Hostility And Aggression in Schizophrenia: Research Since 1960

John F. Taylor, M.A.

Introduction

The inappropriate handling of feelings of hostility, and the accompanying inappropriate expression of aggression, have long been recognized as integral parts of the symptomatology of schizophrenia. Detailed study of the relationship between hostility and Psychopathology awaited sophistication in statistical and methodological procedures, however, and not until the 1950s was much empirical attention given to this area. The present review is concerned primarily with the second decade of this research, a decade that has brought many advancements in knowledge about the relationship between hostility and aggression in schizophrenia.

The relationship between feelings of hostility, acts of aggression, and schizophrenia has been explored from two points of view: (1) the nature of the aggressiveness shown by schizophrenics, and (2) the responses of schizophrenics to stimuli which are, or are perceived by schizophrenics to be, aggressive in nature.

I. Expression of Hostility through Aggression

Overt Aggression

Several factor analytic studies, using psychiatric behavior rating inventories, have extended previous findings about hostility as an etiological and symptomatic factor in schizophrenia. Specifically, the nature of the overt aggression displayed by schizophrenics has been explored in these studies.

In 1957, Buss and Durkee[1] developed a self-administered inventory for assessing mode of hostility expression, with scores for each of eight modes: assault, indirect, irritability, negativism, resentment, suspicion, verbal and guilt. Later, factor-analysis of the scores obtained by 96 subjects (Ss) of various psychiatric diagnoses on this instrument[2] resulted in two factors for males and two for females. For males, factor I was highly loaded on irritability, resentment and suspicion; factor II was a general aggression factor. For females factor I was highly loaded on irritability, resentment and verbal; factor II was highly loaded on assault, verbal, and negativism. For both sexes, then, the first factor included high loadings on irritability and resentment, and the second factor involved overt aggressiveness. All in all, the results yielded two factors: hostility and aggressiveness.

A factor similar to the above factor I for males was found by Cohen, Gurel, and Stumpf,[3] who factor-analyzed a symptom rating scale administered to 1274 hospitalized psychotics. Along with four other factors, they found a paranoid hostility factor with high loadings on suspicion-paranoid, excessively hostile, and thinking disorganization.

Lorr, et al.[4] isolated a hostile belligerence factor by factor-analyzing the scores of 296 patients from 47 mental institutions on a behavior rating inventory. The factor was highly loaded on these variables: expresses feeling of hostility toward others; exhibits attitude of contempt or disdain; manifests hostile or sullen attitude; shows irritability or annoyance; blames others for difficulties; expresses feelings of bitterness and resentment; and complains, gripes and finds fault generally. Lorr and Klett[5] later found this same factor, along with 10 other first-order factors, by factor-analyzing the scores of 823 mental patients on the same behavior rating inventory. Among these other first-order factors were excitement, grandiose expansiveness, and paranoid projection. These four factors together seem to represent a refinement of the single "excitement-hostility" factor that had been found with a high degree of consistency in research during the 1950's.[6,7,8,9]

Not only has the nature of the hostility factor in schizophrenia been clarified by recent research, but its relationship to various indexes of psychiatric improvement has also been explored. Downing, et al.,[10] hypothesizing that decrement in handwriting size would represent increased self-control, compared 12 schizophrenics whose handwriting size had increased over a period of time with 12 schizophrenics whose handwriting had decreased in size over the same time period. The decreasing group showed a corresponding decrease in rated hostility over the experimental period, while the increasing group showed a corresponding increase in rated hostility.

Pugh and Ray[11] have added to previous findings that had found the direction of aggression to be associated with overall Psychopathology.[12,13,14] They divided 72 female chronic schizophrenics into nine groups in terms of the most salient characteristics of their overt behavior. Three of the groups, representing progressively lessened overt hostility, were (1) combative, assaultive, destructive; (2) verbal, hostile troublemakers; and (3) passive resistive. Membership in the first of these groups was associated with decreased tendencies to wear shoes and help with ward tasks, and it was associated with increased tendencies toward unashamed disrobing and masturbation. Membership in the second and third groups was, conversely, associated with trends in the opposite direction on all of these indexes of behavioral maladjustment.

