, syntactic, and lexical aspects of speech. Gestures, by association with hesitation phenomena, often occur in conjunction with specific components of the encoding process.

Hesitations have also been found to increase in frequency with more complex linguistic tasks (Goldman-Eisler, 1968; Graham & Heywood, 1975; Reynolds & Paivio, 1968). We might surmise that the demands on the linguistic system are increased as task complexity increases, which would increase encoding difficulty (e.g. more difficult ideational and lexical decisions).

ii. Encoding difficulties: By implication, the hesitation literature suggests that gestures may be timed with normal speech encoding and they may also flag encoding difficulties. More direct evidence for a relationship between encoding difficulties and gestures can be found in studies looking at speech errors in relation to gestures.

Boomer (1964) reported that body movement was associated with speech disturbances. Jurich and Jurich (1974) found that gestures were significantly correlated with what they termed "editorial errors" (omissions, sentence changes, and incompletions) and not with articulatory errors. Their findings suggest that gestures are related to speech errors of a semantic or syntactic nature.

Evidence that gestures are related to encoding difficulties can also be found by examining the gestural behavior of individuals who appear to experience problems with encoding. As mentioned earlier, a number of studies have found evidence for a relation between language disorders (which would entail encoding difficulties) and changes in the frequency or type of gestural behavior. In addition, studies of gestural behavior in bilingual subjects report that gestures increase while the subject is speaking in the nondominant language (Marcos, 1979; Sainsbury & Wood, 1977). This increase in gestures does not appear to be the result of attempts on the part of the speaker to improve the communicative quality of his message. Marcos (1979) found that the increase of gestures did not involve representational gestures (which would indicate a communicative explanation) but rather with what he termed speech-primacy movements. These are short rhythmic movements that convey a beat-like quality and bear no relation to the content of the message. We might assume that speech is harder to encode in the nondominant language,

again pointing to a link between gestures and encoding difficulties.

iii. Encoding steps: Speech production undoubtedly involves a number of encoding steps such as ideational and imagery components, lexical and syntactic choices and phonation. There is some evidence that different types of language gestures may be associated with different aspects of the encoding process. Butterworth and Beattie (1976) found that representational gestures were linked to pauses and nonrepresentational gestures linked to phonation. The representational gestures appeared during pauses and therefore preceded the utterance. These authors conclude that "representational gestures are products of lexical preplanning processes and seem to indicate that the speaker knows in advance the semantic specification of the words that he will utter, and in some cases has to delay if he has to search for a relatively unavailable item". They hypothesize that gestures may occur first because there is a smaller repertoire of gestures in comparison to the repertoire of possible lexical items and decisions can therefore be made more easily. They further conclude from their findings that there are distinct types of language-related gestures. An additional conclusion is that nonrepresentational gestures appear to be occur more with the spoken product, which would point to relation with encoding steps during the flow of language.

Marcos (1979) also found that different gestures were

related to different aspects of the speech encoding process. He points out that these findings argue against a simple motor overflow hypothesis about why gestures occur.

iv. Cognitive content and demands: As mentioned above, hesitation phenomena have been found to occur with tasks that are inferred to be complex. An examination of gestural phenomena in relation to the cognitive complexity of the task shows more directly that gestures do increase during more difficult linguistic tasks. Marcos (1979), who reports more of what he called pointing movements with low imagery topics (e.g., love, friendship), suggests that gestures are "an active part of the cognitive processes such as the process of transforming ideas into words". Sousa-Poza and Rohrberg (1977; cited by Sousa-Poza et al. 1979) found evidence that certain types of tasks elicit different types of gestures. Concrete tasks, which would be similar to a high imagery task, resulted in the use of more representational gestures. Abstract tasks (low imagery) were associated with nonrepresentional gestures.

There have also been findings of a relation between gestures and more complex language structure. Freedman, Blass, Rifkin, and Quinton (1973) report that language gestures are embedded in syntactically complex language structure, and that nonlanguage gestures, such as body manipulations, occur with less complex language structures. Cicone et al. (1979), in their study of aphasics, also found that many gestures were embedded in deeply structures sentences.

C. The Function of Gestures in Speech Processing

It is clear that some hand gestures may serve a communicative function; however, because they occur when the speaker is alone, appear to be tied to temporal, semantic, and syntactic aspects of speech and do not always exhibit communicative value, one could wonder why they occur and if perhaps they serve some linguistic function. Are gestures simply by-products of speech, that is, a spillover into the motor sphere, or are they phantom-like remnants of an outdated communication system that continues to operate simultaneously with the verbal system because of motoric and neurological ties? Are they reflections of the subject's reaction to the social interaction or his reaction to the failings of his language processes? Or do they serve some function in regards to speech processing? Unfortunately, the answers to these questions are not known; however, some findings and hypotheses have offered some hints that gestures may in fact have a pragmatic linguistic function.

1. The effect of eliminating gestures

Some authors have cleverly tried to get at the possible function of gestures by restricting their usage and examining the effects. Lickiss and Wellens (1978) found that restraining the hands did not affect speech errors, which goes against the argument that gestures are a necessary aspect of speech processing. Graham and Heywood

(1975) noted that the elimination of gestures led to an increase in the use of phrases describing spatial relations and to an increase in the total time spent pausing, but to a decrease in the use of demonstratives (e.g., "there", "like this"). The increase in spatially-oriented language would indicate that gestures often take the place of this type of content;as described above gestures do increase the listener's understanding of messages involving spatial information. The type of demonstratives studied (e.g., "like this") suggest that these words or phrases were used to direct the listener's attention to a gesture which was elaborating on what had been said previously. Therefore, eliminating gestures reduced the need for this type of phrase. Although these two finding appear simply to point out the communicative function of some gestures, the increase in pause time does suggest that the subjects found the speech task more difficult without gestures. Cohen (1977) also found evidence to support the notion of a facilitative function for gestures. Subjects asked to practise giving directions three times prior to actually doing the task used successively fewer gestures on each trial. It would appear that the gestures helped them to plan and encode what they would say but were not needed as much as the subjects became familiar with the topic.

2. Gestures and an organizational role

Freedman et al. (1973) postulate that the rhythmic timing of kinesic phenomena establish for the speaker

"boundaries and coherent chunks of thought out of a continuous flow of verbal utterance". A possible facilitative role for gestures could then be that they aid in organizing the thought behind, or the syntax of speech by concretizing ideas or syntactic units in space. This would explain why gestures so often occur at boundaries of syntactic or ideational units of speech, for example during pauses or at the beginning of clauses. As discussed earlier, gestures have also been found to be associated with more complex language structure, which would likely involve more cognitive organization. Gestures would then be an outward expression of inward cognitive structuring of the message. Perhaps this external "marking and organizing" would help some people to organize their thoughts, particularly if they have trouble with thinking abstractly. Organizing externally could also serve to eliminate some of the many demands placed on internal systems during speech, leaving more "room" for other encoding aspects. This would be most likely to occur with systems that have less resources for speech processing.

It can then be presupposed that subjects who have difficulty organizing their thoughts will use a lot of hand gestures. There is some evidence that this may be the case. Freedman and Hoffman (1967) found that the use of language gestures was increased when two psychiatric patients were in an acute phase and were evidencing poor organization of thought processes. They feel that gestures may be windows

to the degree of organization of thought and could be used to map disease process and/or steps toward recovery .

4. Gesture and the meaning behind speech

There are also theories that suggest that " people may use their bodily activity to facilitate the meaning of word symbols" (Miller, 1963). Barasso, Freedman, Grand, and van Meel (1978) state that gestures may "serve to reactivate a decaying image or enhance an as yet unclear visualization and hence facilitate encoding". Similar to the idea mentioned above of concretizing the syntactic structure, the movements may help to concretize the ideas or images and thereby aid in converting these to symbolic form, that is into spoken language.

