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## Differential Attribution of Personality Based on Multi-Channel Presentation of Verbal and Nonverbal Cues\*

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**SUMMARY.** Subjects made personality judgements of stimulus persons on the basis of auditory and visual cues presented in isolation and/or combination. In a 3 x 4 factorial design either no visual cues or photos or video clips were presented in the visual channel, whereas in the auditory channel either transcript excerpts (content cues) or electronically filtered speech (sequence cues) or random spliced speech (frequency cues) or normal speech samples were presented. The results show that presence or absence of visual cues affects the attribution of conscientiousness and emotional stability. Except for some within-channel cue combinations with overlapping information content (cue generality), personality inferences seem to be cue-specific. The predictive power of these inferences for three types of personality attribution (relationship-based peer ratings, interaction-based coparticipants' ratings, and observation-based judge ratings) was explored. For some types of cues within and across channels and for some traits, cue additivity effects were found (increase of predictive power for cue summation) whereas for

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some cue combinations (mostly those involving static physiognomic cues) an attenuation of predictive power seemed to result from discrepant inferences from auditory and visual cues. Implications for person perception and nonverbal communication are discussed.

## INTRODUCTION

Personality inferences can be made from a large number of different cues provided by a person's behavior or appearance, and many of these cues seem to overlap in terms of their information value (Tagiuri, 1969; Hastorf et al., 1970). Many studies have attempted to assess the degree to which a person's personality, as defined by some external criterion such as self or peer ratings, can be judged accurately on the basis of a variety of cues presented in many different ways (real persons, motion pictures or videotapes of behavior sequences, photographs, voice and speech samples, trait descriptions, behavioral descriptions, schematic drawings, and many more). Very few of these accuracy studies have systematically investigated the relative effects of these different cues, and the means of presenting them, on the personality judgements of naive raters (cf. Warr & Knapper, 1968). The possibility that different types of cues can have different effects on personality attribution may have been neglected due to the strong influence of early theories on the "unity of personality". It was assumed in these theories that personality dispositions affect expressive behavior isomorphically, implying redundancy or interchangeability of different cues of personality (Allport & Vernon, 1933; Wolff, 1943).

Only a few studies deal directly with the attribution of personality traits on the basis of specific cues transmitted in different communication channels as compared to the problem of judgemental accuracy. In a study by Beier & Stumpf (1959), students were exposed to janitors in the classroom under sequential conditions of exposure to auditory and/or visual cues; the study showed that the impressions formed were affected by the mode of presentation. More recently, a few studies have been conducted in which groups of judges have differentially or sequentially received partial information about the same persons, in the form of behavioral descriptions, photographs, motion pictures, speech samples, drawings, or personality sketches. These studies have found, generally, that the type of cue and the channel or the mode of presentation had a significant effect on the personality impressions reported by the judges (Hult, 1970; Boyd & Perry, 1972; Seligman et al., 1972; Cline et al., 1972). However, in these studies no attempt was made to isolate particular types of cues within a communication channel and to

systematically plot the effects of various kinds of cues and within- or cross-channel cue combinations against each other.

In addition, most studies in this area employed a mixture of samples of the stimulus person's actual behavior (in a filmed interaction, for example) and behavioral descriptions of personality sketches provided by the researcher about the stimulus person. Although it is interesting to compare personality judgments based on first-hand observation of the stimulus person's behavior with those based on secondary material such as behavior or trait descriptions in verbal form, this procedure does not address itself to the relative contribution of various types of verbal and nonverbal cues emitted in the course of a single behavioral sequence that is observed by the judges in different modalities or channels of communication.

A few studies concerned with the differential effect of different types of behavioral cues in different channels of communication have appeared recently in the area of nonverbal communication. Many of these have grown out of the interest in the role of cue or channel discrepancies in the communication of emotional states, situations in which inferences of a person's affect based on cues carried in one communication channel conflict or are incompatible with inferences based on cues carried in another channel (Davitz, 1964; Ekman, 1965; Mehrabian, 1970; Bugental et al., 1970). The existence of such cue or channel discrepancies implies that (1) there are stable and independent patterns of inference for particular expressive cues in particular channels as far as emotions and affective states are concerned (cf. Ekman, 1972; Scherer et al., 1972; Scherer, 1974a) and that (2) types of cues resulting in discrepant inferences may occur jointly in a sample of behavior. More research to support these assumptions is clearly called for.

The lack of studies in which particular types of cues are manipulated or isolated within channels of communication, over and above channel separation by playing just videotape or just audiotape samples of interactive behavior, can be explained by the rather obvious conceptual and technical difficulties of doing so. In this study an attempt has been made to use some recently developed techniques of content masking of speech to isolate content cues, sequence cues (e.g., rhythm and continuity), and frequency cues (voice quality) of speech in the auditory channel, and to use still photographs versus videotape clips to obtain a rough separation of static, physiognomic cues and dynamic cues in the visual channel of communication for very short samples of interactive behavior of 15 stimulus persons in group discussions. In what follows, these isolated cues, presented out of the context of co-occurring cues, are called "partial cues".

This study was designed to address itself to the following specific questions:

1. To what extent does selective exposure to particular types of cues or cross-channel cue combinations result in systematic effects on personality impressions as shown in generally higher or lower ratings of the stimulus persons on specific traits in particular exposure conditions? If such systematic effects are found, this can be interpreted as showing that presence or absence of certain cues will affect the level of personality attribution across stimulus persons (i.e., a particular cue may always lead the observer to infer a high degree of a particular trait). In addition, it may or may not differentially affect ratings of particular stimulus persons, i.e., interact with particular characteristics of the stimulus persons.
2. Do systematic effects of partial cue exposure persist even when more complete information becomes available? This may be seen as a primacy effect in which a first impression is so powerful that it will be maintained even in the presence of subsequently obtained detailed (and possibly contradictory) information.

People often get to know strangers on the basis of limited or restricted cues such as talking on the telephone, receiving letters, seeing someone at a party. Frequently rather firm impressions have been formed before additional cues become available. Although there has been strong interest in primacy and recency effects in person perception, these effects have not generally been examined in terms of the relative influence of different types of expressive cues of personality. If different cues are more or less powerful in determining personality impressions, it seems quite obvious that primacy effects would result if one were to observe the more powerful cues early on in the acquaintance process, whereas, unless set or expectancy effects are operative, recency effects might occur if one discovers such cues later in the interaction. Unfortunately, systematic studies of a possible interaction between primacy/recency of cue exposure and degree of cue utilization in information processing are very scarce. Furthermore, the relative "impression power" of different behavioral and appearance cues may depend on the channels or media in which the cues are conveyed (Warr & Knapper, 1968) and the nature of the traits which are to be inferred. If powerful first impressions persist over time, the nature of the cues and the channel of communication available in a first encounter may strongly influence personality attributions and thereby the future nature of the interaction or even of the relationship. This possibility can be studied here by looking for carry-over effects from ratings under partial cue exposure to ratings under relatively complete cue exposure.

3. Do judges arrive at similar personality inferences on the basis of different cues, or do different types of cues yield different, cue-specific information leading to discrepant or at

least independent inferences? This question concerns the relative information specificity or generality of particular types of cues. An extreme form of the "unity of personality" theory implies that a particular trait manifests itself isomorphically in all expressive cues and channels of communication. In this case one would expect "cue generality", i.e., personality inferences should agree with each other even when based on different partial cues. If, on the other hand, judges arrive at very different personality attributions when basing their inferences on different partial cues, a "cue specificity" or "cue uniqueness" explanation arguing for differential information content would be called for.<sup>1</sup> Ekman (1965) has provided some evidence that "head cues" and "body cues" might be differentially effective as aids in inferring the emotional state of the sender. Likewise, the existence of particularly strong stereotypes in the judgment of personality from voice (Kramer, 1963; Scherer, 1972) suggests that particular types of auditory cues may be more powerful determinants of personality attributions than non-vocal types of cues. In terms of a Brunswikian lens model (Brunswick, 1956) one would want to assess the utilization of different cues or stimulus dimensions in the judges' inferential strategy.