Recent research has thus corroborated findings from the 1950's in establishing overt aggressiveness as one part of the symptomatology of schizophrenia. This factor seems to have previously been associated with excitement, and different analyses have broken the "excitement-hostility" factor into different components. Overt hostility has further been used by some recent researchers as a dependent measure of overall level of adjustment; *it thus seems to be one aspect of schizophrenia that is at least indirectly redeemable through therapeutic efforts.*

Projected Aggression

Recent research has clarified findings from the 1950's that schizophrenics tend to give aggressive responses on projective tests and that the tendency to project aggression in this fashion is correlated with the degree of overall psychological disturbance.[15]

Zimet and Fine[16] analyzed the Rorschach performance of 36 process and 24 reactive schizophrenics in terms of oral, anal, phallic, anxiety and aggression content categories. Aggression responses were the second most frequent type, exceeded in frequency only by anxiety responses, and the process schizophrenics gave significantly more aggression responses than did the re-actives. Thus those individuals who showed the greater chance of recovery (the

reactives) projected significantly less hostility than did the group with the poorer prognosis (the process schizophrenics).

Along similar lines, Foulds[17] found paranoid schizophrenics superior to catatonics, hebephrenics and simple schizophrenics in the amount of organization and appropriate logic involved in their TAT hostility responses. Even though the paranoid schizophrenics manifested more projected hostility, Foulds did not regard his findings as contrary to previous results; rather, the catatonics and hebephrenics were said to have been retreating into autism while the paranoids were still actively involved in interpersonal relationships. The apparently high amount of projected hostility in the least pathological group was thus interpreted as an artifact of sampling and an inevitable consequence of comparing withdrawn with socially participating individuals. Recent research has thus continued to verify the observation that, in addition to being overtly manifested, the inappropriate aggressiveness of schizophrenics can be observed on projective devices.

Fantasized Aggression

The active fantasy life often associated with schizophrenia, saliently apparent in hallucinations and delusions, has come under recent scrutiny as one possible avenue for the expression of aggressive feelings toward others.

Basing their hypotheses on the expectation of 15 experienced psychiatrists, Richardson and Moore[18] predicted that in nocturnal dreams schizophrenics would have much uncensored and undistorted sexual and aggressive content, including openly revealed incestuous, aggressive and sadistic scenes. They compared the self-reported dream content of 25 schizophrenics and 25 matched normal control Ss in terms of the total number of Ss with aggressive dreams, the total number of aggressive dreams, and the total number of dreams in which members of the Ss' families were the victims of aggression.

Unexpected Variable

Only in the third variable was there a significant difference, and the results were in the opposite direction from the experimenters' expectations—the schizophrenics fantasized *fewer* instances of aggression against family members than did the normals. The dreams of the schizophrenics did, however, have a quality of bizarreness, unreality and strangeness that was not present in the dreams of the control Ss. It is difficult to accept these results at their face value, however, because of the finding by Cazavelan and Epstein[19] that schizophrenics may be sensitive to their fantasized aggressions and may simply not report them. Twenty female paranoid schizophrenics were compared with 20 matched normal Ss by means of a 212-item self-administered inventory containing statements about daydreams as well as a defensiveness scale. Of the highly defensive Ss, the schizophrenics admitted to fewer fantasized aggressions than did the control Ss; of those with low defensiveness, the schizophrenics admitted to far more fantasized aggressions than did the control Ss. The experimenters concluded that the schizophrenics were more defensive about the presence of manifestly hostile fantasies than were the control Ss.

