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Abstract:
Twenty-five new psychiatric outpatient were clinically evaluated and were routinely administered a brief psychological screening battery which included measures of symptoms, personality,

and cognitive function. Included in this assessment procedure were the Gottschalk-Gleser Content Analysis Scales on which scores were derived from five-minute speech samples by means of an artificial intelligence-based computer program. Intercorrelations of these content analysis measures with scores obtained from the MMPI-2, SCL90, and other measures confirmed previously published construct validation findings. The use of this computerized content analysis procedure for initial, rapid diagnostic neuropsychiatric appraisal is supported by this research.

The Application of Computerized Content Analysis of Speech to the Diagnostic Process in a Psychiatric Outpatient Clinic

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Twenty-five new psychiatric outpatient were clinically evaluated and were routinely administered a brief psychological screening battery which included measures of symptoms, personality, and cognitive function. Included in this assessment procedure were the Gottschalk–Gleser Content Analysis Scales on which scores were derived from five-minute speech samples by means of an artificial intelligence-based computer program. Intercorrelations of these content analysis measures with scores obtained from the MMPI-2, SCL90, and other measures confirmed previously published construct validation findings. The use of this computerized content analysis procedure for initial, rapid diagnostic neuropsychiatric appraisal is supported by this research. © 1997 John Wiley & Sons, Inc. J Clin Psychol **53**: 427–441, 1997.

New developments in the application of artificial intelligence have made feasible the practical use of the computerized content analysis of natural language to facilitate the measurement of eight psychobiological dimensions: anxiety, hostility outwards, hostility inwards, ambivalent hostility, social alienation–personal disorganization, cognitive impairment, depression, and hope. These dimensions are central to the diagnostic process required in a psychiatric outpatient clinic (Gottschalk & Bechtel, 1982, 1993, 1995; Gottschalk, 1995a).

This is a report of a study in which 25 new psychiatric outpatients were clinically evaluated neuropsychiatrically and were administered a battery of psychometric tests, including the Gottschalk–Gleser Content Analysis scales as part of a comprehensive assessment procedure. The Gottschalk–Gleser method involves giving a five-minute speech sample, in response to purposely ambiguous standardized instructions, which were content analyzed by a computerized program capable of providing scores on 8 well-validated content analysis scales (Gottschalk, 1979, 1985, 1995; Gottschalk & Bechtel, 1993, 1995; Gottschalk & Gleser, 1969; Gottschalk, Lolas, & Viney, 1986; Gottschalk, Winget, & Gleser, 1969). It was hoped that the use of these content analysis scales would expedite the neuropsychiatric diagnostic process and demon-

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strate the ability of this computerized system to speed up and supplement the neuropsychiatric evaluative process.

METHOD

Subjects

All patients presenting to the Adult Psychiatric Outpatient Clinic, University of California, Irvine, Medical Center in Orange, California, were routinely administered a brief psychological screening battery which included measures of symptoms, personality, and cognitive functioning. Patients could decline to participate in any or all of the psychological assessment procedures. Twenty-five neuropsychiatric outpatients were randomly selected serially for participation in this study. There were no minority or gender restrictions of any kind in this clinic.

The 25 subjects included 13 females, mean age 36.23 ± 11.16 and 12 males, mean age 41.08 ± 11.51. There were 23 Caucasians, one Asian, and one Hispanic. All the subjects had finished high school, 14 had some college education, five had finished college, and one had attended graduate school. Over 50% were unemployed. Most of the outpatients, 11, had a phobic or mild or moderate depressive disorder, 4 had a major depression, 3 had a bipolar disorder, 3 had a schizophrenic disorder, and the rest had some kind of substance abuse disorder. Eleven of these patients had a concurrent or past history of a somatic disorder, such as bronchial asthma, irritable bowel syndrome or gastritis, essential hypertension, migraine, back injury, goiter, or pituitary tumor.

Measures Administered

MMPI-2 (Butcher, Graham, Williams, & Ben–Porath, 1990; Butcher & Williams, 1992). The MMPI-2 (Minnesota Multiphasic Personality Inventory) consists of 570 items to be answered true or false. The clinical scales have been retained in MMPI-2 in basically the same form that they had in the original MMPI. A few items were deleted from some of the scales because they had become dated or because they were judged to have objectionable content, usually having to do with religious beliefs or bowel or bladder functions. Some of the items in the clinical scales were modified slightly to modernize them or eliminate sexist references or to improve their readability.

The definitions of high scores on the clinical scales have varied in the scientific literature. Some writers have considered a *t* score about 70 as a high score, and others have defined high scores to be those in the upper quartile in a distribution. Others have given descriptors for several *t*-score levels on each scale. Another method has been to identify the highest scale in the profile (high point) regardless of its *t*-score value. Low scores have, also, been defined in different ways in the literature, sometimes as *t*-scores below 40 and sometimes as scores in the lowest quartile. Compared with high MMPI scores, a paucity of information is available in the literature concerning the meaning of low scores.