4. To what extent does exposure to nonverbal cues permit the prediction of personality criteria? In addition to the utilization of specific cues in inference, the ecological validity of certain cues determines the extent to which a judge with access to these cues can predict a criterion value. The problem in this kind of research is to find the "true" criterion of personality in order to assess the "accuracy" of the judgment. In most studies on accuracy in person perception, self ratings of personality were used as external criteria for the traits under study (cf. Hastorf et al., 1970). However, since self ratings may be vastly distorted due to social desirability, defense mechanisms and other factors, these self attributions may be no more valid as indicators of stable traits as personality attributions by other judges who know the stimulus person or who have access to samples of this behavior. Here, we use three different criteria of personality attribution and assess the degree to which they can be predicted on the basis of partial cue exposure. Each of these criteria consists of a type of personality attribution in the form of trait ratings. However, contrary to the partial cue exposure ratings, these attributions are based on more complete information about the stimulus persons. The three criteria differ in

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<sup>1</sup> Strictly speaking, the terms "cue generality" and "cue specificity" are misleading since *inferences* generalize over cues or are specific to cues. However, the terms are used here to avoid lengthy and cumbersome expressions.

that the information upon which the criterion ratings are based differs in terms of the number and type of cues available to judges and the length of exposure of the respective judges to the stimulus persons.

The first criterion, called "observation-based attribution", is based on exposure to a person's behavior in both the auditory and visual channel. These ratings are supposed to correspond to a first impression situation in real life: observation of a person's behavior in a specific situation with access to both auditory and visual cues. This situation arises, for example, when someone's identity is pointed out to us and we observe a short sample of his or her behavior at this moment, or, for that matter, if we are shown an excerpt of a public figure's behavior on TV (if we have not yet formed stereotypic expectations about that person). In this study a situation of this kind is represented by exposure to a videotape clip showing about 15-20 s of a person's behavior in a group discussion.

The second criterion, called "interaction-based attribution", is based on an interaction of the judges with each person to be judged (in the form of a simulated jury discussion of about one hour's duration after which the six participants rated each other in terms of their respective personality traits). In this case, all cues available in the observation criterion are available but for a much longer period of time and free from possible media effects (audio and video recording). To some extent tactile, olfactory and proxemic cues may play a role in the personality inferences made in this situation.

The third criterion, the "relationship-based attribution", consists of peer ratings of the stimulus persons. The personality judgments made by these peers or friends are based on a long-term relationship with the person and may be affected by a large number of different cues, some of which may overlap with the cues available for the observation and interaction criteria. This criterion is comparable, of course, to the external criteria of personality which are sometimes used to assess "accuracy" of personality judgments (cf. Scherer, 1972). The degree to which the personality inferences based on nonverbal cues explain the variance of the respective criterion determines the "predictive power" of these cues for this criterion.

5. An important question with implications for professional "person perceivers" such as job interviewers or clinicians, is the notion of "cue additivity". Can we generalize from studies on the effectiveness of media messages and assume that "an increase in the number of cues available in the communication of information increases the information gain from that communication" (Severin, 1967, p. 238)? In that case we would expect that cue summation would lead to more accurate predictions of the personality attribution criteria. Or is it more likely that specific cues carry exclusive information about specific personality traits? In that case selective exposure to these cues, isolated from other, irrelevant cues, would increase the accuracy

of predictions of personality attributions since the essential cues are not masked or confused due to the presence of irrelevant cues.

There is some indication that the latter holds true in situations where a person attempts to deceive observers about his actual state providing misleading cues in the course of impression management activities (cf. Ekman & Friesen, 1969). In a multi-channel study of expressive behavior in deception, Ekman et al. (1976) found that judges accurately inferred a more negative affect state of the deceiving subjects when they were selectively exposed to "leakage cues" (body movement and content-filtered speech) in both the auditory and the visual channel.

If personality-relevant cues contain cue specific information, the addition of more cues should strongly increase predictive power when different cues contain congruent and complementary information about different aspects of the trait being judged, whereas in the case of cue generality one would expect only a small gain in predictive power since there is a large degree of overlap in the information content. Conversely, a negative effect on predictive power would be expected for a cue specificity situation when cues with discrepant information content concerning the trait being judged are jointly used in personality inference (assuming an averaging process). No effects on predictive power would be expected if cues are independent of each other in terms of inference and information value. The role of cue additivity in personality attribution is studied in this research by observing whether predictive power is increased or decreased (or remains unaffected) when different cues are added to each other within one channel and across channels, and are jointly presented to a group of judges.

## METHOD

### *Stimulus Persons*

15 stimulus persons were selected from 30 adult males who had participated in simulated jury discussions in groups of six, in which they debated a criminal case for about 1 h. Discussions had been audio- and videotaped, and extensive personality ratings consisting of self-ratings, peer ratings, and ratings by the other "jury members" in each group were secured. The details of the recruitment of the subjects, the administration of the personality tests, the procedure followed in the discussion of the criminal case, and other pertinent information can be found in reports of prior studies (Scherer, 1970a, 1972).

### *Selection of Stimulus Material*

The selection of stimulus persons for this study depended entirely on the availability of adequate audio and video material. The criterion was the possibility of editing out of the original videotape an utterance of one or two sentences during which the speaker was not interrupted by other speakers and during which the head and the upper part of the body of the speaker were fully visible on the video screen. Care was taken to select video clips centering on one stimulus person only, without other speakers being visible in the background, and not containing rapid zooming or other distracting recording characteristics. The samples obtained for the 15 stimulus persons consisted of speech and behavior samples of about 15 to 20 s each.

### *Preparation of Stimulus Material*

In order to isolate particular types of cues within the two major channels of communication available to the judges, the master video- and audiotapes were used to prepare the following versions of speech and behavior in which particular cues were absent, masked, or distorted.

In the auditory channel, slide presentation of the script of the sample utterance was used to provide "verbal content cues" only (Script Only). Content-filtering of speech (CF), using electronic filtering procedures to remove voice frequencies above about 500 Hz, which renders speech unintelligible (cf. Rogers et al., 1971), was used to isolate "speech continuity cues" or "sequence cues", since the filtering procedure does not affect the perception of pauses and other disfluencies, rate of speech, rhythm and intonation contours, but masks speech content and voice quality. "Voice quality cues" or "voice frequency cues" were isolated by using the randomized-splicing technique (RS) developed by Scherer (1971) which renders speech content unintelligible, eliminates pauses, and masks or strongly distorts intonation, speech rhythm, and other sequence cues. The use of these two masking techniques does not provide complete separation of sequence and frequency cues, yet content filtered speech contains predominantly sequence cues, random spliced speech predominantly frequency cues (cf. Scherer, 1971). "Normal speech cues" were provided by just playing the unaltered audiotape exposing judges to speech content, speech sequence, and voice quality.