Results that showed slight differences in the aggressive content of the dreams of schizophrenics and of non-schizophrenics were obtained by Hall.[20] He compared 50 male mental patients, the majority of whom were schizophrenic, with 100 male college students in terms of dream content. A total of 11 different scores for aggressive encounters were calculated, in addition to five scores comparing aggressiveness with friendliness. There were no significant differences between the mental patients and the college students on any of the 11

aggression scores, but the college students fantasized twice as many friendly encounters as did the mental patients. When a further analysis was done on the data, the distinctive nature of schizophrenic fantasized aggression was uncovered. These male schizophrenics were found to have a specific deficit in friendliness toward females. Two-thirds of the fantasized interactions with females were aggressive in nature for the schizophrenics, while just 37% were aggressive in nature for the control Ss.

The inconsistent results of recent research on dream-related aggression in schizophrenia should provide impetus for further investigation in this area. There may be sex differences in fantasized aggression, and one research advancement would consist of a replication of Hall's[20] study, using female Ss. Sound research into fantasized aggression in schizophrenia has started.

II. Reactions to Hostile and Aggressive Stimuli

Pathological Thinking and Projected Aggression

Recent investigations have explored the relationship between thought disorder in schizophrenia and the tendency to perceive ambiguous stimuli as being aggressive in nature.

Silverman[21] compared the Rorschach performance of 48 adult male schizophrenics with that of 30 adult male medical patients in terms of aggressive imagery and evidence of thought disturbance (primary process thinking). Silverman drew two conclusions from his results: (1) for the schizophrenics as well as the control Ss, the greater the number of responses with aggressive content, the more frequently did there appear manifestations of thought disturbance, and (2) for both groups, responses with aggressive content were more apt to be accompanied by manifestations of thought disturbance than were responses without aggressive content. Both of these observed effects were more prominent for the schizophrenic than for the control *Ss*, the correlations between projected aggression and thought disturbance being .58 and .49 respectively.

Having established that projected aggression is associated with thought disturbance in at least one non-psychiatric group, Silverman further investigated this relationship by activating aggressive feelings in 77 male hospital attendants.[22] When these Ss were immediately thereafter given an inkblot test, those for whom there had been a prior external activation of aggressive ideas responded with increases in pathological thinking and libidinal images. Thus a state of aroused aggressiveness facilitated the production of schizophrenic-like responses on the projective test. A subsequent comparison of subliminal vs. supraliminal activation of aggressive feelings in 120 male attendants[23] found the former to be superior to the latter in eliciting libidinal imagery and pathological thinking on an inkblot test. The effect was found to be even greater for attendants who gave many aggressive responses on a pretest, i.e., Ss who were already "aggressive" before the experimental arousal of aggressive feelings. The general correlation between projected aggression and pathological thinking in schizophrenia thus seems to be fairly well established. Schizophrenics who give aggressive responses to neutral ambiguous stimuli (projective tests) tend to show more evidence of disturbed thought processes than do schizophrenics who do not give aggressive responses on projective tests. A state of aroused aggressiveness in normals[22] has also been shown to lead to disturbed thought processes.

Pathological Thinking and Aggressive Stimuli

Some investigators have explored the reactions of schizophrenic individuals to

stimuli which are patently aggressive in nature. Silverman[24] gave TAT cards with high and low aggressive "pull" to 20 adolescent schizophrenics and 20 adolescents diagnosed as neurotic or as having a personality disorder. He found that the schizophrenics displayed more evidence of thought disturbance than did the control Ss under both high and low aggressive stimulation. There was some degree of thought disturbance among the control group under the high aggression condition, and this result was well in line with a previous finding.[21] The schizophrenics, however, showed a comparable amount of thought disturbance in the low aggression condition; they were just as pathological in their thinking under low aggressive stimulation as the control Ss were under high aggressive stimulation. The results of this experiment, when considered along with subsequent similar find-ings,[22,23,25] support the inference that schizophrenics give responses indicative of a *chronic state of heightened arousability* in terms of aggressiveness. Mednick[26] has offered an explanation of schizophrenia in terms of "high drive" states, and Silverman's findings seem interpretable from this point of view.