The use of MMPI scores (and scores from other psychometric measures) to contribute to the construct validation of yet another diagnostic assessment measure (one derived from the content analysis of natural language) is our aim here. We are regarding significant intercorrelations between scores derived from different measures indicative of areas of behavior or mental processes that are similar, equivalent or have a cause and effect relationship with one another. Significant mathematical intercorrelations, by themselves, cannot tell us which of these phenomena are relevant. Here, we will be focusing primarily on the definitions of the high scores in the MMPI clinical scales to make sense of the intercorrelations involving the MMPI-2 test. We realize that profiles of scores based on MMPI-2 scales are often preferred by some clini-

cians, but the relatively small number of patients in this study as well as our overall methodology do not make appropriate our using MMPI-2 profile scores in this study.

A listing and brief descriptive summary follows concerning what each MMPI-2 scale used in this study is reported to measure (Graham, 1990), based on high scores.

Scale 1. Hypochondriasis (Hs). Very high scores on this scale suggest dramatic and sometimes bizarre somatic concerns. More moderate elevations on this scale indicate generally vague, nonspecific complaints. High scores tend to be selfish, self-centered, and narcissistic; they tend to be pessimistic, unhappy, dissatisfied, defeatist, and cynical. Often they see themselves as medically ill.

Scale 2. Depression (D). High scorers often display depressive symptoms. They tend to report feeling pessimistic, unhappy, weak, fatigue, tense, and irritable. Self-depreciation, poor self-esteem, and guilt feelings are common. They tend to be overcontrolled and to deny their own impulses. They are likely to avoid unpleasantness and make concessions to avoid confrontations.

Scale 3. Conversion Hysteria (Hy). High scorers suggest persons who react to stress and avoid responsibility by developing physical symptoms, which usually do not fit any known organic disorder. The symptom complaints may disappear suddenly when stress subsides and reappear suddenly under stress. They are not likely to report severe anxiety, tension, or depression.

Scale 4. Psychopathic Deviate (Pd). High scorers tend to engage in a variety of asocial, antisocial, and even criminal behaviors. They tend to be rebellious towards authority, have stormy relationships with family members, have a poor work history, and be underachieving at school. They tend to be impulsive and strive for immediate gratification.

Scale 5. Masculinity/Femininity (MF). High scores suggest the possibility of sexual concerns and problems. Males with high scores may be experiencing conflicts in sexual identity and masculine adequacy. They tend to be sociable and sensitive to others. Females having high scores are interested in sports, hobbies, and other activities that tend to be more masculine than feminine. High scoring women tend to be very outgoing, uninhibited, and self-confident, easy-going, relaxed, and balanced.

Scale 6. Paranoia (Pa). Higher scorers may exhibit frankly psychotic behavior. Their thinking may be disturbed, and they may have delusions of persecution or grandeur and ideas of reference. They may feel mistreated and resentful. Moderately elevated scores are not generally associated with psychosis but rather with excessive sensitivity and to blame others for their own difficulties. They tend to be moralistic and rigid in their opinions. They tend to experience the environment as demanding and not supportive and overly sensitive to what other people think of them and suspicious of their motives.

Scale 7. Psychasthenia (Ps). High scorers tend to experience psychological turmoil and discomfort. They worry excessively and report having difficulty concentrating. They tend to be rigid and moralistic, perfectionistic, and conscientious. They tend to be neat, orderly, and meticulous. They tend to be shy and do not interact well socially.

Scale 8. Schizophrenia (Sc). High scores suggest the possibility of a psychotic disorder. Confusion, disorganization, and disorientation may be present. Social alienation is frequent. Such

scores may be associated with immaturity and impulsivity but, nevertheless, imaginativeness and creativity.

Scale 9. Hypomania (Ma). High scores may suggest a manic episode, excessive purposeless activity, emotional lability, flight of ideas, possibly hallucinations and/or delusions of grandeur. Moderately elevated scores are less likely to suggest psychotic symptoms; they tend usually to be associated with overactivity unrealistic self-appraisal, high energy output, exaggerated appraisal of self-worth. Elevated scores are associated with extroversion, gregariousness, an outward picture of confidence and poise.

Scale 0. Social Introversion (Si). High scorers are very insecure and uncomfortable in social situations. They are reserved and timid. They lack self-confidence. They tend to be overcontrolled and are not likely to display directly their feelings.

Scale L. If L scale scores are higher than would be expected when demographic variables are considered, this suggests the possibility that the person is not being frank in answering items on the MMPI. As a consequence the patient's scores on the clinical scales have been lowered artificially in the direction of appearing better adjusted psychologically. In addition to a defensive test-taking attitude, higher scorers tend to be overly conventional, rigid, moralistic, users of denial, and lack insight into their own motivations.

Scale F. The *F* scale was originally developed to detect deviant or atypical ways of responding to test items (Meehl & Hathaway, 1946). The 64 items in the original *F* scale were answered in the scored direction by fewer than 10% of adult normal subjects. Several of the *F* scale items were deleted from MMPI-2 because of objectionable content leaving the *F* scale with 60 items in the revised test. In general, because the scales of MMPI-2 are intercorrelated, high scores on the *F* scale usually are associated with high scores on the clinical scales, especially on scales 6 and 8. High scores on the *F* scale also tend to correlate with age and race, with adolescents and Blacks scoring approximately 10 *t*-score points higher on the *F* scale than other groups. The *F* scale is useful in detecting devious response sets. It can serve as an indicator of degree of psychopathology, with higher scores suggesting greater psychopathological processes.