In the visual channel either no visual information was presented (No Visual Cues), or "static visual cues" were provided via a still photograph of the speaker (Photo), or "dynamic visual cues" were provided via a video clip of the behavior sample (Video). Static cues consisted mainly of the facial features of the speaker (with a generally neutral facial expression) and a view of the upper body and clothing. Still photos of the stimulus persons had been taken through a one-way window during the group discussion (in the same way as the videotaping), using a camera with a telephoto lens. These shots were not necessarily taken during the behavior period contained on the video clip. Dynamic cues visible in the video clip provided information on

changing facial expression, lip movements, shifts of the upper body, and hand movements.<sup>2</sup>

### *Design of the Rating Conditions*

The four types of cues in the auditory channel (Script Only, Content Filtered Speech, Random Spliced Speech, Normal Speech) and the three types of cues in the visual channel (No Visual Cues, Photo, Video) were combined in a 3 x 4 factorial design.<sup>3</sup> Each of the resulting 12 conditions was presented to an independent group of raters who judged all 15 stimulus persons on five personality traits. In addition to rating the stimulus persons on the basis of these partial cues, judges rated all 15 stimulus persons a second time in an audio-visual "Normal Speech/Video" (complete auditory and visual information) condition. The analysis-of-variance design allows us to separate "type-of-cue-effects" (main effects) and "cross-channel-cue-combination-effects" (interaction effects) of the differential partial exposure to these types of cues and cue combinations on the personality judgment of naive observers.

### *Personality Scales*

Using 7-point scales, judges rated the 15 speakers on five personality dimensions: conscientiousness, emotional stability, extraversion, assertiveness, and agreeableness. Detailed descriptions of the behavioral implications of these dimensions were given to the raters before starting the rating procedure. Further details on the selection of these dimensions, the nature of the scales, and intercorrelation can be found in Scherer (1970a, 1972).

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<sup>2</sup> The conceptualization of static vs. dynamic conditions is not quite accurate since the photo and video conditions differ not only in terms of still vs. moving pictures but also in terms of information content since for some stimulus persons several changing facial expressions and gestures may have been provided in the video condition whereas the photos showed generally a neutral expression. In a more elegant manipulation one could contrast the video clips with series of photographs showing several expressions.

<sup>3</sup> The "Script Only" or "content cues" type occupies a fence-straddling position since it qualifies in a way as "no auditory cues" (since the judges do not hear anything) although the cues conveyed are part of the normal speech signal. Even though judges read the script (visual input) it does not seem sensible to treat this mode as part of the visual channel. Obviously, there is a discrepancy here between the sending channel (cue origin) and the receiving channel (cue perception). Since the present research emphasises cue origin (in terms of relative information value), Script Only is analysed as part of the auditory channel.

### *Raters*

151 undergraduates, 81 male and 70 female, at the University of Pennsylvania took part in the experiment. Within the 12 conditions the male-female ratios were roughly equal, with a slight preponderance of male raters. Group size varied from 10 to 17. Since no main effect for sex differences was found in an overall analysis-of-variance of the ratings, average ratings for rater groups across all raters were computed.

### *Rating Procedure*

Raters were seated in three rows in front of a projection screen and a television monitor. After hearing a brief live introduction, they completed a personal background questionnaire and rated themselves on the five personality dimensions and a 35-item personality attribute form. Assignment to experimental conditions was random, and only one condition was run in each session. Raters were exposed to the particular combination of auditory and visual cues required by the respective experimental condition, with the cues presented simultaneously, except in the Script Only condition, in which for each stimulus person the slide with the transcript was shown first, followed by the proper visual stimulus ("partial cue" rating). Subjects rated each of the 15 stimulus persons on five personality dimensions immediately after presentation of the respective sample. After having rated all 15 speakers in the experimental condition, raters were shown the original videotape clips with the full sound ("audio-visual" rating), and the rating procedure was repeated. Thus, in one condition (Normal Speech/Video), the partial cue ratings and the audio-visual ratings were based on identical stimulus exposure.

Slides were projected using a Kodak carousel projector; audiotapes were played using a Revox A77 tape recorder, a Pioneer amplifier, and KLH speakers; videotapes were played back using Sony 1/2 inch videotape equipment.

### *Prediction Criteria*

In the present study two sets of ratings could be used to represent the observation-based attribution criterion: the partial cue ratings in the Normal Speech/Video condition or the mean ratings for all rater groups based on audio-visual exposure, the second rating performed by all groups. Since both sets of ratings correlate very highly with each other (mean  $r$  across traits = 0.89), and since the mean audio-visual ratings across all 12 conditions are based on  $N = 151$  judges, which should guarantee a greater reliability of the mean ratings (compared to the Normal Speech/Video rating group with  $N = 15$ ), the mean audio-visual exposure rating was chosen to represent the observation criterion.

The interaction criterion consists of the mean ratings of the five fellow jurors in each simulated jury discussion for each of the stimulus persons. These ratings were made on a 35-item adjective rating list yielding eight

personality scales. Since earlier results have shown very high intercorrelations between the five dimensional ratings and these scales (cf. Scherer, 1970a), the respective equivalents of these scales to the five dimensions were used as the interaction criterion value since the jurors did not directly rate each other on the five personality dimensions.

The relationship criterion consists of the mean ratings of two to three peers for each stimulus person. Each juror had been asked to pass complete sets of rating forms on to three acquaintances of the same sex, approximate age, and social class, who had known him for some time, and to ask them to return the completed rating forms directly to the investigator (cf. Scherer, 1970a, 1972).

## RESULTS AND DISCUSSION

### *1. Effects of Types of Cues on Personality Impression*

The first analysis examined systematic differences in the judgments on the five personality scales across different types of cues within each channel using five two-way analyses of variance in which judges were units of analysis, and in which auditory channel (Script Only/Content Filtered/Random Spliced/Normal Speech), and visual channel (No Visual Cues/Photo/Video) were between-units factors. For conscientiousness, there was a significant visual channel main effect ( $F(2,137) = 3.53$ ,  $\eta = 0.22$ ,  $P < 0.05$ ) due almost entirely to the difference between no visual cues present ( $\bar{X} = 4.70$ ) and either photo or video information present (combined  $\bar{X} = 4.94$ ). An analogous main effect was found for emotional stability ( $F(2,137) = 4.81$ ,  $\eta = 0.26$ ,  $P < 0.01$ ), where the ratings were also much lower in the condition of no visual information present ( $\bar{X} = 4.23$ ) compared to Photo or Video (combined  $\bar{X} = 4.48$ ). No main effects either for the visual or the auditory factor were found for the ratings of extraversion, assertiveness, or agreeableness. This suggests that the presence of visual information about the person to be judged leads to impressions of a higher degree of emotional stability and conscientiousness compared to situations in which no visual cues are presented.

Effects of cross-channel cue combinations might be expected in this analysis to yield significant interaction effects. This was found only for the ratings of conscientiousness ( $F(6,137) = 2.96$ ,  $\eta = 0.34$ ,  $P < 0.01$ ). Examination of the residual effect sizes showed the interaction to be almost entirely due to the difference in the ratings between the Photo and Video conditions, depending on whether normal speech or just the script was presented. The speakers were rated as more

conscientious when the judges had access to either Video (combined with Script) or Normal Speech (combined with Photo) but less conscientious when they were exposed to neither (Photo/Script) or both. Although the F was not significant, a similar trend was obtained for emotional stability. Since these comparisons between means had not been planned and since they are difficult to interpret, we want to be cautious in not attaching too much importance to them.

It might seem surprising that on the whole, type of cue and cross channel cue combinations had little systematic effect on the ratings, particularly for extraversion and assertiveness. One could argue that the judges were unable to make reliable discriminations between speakers on these traits, resulting in highly similar means across all conditions. However, a "speaker" or "stimulus person" factor was examined in the analyses-of-variance that have been described above. Highly significant main effects and interaction effects involving the speaker factor were found for the ratings of all five traits. This obviously does not support a lack-of-discriminability explanation.