The idea that gestures facilitate speech in semantic ways is an intellectually interesting one. Perhaps the increased time spent pausing when gestures are eliminated is due to the speaker finding it difficult to make lexical decisions without the aid of gesture. As was reported by Butterworth and Beattie (1976), representational gestures are emitted before the utterance and therefore may actually aid in forming the ideas into the spoken word. Some aphasics, as reported by Weisenburg and McBride (1935: cited in Miller, 1963), can say or read a word only after acting out a related motoric action (e.g., for scissors- a cutting motion). Representational gestures paint a concrete picture of the meaning of the message in front of the speaker and therefore may invoke easier access to a possible lexical

choice or a specific word or phrase that the speaker has in mind. Perhaps the gesture triggers associative bonds between the action or picture created and the word symbol, thereby bringing it to mind.

The idea of descriptive-like gestures giving aid through meaning-oriented channels seems plausible; however, could it be possible that nonrepresentational gestures also operate through these channels? Perhaps there is something about motoric movement alone that enhances the more semantic aspects of speech encoding. The results of a study by Miller (1963) are consistent with this possibility. He found that concurrent activity had the effect of increasing the maintenance of word meaning when a word was repeated over and over. If the reader is unfamiliar with this phenomenon than simply repeat any word over and over and note that after many trials the sounds become meaningless. If the movement was similar to the word (as would be the case with representational gestures) Miller found that the effect was greater than it was for other movements; however, it appeared that nonrelated movements also increased maintenance of meaning. If this is the case, then even nonrepresentational movements could ameliorate speech processes by enhancing meaning. These effects could operate at different stages of the encoding process. The occurrence of gestures in relation to syntax may reveal that the movement helps preserve the meaning of the message across syntactic boundaries (as suggested by Delis et al., 1979) or

while the next lexical decision is made. In general, hand gestures may also help in finding the next word or phrase regardless of whether they have representational value. Many of us have snapped our fingers, tightened hand muscles, or groped in space as though this would have the magical effect of making the desired word come to us. Perhaps this is indeed what happens. Many of us have also tensed our bodies while concentrating intensely on a task as if this somehow increases mental capacity. Although one could come up with alternate explanations of why these motoric correlations occur, the facilitation hypothesis is a possible explanation.

Although this is a fascinating possibility, it still does not indicate how nonrepresentational motor movement could actually serve to facilitate mental processes. One possibility is that motor movement somehow causes the entire brain to become more active. However, this would not explain why hand gestures are the motoric method "of choice" to facilitate speech processes. Perhaps it is the close neurological ties between speech and gesture, or the relatively large division of the cortex devoted to the hands, that make this type of movement the most efficient at speeding up linguistic processing.

D. Gestures and Intraperson States and Traits

Although the focus of this section is on the relation between gesture and speech, it will be useful to investigate

some of the other gesture literature concerning intraperson variables; these findings cannot be ignored if one wishes to make inferences about gestural usage. What is apparent about these studies is that they rarely contradict, and often serve to complement language-based theories of gestural activity.

1. Gestures and anxiety

Clinicians and researchers have long been interested in nonverbal behavior and the messages it can relay to the clinician about the client's emotional state. Jurich and Jurich (1974) found that language-related hand gestures were related to indices of anxiety, and Sainsbury (1955) noted that gestures increased with planned stress periods in interviews. Anxiety has also been found to have a negative effect on speech efficiency (Dibner, 1956; Kasl & Mahl, 1965; Mahl, 1956; Ragsdale, 1976; Reynolds & Paivio (1968); Wiens et al., 1980). Speech errors and hand movements are often seen as indications of underlying anxiety. It could be surmised from these findings that gestures are directly related to increased arousal levels. However, there is another explanation: it may be that the increase in gestures is mediated by speech encoding difficulties spawned by the anxious state. The anxiety may interfere with speech processing by drawing attention and concentration away from the speech task. Anyone who has experienced public speaking anxiety has been witness to the problems it causes with both concentration and speech. Therefore, in applying this

hypothesis, gestures would be related to arousal but only in an indirect way. There is also research that suggests that it is the nonlanguage gestures that are most closely linked to emotional and attentional factors (Barasso et al., 1978; Freedman, O'Hanlon, Oltman & Witkin, 1972; Muller & Chambliss, 1980; Wiens et al., 1980).

2. Gestures and cognitive style

Another interesting line of work involves the relation between gestures and cognitive style. Freedman et. al. (1972) found that field dependent subjects used more of one type of language hand gesture (ie. motor primacy movements) than did field independent subjects. They feel that field dependent people have difficulty "articulating thoughts from an experiential mass" and that the gestures are therefore outward symptoms of problems with representing and encoding thoughts into words. I noted earlier that the cognitive complexity of the stimulus can affect encoding difficulties and increase hand gestures; now we have the added possibility that cognitive style may also create similar difficulties and yield similar gestural increases.

3. Gestures and negative content and affect

Freud (cited by Freedman et al., 1973) "viewed the motor channel as a major pathway in the expression of aggression and he described clinical phenomena such as resistiveness and negation which revealed themselves motorically." Sainsbury (1955), in addition to noting that gestures increased during emotional topics, found that

gestures increase when an utterance expressed disturbed feeling, particularly feelings of resentment. Similarly, Wiens et al. (1980) found that the use of language-related hand gestures was related to the expression of negative affect. Freedman et al. (1973) also found such a relation, with the additional finding that both language and nonlanguage gestures were related to negative affect but in different ways. They found a strong relation between certain types language gestures and overt hostility. Certain nonlanguage gestures were found to be correlated with covert hostility. Although these findings could be interpreted to indicate that gestures are linked to negative emotion, there are alternative explanations. The Freedman group did not focus on the affective aspect of their findings. They feel that the gestural correlates reflect the ability to encode "hostile promptings" into the spoken word. They interpret their hand gesture data in terms of encoding factors, and they suggest that gestures are "reflections of psychological structure on the kinetic level."

Freedman and his associates noted that they could not find anything apparent in the hand gestures themselves that appeared to be related to aggression. Given this, it is difficult to imagine a direct reason why negative speech would cause an increase in hand gestures. It is possible that it is the arousal evoked by the message that causes an increase in gestures by stimulating motoric channels. This

would not explain, however, why overt and covert hostility would elicit different types of movements, that is language versus nonlanguage. The fact that the language-oriented gestures occurred when the hostility was verbalized suggests that language processing may have been a mediating factor. The effects could be similar to anxiety and a similar hypothesis could be applied. The negative subject matter may have caused inner tension and disrupted the encoding process. The subject's concentration could have been disrupted by emotional factors associated directly with the feelings he has about what he is saying, or by having to speak in a "not so nice way" which may invoke guilt or a desire to assess the impact of the message on the listener. In either case, attention would be taken away from speech, making encoding more difficult and thus causing an increase in hand gestures.

4. Summary

The results of studies examining the relation of gestures to various intraperson states and traits do not conflict with other explanations for language-related hand gestures, but they do indicate that emotional factors can play a role in the verbal and nonverbal commmunicative process. This is not a surprising finding; as discussed earlier, language functions are likely affected by a number of psychological systems .

E. Overall Summary

The above discussion of only some of the hand gesture literature reveals that it is a complex and fascinating area. It is also clear that much more research is needed before we will understand the exact nature of speech/gesture relations. Based on the research done thus far a number of tentative conclusions can be reached:

1. Gestures and speech may have a similar neurological base.

2. Gestures are connected to rhythmical, syntactic, and semantic aspects of speech.

3. Gestures appear to have a communicative function but may also be intimately tied to speech encoding processes and difficulties.