Scale K. High scores on this scale suggest the possibility of either a deliberate attempt to deny problems and psychopathology and, hence, to appear in a favorable light or of general false responding (Meehl & Hathaway, 1946; McKinley, Hathaway, & Meehl, 1948). High K scale scorers may be trying to maintain an appearance of adequacy, control, and effectiveness. They tend to be shy, inhibited, and reluctant to become emotionally involved with other people.

The MMPI is considered reliable if there is no omission of more than 30 items in the test taking process and if the F Scale score is not equal to or greater than 23. K corrected scores were used in all analyses.

SCL-90-R (Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974). The Symptom Checklist (SCL) used was the 90 item version of this self-report inventory. All items are rated on a five point scale ranging from "0" (not at all) to "4" (extremely). Nine factors are provided: somatization, obsessive compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoticism, and a global symptom index.

Gottschalk–Gleser Content Analysis Scales. The Gottschalk–Gleser Measures from the content analysis of verbal behavior of Anxiety, Hostility Outward (Overt, Covert, and Total), Hostility Inwards, Ambivalent Hostility, Social Alienation-Personal Disorganization, Cogni-

tive Impairment, Depression (and seven subscales), and Hope (Gottschalk, 1974, 1979, 1994, 1995a; Gottschalk & Bechtel, 1993, 1995; Gottschalk, Eckardt, Pautler, Wolf, & Terman, 1983; Gottschalk & Gleser, 1969; Gottschalk & Hoigaard–Martin, 1986; Gottschalk, Lolas, & Viney, 1986). The verbal samples obtained from the patients were elicited by purposely ambiguous instructions ("standard method"; Gottschalk, Winget, & Gleser, 1969). These instructions were: "This is a study of speaking and conversational habits. I would like you to talk for five minutes about any interesting or dramatic personal life experiences you have ever had. While you are talking, I would prefer not to reply to any questions you may have until the five-minute period is over. I will tell you when to start talking and when to stop. Do you have any questions now? If not, then you may start."

These tape recorded speech samples were typed in ASCII or WP5.1 on a computer diskette and computer-analyzed for eight major scales and 16 subscales on the IBM-compatible software program developed by Gottschalk and Bechtel (Bechtel, 1997; Gottschalk, 1985, 1995, 1997; Gottschalk & Bechtel, 1982, 1993, 1995; Gottschalk, Hausmann, & Brown, 1975).

The Shipley Institute of Living Intelligence Scale (Shipley & Burlingame, 1941).

Shapiro Control Inventory (Shapiro & Bates, 1990; Shapiro, Bates, Greenzang, & Carrere, 1991). The Shapiro Control Inventory (SCI) is an 187 item paper and pencil inventory which has nine scales and five additional refinements. There are four sense-of-control scales, three in the general domain measures with a 7-point Likert format (overall, positive, negative) and one domain specific measures by a 6-point Likert format (consisting of 25 parameters). There are four mode scales (Shapiro, 1994) which measure by a 4-point Likert format (positive assertive, positive yielding, negative assertive, and negative yielding). Motivation for control includes a desire for control scale measured by a 7-point Likert format, mode satisfaction, parameter satisfaction, and mode by parameters change information. Agency (source) of a person's sense of control includes origination from self and from other (including family/friends, society/government, and God, higher power).

Data Analysis

MMPI responses were transformed to *t* scores. The Gottschalk–Gleser Content analysis scores were corrected for the number of words spoken during the five-minute period each verbal sample was collected, and other recommended mathematical transformations were carried out (Gottschalk, 1995; Gottschalk & Gleser, 1969). Raw scores were used in the data analysis for all other test measures obtained.

Nonparametric Kendall correlation coefficients were obtained between all groups of variables. One-tail probability values were used to assess statistical significance either because pre-existing hypotheses or findings have supported such relationships or when there were no such previous hypotheses or findings the need for further studies would be acknowledged.

RESULTS

Anxiety Scale Intercorrelations

Table 1 gives the nonparametric correlations (Kendall) between the Anxiety Scale scores with other psychosocial and psychometric test scores used in this study. The Symptom Checklist (SCL90) (A) Anxiety factor scale scores correlated significantly with the Total Anxiety Scale scores ($r = .38$, $p < .000$, one-tail test), the SCL90 (D) Depression factor scores correlated