Another and perhaps more supportable explanation for the lack of strong cue and channel effects might be that there is some degree of redundancy in the expressive cues of various personality traits, such that the absence of certain cues in one channel can be compensated for by cues in another channel. One would expect this to be particularly true for traits such as extraversion and assertiveness, since their signalling function is most important for the successful conduct of social interaction. Consequently, some degree of redundancy in terms of information-carrying cues is to be expected to assure that the message does not get lost.

## *2. Carry-over of Systematic Effects to Situation of Complete Cue Availability*

As described in the method section, judges rated all speakers a second time under conditions of exposure to all information channels (audio-visual rating condition). Hence it was possible to examine carry-over of systematic effects of particular types of cues and cue combinations to the condition of complete information availability. The auditory by visual interaction for the ratings on conscientiousness was again found to be significant for the ratings of conscientiousness under audio-visual exposure ( $F(6,137) = 4.25$ ,  $\eta = 0.40$ ,  $P < 0.01$ ) even though raters in all conditions were exposed to exactly the same information, suggesting a carry-over of these effects from the partial exposure condition. This result suggests that even under conditions of complete exposure to all available cues systematic effects of former partial (cross channel) cue combinations on the judgment of conscientiousness remain. At least for the trait of conscientiousness, then, these findings point to the potential importance of first impressions based on partial information. However,

since the effect does not generalize over traits these results, even though suggestive, are hardly conclusive.

### *3. Agreement between Ratings across Exposure Conditions*

To what extent do inferences based on different sets of partial cues or cue combinations agree with each other? The relative inference specificity or generality of specific types of cues for personality attribution can be assessed by looking at the correlations of the mean ratings of the 15 stimulus persons under each partial cue condition with the mean rating of these persons under each other condition. Unless a high correlation between two sets of ratings is due to chance, knowledge of how a person is judged on the basis of one set of cues would allow us to predict, within certain limits, how that person will be seen by observers with access to a different set of cues. The central question to be discussed in this section, then, is the extent to which similarity of information content and information value of different types of cues allows such prediction.

We asked whether inferences based on one type of cue can predict inferences from the same type of cue if it appears in combination with various cues from other channels. For example, do ratings based on electronically content-filtered speech agree highly with one another irrespective of whether this auditory cue has been paired with Photo, Video, or No Visual cues? To some extent, this question implies the problem of inference strength and inference stability of certain cues independent of the cue context in which they occur. In the present case, judges agreed very highly with each other on all five traits whenever they were exposed to normal speech cues irrespective of the visual cues with which they were paired (mean intercorrelation of  $r = 0.70$ ,  $P < 0.01$  across all traits). This implies that normal speech cues produce strong and reliable inferences relatively unaffected by type of information carried by cues in the other channels, allowing a reasonable prediction of how a person will be judged on the basis of his speech, possibly due to strong cultural stereotypes (cf. Kramer, 1963; Scherer, 1972).

Such stability of inference on the basis of the same type of cue in different contexts was also found for frequency-related voice cues (Random Spliced Speech) for extraversion ( $r = 0.53$ ,  $P < 0.05$ ) and assertiveness ( $r = 0.59$ ,  $P < 0.05$ ) as well as for Video for emotional stability ( $r = 0.62$ ,  $P < 0.05$ ), extraversion ( $r = 0.76$ ,  $P < 0.001$ ), and assertiveness ( $r = 0.61$ ,  $P < 0.05$ ), and for Photo for extraversion only ( $r = 0.62$ ,  $P < 0.05$ ). Ratings based on Script Only and Content Filtered Speech did not agree consistently with each other across different cue channel combinations.

These data corroborate an earlier finding showing significantly lower reliability for judgments of affect based on electronically filtered speech as compared to judgments based on random-spliced speech (Scherer et al., 1972). It appears, then, that strong, reliable inferences independent of cue context are afforded mainly by voice frequency cues in the auditory channel and dynamic movement cues in the visual channel.

A related type of analysis examines the degree of agreement between inferences based on overlapping cues in two conditions. An overlap between cues is assumed when in one exposure condition cues are provided, for example, pauses in content-filtered speech samples, that are also audible in another exposure condition, e.g., Normal Speech. Thus pause cues overlap in a comparison of these two conditions. The same is true for physiognomic cues; between the Photo and Video conditions, for example. Since at least some of the cues overlap, one would expect a high level of agreement between such conditions, unless the "overlapping" information is irrelevant to the judgments to be made. In the present data this is found only for the correlations between Random Spliced Speech/No Visual Cues and Random Spliced Speech/Video as well as Content Filtered Speech/No Visual Cues and Content Filtered Speech/Video on one hand and all conditions with a Normal Speech component for extraversion and assertiveness (mean  $r = 0.61$ ,  $P < 0.05$  for Random Spliced Speech/No Visual Cues and Random Spliced Speech/Video correlations,  $r = 0.57$ ,  $P < 0.05$  for Content Filtered Speech/No Visual Cues and Content Filtered Speech/Video correlations). There were no consistent significant correlations between Photo and the Video condition, i.e., physiognomic appearance, hair style, clothing, etc. are not very powerful or at least not very consistent determinants of personality impressions. Both frequency and sequence related speech cues, however, seem strongly and consistently to affect the inference of extraversion and assertiveness. Generally it appears from these results that cues affecting the inference of these interpersonal traits (cf. Scherer, 1972, p. 207) have a stronger and more reliable impact on personality judgment.

We now turn to a more systematic analysis of the effect of overlapping cues on agreement between rating conditions. In Table 1 all 66 possible pairs or comparisons between the 12 partial exposure rating conditions have been categorized into five classes of "cue compatibility" depending on whether the cues in the respective auditory and visual components were the same (e.g., *Random Spliced Speech/Photo - Random Spliced Speech/Video*), different (e.g., *Random Spliced Speech/Photo - Script/Video*), or overlapped each other as defined above (e.g., *Random Spliced Speech/Photo - Normal Speech/No Visual cues*). Due to the fact that there are always two channel components, the following five categories in ascending order of cue compatibility can be constructed: same/overlap, same/different, overlap/overlap, overlap/different, different/

Table 1. Proportion of significant correlations ( $P < 0.05$ ) between partial exposure rating conditions by cue compatibility of paired conditions.

|                     | Pairs<br>Same/<br>overlap | Same/<br>different | Overlap/<br>overlap | Overlap/<br>different | Different/<br>different | Mean |
|---------------------|---------------------------|--------------------|---------------------|-----------------------|-------------------------|------|
| Conscientiousness   | 0.50                      | 0.15               | 0.13                | 0.04                  | 0.00                    | 0.16 |
| Emotional stability | 0.42                      | 0.38               | 0.13                | 0.09                  | 0.00                    | 0.20 |
| Extra-version       | 0.67                      | 0.62               | 0.26                | 0.22                  | 0.00                    | 0.35 |
| Assertiveness       | 0.50                      | 0.62               | 0.13                | 0.35                  | 0.10                    | 0.34 |
| Agreeableness       | 0.67                      | 0.23               | 0.13                | 0.04                  | 0.00                    | 0.21 |

Note: Cue compatibility is defined by whether the auditory and/or visual components of the stimuli in two partial rating conditions under comparison are the *same* types of cues, e.g., RS-Photo/RS-Video, whether one can assume that the respective cues *overlap*, e.g., RS-Photo/Normal Speech-No visual, or whether they are *different*, RS-Photo/Script-Video, RS-Photo/CF-No visual. Thus, RS-Photo/Normal Speech-Video would be classified as *overlap/overlap*, CF-Photo/CF-No Visual as *same/different*, and so on. Comparisons are arranged in the table in the order of decreasing cue compatibility.