Subliminal Stimuli

In an experiment that used neither inkblots nor TAT cards as media for eliciting or measuring responses, Silverman and Spiro[27] studied the responses of 19 paranoid and 21 non-paranoid schizophrenics to subliminally presented aggressive stimuli. Dependent measures consisted of (1) recall of a simple narrative, (2) a word association task and (3) a projective device consisting of a series of faces which were rated in terms of pleasantness by the S. On this last measure, rating a face as not pleasant was interpreted as seeing it as aggressive, and this perception was considered indicative of having projected aggressiveness onto it. When all 40 Ss were considered together, significant increases in pathological thinking appeared on the story recall and on the word association tasks when an aggressive, as opposed to a neutral, stimulus was subliminally presented prior to the dependent measures. When the two experimental groups were considered separately, under aggressive stimulation conditions the paranoids were found to show more projection of aggression on the faces test and more impairment on the word association task than the non-paranoids, while the latter group showed significant impairment on the recall task.

Attempting to solve the methodological problem of matching experimental groups, Silverman[28] had each of 32 male schizophrenics serve as his own control by going through the same experimental procedure twice, once with subliminal aggressive stimulation and once with subliminal stimulation by a neutral stimulus. The results served to corroborate the findings he had previously obtained by using matched groups of Ss, in that he found significant increases in signs of thought disturbance in response to inkblots under the aggressive stimulation condition.

Schizophrenics thus seem to manifest signs of increased thought disturbance when aggressive stimuli are presented to them. More research is needed in order to uncover the factors responsible for this phenomenon. Silverman and Spiro's[27] comparison of paranoid and non-paranoid schizophrenics is a start in this direction.

Distorted Perception of Aggressive Stimuli

Inaccurate interpretation of hostility shown by others is among the many weaknesses in social judgment that are typically a part of the symptomatology of schizophrenia. One explanation is that situations involving aggression are particularly threatening, and inaccurate perceptions are related to attempts at psychological defense.

Buck and Kates[29] conducted two

experiments involving perception of love and anger cues. They used a series of cartoons with assorted geometric forms that moved in accordance with patterns previously rated as indicative of "love" and "anger" by 200 college students. In the first experiment, 30 male schizophrenics were compared with 30 male normal control Ss in their ability to perceive the movement patterns as being indicative of love or anger. There were no significant differences in the ability of either group to perceive the "love" pattern, but the schizophrenics showed a marked impairment in their ability to perceive the "anger" pattern appropriately. In a follow-up experiment, these investigators controlled for premorbid adjustment by comparing the performance of 48 poor premorbid schizophrenics, 48 good premorbid schizophrenics and 48 matched normal control Ss. The poor premorbids were found to be significantly inferior to the other two groups in their perception of the "love" pattern, while both schizophrenic groups were equally inferior to the control Ss in their ability to perceive the "anger" pattern appropriately.

Brodsky[30] studied perception of aggression in a sorting task involving pictures of non-interpersonal aggression (e.g., tornado) and interpersonal aggression (e.g., man with club). Five groups of Ss were used: 12 acute schizophrenics, 12 chronic schizophrenics, 12 hospitalized patients with acute physical illness, 12 hospitalized patients with chronic physical illness and 12 normal control Ss. Correct perception of aggression involved sorting the pictures in terms of the presence or absence of aggression. The results were that the schizophrenic Ss, as opposed to the medical and normal control Ss, took longer to sort the pictures and had more difficulty sorting in terms of aggression. The deficit shown by the schizophrenics was more pronounced when interpersonal aggression was pictured than when non-interpersonal aggression was pictured.

Perceptual Defenses

In addition to exploring the ability of schizophrenic individuals to perceive aggression, recent research has also focused attention on phenomena that may be interpreted as perceptual defenses.