Table 1. *Intercorrelations of Anxiety Scale Scores with Other Measures*

	Death Anxiety	Mutilation Anxiety	Separation Anxiety	Guilt Anxiety	Shame Anxiety	Diffuse Anxiety	Total Anxiety
SCL90 Anxiety factor scale							.38, $p < .001$
SCL90 D Depression	.26, $p < .05$				.38, $p < .03$		
SCL90 Anx Anxiety		.30, $p < .03$					
SCL90 Pax Scale	.30, $p < .03$						.38, $p < .001$
SCL90 Did scale				.27, $p < .02$			
SCL90 GSI Global Symptom index	.33, $p < .02$	.26, $p < .05$					
MMPI F scale	.25, $p < .05$						
MMPI L scale							−.26, $p < .05$
MMPI scale1 Hypochondriasis (Hs)				.33, $p < .02$	.26, $p < .05$		
MMPI scale2 Depression (D)				.31, $p < .02$			
MMPI scale3 Hysteria (Hy)				.25, $p < .05$			
MMPI scale6 Paranoia (Pa)					−.43, $p < .003$		
MMPI scale3 Schizophrenia (Sc)				.30, $p < .03$			
MMPI scale0 Social introversion (SI)	.45, $p < .002$						.26, $p < .05$
SCI (negative sense of control				.27, $p < .03$	−.28, $p < .03$		
SCI (positive assertive)							−.31, $p < .03$

with the Gottschalk–Gleser Death anxiety subscale scores ($r = .26$, $p < .05$), the SCL90 A factor scores correlated with the Gottschalk–Gleser Mutilation anxiety scores ($r = .30$, $p < .03$), and the SCL90 GSI Global symptom index scores correlated with the Gottschalk–Gleser Death anxiety subscale scores ($r = .33$, $p < .02$) and the Mutilation anxiety scores ($r = .26$, $p < .05$).

Table 1 also gives the intercorrelations between MMPI D scores and the Gottschalk–Gleser guilt anxiety scores ($r = .31$, $p < .02$), the MMPI Hy scores and the Gottschalk–Gleser guilt anxiety scores ($r = .25$, $p < .02$), the MMPI Hs and guilt anxiety scores ($r = .33$, $p < .02$), the MMPI Sc scale scores and the Guilt anxiety scale scores ($r = .30$, $p < .03$), the MMPI Si scores and the Death anxiety scores ($r = .45$, $p < .002$) as well as the Total Anxiety scale scores ($r = .26$, $p < .05$), and the MMPI PA scores and the shame anxiety scores ($r = -.43$, $p < .003$). And lastly, a significant negative correlation occurred between MMPI L scale scores and Gottschalk–Gleser Total Anxiety scale scores ($r = .26$, $p < .05$).

Though these correlations are, for the most part low, they are significant and confirm previous construct validation research for the Gottschalk–Gleser Anxiety scale (Gleser, Gottschalk, & Springer, 1961; Gottschalk, 1979, 1995; Gottschalk & Gleser, 1969; Gottschalk, Springer, & Gleser, 1961; Koch & Schofer, 1986). The negative correlation of the Total Anxiety scale scores and the MMPI L scale is of interest and needs further study.

The Self Control Inventory is a relatively new measure that is in the process of further validation. Table 1 indicates low significant positive intercorrelations between the Self Control Inventory scores for negative self control scores and Gottschalk–Gleser Guilt anxiety scores ($r = .27$, $p < .03$); whereas with Shame anxiety subscale scores ($r = -.28$, $p < .03$) these correlations are in the negative direction. This finding supports the observation that guilt and shame have different psychodynamics (Lewis, 1971; Piers & Singer, 1953), but these correlations merit more research. A significant negative correlation occurred between self control, positive A scores and Gottschalk–Gleser Total Anxiety scale scores ($r = -.31$, $p < .03$).

Hostility Scales Intercorrelations

Total hostility outward scores (one-tail tests) correlated significantly with the MMPI F scale scores ($r = .27$, $p < .04$), MMPI (D) Depression scores ($r = .32$, $p < .02$), MMPI Pd scores ($r = .26$, $p < .05$) and MMPI Ps scores ($r = .29$, $p < .03$). Hostility outward (overt) scores correlated significantly with Self Control Scores (SCI negsc—others have too much control over me) ($r = .36$, $p < .02$).

Hostility inward scores correlated significantly with the MMPI Hy scores ($r = .29$, $p < .03$). Hostility inward scores also correlated significantly with some of the SCL90 scores, namely, SCL90 (Is) Interpersonal sensitivity ($r = .26$, $p < .05$), SCL90 (Dep) Depression ($r = .25$, $p < .05$), SCL90 Anx ($r = .26$, $p < .05$), SCL90 (A-H) Hostility ($r = .27$, $p < .05$), SCL90 (Pid) Paranoid ideation ($r = .38$, $p < .007$), SCL90 (Psy) Psychoticism ($r = .29$, $p < .03$), and SCL90 GSI ($r = .41$, $p < .004$). Hostility inward scores, also, correlated significantly with Self control scores (SCI negsc—others have self control that I do not have) ($r = .33$, $p < .02$).

Ambivalent hostility scores correlated significantly with the MMPI MF scores ($r = .27$, $p < .05$). Ambivalent hostility scores are based on hostile or adverse verbal content in which other individuals or events in the external environment are directed at the speaker. The only explanation we can offer for the significant correlation between ambivalent hostility scores and MMPI MF scores in a group of psychiatric outpatients is that the more some individuals (regardless of sex) have some deviance in the balance between masculinity and femininity on the MMPI, the more likely they will feel that other people or the environment are unfriendly toward them.

These significant intercorrelations between the three Gottschalk–Gleser Hostility scales and a wide variety of psychobiological measures from the SCL90, MMPI, and Self Control Inventory confirm previous construct validation research involving these Hostility scales (Gottschalk, 1979, 1995; Gottschalk & Gleser, 1969; Gottschalk, Gleser, & Springer, 1963; Gottschalk, Lolas, & Viney, 1986; Koch & Schofer, 1986).