4. Gestures may serve to facilitate the encoding processes at various levels.

5. Gestures appear to be linked to the cognitive or ideational processes underlying speech and also to the cognitive style of the individual.

6. There appear to be distinct types of language-related hand gestures that may be tied to different aspects of speech processing.

7. Gestures have been found to be associated with emotion, arousal and the affective content of speech; however, these finding do not contradict the notion of a link between speech and gesture and in some cases serve to complement it.

All of these conclusions are consistent with a strong link between speech and gesture, and they support the notion that gestures are a visible means of accessing processes behind spoken language.

IV. GESTURES AND SPEECH PROCESSING IN PSYCHOPATHS

An examination of the gesture literature suggests that gestures may provide an excellent opportunity to look for language anomalies in psychopaths. Some of the findings seem to bear directly on the clinical observations of the spoken language of psychopaths. For example, gestures appear to be related to the encoding process, phrase length, and as shown in the aphasia literature, to the continuity of thought carried between phrases.

If psychopaths differ from others in the way they process speech, a possible cause of this may be that psychopaths have less left hemisphere resources for language. The lack of resources may cause them to have difficulty with processing or may dictate that speech encoding must be carried out in a different way. The gestural literature taps into the resource idea by revealing that gestures are found to increase with greater demands on the language system (e.g., with more complex content and syntax; when speaking in a nondominant language). It was also suggested above that the heavy use of gestures in relation to organization of thought and syntax may serve to alleviate some of the demands on the language system by externalizing some encoding aspects. The relation between gestures and linguistic demands suggests that people with limited language resources would show a pronounced increase in gestural activity when task demands are great.

An integration of the language/psychopathy findings and the gesture/language literature would suggest that psychopaths should show heavy use of language-related hand gestures.

It is also worth noting that ties between language, cognition and gesture reveal that hand gestures and language exploration may provide a good deal of information concerning the central processing of an individual. If language itself is not a key factor in the etiology of psychopathy these studies would suggest that it may open the door to more central processing factors and thereby to the possibility of getting at other possible etiological mechanisms.

To date there has been little investigation of hand gestures in psychopaths. Rime, Bouvy, Leborgne and Rouillon (1978) found that psychopaths used more hand movement than did nonpsychopaths. However, they were studying gestures as nonverbal behavior and therefore did not distinquish between language-related and other hand gestures. Gillstrom and Hare (in press) did distinguish between language and nonlanguage gestures and found that psychopaths used a particular type of language-related hand gesture (beats) more than did other criminals. The psychopathic group did not differ from the nonpsychopathic criminals in the frequency of nonlanguage hand gestures. Many of the aforementioned studies of hand gestures have not looked at different types of language-related gestures and so the

exact significance of beat gestures is not clear. Beats are small rapid movements that are not related to the content of the dialogue in any obvious way. Studies that have looked at them alone or in conjunction with other nonrepresentational gestures suggest that they are related to the encoding process. Freedman et al. (1973) placed these types of gestures in a category called speech primacy movements as opposed to motor primacy movements. These authors believe that this category of gesture is the one most intimately tied or phased with speech. McNeill (1985) argues that beats may represent demarcation of discourse into functionally discrete units. If this is the case, an increase in beat gestures may indicate that psychopaths process speech in small conceptual units. McNeill also feels that beat gestures mark meta-linguistic points in the breakdown of the speech process and that they are perhaps attempts to reinstate speech flow. This would suggest that psychopaths experience encoding difficulties. Further evidence for this is that beats are the type of gestures that increase when individuals are speaking in a nondominant language and are likely experiencing encoding difficulties (Marcos, 1979). Although all gestures increased in the patients suffering acute phases of mood disorder studied by Freedman and Hoffman (1967), beat-like gestures showed the most dramatic increase. This points to the added possibility that psychopaths have difficulty organizing their thoughts and/or speech. In summary, the increased

usage of 'beats' found by Gillstrom and Hare (in press) is suggestive of possible differences and/or difficulties in the processing of spoken language in psychopaths, thus lending support to the clinical observations.

Concerning laterality of gestural behavior, Gillstrom and Hare found an overall right-hand bias in both psychopaths and nonpsychopaths for all gestural categories, although the psychopaths did show a tendency for more left hand use for beat gestures. This trend may be indicative of some kind of speech processing asymmetry in psychopaths.

V. PURPOSE OF THE PRESENT STUDY

The purpose of the present study was to replicate the Gillstrom and Hare (in press) findings and to determine if hand gestures can provide additional clues to language processes in psychopaths. Based on both theoretical and empirical foundations it can be predicted that psychopaths should show heavy use of language-related hand gestures. As is suggested by Gillstrom and Hare the increase may be limited to beat gestures.

The study was also designed to provide further data on the issue of cerebral organization of language in psychopaths. As discussed above, divided visual-field and dichotic listening studies have suggested that language may be less lateralized in psychopaths than is the case in other individuals. Examination of hand preference while gesturing may provide information relevant to this issue. Although it is still not known if all language gestures are lateralized, all studies found that iconic (representational) gestures are most often made with the right hand in individuals assumed to have language processes in the left hemisphere. If psychopaths are less lateralized for speech processes we would expect them to show less of a right hand preference for iconic gestures than is shown by other criminals .

VI. METHOD

A. Subjects

The subjects were selected from a pool of 125 male prison inmates who had volunteered to participate in several research projects and who also consented to have their institutional files inspected. Two investigators, using information from both case history files and a semi-structured interview, independently completed the 20-item Psychopathy Checklist (PCL) for each inmate. The PCL, described in detail elsewhere (Hare, 1980, 1985a,b), is a reliable and valid instrument for the assessment of psychopathy in criminal populations. Each item is scored on a 3-point scale (0, 1, 2) according to the extent to which it applies to the inmate; the total score can range from 0 to 40. Interrater reliability and coefficient alpha are typically above .85. The ratings of each investigator were averaged to obtain the final PCL score for each inmate. The mean PCL score for the entire pool was 24.0 (*SD* =7.5).

The PCL (20 item) is a revised version of an earlier more extensively used 22 item psychopathy checklist. Hare (unpublished data) has found that the two versions have very similar psychometric properties and that they are highly correlated ($r \geq .90$). In the present sample the correlation between the 20- and 22-item versions was .96.

There is some evidence to suggest that gestures are affected both by culture and/or language spoken (e.g., Graham & Argyle, 1975; Sainsbury & Wood, 1977). A number of

exclusion criteria were therefore used to limit the possible effects of these variables. In order to be included in the present study the inmate had to be Caucasian, born in Canada, and had to have English as his first language. In addition, an inmate had to be right-handed (as determined by a handedness questionnaire, Annett, 1970) in order to provide a more homogeneous sample for the study of possible laterality effects. A total of 56 subjects met these criteria. The mean PCL score for this subsample was 25.5, (SD=7.4.)

These 56 subjects were then divided into three groups based on their PCL-20 score. Those scoring above 30 were defined as psychopaths (Group P; N=18), those with scores between 21-30 as "mixed" (Group M; N=20) and those scoring 20 and below as nonpsychopaths (Group NP; N=18). The cut-off criteria conform to those suggested by Hare (1985b). The mean PCL score for groups NP, M, and P was 16.7 (SD = 3.1), 26.1 (SD =2.5) and 33.5 (SD = 2.9), respectively. The mean age for Groups NP, M and P was 31.7 (SD = 8.1), 30.9 (SD = 7.0) and 27.8 (SD = 8.2), respectively. Mean years of formal education for Groups NP, M and P was 9.4 (SD = 2.1), 9.4 (SD = 2.28) and 8.4 (SD = 2.12). There were no significant group differences in age, $F(2,53) = 1.14$, $p = .3$, or education, $F(2,53) = 1.33$, $p = .3$.