different. For each of these categories the proportion or percentage of significant correlations out of all possible correlations between the pairs of conditions in each category were computed for each trait. The data in Table 1 show that the proportion of significant inter-condition correlation drops with decreasing cue compatibility; the proportion for all traits combined shows a significant decreasing linear trend ( $F_{(1,3)} = 37.55$ ,  $r = 0.96$ ,  $P < 0.01$ ) in an analysis-of-variance treating the traits as replicates. As one would expect, the more overlap or compatibility between different types of cues or cue combinations on which personality judgments are based, the more agreement between judges is found. One might argue that finding higher agreement as a positive function of the similarity of the stimulus situations is not very profound. However, the strength of this relationship and the lack of agreement when the respective cues are different clearly invalidates the assumption that personality information is highly redundant across different cues. It does not seem to be the case that any one of many possible cues will be sufficient to infer the respective traits, as an extreme version of the "unity of personality" theory would hold. On the contrary, we have to assume that different cues can give rise to quite distinctive and possibly incompatible personality inferences when encountered in isolation or in specific combinations.

The data in Table 1 show again that agreement between different conditions is greater for the more interpersonal traits of extraversion and assertiveness than for other traits ( $F_{(4,16)} = 14.40$ ,  $\eta^2 = 0.88$ ,  $P < 0.001$ ). Partitioning the sums of squares for replicates (traits) in the analysis-of-variance reported above to compare these more interpersonal traits with the remaining less interpersonal traits, one finds a strong component due to this difference ( $F_{(1,16)} = 47.3$ ,  $\eta^2 = 0.86$ ,  $P < 0.001$ ). This result seems to imply that personality characteristics related to interaction style are inferred more consistently from many different cues and cue combinations. The present data do not allow us to decide whether this is due to a greater stereotyping of inference for these traits or whether more interpersonal personality dispositions compared to less interpersonal traits have stronger and more numerous concomitants in behavior and appearance providing more consistent cues in the inference process.

#### 4. Predictive Power of Partial Cue Exposure Ratings

In the following section the correlation between the partial cue exposure ratings and each of the three sets of criteria will be reported separately for each of the five personality traits. To test the hypothesis that the addition of further types of cues in each channel will increase predictive power, an analysis-of-variance with one correlation coefficient in each cell of the  $3 \times 4$  matrix was computed (using the AB interaction as an error term). For both the auditory and the visual channel factor the linear and quadratic components of the mean square of the effect were computed and tested for significance using the appropriate F-test. The linear component tests increasing trends (i.e., No Visual Cues < Photo < Video or Script Only < Content Filtered Speech < Random Spliced Speech < Normal Speech) whereas the quadratic component tests whether the in-between conditions show lower or higher correlations than the extreme conditions (i.e., Photo < No Visual Cues = Video or Content Filtered Speech = Random Spliced Speech < Script Only = Normal Speech). In the text, the correlation ratio  $\eta$  for each component (indicating the strength of the component) and the appropriate F-based significance level are given. Due to the nature of these analyses, only "type-of-cue-effects" (main effects) can be studied, since the interaction term is used to estimate the MS error.

If predictive power of partial cue ratings increases with added sets of partial cues we would expect significant linear trends for the marginals on both the auditory and the visual factor. In the  $3 \times 4$  matrix the levels of the factors have been arranged in the order from least complete to most complete representation of types of cues for each channel. In the visual channel the ordering "No Visual cues --Photo--Video" is self-evident since each level contains all the cues of the preceding level plus some additional ones. The ordering is less obvious in the case of the auditory channel since neither Content Filtered Speech nor Random Spliced Speech present all the cues of

the preceding condition plus additional cues (as for example from Photo to Video or from Random Spliced Speech or Content Filtered Speech to Normal Speech). However, it is assumed that cue addition across the present ordering is present since Content Filtered Speech and Random Spliced Speech add auditory cues to the Script Only (non-auditory) condition, and since Random Spliced Speech adds the whole range of voice-frequency cues to the limited band present in Content Filtered Speech without masking all the cues audible in the Content Filtered Speech condition, i.e. pitch range, loudness, and possibly even rhythmic features are preserved (cf. Scherer, 1971). Thus significant linear trends in the values of the marginals both in the auditory and visual channel are taken as evidence for cue additivity in terms of predicting the criteria. It should be noted that such significant linear trends are also evidence against the assumption of cue generality since, as pointed out above, one would not expect an increase in predictive power if cues containing the same information are added. Significant quadratic trends indicate that the central cue conditions on each continuum (Content Filtered Speech and Random Spliced Speech in the auditory channel, Photo in the visual channel) are either systematically higher or lower than the two extremes, which may be interpreted as cue specificity.

Table 2. Correlations between partial cue ratings of conscientiousness and three sets of criteria

| Auditory cues           |                | Visual cues |         |         |      |
|-------------------------|----------------|-------------|---------|---------|------|
|                         |                | None        | Photo   | Video   | Mean |
| Script only             | R <sup>a</sup> | -0.16       | 0.06    | 0.17    | 0.02 |
|                         | I <sup>b</sup> | 0.15        | -0.11   | -0.01   | 0.01 |
|                         | O <sup>c</sup> | 0.45*       | 0.67**  | 0.50*   | 0.54 |
| Content-filtered speech | R              | 0.01        | 0.45*   | -0.25   | 0.07 |
|                         | I              | 0.25        | 0.29    | 0.25    | 0.26 |
|                         | O              | 0.00        | 0.38    | 0.61**  | 0.33 |
| Random-spliced speech   | R              | 0.21        | 0.08    | 0.24    | 0.18 |
|                         | I              | 0.25        | -0.05   | 0.55*   | 0.25 |
|                         | O              | 0.38        | 0.01    | 0.45*   | 0.28 |
| Normal speech           | R              | -0.07       | 0.08    | 0.13    | 0.05 |
|                         | I              | 0.31        | 0.43    | 0.47*   | 0.40 |
|                         | O              | 0.77***     | 0.74*** | 0.92*** | 0.81 |
| Mean                    | R              | -0.00       | 0.17    | 0.07    | 0.08 |
|                         | I              | 0.24        | 0.14    | 0.32    | 0.23 |
|                         | O              | 0.40        | 0.45    | 0.62    | 0.49 |

a<sub>R</sub> = Relationship criterion; b<sub>I</sub> = Interaction criterion; c<sub>O</sub> = Observation criterion. \* P < 0.05; \*\* P < 0.01; \*\*\* P < 0.001, all one-tailed

Table 3. Correlations between partial cue ratings of emotional stability and three sets of criteria

|                         |                | Visual cues |        |         |       |
|-------------------------|----------------|-------------|--------|---------|-------|
| Auditory cues           |                | None        | Photo  | Video   | Mean  |
| Script only             | R <sup>a</sup> | 0.11        | -0.25  | 0.06    | -0.03 |
|                         | I <sup>b</sup> | 0.14        | -0.20  | 0.13    | 0.02  |
|                         | O <sup>c</sup> | 0.25        | -0.36  | 0.65**  | 0.18  |
|                         |                |             |        |         |       |
| Content-filtered speech | R              | 0.10        | 0.01   | 0.37    | 0.16  |
|                         | I              | 0.06        | -0.35  | 0.56*   | 0.09  |
|                         | O              | 0.23        | -0.22  | 0.81*** | 0.27  |
| Random-spliced speech   | R              | 0.17        | 0.19   | 0.32    | 0.23  |
|                         | I              | 0.41        | 0.25   | 0.47*   | 0.38  |
|                         | O              | 0.63**      | 0.03   | 0.73**  | 0.46  |
| Normal speech           | R              | 0.22        | 0.29   | 0.21    | 0.24  |
|                         | I              | 0.19        | 0.52*  | 0.30    | 0.34  |
|                         | O              | 0.82***     | 0.73** | 0.94*** | 0.83  |
| Mean                    | R              | 0.15        | 0.06   | 0.24    | 0.15  |
|                         | I              | 0.20        | 0.06   | 0.37    | 0.21  |
|                         | O              | 0.48        | 0.05   | 0.78    | 0.44  |

a<sub>R</sub> = Relationship criterion; b<sub>I</sub> = Interaction criterion; c<sub>O</sub> = Observation criterion; \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001, all one-tailed