Depression Scale Intercorrelations

The total depression scale scores correlated significantly (one tail) with SCL90 Anx scores ($r = .24$, $p < .05$), SCL90 (Pa) Phobic anxiety scores ($r = .39$, $p < .005$), SCL90 (Pid) Paranoid ideation scores ($r = .35$, $p < .01$), SCL90 GSI scores ($r = .28$, $p < .03$). An increasing number of clinical papers point to the comorbidity of anxiety and depression (Barlow, DiNardo, Vermilyea, Vermilyea, & Blanchard, 1986; Zinbarg, et al., 1994).

Total depression scores also correlated significantly with "estimated" Speech Perception Test scores ($r = .30$, $p < .04$) and "estimated" Trails B test scores ($r = -.27$, $p < .05$) as well as total hope scores ($r = -.36$, $p < .01$) and social alienation-personal disorganization scores ($r = .26$, $p < .03$). These "estimated" neuropsychological test scores (derived from the Halsted Reitan Neuropsychological Test battery) were calculated from regression formulas derived originally in a research study of a large number of alcoholic patients at the Veterans Administration Medical Center at Long Beach, California, in which form and content data in verbal behavior indicative of cognitive impairment from the five-minute speech samples of these patients were selectively correlated with test items from all neuropsychological tests in the Halstead-Reitan test battery (Gottschalk, 1997; Gottschalk & Bechtel, 1993; Gottschalk, Eckardt, & Feldman, 1979; Gottschalk, Eckardt, Pautler, Wolf, & Terman, 1983). Predictive formulas were derived and tested from these data enabling one to use specific verbal item scores plus the subject's age, educational level, and sex to provide, at a significant level of probability, an "estimated" score for 13 different neuropsychological tests. These "estimated" scores were obtained by a computerized program whenever the Gottschalk Cognitive Impairment scores on any patient exceeded one standard deviation above the norms for this Cognitive Impairment scale (Gottschalk, 1995; Gottschalk & Bechtel, 1993, 1995; Gottschalk, Eckardt, Pautler, Wolf & Terman, 1983).

The correlations found with these "estimated" neuropsychological test scores are given, here, for heuristic purposes. They are provided at this time to alert the clinician to obtain careful neuropsychological testing when these "estimated" scores are in an elevated range. Also, in the present study, their intercorrelations with other measures that are not considered generally to assess impairment of cognitive function may serve as motivation for further research.

Since the Total Depression Scale scores include certain other Gottschalk content analysis subscales (Gottschalk & Hoigaard–Martin, 1986), it is not surprising that there were significant intercorrelations between total depression scores and total hostility outward scores ($r = .34$, $p < .01$), hostility inward scores ($r = .40$, $p < .004$), ambivalent hostility scores ($r = .46$, $p < .001$), mutilation anxiety scores ($r = .48$, $p < .001$), guilt anxiety scores ($r = .36$, $p < .002$), separation anxiety scores ($r = .39$, $p < .002$), and total anxiety scores ($r = .68$, $p < .001$). Between the Total Depression Scale scores and the Depression Subscales there were the following significant correlations: Depression Subscale I (Hopelessness) scores ($r = .44$, $p < .000$), Depression Subscale II (Self-Accusatoriness—composed of guilt and shame anxiety plus hostility inward scales) scores ($r = .39$, $p < .000$), Depression Subscale V (Death/Mutilation) scores ($r = .53$, $p < .000$), Depression Subscale VI (Separation) scores ($r = .40$, $p < .000$), Depression Subscale VII ($r = .31$, $p < .01$). Depression Subscale III (Psychomotor Retardation) scores did not correlate significantly with Total Depression Scale scores, but they correlated with Depression Subscale IV scores ($r = .37$, $p < .01$). And Depression Subscale IV

(Somatic concerns) scores also did not correlate significantly with Total Depression Scale scores, but they correlated with Depression Subscale VII (Hostility out) scores ($r = .29$, $p < .03$) as well as with Depression Subscale III (Psychomotor Retardation) scores, as indicated above.

With regards to significant intercorrelations involving the seven Depression Subscales, Depression Subscale I (Hopelessness) correlated with SCL90 GSI scores ($r = .29$, $p < .03$). Depression Subscale II (Self-Accusatoriness) correlated with several Content Analysis Scale scores, namely, ambivalent hostility scores ($r = .31$, $p < .02$), hostility in scores ($r = .51$, $p < .000$), social alienation-personal disorganization scores ($r = .31$, $p < .02$), and negatively with cognitive impairment scores ($r = -.32$, $p < .02$). The Depression Subscale II scores correlated with the MMPI D scores ($r = .27$, $p < .04$) and the MMPI Si (Social introversion) scores ($r = .29$, $p < .03$). The Depression Subscale II scores also correlated with the SCL90 A-H (Hostility) scores ($r = .27$, $p < .04$) and the SCL90 Pax (Phobic anxiety) scores ($r = .24$, $p < .06$). The Depression Subscale III (Psychomotor retardation scores correlated with the MMPI Hs scores ($r = -.28$, $p < .05$) and the Self Control positive scores ($r = .30$, $p < .05$). The Depression Subscale IV (Somatic concerns) scores correlated with the Content Analysis total hostility out scores ($r = .27$, $p < .04$) and the Depression Subscale III (Psychomotor retardation) scores ($r = .37$, $p < .01$). The Depression Subscale V (Death and mutilation anxiety), as would be expected, correlated with content analysis death anxiety scores ($r = .44$, $p < .002$) and total anxiety scores ($r = .57$, $p < .001$).