B. Procedure

The interviews used to assist in the assessments of psychopathy were videotaped. The interviewer sat in front

of the inmate, but slightly off-center. The video camera was located 3 meters behind the interviewer in such a way as to provide a clear front view of the inmate, who sat at the other end of a small table.

Two segments of the interview were analyzed, one in which the subject answered questions concerning his family life as a child, and the other in which he was questioned about his criminal history and his present offense. These particular segments were chosen for two reasons: (1) Both segments are usually successful in getting the inmate to talk freely; (2) The segments tap somewhat different types of content, and it was therefore possible to evaluate the effects of content on gestural behavior. The family-life segment was felt to be more people-oriented and would correspond to the low-imagery, more abstract conditions that have been used in other studies. The criminal activity segment was assumed to be more action- oriented and concrete, and likely involved more potential for imagery. Ten minutes were sampled from each of the two segments for a total of 20 minutes of conversation with each inmate.

The gestures were coded by the author, who was blind to group membership. A second investigator coded a random sample of 20 inmates to assess the reliability of the coding system.

All movements made by the inmates' hands were coded. First, the hand (left, right or both) involved in the movement was recorded and then the movement was classified

into one of six categories (three language and three nonlanguage). The coding system was the same as that used by Gillstrom and Hare (in press) with the addition of one language gesture category.

The nonlanguage categories were body manipulations, object manipulations and postural movements. Body manipulations involved any type of scratching or rubbing of a body part (e.g., pulling one's beard). Object manipulations were those movements where the subject actively moved touched or 'fiddled' with an external object (e.g., playing with a pencil). This category also included movements related to smoking. Postural movements were any changes in arm location, including stretches but excluding movements that occurred as part of another gesture.

As indicated in the literature review, there are several distinct types of language-related hand gestures. They differ in form, associative aspects, and inferred functional roles. Although different names are often used to identify gesture types, most researchers use similar grouping strategies; they differ in terms of how finely they subdivide them and in the rules used to make the finer distinctions. In this study language gestures were divided into three types: iconix, beats, and designators.

Iconic gestures (termed used by McNeill & Levy, 1982) are the easiest to describe and to identify. They are related to the content of speech in a direct way. They appear to be intentional and serve to complement or add

information to what is being said. For example, the subject may use his hands to depict a spatial relationship, point to concrete object or person present, paint a picture, or reanact human movement. He may hold his hand up high while saying that the man he robbed was very tall, or pretend to be holding a steering wheel while describing a high speed chase. To decide if a gesture fitted this category, the rater asked herself if the motion told her something about what was being said. Other terms that have been applied to this type of gesture are motor primacy movements - representational subtype (Freedman et al., 1973; Marcos, 1979) and gesture (Butterworth & Beattie, 1976). In the Ekman and Friesen (1969) coding system this category would cover four of the six Illustrator categories (namely, Deictic, Spatial, Kinetographic, and Pictographic movements).

The remainder of the language gestures were divided into two categories, beats and designators. The literature is less clear concerning these types of movements and they have been classified in various ways by different researchers. In some studies they have been simply left as one category of miscellaneous nonrepresentational gestures. The key divisionary factors used in this study are intentionality (the speaker appears to have moved his hand on purpose) and relatedness to speech content.

Beats (name used by McNeill & Levy, 1982) are small rapid movements which appear to be nonintentional. The hand

simply springs to life and then rests again. They also appear to bear no relation to what is being said other than that they occur during speech and possess a rhythmical relation to the speech. It is difficult to tell from their gesture descriptions if various authors are referring to this type of gesture, but it would appear that beats are the same as the speech primacy movements (more particularly the subcategory of punctuating movements) described by Freedman et al., (1973) and by Marcos (1979). In Ekman and Freisen's coding system beats would be coded in their category of 'batons'. It is important to note that although the term 'beats' is applied, gestures which were used to intentionally "beat out the rhythm" were not classified in this category; they were intentionally carried out and therefore were placed in the last category of nonrepresentational gestures, designators.

Designators encompass a wide variety of movements. They appear to be intentional and do seem related to the discourse in both rhythmic and metaphoric ways. As the term implies, these gestures serve to designate or accentuate a particular word or phrase. The relation to the discourse is more abstract than is the case with iconic gestures. For example, while the subject makes a statement, he may hold his palm out as if to hand the listener the idea. He may hold his hand in the air and move it into various positions as he speaks as if to designate objects and ideas in space or he may hold both hands out as if to metaphorically hold

the thought he is trying to get across to the listener. In the Gillstrom and Hare (in press) study these gestures were categorized into either the iconix or beat categories for various reasons; however, to help purify the categories. I now feel that they should be put into a category of their own. With regard to intentionality and relatedness to content, these movements seem to fall in between iconic and beat gestures. Various designators have been called Ideographs and Baton movements by Ekman and Friesen (1969), Metaphoric and Mathematical Gestures by McNeill and Levy (1982), and Pointing and Groping Movements by Marcos (1979).

Both raters found it difficult to differentiate between beats and designators for some individuals. Some movements appear to start unintentionally, but once the hand springs to life it is employed in a more structured and intentional way. Although these could be seen as a combination of beat and designator, they were classed as designators unless there was a clear break between the unintentional and intentional components, in which case, the movement was viewed as one beat and one designator. There are also rapid movements where the hand springs to life and moves to a more elevated level than is found in the average beat gesture, and it is unclear if it is actually designating an idea in space. In these cases, the rater categorized the gesture based on whether it was felt to be intentional (designator) or nonintentional (beat).

It was difficult to draw clear parallels between my

beat-designator distinction and the categories used by other investigators. Comparisons are difficult because other coding systems do not use an intentionality dimension to classify gestures (although Freedman et al.'s (1973) distinction between speech primacy and motor primacy movement may reflect a similar idea). The intentionality dimension was intended to classify gestures on the basis of conscious control, a dimension which I felt would help to interpret the findings.

My coding stategy results in very pure categories for beats and iconix but, unfortunately, a rather large mixed category for designators. In future research it may be useful to define subtypes of this category.

If speech gestures are linked to language processes, they will likely be affected by the quantity of verbal output. Therefore, the number of words spoken by each subject in both segments was tallied to ensure that no significant differences occurred across groups.

VII. RESULTS

A. Inter-rater Reliability for Gestural Categories

The coding procedure for hand gestures was reliable across the two raters. Only two categories had an interrater reliability of less than .9; these were iconic gestures (r = .84) and the "both hands" category. (r = .60).

B. Gestural Use by the Entire Sample

Table I shows the mean gesture use for categories, hands, and segments pooled across groups. Designators, which subsume many kinds of gestures, were used most often, followed by beats and iconic gestures. There was great variablity in the number of gestures used across individuals. The designator category was the most variable.

Language and nonlanguage gestures showed similar hand use; in both categories, the right and left hands were used with relatively the same frequency and were each used twice as often as "both hands".

The use of nonlanguage gestures did not vary across segments. In contrast, language gestures were used more often in the crime segment than in the family segment.

Table I

Summary of gestures used by the entire sample

Category	M	SD
Language Gestures		
Total language gestures	84.3	71.3
Beat gestures	25.0	19.4
Designator gestures	46.6	50.6
Iconic gestures	12.7	13.6
Right hand	34.0	34.1
Left hand	33.0	33.6
Both hands	17.3	20.8
Family segment	36.9	33.5
Crime segment	47.4	43.5
Nonlanguage gestures		
Total nonlanguage gestures	72.8	37.3
Body manipulations	32.1	19.1
Object manipulations	19.7	18.9
Posture changes	21.0	16.2
Right hand	26.7	17.9
Left hand	31.3	24.7
Both hand	14.8	10.8
Family segment	35.8	20.1
Crime segment	37.0	20.4

Note. N = 56.