The results for conscientiousness are shown in Table 2. There are no systematic effects for either the auditory or the visual channel for the relationship criterion. For the interaction criterion there is a significant linear trend ( $\eta = 0.74$ ,  $P < 0.05$ ) for the auditory but not for the visual channel. A significant quadratic trend in the auditory channel ( $\eta = 0.79$ ,  $P < 0.01$ ) is found for the observation criterion with the means for Script Only and Normal Speech exceeding the values for Content Filtered Speech and Random Spliced Speech. The correlations for emotional stability found in Table 3 show a significant linear trend ( $\eta = 0.73$ ,  $P < 0.05$ ) in the auditory channel for the relationship criterion. There is a linear trend bordering on significance ( $\eta = 0.61$ ,  $p < 0.066$ ) for the interaction criterion and a strongly significant linear trend ( $\eta = 0.85$ ,  $P < 0.01$ ) for the observation criterion in the auditory channel. In the visual channel we find a linear trend ( $\eta = 0.64$ ,  $P < 0.05$ ) and a significant quadratic effect ( $\eta = 0.88$ ,  $P < 0.01$ ) with the mean for Photo below No Visual and Video for the observation criterion.

Table. 4. Correlations between partial cue ratings of extraversion and three sets of criteria

| Auditory cues           |                | Visual cues |        |         | Mean |
|-------------------------|----------------|-------------|--------|---------|------|
|                         |                | None        | Photo  | Video   |      |
| Script only             | R <sup>a</sup> | -0.40       | 0.33   | 0.14    | 0.02 |
|                         | I <sup>b</sup> | -0.18       | 0.19   | -0.01   | 0.00 |
|                         | O <sup>c</sup> | 0.24        | 0.23   | 0.65**  | 0.37 |
| Content-filtered speech | R              | 0.19        | 0.10   | 0.25    | 0.18 |
|                         | I              | 0.60**      | 0.35   | 0.40    | 0.45 |
|                         | O              | 0.53*       | 0.39   | 0.79*** | 0.57 |
| Random-spliced speech   | R              | 0.20        | 0.40   | 0.03    | 0.21 |
|                         | I              | 0.40        | 0.29   | 0.13    | 0.27 |
|                         | O              | 0.81***     | 0.34   | 0.75*** | 0.63 |
| Normal speech           | R              | -0.00       | 0.21   | 0.05    | 0.09 |
|                         | I              | 0.12        | 0.25   | 0.39    | 0.25 |
|                         | O              | 0.80***     | 0.73** | 0.79*** | 0.77 |
| Mean                    | R              | 0.00        | 0.26   | 0.12    | 0.13 |
|                         | I              | 0.24        | 0.27   | 0.23    | 0.24 |
|                         | O              | 0.60        | 0.42   | 0.75    | 0.59 |

a<sub>R</sub> = Relationship criterion; b<sub>I</sub> = Interaction criterion; c<sub>O</sub> = Observation criterion; \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001, all one-tailed

Table 5. Correlations between partial cue ratings of assertiveness and three sets of criteria

| Auditory cues           |                | Visual cues |         |         | Mean  |
|-------------------------|----------------|-------------|---------|---------|-------|
|                         |                | None        | Photo   | Video   |       |
| Script only             | R <sup>a</sup> | -0.27       | -0.12   | -0.15   | -0.18 |
|                         | I <sup>b</sup> | 0.04        | -0.20   | 0.08    | -0.03 |
|                         | O <sup>c</sup> | 0.35        | 0.32    | 0.48*   | 0.38  |
| Content-filtered speech | R              | -0.18       | -0.09   | -0.42   | -0.23 |
|                         | I              | 0.22        | -0.08   | 0.51*   | 0.22  |
|                         | O              | 0.38        | 0.14    | 0.67**  | 0.40  |
| Random spliced speech   | R              | -0.18       | -0.05   | -0.24   | -0.16 |
|                         | I              | 0.31        | 0.15    | 0.37    | 0.28  |
|                         | O              | 0.75***     | 0.36    | 0.70**  | 0.60  |
| Normal speech           | R              | -0.29       | -0.38   | -0.27   | -0.31 |
|                         | I              | 0.51*       | 0.63**  | 0.46*   | 0.53  |
|                         | O              | 0.87***     | 0.84*** | 0.93*** | 0.88  |
| Mean                    | R              | -0.23       | -0.16   | -0.27   | -0.22 |
|                         | I              | 0.27        | 0.13    | 0.36    | 0.25  |
|                         | O              | 0.59        | 0.42    | 0.70    | 0.57  |

a<sub>R</sub> = Relationship criterion; b<sub>I</sub> = Interaction criterion; c<sub>O</sub> = Observation criterion; \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001, all one-tailed

The results for extraversion in Table 4 show no systematic effects for the relationship or interaction criteria except for a quadratic trend ( $\eta = 0.70$ ,  $P < 0.05$ ) in the auditory channel for the interaction criterion. There is a significant linear trend ( $\eta = 0.81$ ,  $P < 0.01$ ) in the auditory channel and a significant quadratic trend ( $\eta = 0.76$ ,  $P < 0.05$ ) in the visual channel (Photo being lower) for the observation criterion.

For assertiveness, Table 5, there are highly significant linear trends in the auditory channel for both the interaction ( $\eta = 0.87$ ,  $P < 0.01$ ) and observation criteria ( $\eta = 0.91$ ,  $P < 0.001$ ). In the visual channel we again find a quadratic trend ( $\eta = 0.78$ ,  $P < 0.05$ ) (Photo being lower) for the observation criterion.

For agreeableness, Table 6, we find a quadratic trend  $\eta = 0.76$ ,  $P < 0.05$ ) in the auditory channel (Content Filtered Speech and Random Spliced Speech being lower) for the observation criterion. In the visual channel there is, for the first time, a significant linear trend for both the interaction ( $\eta = 0.75$ ,  $P < 0.05$ ) and observation ( $\eta = 0.64$ ,  $P < 0.05$ ) criteria, and a quadratic trend ( $\eta = 0.64$ ,  $P < 0.05$ ) for the relationship criterion.