This Depression Subscale V (Death and mutilation anxiety) scores also correlated negatively with MMPI L scale scores ($r = .38$, $p < .01$) and positively with MMPI F scores ($r = .30$, $p < .03$), and MMPI (Si) Social introversion scores ($r = .38$, $p < .009$). These significant correlations with the MMPI L and F scales merit further research.

That higher combinations of death and mutilation anxiety scores are associated with lower MMPI L scale scores may be peculiar to this sample of 25 psychiatric outpatients. On the other hand, it is plausible that more disturbed psychiatric patients are less likely to make responses that elevate the MMPI L scale scores. The significant positive correlation between Depression Subscale V (Death and mutilation anxiety) scores and MMPI F scale scores is consistent with the viewpoint that the MMPI F scale is an indicator of degree of psychopathology.

Finally, the Depression Subscale V scores correlated with the SCL90 Pid ($r = .30$, $p < .03$), as well as the SCL90 GSI scores ($r = .33$, $p < .03$), the Depression Subscale I (Hopelessness) scores ($r = .33$, $p < .01$), as well as the Depression Subscale VI (Separation anxiety) scores ($r = .32$, $p < .02$). Depression Subscale VI (Separation anxiety) correlated with separation anxiety scores ($r = .31$, $p < .002$), and total anxiety scores ($r = .24$; $p < .05$) as well as, negatively, with shame anxiety scores ($r = -.24$, $p < .05$). These Subscale VI scores also correlated with MMPI Sc scores ($r = .29$, $p < .03$). The Depression Subscale VII (Hostility outward) scores correlated, as one would expect, with total hostility out scores ($r = .97$, $p < .000$), hostility out overt scores ($r = .37$, $p < .001$), hostility out covert scores ($r = .81$, $p < .000$), and guilt anxiety scores ($r = .34$, $p < .01$). On other measures, Subscale VII scores correlated with MMPI (D) Depression scores ($r = .30$, $p < .03$), MMPI F scale scores ($r = .27$, $p < .04$) and MMPI Pa scores ($r = .27$, $p < .04$) Subscale VII scores also correlated with SCL90 Pid scores ($r = .35$, $p < .01$), SCL90 GSI scores ($r = .33$, $p < .02$), and SCL90 (Pax) Phobic anxiety scores ($r = .39$, $p < .005$).

Social Alienation-Personal Disorganization Scale Intercorrelations

Social Alienation-Personal Disorganization Scale ("Schizophrenic" Scale; Gottschalk & Gleser, 1969) scores correlated positively with Content Analysis Scale cognitive impairment scores

($r = .24$, $p < .05$) and total depression scores ($r = .26$, $p < .03$) and negatively with total hope scores ($r = -.42$, $p < .002$).

Cognitive Impairment Scale Intercorrelations

Intercorrelations between the Cognitive Impairment Scale scores and other measures are summarized in Table 2.

Cognitive Impairment Scale scores correlated positively with Content Analysis Scale social alienation-personal disorganization scores ($r = .24$, $p < .05$) and negatively with overt hostility outward scores ($r = -.31$, $p < .02$). With estimated measures derived from predictor formulas derived from content analysis scores, cognitive impairment scores correlated with TPT (location) scores ($r = .51$, $p < .002$) and Trails A scores ($r = .26$, $p < .05$) and the Wisconsin Card Sort test scores ($r = -.44$, $p < .005$). There was a significant positive correlation between the cognitive impairment scores and MMPI Hs scores ($r = .26$, $p < .04$) and a negative correlation with DSM IIIR Axis V (severity of stressors) ratings ($r = -.34$, $p < .01$).

Hope Scale Intercorrelations

Intercorrelations between Hope Scale scores and scores from other measures are given in Table 3.

Total Hope Scale scores correlated with one of its two subscale scores (hopefulness and hopelessness), namely, hopelessness scores ($r = .42$, $p < .003$), indicating that this sample of patients had total hope scores composed primarily of speech references to hopelessness more than hopefulness. There were positive correlations between total hope scores and SCL90 D scores ($r = .41$, $p < .004$), SCL90 A scores ($r = .31$, $p < .02$), and SCL90 Pax scores ($r = .34$, $p < .01$). With regards to the MMPI test, total hope scores correlated significantly with MMPI D scores ($r = .31$, $p < .02$), MMPI Hs scores ($r = .25$, $p < .05$), MMPI Pd scores ($r = .28$, $p < .03$), and MMPI Pa scores ($r = .23$, $p < .05$). With the Self-Control Inventory, total hope scores correlated with SCI Total scores ($r = .27$, $p < .05$) and SCI Positive Self-Control scores ($r = .28$, $p < .04$). A positive correlation occurred between total hope scores and Beck Depression Inventory scores ($r = .34$, $p < .01$). Curiously, there was a positive correlation between total hope scores and "estimated" Digit Symbol scores ($r = .41$, $p < .007$) and Objective Assembly scores ($r = .28$, $p < .05$).