The correlations between the various gestures are presented in Table II. The subcategories within each of the larger language and nonlanguage categories were highly correlated with one another; individuals tended to be consistent in their use of hand gestures within the language and nonlanguage categories (with the exception of the object and posture nonlanguage categories). The small correlations between the language and nonlanguage categories may suggest that increases in language gesture usage are not simply due to a tendency to move in general.

Table II

Correlations between gesture categories

	1	2	3	4	5	6	7	8
1 Beat	-	.42**	.35**	-	.02	-.01	.01	.01
2 Desig.		-	.69***	-	.01	.04	.13	.08
3 Iconix			-	-	.16	.13	.11	.18
4 Language				-	.04	.05	.12	.07
5 Body					-	.24*	.48***	-
6 Object						-	-.01	-
7 Posture							-	-
8 Nonlang.								-

Note. df = 54. * p<.05; ** p<.01; *** p<.001.

C. Results of Statistical Analyses

For the purposes of the analyses, the three gesture categories not related to language were summed to form one nonlanguage category. The gesture literature has demonstrated that various types of language-related gestures differ from one another in form, use, and function; each of these categories (beats, designators, iconix) were analyzed separately. For each gesture category a 3x3x2 factorial analysis of variance was performed, with group (P, M, NP) as a between factor and hand (left, right, both) and segment (family, crime) as within factors. In order to have an equal number of subjects in each group, two subjects were randomly dropped from the middle group yielding 18 subjects in each group.

1. Beats:

A summary of the use of beat gestures across groups is presented in Table III. The ANOVA revealed a group effect, F (2,51) = 3.35, $p < .04$. Tukey HSD pairwise comparisons (described in Glass & Hopkins, 1984) indicated that group P used significantly more beat gestures than did either group NP or Group M ($p<.05$). Groups NP and M did not differ from one another. This replicates the findings of Gillstrom and Hare (in press). However, in this study a Group x Segment interaction was also obtained, F (2,51) = 3.10, $p < .05$. The interaction is depicted in Figure 1. Examining the

simple effects of group at each level of the segment factor revealed a significant group effect for the family condition, F (2,51) = 4.64, $p < .01$, but not for the crime segment, F (2,51) = 1.45, $p = .24$. Tukey HSD tests indicated that only groups P and NP differed significantly ($p<.05$). Group P used significantly more beat gestures than did group NP in the family segment.

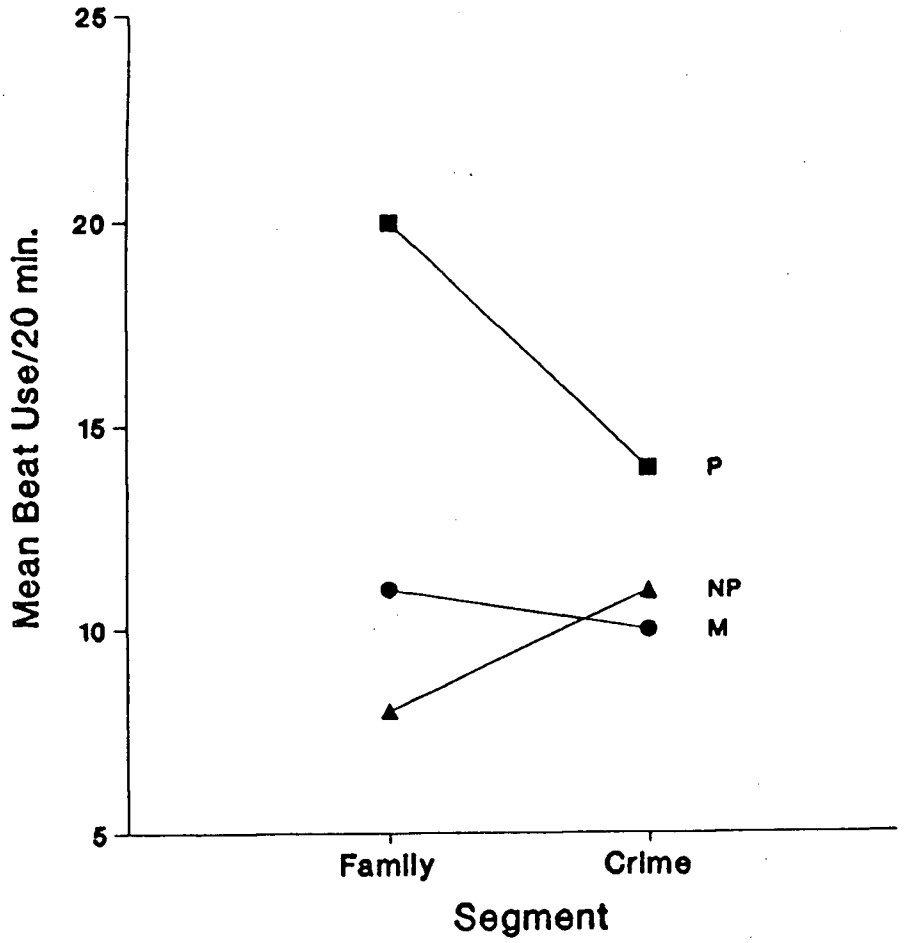

Figure 1. Group by Segment interaction for beats

Table III

Mean number of beats used by each group

	Group NP		Group M		Group P	
	M	SD	M	SD	M	SD
Total Beats	19.8	16.0	20.6	18.7	34.3	21.7
Right hand	6.4	6.7	10.7	13.1	12.4	11.6
Left hand	8.1	11.9	5.6	3.9	16.8	14.4
Both hands	5.4	6.4	4.2	6.4	5.1	5.8
Family segment	8.2	6.4	11.3	10.9	19.5	15.4
Crime segment	11.6	10.7	9.3	8.3	14.8	10.3

Note. N = 18 in each group.

The ANOVA also showed a significant overall hand effect, F (2,50) = 13.2, $p < .001$. Tukey HSD tests revealed that both the right and left hands were used more often than "both hands" ($p<.05$).

There was also a Group x Hand interaction, F (2,50) = 3.30, $p < .01$. The main interest was in the use of the right hand relative to the left hand in each group. Tukey HSD tests showed that only the M group showed a difference between right and left hand use; group M used the right hand significantly more often than the left for beat gestures ($p<.05$). In contrast to Group M, both groups P and NP showed a trend towards a left hand preference for beats.

There was no overall segment effect F (2,50) =.66, p=.42, and no Segment x Hand interaction, F (2,50) = .55, p = .58.

2. Designators

The mean number of designator gestures used by each group is presented in Table IV. Although group P made more of these gestures than did either of the other groups the difference was not significant, F (2,51) =1.43, p = .25. There also were no Group x Hand, F (2,50) =1.89, p = .12, or Group x Segment, F (2,51) = .43, p = .65, interactions.

Table IV

Mean number of designators used by each group

	Group NP		Group M		Group P	
	M	SD	M	SD	M	SD
Total Designators	33.2	32.9	49.0	62.6	61.7	51.7
Right hand	12.4	15.1	20.0	31.5	23.2	21.1
Left hand	15.8	19.4	15.3	20.3	28.9	29.1
Both hands	5.0	4.6	13.7	22.5	9.6	11.0
Family segment	10.9	12.1	21.3	26.5	28.4	24.2
Crime segment	22.3	24.1	27.7	37.6	33.3	33.9

Note. N = 18 in each group.