Table 6. Correlations between partial cue ratings of agreeableness and three sets of criteria

| Auditory cues           |                | Visual cues |        |         | Mean  |
|-------------------------|----------------|-------------|--------|---------|-------|
|                         |                | None        | Photo  | Video   |       |
| Script only             | R <sup>a</sup> | -0.50       | -0.50  | -0.23   | -0.41 |
|                         | I <sup>b</sup> | 0.05        | 0.15   | 0.25    | 0.15  |
|                         | O <sup>c</sup> | 0.24        | 0.60** | 0.55*   | 0.46  |
| Content-filtered speech | R              | 0.21        | -0.41  | 0.17    | -0.01 |
|                         | I              | 0.04        | -0.09  | 0.57*   | 0.17  |
|                         | O              | 0.20        | -0.15  | 0.67**  | 0.24  |
| Random-spliced speech   | R              | -0.45       | -0.40  | 0.10    | -0.25 |
|                         | I              | -0.10       | 0.07   | 0.52*   | 0.16  |
|                         | O              | 0.03        | 0.14   | 0.59*   | 0.25  |
| Normal speech           | R              | -0.19       | -0.09  | 0.00    | -0.09 |
|                         | I              | 0.23        | 0.35   | 0.29    | 0.29  |
|                         | O              | 0.89***     | 0.62** | 0.86*** | 0.79  |
| Mean                    | R              | -0.23       | -0.35  | 0.01    | 0.19  |
|                         | I              | 0.06        | 0.12   | 0.41    | 0.21  |
|                         | O              | 0.34        | 0.30   | 0.67    | 0.44  |

a<sub>R</sub> = Relationship criterion; b<sub>I</sub> = Interaction criterion; c<sub>O</sub> = Observation criterion; \*P < 0.05; \*\*P < 0.01; \*\*\*P < 0.001, all one-tailed

The assumption that the addition of cues leads to an increase in predictive power is not supported for all criteria or all traits. No systematic pattern of effects is found for the relationship criterion which may be due to the fact that virtually all correlations are non-significant indicating that this criterion cannot be predicted on the basis of very short exposure to partial cues in the present experimental set-up. This does not imply, however, that none of the partial cues studied in this research have any power to predict the relationship criterion. Scherer (1972) has shown, using voices drawn from the same pool of speakers as in this study, that naive judges can significantly predict peer ratings of extraversion on the basis of 20-s long randomized-spliced voice samples.<sup>4</sup> Correlations between experimental ratings in the Random Spliced Speech conditions and extraversion peer ratings (relationship criterion) in this study are in the same direction but fail to reach significance. The weaker predictive power of the frequency cues in the Random Spliced Speech conditions in the present study could be due to a large number of methodological differences between the two studies: (1) Scherer (1972) used highly motivated adult females as raters compared to college students in the present study; (2) the 12 speakers who were studied earlier were selected from extreme scores on the major personality dimensions while the 15 stimulus persons (out of the 30 available) studied here were selected on the basis of availability of video clips meeting the requirements for the partial cue manipulation (10 of these speakers were used in both studies). Finally, (3) judges in the Scherer (1972) study heard a continuous tape loop with the 20-s voice sample while they completed their ratings whereas in the present study a single presentation of the 15-20 s voice sample preceded the judges' ratings. All of these factors should weaken the predictive power of the judges' ratings in this study. The results in Table 4 suggest that frequency cues may still have higher predictive power for the relationship criterion of extraversion than other partial cues; the correlation for the Random Spliced Speech condition, for example, almost reaches significance ( $r = 0.40$ ,  $P < 0.07$  one-tailed).

The predictive power of the partial cue ratings for the interaction criterion is generally much higher than for the relationship criterion. For a number of traits there are significant

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This result was found for American speakers only. For German speakers, peer ratings of conscientiousness, emotional stability, and assertiveness could be predicted with better-than-chance accuracy on the basis of similar voice samples (Scherer, 1972).

correlations between the interaction criterion and specific partial cue conditions, particularly for Content Filtered Speech/Video, Random Spliced Speech/Video, and Normal Speech/Video combinations. Since no comparisons between single means or groups of means had been planned in advance, the significance of this pattern has not been established. The data do suggest the hypothesis, to be tested in further studies, that the combination of dynamic visual cues and sequence and/or frequency cues of speech may be sufficient to attain the maximum level of predictive power of personality attributions for the interaction criterion in a cue exposure situation of the same type and length as in this study.

For the marginals of the auditory channel conditions there are significant linear trends for conscientiousness and assertiveness, indicating that predictive power increases as further auditory cues are added. There is a significant quadratic trend for extraversion which seems to reflect the high predictive power of Content Filtered Speech cues for this trait. A significant linear trend for the visual channel is found for agreeableness.

As expected, predictive power of the partial-cue-based personality attributions is highest for the observation criterion, since for many partial cue conditions there is a high degree of overlap in terms of the cues on which both sets of ratings are based. Thus, predictive power of a particular type of partial cue in this analysis can be interpreted as a measure of relative prominence of this cue in a cue combination in terms of its utilization for inference and attribution of personality. Again, since no planned comparisons were made, no assessment of the significance of differences between cue conditions in this respect are reported. However, inspection of Tables 2-6 suggests the hypothesis, to be tested in further research, that exposure conditions containing frequency-related auditory cues (Random Spliced Speech and Normal Speech) have higher predictive power (i.e., are utilized to a higher degree in personality inference) than predominantly sequence related cues (Content Filtered Speech). The former tend to have higher predictive power than visual cues. Of the latter, dynamic video cues seem to be far more predictive of attributions based on audiovisual exposure than the static photo cues, except for the trait of agreeableness.

Significant linear trends for the auditory means suggest strong cue additivity effects in this channel for emotional stability, extraversion, and assertiveness. For the same traits there are significant quadratic trends for the visual channel where the Photo condition generally tends to lower predictive power compared to the No Visual cues condition. This pattern points to a cross-channel cue discrepancy effect: personality attributions

based on pure sequence and/or frequency cues in the auditory channel seem to disagree with attributions based on static physiognomic cues. If both types of cues are combined in the same cue exposure situation, confusion and lower overall predictive power (compared to auditory cues only) seem to result. Since the auditory cues seem to have higher predictive power for external criteria used to assess "accuracy" of personality attribution (e.g., the interaction criterion), exposure of judges to photos of stimulus persons may actually mislead them, at least with respect to traits such as emotional stability, extraversion, and assertiveness. Even though these results are preliminary and the interpretation tentative, one may start to wonder about the advisability of the continued use of photographs in college admissions, employment screening, or even dating services. This problem is particularly serious since we have seen earlier that impressions of high conscientiousness based on partial exposure to visual cues may persist even as complete information becomes available.

The possible discrepancy of personality impressions based on voice or photo is nicely illustrated by the surprise one often experiences in encountering someone face-to-face for the first time whom one has gotten to know via telephone.

For the trait of agreeableness, however, we do find a significant linear trend in the visual channel, indicating that predictive power for this trait increases as visual cues are added. A trend in this direction is also found for conscientiousness. For both of these traits there is a significant quadratic effect in the auditory channel due to lower overall predictive power in conditions containing Random Spliced Speech and Content Filtered Speech (particularly when paired with photo cues). This pattern of results again underlines the discrepancy of attributions based on physiognomic cues (Photo) or sequence and frequency cues of voice and speech. However, there is no indication that photo cues are more valid indicators of agreeableness or conscientiousness than auditory cues as far as the relationship or the interaction criterion are concerned.

One may conclude from these results that our personality attributions based on audio-visual cue combinations seem to rely more strongly on auditory cues when inferences of emotional stability, extraversion, and assertiveness are required, and more strongly on visual cues when conscientiousness and agreeableness are to be judged. Discrepant inferences (leading to lower predictive power) seem to result when physiognomic cues and pure auditory cues (with speech content masked) are present simultaneously, whereas combinations of pure auditory cues with dynamic visual cues (Video) tend to increase predictive power, at least as far as the interaction criterion and the observation criterion are concerned.

## CONCLUSIONS

The effects of different types of verbal and nonverbal cues communicated in both the auditory and visual channels of behavior and appearance of stimulus persons on the personality attributions of observers, as studied in this research, cannot be easily summarized. Such effects do seem to strongly depend on the nature of the personality traits to be inferred and the nature of the criterion used as an indicator of personality attributions.