When the hopeful components of the Hope Scale were singled out from the hopeless components, some interesting correlations were found. Hopeful scores correlated negatively

Table 2. *Intercorrelations Between Cognitive Impairment Scales Scores and Other Measures*

	Number	Cognitive Impairment	*p*
Trails A	18	.260	.050
TPT (location)	18	.510	.002
Wisconsin Card Sort	18	−.440	.005
MMPI Hypochondriasis (Hs)	22	.260	.040
DSMIIIR (V)	23	−.340	.010
Hostility Outward, Overt	24	−.310	.020
Social Alienation–Personal Disorganization	24	.240	.050

Table 3. *Intercorrelations of Total Hope Scale (Hopefulness plus Hopelessness) Scores with Other Measures*

	Number	Total Hope	*p*
Digit symbol	18	.420	.007
Object assembly	18	.280	.050
Hopelessness score (Hope2)	24	.420	.003
SCL90 Depression	20	.270	.050
SCL90 Anxiety	20	.280	.040
SCL90 A-H	22	.410	.004
MMPI Scale1 Hypochondriasis	22	.250	.050
MMPI Scale2 Depression	22	.310	.020
MMPI Scale4 Psychopathic Deviate	22	.280	.030
MMPI Scale6 Paranoia	22	.230	.060
Self Control Inventory (Total)	20	.270	.050
Self Control Inventory (Positive Self Control)	20	.280	.040

with Self-Control Total scores ($r = -.29$, $p < .02$), Self-Control-Positive Self-Control scores ($r = -.31$, $p < .02$), Content Analysis death anxiety scores ($r = -.28$, $p < .03$), Depression Subscale III (Psychomotor retardation) scores ($r = -.28$, $p < .03$), and Depression Subscale IV (Somatic concerns) scores ($r = .43$, $p < .002$).

Shapiro Control Inventory Intercorrelations

Intercorrelations involving scores from the Shapiro Control Inventory (SCI) and scores from other measures are given in Table 4.

Shapiro Control Inventory scores correlated with the following Content Analysis Scale measures: SCI negative self-control scores with guilt anxiety scores ($r = .27$, $p < .05$), shame anxiety scores ($r = -.27$, $p < .05$), overt hostility outward scores ($r = .36$, $p < .02$), hostility inwards scores ($r = .33$, $p < .02$). Self-control inventory positive P scores correlated with total anxiety scores ($r = -.31$, $p < .03$). SCI total scores correlated with total hope scores ($r = -.27$, $p < .04$) and with hopeful scores ($r = -.29$, $p < .04$). SCI positive self-control scores correlated with scores of total hope ($r = -.28$, $p < .04$) and hopefulness ($r = -.32$, $p < .02$).

SCI total scores correlated with the MMPI Sc scores ($r = -.32$, $p < .03$), MMPI Ma scores ($r = .29$, $p < .04$), MMPI K scores ($r = .52$, $p < .000$), MMPI D scores ($r = .40$, $p < .000$), MMPI Si scores ($r = -.29$, $p < .04$), MMPI Pa scores ($r = -.42$, $p < .005$).

With the Symptom Checklist (SCL) subscales, there were the following correlations: SCI total scores and SCL90 (So) Somatization scores ($r = -.27$, $p < .05$), SCL90 (OC) Obsessive compulsive scores ($r = -.43$, $p < .000$), SCL90 (Is) Interpersonal sensitivity ($r = -.54$, $p < .000$), SCL90 D scores ($r = .55$, $p < .000$), SCL90 A Anxiety scores ($r = -.48$, $p < .000$), SCL90 A-H scores ($r = -.43$, $p < .000$), SCL90 Pax scores ($r = -.50$, $p < .000$), SCL90 Pi scores ($r = -.54$, $p < .000$), SCL90 Psy scores ($r = -.36$, $p < .01$), SCL90 (Gsi) Global symptom index scores ($r = -.50$, $p < .000$).

With "estimated" cognitive impairment scores derived from content analysis scores, SCI scores correlated as follows: self-control inventory (SCI) positive A scores and digit span ($r = .39$, $p < .02$) and Benton Visual Retention scores ($r = -.41$, $p < .01$) and with SCI positive Y scores and Shipley Hartford Verbal scores ($r = .48$, $p < .007$).