In a previously described experiment[28] where each schizophrenic S served as his own control by going through the experimental procedure under both aggressive and neutral subliminal stimulation conditions, the experimenter determined the recognition thresholds for the two types of subliminal stimuli. He found that the median recognition threshold for the aggressive picture was 10 times as great as the median threshold for the neutral stimulus (400 as opposed to 40 milliseconds). Such blocking of perception has been shown to be associated with highly anxiety-arousing cues,[31] and these results may be interpreted as indicating that the aggressive stimuli were distinctly threatening for the schizophrenic Ss.

Another study showing perceptual defense with regard to aggressive stimuli was done by Pearl and Berg.[32] Sixteen schizophrenics rated as having trouble with their aggressive feelings were asked to look at pictures that represented the three primary conflict areas of sex, dependency and aggression. Each S was then instructed to estimate the length of time each of the three stimuli had been presented to him. Estimates for the aggressive stimuli were the most distorted, followed by sex and dependency in that order. All three were overestimated, and the error on the aggressive stimulus was significantly higher than the errors on the other two stimuli. The Ss, at the same time, were able to be nearly perfect in their estimate of the length of time that an additional neutral stimulus had been presented to them.

John F. Taylor, M.A.

Psychology Intern
Brecksville (Ohio) Veterans Administration Hospital and
Doctoral candidate,
Kent State University
Kent, Ohio

Disappointingly few of the empirical investigations of perceptual defensive phenomena have involved psychiatric groups as Ss. The burgeoning research along these lines, however, may possibly have much to offer in terms of the mechanisms by which schizophrenics perceive social and interpersonal stimuli. The token evidence available at the present time indicates that schizophrenics tend to use "normal" perceptual defense mechanisms against "abnormal" targets; aggressive stimulation seems to be particularly anxiety-arousing for schizophrenics, more so than for non-schizophrenics. A comparison with a non-psychiatric group in a carefully controlled perceptual defense experiment would be a meaningful next step in studying the distorted perceptions of schizophrenics to aggressive stimuli.

III. Discussion

Typical observational research methodology in this area has involved rating a group of schizophrenics on "overt hostility' and correlating the ratings with other indexes of Psychopathology. Typical experimental methodology has involved (1) giving schizophrenic Ss an ambiguous stimulus and noting the amount of hostility responses elicited, or (2) giving schizophrenic Ss an aggressive stimulus and noting evidence of thought disturbance or perceptual defense.

The inappropriate harboring and expression of hostility through overt behavior, fantasy and projection has been shown to be an integral part of symptomatology; it thus seems to represent *a major conflict area in schizophrenia.* Schizophrenics seem to be more defensive about their own feelings of hostility than are non-schizophrenics, and they appear to be more threatened by aggressive stimuli. The severity of inappropriate aggressions and other hostile responses has been shown to vary directly with indexes of overall adjustment. Aggresive imagery that is not given vent by ordinary means (e.g., is aroused subliminally) tends to disrupt cognitive functioning in schizophrenics as well as in non-schizophrenics. The global picture that emerges is one of general hyperresponsiveness and hyper-arousability to aggression.

Numerous advancements have been made in this area, but the research as a whole must still be regarded as in its infancy. Investigations into the fantasized aggression of schizophrenics have yielded conflicting results, and there have been no systematic investigations of major variables such as sex differences. The relationship between pathological thinking and projected aggression needs to be explored with groups of various degrees of psychological impairment. The responses of schizophrenics to aggressive stimuli have not yet been systematically explored; few studies, for example, have compared schizophrenic subtypes with each other. The inability of schizophrenics to recognize or classify aggressive stimuli appropriately needs more empirical exploration, and perceptual defenses need to be investigated further. Finally, standard controlled laboratory procedures for the experimental investigation of human aggression[33] have not yet been used with schizophrenic Ss. All of these avenues for research hold promise in adding to our knowledge about inappropriate feelings of hostility, an important aspect of the Psychopathology of schizophrenia.