As far as overall effects of particular types of cues on personality inference are concerned, the degree of attribution of conscientiousness and emotional stability seems to depend strongly on the availability of visual cues. Judges tend to attribute lower levels of these traits if they have to base their judgments on auditory information only. At least for conscientiousness, the level of attribution may be affected by an interaction between auditory and visual cues. Of particular interest is the possibility that such "level of attribution" effects due to partial cue exposure carry over to inferences based on complete cue exposure. A replication of these findings would have an important bearing on the primary-recency controversy in person perception and clearly deserves further study.

The notion that there is a large degree of cue generality or interchangeability in personality inference is scarcely supported by the present results. Neither do the attributions based on different types of cues agree strongly with each other (except if there is a large degree of overlap in certain types of cues across partial cue exposure situations) nor is the predictive power of these attributions for different external criteria invariant across various partial cue exposure situations. It is possible, of course, that due to the rather short duration of the behavior samples of 15-20 s some types of cues with low information transmission rate (which may be true for posture and body movement, for example) did not attain their maximum information value. In order to check the notion that cue generality results if all types of cues can be utilized to their maximal information value, studies comparing exposure situations of various lengths seem to be called for.

On the whole, however, the present results support the notion of cue specificity, i.e. different types of cues seem to contain criteria-related information specific to them and seem to lead to cue-specific inferences. The important question to settle seems to be whether cue-specific information and/or inferences are *congruent and complementary*, as seems to be the case with sequence vs. frequency cues in the auditory channel, or *discrepant*,

as exemplified by inferences based on photos vs. inferences based on auditory cues, at least for some traits. If inferences are complementary (i.e., if they reflect different sections of the variance in the underlying criterion) an increase in predictive power will result from cue combination (cue additivity), as shown for the auditory cues, particularly for the trait of assertiveness. Attenuation of predictive power will result, however, if cues leading to discrepant inferences are combined, as shown by the Random Spliced Speech/Photo and Content Filtered Speech/Photo combinations.

The respective results on cue additivity in this paper are somewhat inconclusive since it is not clear whether cue congruence or discrepancy is due to the differential utilization of the cues by the judges' inferential strategy or to differences in the ecological validities of these cues (Brunswik, 1956). Scherer (1974b) has suggested independently measuring distal cues and proximal cues in this type of person perception research to allow independent assessments of ecological validity coefficients and utilization coefficients and to test models of the personality inference process using path analytic methods. A combination of these methods with the cue isolation procedure used in this study may be needed to further clarify the role of different verbal and nonverbal cues in personality inference.

The results of the present study seem to suggest that inferences of more interpersonal traits such as extraversion and assertiveness may be strongly based on auditory cues and may attain a fair degree of "functional validity" at least in predicting an interaction criterion, as defined in this study. Inferences of conscientiousness and agreeableness, on the other hand, seem to be based mostly on visual cues without much evidence of functional validity in terms of predicting an external criterion. Further research, using the more complex methodological approach suggested above, is clearly needed to substantiate these first leads in the direction of cue effects in person perception.

#### REFERENCES

- Allport, G.W., Vernon, P.E.: Studies in expressive movement. New York: Macmillan 1933
- Beier, E.G., Stumpf, J.: Cues influencing judgment of personality characteristics. J. cons. Psychol. 23, 219-225 (1959)
- Boyd, J.E., Perry, R.P.: Quantitative information differences between object-person presentation methods. J. soc. Psychol. 86, 75-80 (1972)
- Brunswik, E.: Perception and the representative design of psychological experiments. Berkeley: University of California Press 1956

- Bugental, D.E., Kaswan, J.W., Love, L.R.: Perception of contradictory meanings conveyed by verbal and non-verbal channels. *J. Personality and soc. Psychol.* 16, 647-655 (1970)
- Cline, V.R., Atzet, J., Holmes, E.: Assessing the validity of verbal and non-verbal cues in accurately judging others. *Comparative Group Studies* 3, 383-394 (1972)
- Davitz, J.R.: The communication of emotional meaning. New York: McGraw-Hill 1964
- Ekman, P.: Differential communication of affect by head and body cues. *J. Personality and soc. Psychol.* 2, 726-735 (1965)
- Ekman, P.: Universals and cultural differences in facial expressions of emotion. In J. Cole (Ed.), *Nebraska Symposium on Motivation* (Vol. 19). Lincoln: University of Nebraska Press 1972
- Ekman, P., Friesen, W.V.: Nonverbal leakage and clues to deception. *Psychiatry* 32, 88-106 (1969)
- Ekman, P., Friesen, W.V., Scherer, K.R.: Body movement and voice pitch in deceptive interaction. *Semiotica* 16, 23-27 (1976)
- Hastorf, A.H., Schneider, D.J., Polefka, J.: *Person perception*. Reading, Mass.: Addison-Wesley 1970
- Hult, R.H.: The effect of communication channel variation on rater response. *Dissertation Abstracts International* 31 (8-A), 3875 (1971)
- Kramer, E.: The judgment of personal characteristics and emotions from non-verbal properties of speech. *Psychol. Bull.* 60, 408-420 (1963)
- Mehrabian, A.: When are feelings communicated inconsistently? *J. exp. Res. Personality* 4, 198-212 (1970)
- Rogers, P.L., Scherer, K.R., Rosenthal, R.: Content-filtering human speech: A simple electronic system. *Behav. Res. Meth. Instrumentation* 3, 16-18 (1971)
- Scherer, K.R.: Attribution of personality from voice: A cross-cultural study on the dynamics of interpersonal perception. Unpublished Ph. D. thesis, Harvard University, 1970 (a)
- Scherer, K.R.: *Nonverbale Kommunikation*. Hamburg: Buske, 1970 b. IPK-Forschungsbericht
- Scherer, K.R.: Randomized splicing: A note on a simple technique for masking speech content. *J. exp. Res. Personality* 5, 155-159 (1971)
- Scherer, K.R.: Judging personality from voice: A cross-cultural approach to an old issue in interpersonal perception. *J. Personality* 40, 191-210 (1972)
- Scherer, K.R.: Acoustic concomitants of emotional dimensions: Judging affect from synthesized tone sequences. In S. Weitz (Ed.), *Nonverbal communication*. New York: Oxford University Press 1974a
- Scherer, K.R.: *Persönlichkeit, Stimmqualität und Persönlichkeitsattribution: Pfadanalytische Untersuchungen zu non-verbalen Kommunikationsprozessen. Bericht über den 28. Kongress der Deutschen Gesellschaft für Psychologie* (Vol. 3), 61-73. Göttingen: Hogrefe, 1974b
- Scherer, K.R., Koivumaki, J., Rosenthal, R.: Minimal cues in the vocal communication of affect: Judging emotions from content-masked speech. *J. Psycholing. Res.* 1, 269-285 (1972)

- Seligman, C.R., Tucker, G.R., Lambert, W.E.: The effects of speech style and other attributes on teachers' attitudes towards students. *Language in Society* 1, 131-142 (1972)
- Severin, W.: Another look at cue summation. *AV Communication Rev.* 15, 233-245 (1967)
- Tagiuri, R.: Person Perception. In: G. Lindzey and E. Aronson (Eds.), *Handbook of Social Psychology* (Vol. 3), (2nd ed.), Reading, Mass.: Addison-Wesley 1969
- Warr, P.B., Knapper, C.: *The perception of people and events*. New York: Wiley 1968
- Wolff, W.: *The expression of personality*. New York: Harper 1943