Table 4. *Intercorrelations Between Self-Control Inventory Scores and Other Measures*

	SCI TOTAL	SCIpossc	SCInegsc	SCIposA	SCIposY	SCInegY
Guilt Anxiety subscale			.27, $p < .05$			
Shame Anxiety subscale			.27, $p < .05$			
Total Anxiety scale				−.31, $p < .03$		
Hostility Outward, overt subscale			.36, $p < .02$			
Hostility Inward scale			.33, $p < .02$			
Total Hope scale	−.27, $p < .05$					
Hope1 (Hopeful) subscale	−.29, $p < .04$	−.32, $p < .02$				
Depression subscale3 Psychomotor retardation					.30, $p < .02$	
Digit Span (estimated)				.39, $p < .02$	.33, $p < .05$	
Benton Visual Retention (estimated)				−.41, $p < .01$		
Shipley Hartford, Verbal (estimated)					.45, $p < .007$	
SCL90 Anxiety	−.48, $p < .002$	.37, $p < .004$	.53, $p < .001$			
SCI90 Depression	.55, $p < .001$	.43, $p < .000$				
SCL90 A-H	−.43, $p < .000$	.31, $p < .008$	.41, $p < .003$			
SCL90 Pax	−.51, $p < .002$	.43, $p < .000$	.42, $p < .004$			
SCL90 Did	−.54, $p < .001$	.42, $p < .007$	.63, $p < .000$			
SCL90 Psy	−.36, $p < .02$		.53, $p < .001$			
SCL90 GSI	−.40, $p < .001$	.41, $p < .007$	.50, $p < .002$			
SCL90 Sam	−.27, $p < .05$		.53, $p < .001$			
SCL90 OC	−.43, $p < .000$	.43, $p < .000$	.53, $p < .001$	.38, $p < .01$		
SCL90 IS	−.59, $p < .000$					
MMPI F		.26, $p < .04$		.27, $p < .05$		
MMPI K	.52, $p < .000$	.41, $p < .007$	.42, $p < .005$	.28, $p < .05$	.33, $p < .02$	
MMPI Scale2 Depression	.42, $p < .005$	.46, $p < .02$	.37, $p < .01$			
MMPI Scale6 Paranoia	−.42, $p < .005$					
MMPI Scale8 Schizophrenia	−.32, $p < .03$	.31, $p < .02$	.31, $p < .02$			
MMPI Scale9 Hypomania	.29, $p < .04$		.43, $p < .006$			
MMPI Scale0 Social Introversion	−.29, $p < .04$	−.33, $p < .02$				.31, $p < .02$

DISCUSSION

This study makes use of the computerized scoring of content and form of speech to measure the magnitude of many psychobiological dimensions, pertinent to neuropsychiatric assessment. The computerized scoring system uses the LISP artificial intelligence software program developed by Gottschalk and Bechtel (Bechtel, 1997; Gottschalk, 1995ab; Gottschalk & Bechtel, 1982, 1989, 1993, 1995). For the most part, the intercorrelations involving the content analysis scales with other measures thoroughly confirm previously reported validation research dealing with these content analysis scales (Gleser, Gottschalk, & Springer, 1961; Gottschalk, 1974, 1979, 1994, 1995, 1997; Gottschalk & Gleser, 1969; Gottschalk, Gleser, & Springer, 1963; Gottschalk, Hoigaard, Birch, & Rickels, 1979; Gottschalk, Lolas, & Viney, 1986; Gottschalk, Springer, & Gleser, 1961; Koch & Schofer, 1986).

Intercorrelations of content analysis scale scores obtained from five minute speech samples given by psychiatric outpatients in response to purposely ambiguous instructions (to talk about any interesting or dramatic life experiences) with scores from the MMPI-2, SCL90, Shapiro Self Control Inventory, and other psychometric measures are reported.

A few correlations involving the MMPI F, K, and L scales and certain content analysis scale scores have not been previously noted, are plausible, but merit further research.

These intercorrelations are reported, here, in detail to serve as a foundation for further studies in those instances where more replication and validation might be appropriate. They are also given in detail in order to provide a map for the clinical researcher who might be interested in using this rapid and yet comprehensive computerized five-minute speech sample method for initial screening of the diagnostic and other assessment ramifications of this approach.

Intercorrelations involving the Shapiro Self Control Inventory, some of the content analysis scale scores, the MMPI-2, the SCL90, and other psychometric measures contribute to the validation of the Self Control Inventory as well as elaborating on the construct validation of the content analysis scales.

We believe that, in this computer age, further development of the usefulness and applications of this computerized content analysis method of diagnostic evaluation can be expected to take place.

SUMMARY AND CONCLUSIONS

This is a report of the neuropsychiatric evaluation of 25 new psychiatric outpatients by the application of a computerized content analysis method of a five-minute speech sample obtained from each patient. The diagnostic assessment included, in addition to a comprehensive clinical psychiatric evaluation, the administration of a group of other psychosocial or psychometric measures, such as, the MMPI-2, the Hopkins Symptom Check List, the Beck Depression Inventory, and the Shapiro Control Inventory.

The significant intercorrelations found between the latter measures and scores derived from the verbal behavior content analysis measures (on anxiety, hostility outward, hostility inward, ambivalent hostility, depression, social alienation–personal disorganization, cognitive impairment, and hope) confirm previously published construct validation research involving these content analysis scales. The present research further confirms that computerized scores, using artificial intelligence software (LISP), derived from these five-minute verbal samples are as equally accurate and significantly intercorrelated with other criterion measures as scores obtained by trained human content analysis scorers.

The use of this computerized five-minute verbal behavior content analysis screening procedure for initial, rapid neuropsychiatric comprehensive diagnostic assessment is supported by this study.

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