Summary

Research on hostility and aggression in schizophrenia was reviewed, with particular emphasis on advancements made by studies in the last decade. Studies dealing with the expression of hostility were divided in terms of mode of expression (overt, projection and fantasy), while studies dealing with reactions to hostility were divided in terms of the dependent variable (pathological thinking and perceptual distortion). Hostility was shown to be a major conflict area in schizophrenia, manifestations of this conflict having been found in a variety of ways. Appropriate conclusions were drawn about the present status of knowledge from each of the types of research in this area, and fruitful avenues for future research were suggested.

REFERENCES

1. Buss, A. and Durkee, A.: An inventory for assessing different kinds of hostility. J. Consult. Psychol. 21:343-349, 1957.
2. Buss, A., Fischer, H. and Simmons, A.: Aggression and hostility in psychiatric patients. J. Consult. Psychol. 26:84-89, 1962.
3. Cohen, J., Gurel, L. and Stumpf, J.: Dimensions of psychiatric symptom ratings determined at thirteen timepoints from hospital admission. J. Consult. Psychol. 30:39-44, 1966.
4. Lorr, M., McNair, D., Klett, C. and Lasky, J.: Evidence of ten psychotic syndromes. J. Consult. Psychol. 26:185-189, 1962.
5. Lorr, M. and Klett, C: Constancy of psychotic syndromes in men and women. J. Consult. Psychol. 29:309-313, 1965.
6. Guertin, W.: A factor-analytic study of schizophrenic svmptoms. J. Consult. Psychol. 16: 308-312, 1952.
7. Lorr, M., Jenkins, R., and Holsopple, J.: Factors descriptive of chronic schizophrenics selected for the operation of prefrontal lobotomy. J. Consult. Psychol. 18:293-296, 1954.
8. Lorr, M., Jenkins, R. and O'Connor, J.: Factors descriptive of Psychopathology and behavior of hospitalized psychotics. J. Abnorm. & Soc. Psychol. 50:78-86, 1955.
9. Wittenborn, J.: Symptom patterns in a group of mental hospital patients. J. Consult. Psychol. 15:290-302, 1951.
10. Downing, R., Ebert, J., Boruchow, J. and Valentine, J.: Temporal changes in handwriting size, level of premorbid social functioning and intellectual level during treatment in acute schizophrenics. J. Nerv. & Ment. Dis. 142:526-533, 1966.
11. Pugh, L. and Ray, T.: Behavior style categories of chronic schizophrenic women. Arch. Gen. Psychiat. 13:457-468, 1965.
12. Albee, G.: Patterns of aggression in Psychopathology. J. Consult. Psychol. 14:465-468, 1950.
13. Feldman, D., Pascal, G. and Swenson, C: Direction of aggression as a prognostic variable in mental illness. J. Consult. Psychol. 18: 167-170, 1954.
14. Pascal, G., Swensen, C, Feldman, D., Cole, M. and Bayard, J.: Prognostic criteria in the case histories of hospitalized mental patients. J. Consult. Psychol. 17:163-171, 1953.
15. Grauer, D.: Prognosis in paranoid schizophrenia on the basis of the Rorschach. J. Consult. Psychol. 17:199-205, 1953.
16. Zimet, C. and Fine, H.: Primary and secondary process in two types of schizophrenia. Am. Psychol. 17:296, 1962. (Abstract)
17. Foulds, G.: Organization and hostility in the Thematic Apperception Test stories of schizophrenics. Brit. J. Psychiat. 110:64-66, 1964.
18. Richardson, G. and Moore, R.: On the manifest dream in schizophrenia. J. Am. Psycho-anal. A. 11:281-302, 1963.
19. Cazavelan, J. and Epstein, S.: Daydreams of female paranoid schizophrenics. J. Clin. Psv-chol. 22:27-32, 1966.
20. Hall, C: A comparison of the dreams of four groups of hospitalized mental patients with each other and with a normal population. J. Nerv. & Ment. Dis. 143:135-139, 1966.
21. Silverman, L.: On the relationship between aggressive imagery and thought disturbance in Rorschach responses. J. Proj. Tech. 27:336-344, 1963.
22. Silverman, L.: A study of the effects of sub-liminally presented aggressive stimuli on the production of pathological thinking in a non-psychiatric population. J. Nerv. & Ment. Dis. 141:443-445, 1966.
23. Silverman, L. and Goldweber, A.: A further study of the effects of subliminal aggressive stimulation on thinking. J. Nerv. & Ment. Dis. 143:463-472, 1966.
24. Silverman, L.: Ego disturbance in TAT stories as a function of aggression-arousing stimulus properties. J. Nerv. & Ment. Dis. 138:248-254, 1964.