There was a main effect of segment, F (1,51) = 6.15, $p < .02$; significantly more designator gestures occurred in the crime segment (M = 27.8) than in the family segment (M = 20.2). There was no Segment x Hand interaction, F (2,50) = .28, p = .76.

A main effect of hand was significant, F (2,50)= 14.6, $p < .001$. Tukey HSD tests revealed that both the left and right hands were used more than were "both hands" ($p<.05$); there was no difference in right and left hand use.

3. Iconix

The mean number of iconic gestures used by each group is presented in Table V. Although Group P made more iconic gestures than did the other groups, the differences were not significant, F (2,51) = 2.29, p = .11. There was also no interaction between group and segment, F (2,51) = .18, p = .84, or group and hand, F (2,50) = .8, p = .53.

There was a significant main effect for segment, (F(2,50)=10.51, $p < .002$, with more iconic gestures occurring in the crime segment (M = 8.4) than in the family segment (M = 4.5).

Table V

Mean number of iconic gestures used by each group

	Group NP		Group M		Group P	
	M	SD	M	SD	M	SD
Total iconix	9.1	8.2	11.8	16.1	17.8	14.8
Right hand	3.9	2.9	5.5	6.0	7.9	8.2
Left hand	2.4	3.7	3.4	6.0	5.7	7.2
Both hands	2.7	3.3	2.9	6.1	4.1	3.5
Family segment	3.1	2.8	3.7	3.6	6.6	7.2
Crime segment	6.1	6.3	8.1	13.0	11.1	10.3

Note. N = 18 in each group.

A significant Hand by Segment interaction, $\underline{F}(1,51)=5.17$, $p= <.01$, revealed that it was the right hand that contibuted most to the segment effect (see Figure 2). Tests of the simple effects of hand at each level of the segment factor revealed that there was a strong hand preference in the crime segment, ($\underline{F}(2,50)=9.45$, $p <.001$, but not in the family segment, $\underline{F}(2,50)=1.47$, $p=.23$. Tukey HSD tests indicated that the right hand was preferred over both the left hand and both hands in the crime segment ($p<.05$).

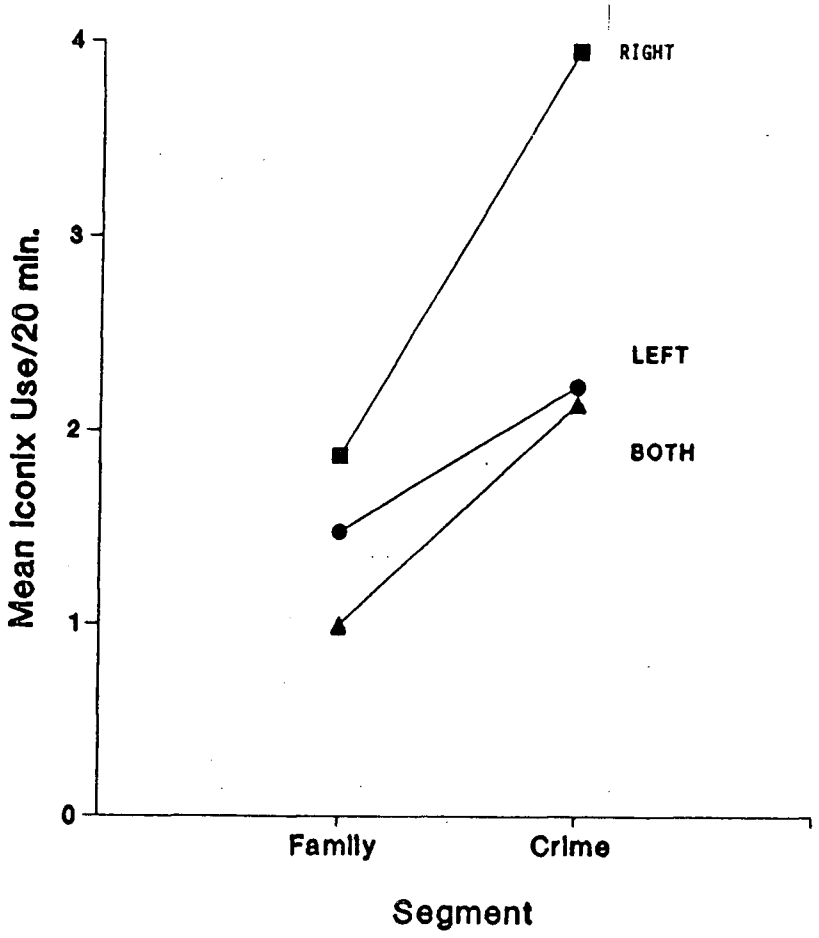

Figure 2. Hand by Segment interaction for iconix

4. Nonlanguage gestures

The mean number of nonlanguage gestures used by each group is presented in Table VI. No group differences were found for nonlanguage gestures, F (2,51) = 1.35, p = .27. There also were no Group by Hand, F (2,50) =.77, p = .55, or Group by Segment, F (2,51) = 0.0, p=.999, interactions.

In addition there was no overall segment effect, F (1,51) = .27, p = .60, or Segment by Hand interaction, F (2,50) = .12, p = .89.

The only significant effect found for the nonlanguage gestures was an overall hand effect, F (2,50) = 16.42, p < .001. Tukey HSD tests revealed that both the right and left hands were used more often than were "both hands" ($p<.05$); the left and right hands did not differ from on another.

Table VI

Mean number of nonlanguage gestures used by each group

	Group NP		Group M		Group P	
	M	SD	M	SD	M	SD
Total nonlanguage	63.6	38.3	83.3	37.5	77.4	35.2
Right hand	23.6	18.4	32.2	21.4	26.8	11.7
Left hand	24.8	23.5	35.1	22.3	36.4	28.0
Both hands	15.2	14.8	16.1	6.2	14.2	10.1
Family segment	31.2	20.8	41.2	17.9	38.2	20.1
Crime segment	32.3	19.9	42.2	22.3	39.2	17.8

Note. N = 18 in each group.

5. Laterality effects

Performance asymmetries may be influenced by individual differences in overall level of performance (Marshall et al., 1975). Therefore, laterality coefficients were calculated for each individual for each gesture category; the formula was R - L / R + L. The coefficients obtained for groups NP, M and P respectively were: beats: .06, .22, -.07; designators: -.16, .19, -.11; iconix: .42, .61, .14; nonlanguage: .03, -.07, -.03. None of the laterality findings were significant ($p > .05$ in each case). It is worth noting, however, that group P tended to be less lateralized in the use of iconic gestures than were the other groups; it is iconic gestures that tend to be lateralized in most individuals.

6. Verbal output

The large number of gestures used by group P was not due to greater overall verbal output (number of words spoken). A oneway ANOVA revealed no significant group differences in the number of words spoken in the experiment $F(2,53)=.5$, $p=.6$). The mean number of words spoken by groups NP, M, and P was 1534, 1687, 1648, respectively. In addition, there were no group differences in the number of words spoken in either the family, $F(2,51)=1.1$, $p=.36$ or the crime, $F(2,51)=.3$, $p=.7$, segments.

D. Normative Comparisons

The use of nonpsychopathic criminals as a comparison group controls for a number of possible extraneous variables (e.g., level of education, SES, prison effects). However, without a "normal", noncriminal comparison group it is difficult to determine whether it is the psychopaths or the nonpsychopaths who are deviant in the use of gestures.

There appears to be no really adequate normative data regarding gestural behavior but a look at frequencies obtained in other studies may help to put the present results in context.

Only one study could be found that reported frequencies for beat gestures. Marcos (1979) reported that speech primacy movements (his term for beats) were made at a rate of .69 per minute while bilingual college students were speaking in their dominant language and 1.1 per minute when speaking in their nondominant language. In the present study beats were used by groups NP, M, and P, respectively, at a rate of .99, 1.03, and 1.7 per minute. This would indicate that all criminal groups made more beat gestures than did the "normal" sample, and that group P was the most aberrant.

Most studies that have reported gesture frequency do so for language gestures in general. Investigators report that during dyad conversations (Dalby et al., 1980; Rosenfeld, 1966) or while speaking alone on various topics (Kimura,

1973b), college students make around 1-2 language gestures per minute. Marcos (1979) found that during a monologue adult men and women used an average of .8 gestures per minute. Similarly, Ingram (1975) found that children (during dyad conversation) used an average of .8 gestures per minute. In the present study groups NP, M and P used respectively, 3.1, 4.1, and 5.7 gestures per minute, a 3 to 6 times increase over the reported frequencies in "normal" adults and children. However, in a study of male college students who scored on the upper and lower thirds of a field-dependent/independent scale, Sousa-Posa et al. (1979) found gesture frequencies higher than those found in this study. They only reported the mean for right and left hand gestures; they found a rate of 5.2 gestures per minute. The P M and NP subjects in this study used (right and left) gestures at a rate of 4.7, 2.9, and 2.5 per minute. This suggests that group P gestured at about the same rate as did the college sample. Unfortunately, Sousa-Posa and his group did not report the frequency of gestures employed by the high and low field-dependence groups. They did, however, cite a previous study in which field dependent subjects used more gestures than did field independent subjects. Because Sousa-Posa et al.'s (1979) sample contained field dependent subjects, they may have obtained higher frequencies of gestures than found in other studies of "normal" subjects.

One difficulty with making comparisons between the present results and those of other studies is that different

procedures were used. Various procedures very likely lead to different rates of verbal output. Rather than comparing raw gestural output, it may be more appropriate to compare studies in terms of gestures per number of words spoken. Feyereisen (1979) studied a group of normal subjects for comparative purposes in his aphasia study and found that they used gestures at the rate of 4.5 per 100 words during conversation. Groups P, M and NP in the present study used gestures at the rate of 6.9, 4.9, and 4.0 per 100 words respectively. On this basis, it appears that the gesture rate of nonpsychopathic criminals was similar to Feyereisen's normal group, and that psychopaths made relatively heavy use of gestures.

Although not conclusive, the majority of comparisons suggest that it is the psychopaths that exhibit an "abnormal" frequency of language gestures. In addition, some results indicate that criminals in general may make more use of hand gestures than do noncriminals.

VIII. SUMMARY AND DISCUSSION

A. Hand Preference for Gesturing

There was no difference between right and left hands in the use of beats, designators, and nonlanguage gestures. There was a right-hand preference for iconic (representational) gestures, which replicates the findings of Sousa-Poza et al. (1979) and McNeill and Levy (1982). Iconic gestures involve complex motor movement and are symbolic in nature; a right hand preference is consistent with arguments that the left-hemisphere is specialized for complex motor sequences or that it is specialized for symbolic functions. The right-hand preference found in the present study was confined to the crime segment. The crime segment was presumably a relatively concrete language task that would likely involve visual imagery. Sousa-Poza et al. (1979) have suggested that "movement asymmetry is related to visual imagery in the verbal encoding process." The content of the crime segment may have elicited a type of iconic gesture that differed from that in the family segment. Perhaps the gestures were more representational of images the subject "had in mind" while speaking and therefore were more tied to the processing carried out in the left hemisphere.

It was predicted that if psychopaths are less lateralized for speech processing they would show less of a right hand preference for iconic gestures than would other

criminals. This was not found to be the case. This does not necessarily conflict with evidence that psychopaths differ from others in the lateral organization and processing of language. Firstly, there was a trend for Group P's iconic gestures to be less lateralized than those of Groups NP an M. Secondly, both the tachistoscopic (Hare & Jutai, in press) and evoked potential (Jutai et. al, 1987) studies suggest that laterality differences emerge with complex semantic tasks. The tasks used in the present study may not have been complex enough for unusual lateralized efforts to emerge. Another possibility may be that psychopaths were employing lateral differences in processing the tasks in the present study but that these differences were not related to hand preference for gesturing.

B. Segment Effects for Iconix and Designators

A segment effect was found for all groups for both iconic and designator gestures. This supports the defining characteristic of these gestures, that is, that they are related to speech content. The effect was much stronger for iconic gestures than for designators, which is consistent with the belief that these gestures are the ones most related to content. Both types of gestures occurred more often in the crime segment than in the family segment presumably because, as mentioned, the crime segment was more concrete and involved more imagery than did the family segment. The segment content involved descriptions of

concrete objects (e.g., pictures of the crime scene), as well as more sequential story telling (e.g., how the crime was carried out). The heavy use of iconic gestures was probably related to the former and the heavy use of designators to the latter.

The fact that there was no overall condition effect for beat gestures confirms that they are not related to the content of the narrative in any direct way.

C. Psychopathy and Use of Beats

Psychopaths showed a tendency to use more types of language gestures of all kinds but only the beat category differentiated between groups at a statistically significant level. This replicates the findings of Gillstrom and Hare (in press).

The gesture literature indicates that gestures may be associated with: interpersonal dynamics (e.g., affiliation); anxiety; the expression of negative affect; communication; and speech encoding processes and difficulties. It will be argued here that the last possibility provides the most tenable explanation of the large number of beats used by psychopaths.

The interpersonal- and communication-oriented hypotheses seem unlikely given the nature of beats. Beats do not appear to be intentional and there is nothing in their phenomenology that would sugggest that they could contribute to the fulfillment of interpersonal quests.

Beats are also not related to content and therefore it does not seem plausible that the increase involved attempts to facilitate communication. If an indiviual intended to improve his message through gesture he would likely increase his use of representational (iconic) gestures.

Some studies have suggested that gestures increase in frequency as a function of anxiety. However, there is no reason to believe that the pscyhopaths in this study were more anxious during discussion of their family backgrounds than during discussions of their criminal activity. Their callous nature and lack of connectedness to other human beings suggests that they should find discussing these topics less disturbing than would be the case for nonpsychopaths.

Some studies have also demonstated that gestures increase as a function of the expression of negative affect. Speech content was not analyzed and therefore, it is not known if psychopaths were expressing more negative affect than the nonpsychopaths. However, if it is assumed that the relationship between gestures and negative affect is founded in the affective impact of negative statements, it could be argued that the impact would be less on psychopaths than on other individuals given the psychopath's lack of affective depth.

Beat gestures have been described as the gesture most intimately tied to speech processes (Freedman et al.,1972)

and to encoding difficulties (Marco, 1979; McNeill, 1985); therefore, the most plausible explanation for the heavy use of beats by psychopaths is that they are experienced problems with speech encoding.

It was in the family segment that psychopaths used the most beats. If beats reflect encoding difficulties, the root of these problems lies in the difference between the family and crime segments. Two obvious dimensions that differentiate between the segments are abstraction and "word emotionality".

The family segment was more abstract than the criminal segment in the sense that it involved more abstract words and would be less likely to involve visual imagery. Sousa-Poza et al. (1979) feel that the use of visual imagery facilitates verbal encoding and that abstract material is therefore more difficult to encode than concrete material. Sousa-Poza and Rohrberg (1977) also found that abstract tasks tended to elicit more nonrepresentational gestures (of which beats are a subtype) than do concrete tasks. This suggests that psychopaths may have found it difficult to encode a task when they could not employ visual imagery. However, this hypothesis suggests that nonpsychopaths should have also shown more nonrepresentational gestures in the family segment than the criminal segment; but this was not the case.