25. Silverman, L.: Further data on the relationship between aggressive drive activation and impairments in thinking: the effects of the blocking of aggressive discharge on the thought processes. J. Nerv. & Ment. Dis. 141:61-67, 1965.
26. Mednick, S.: A learning theory approach to research in schizophrenia. Psychol. Bull. 55: 316-327, 1958.
27. Silverman, L. and Spiro, R.: Further investigation of the effects of subliminal aggressive stimulation on the ego functioning of schizophrenics. J. Consult. Psychol. 31:225-232, 1967.
28. Silverman, L.: A technique for the study of psychodynamic relationships: the effects of subliminally presented aggressive stimuli on the production of pathological thinking in a schizophrenic population. J. Consult. Psychol. 30:103-111, 1966.
29. Buck, L. and Kates, S.: Perceptual categorization of love and anger cues in schizophrenia. J. Abnorm. & Soc. Psychol. 67:480-490, 1963.
30. Brodsky, M.: Interpersonal stimuli as interference in a sorting task. J. Pers. 31:517-533, 1963.
31. Postman, L. and Brown, D.: The perceptual consequences of success and failure. J. Abnorm. & Soc. Psychol. 47:213-221, 1952.
32. Pearl, D. and Berg, P.: Time perception and conflict arousal in schizophrenia. J. Abnorm. & Soc. Psychol. 66:332-338, 1963.
33. Buss, A.: The Psychology of Aggression. N.Y., Wiley, 1961.

INFORMATION FOR MANUSCRIPT CONTRIBUTORS

Manuscripts submitted for consideration and editorial correspondence should be directed to one of the following Co-Editors:

J. Ross MacLean, M.D.
Medical Director, Hollywood Hospital
515 Fifth Avenue,
New Westminster, British Columbia, Canada

Abram Hoffer, M.D., Ph.D. 800 Spadina

Crescent East Saskatoon, Saskatchewan, Canada

Humphry Osmond, M.D., Director
Bureau of Research in Neurology and Psychiatry
Princeton, New Jersey

Submit typewritten manuscript in triplicate, double-spaced on 8/2 by 11 in. paper, with good margins. Authors' full names, academic or professional affiliations and degrees should be given. Also include head and shoulder glossy print of author and co-authors. Tables, illustrations and references should be cited in numbered sequence in text. Tables should be numbered and typed on separate sheets. References should follow style of the "Index Medicus" and should be listed in order by number.

Co-Editors reserve the right to refuse any manuscript submitted, whether solicited or unsolicited, and to suggest modifications before publishing.

Illustrations. Submit as black-ink drawings of quality or clear glossy prints. Identify each illustration by number, indicate "top" on upper left-hand corner of back; write lightly, use soft pencil. Legends must accompany each illustration.

Authors' corrections. Galley proofs will be submitted to authors for correction; prompt return will facilitate prompt publication. Cost of corrections (other than typographic errors), deletions or additions will be charged to authors.

Reprints. Authors may order reprints, at regular rates, when galley proofs are returned to the publishers: Lowrie Associates, Inc., 6950 France Avenue, Minneapolis, Minnesota 55435.