Perhaps it was not the lack of visual imagery that made this segment more difficult for psychopaths but the

abstractness of the words and concepts discussed. The results of a tachistoscopic study (Hare & Jutai, in press) indicated that an abstract semantic categorization task produced a left visual field (right-hemisphere) superiority in psychopaths and a right visual field (left-hemisphere) superiority in other criminals. This can be interpreted as indicating that the left hemisphere of psychopaths is less specialized for abstract tasks than is the case with other individuals. In the present study, limited left hemisphere resources for abstraction may have made the family discussions more difficult for psychopaths.

The second dimension that the crime and family segments varied on was in the use of emotion-laden words and concepts. Examples of the types of questions asked in this segment were: Do you think your parents showed you love? Was your mother a warm or cold person? It is apparent from these questions that, in order to provide an answer, an individual has to be able to grasp the meaning of a number of emotion-oriented words and concepts. The psychopath likely does not possess the ability to feel the impact of the meaning of words such as love because he has not experienced the feelings that they represent. He likely "understands" them only in a literal or intellectual way. Evidence for this idea can be found in the study by Williamson et al. (in press) in which affective words did not appear to have the same meaning or impact for psychopaths as they did for nonpsychopaths. Perhaps this

semantic difference made the encoding of the family task much more difficult for the psychopaths. Hare et al. (1987) reported that psychopaths rely on denotative (literal) as opposed to connotative aspects of words. Psychopaths may have had to use a different encoding strategy when discussing emotional topics. It could be assumed that with emotional words and concepts the psychopaths had very little in the way of connotative associations and thus had to rely very strongly on literal definitions. How this would make encoding more difficult can be illustrated by hypothesizing the steps that would be involved in answering a question such as "Do you think your parents loved you?". A nonpsychopath understands this on an emotional and connotative level and can reply quickly. On the other hand a psychopath would first have to recall the literal meaning of the concept of love and then try to apply his parents behavior to this definition. In a sense he can only make an educated guess as to whether his parents showed him love. A possible parallel to this idea is when bilingual subjects speak in the nondominant language (they show an increase in beat gestures). When speaking in a nondominant language words would have less "ingrained" meaning for an individual and encoding would likely involve more steps and cross referencing to the dominant language. Perhaps emotional words are in a sense a nondominant language for psychopaths.

The author has noted that often during the family segment some psychopaths take a long time to answer

questions. They often make statements such as: "well... that's a difficult question", or "what exactly do you mean?". Some say they would rather not answer the question or come right out and say that they really do not know what love (or some other word) means. This suggests that psychopaths may have difficulty discussing these issues and that the difficulty may be founded in a fundamental inability to understand the concepts or to understand them in a way that makes it easy for them to answer.

Speech characteristics were not analyzed and therefore it is difficult to ascertain the effect that the proposed encoding difficulties had on the actual speech output of psychopaths. Beats have been found to be related to an increase in pauses and disruptions in the flow of speech, an increase in extra-narrative statements, difficulty with lexical decisions, a tendency towards the use of small speech units, or disorganization of thought behind speech. Future research should examine the precise relations between beats and speech content and structure in psychopaths.

The review of the gesture literature indicates that some gestures may serve a pragmatic function, for example, aiding with organization or speeding up processing; only the latter role seems possible for beats. Although beats have a rhythmical relationship to speech and likely reflect aspects of internal organization (e.g., demarcation of units), they are unintentional and therefore would not be used

consciously by the speaker to facilitate organization. Designator gestures would appear to be more capable of fulfilling this type of function. It was suggested earlier that nonrepresentational gestures, such as beats, may be able to facilitate processing by causing the brain to become more active. Therefore, beats could be more than simply reflections of encoding difficulties; they may serve to speed up processing. They would increase in psychopaths in the family segment in order to speed up processing during a more demanding task.

It is difficult to know if the speech behavior of psychopaths noted during clinical interviews is related to the findings of this study. Beats mark off units of speech and, therefore, a large number of beats may be associated with speech consisting of small phrases. In both aphasic and normal individuals beats occur at points of discontinuity in meaning and structure of speech. Therefore a high beat rate may also reflect the inability for psychopaths to keep a logical train of thought during speech. Because the high beat rate was evident only in the family segment, it would be useful to determine if phrase length was smaller, and difficulty in maintaining a coherent flow of speech greater, during the family segment than during the criminal segment. If so, perhaps the task demands in this segment caused the psychopaths to process speech in small phrases and also made it more difficult to maintain a coherent flow of speech. In any case, a detailed analysis of hand gestures and concomitant speech is needed.

The main purpose for examining speech behavior in psychopaths was to obtain clues concerning the etiology of the disorder. Although it is too early to derive any conclusions from language findings, the results of this study point to some interesting speculations.

The first possibility is that speech difficulties occur in psychopaths because of their lack of affective depth; speech difficulties are a "symptom" of the disease. Their lack of affective depth makes it more difficult for them to understand and process words and concepts involving emotion. This hypothesis, however, does not tell us anything about etiology, only more about the symptomology of psychopathy.

Another possibility is that psychopaths have a general deficit in areas of abstraction. This deficit could act as a third variable, causing both psychopathy and language differences. Perhaps the ability to love necessitates an ability to move beyond the surface exchange of people and to see and feel interpersonal interaction at "higher", more abstract levels. Similarly, the operation and formation of conscience may depend on an ability to abstract generalities and to "move" to higher levels to compare one's behavior to these general "laws" concerning right and wrong. Perhaps psychopaths cannot see the "wholeness" of anything. Perhaps they cannot "rise" above and view their own behavior and thus are locked in the "plane" of simple action and reaction. This may be why psychopaths have difficulty

maintaining a coherent stream of thought during speech, put incongruent and unrelated phrases together, tell different versions of the same story as if not understanding that listeners can see the incongruencies, or fail to stick to any long term goals. They appear to act and interact only for the moment and not in the framework of a "whole".

A second and related idea is a third variable involving an inability to extract meaning. Hare et al. (1987) reported that psychopaths rely more on denotative as opposed to connotative meaning of words than do other criminals. Connotation involves the associated significance that society and individuals place on words in addition to literal meaning. Perhaps psychopaths are not capable of extracting meaning and therefore language and experience has no personal significance for them. They would have little difficulty understanding concrete material because it has a direct referrent outside of themselves in their environment (e.g., a chair) but when the word definition relies on meaning that has been extracted through experience the psychopath is "lost". It was suggested above that emotional words may not have the same meaning for psychopaths because they have never had these experiences. However, it is possible that the reason they have not experienced love and other deeper aspects of being is because of an inability to extract meaning from interpersonal interactions and experience. If this is the case, the psychopath lives a life of acting and reacting,

totally oblivious to the deeper more meaningful aspects of human existence.

If, in fact, the etiology of psychopathy involves an inability for abstraction and/or an inability to extract meaning, the question of why still remains. Cleckley (1976) draws a parallel between psychopathy and semantic aphasia. In both cases the individual "cannot formulate anything very pertinent or meaningful within his own awareness". Henry Head (cited by Cleckley, 1976) believed that semantic aphasia stems from pathology at or near the supramarginal gyrus. We may discover that psychopathy also stems from a specific brain pathology.

D. Directions for Research

The results of this study raise several questions concerning the impact of the language task on the language processing systems of psychopaths. Two questions can be asked: What aspect of the family-oriented task served to cause the increase in beat gestures? And what difficulties or differences in the speech processing of psychopaths does an increase in beats signify? A study examining beat use during three types of tasks (one concrete, one abstract but not involving emotion, and one emotional) would help to sort out if it is abstraction or emotion that was the key factor in the family segment. In addition, future studies analyzing speech content, structure, and disturbance in

relation to beats would help to determine what beat gestures signify about speech processing in psychopaths. I am currently designing a study to answer some of these questions.

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