

STUDYING THE EFFECT OF CHLORPROMAZINE ON HANDWRITING

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ABSTRACT

Handwriting is an acquired skill. It is one of the most important parameters of the personal identification. It involves muscular actions and reflexes. There must be constant coordination between the wrist and the arm muscles. Centrally acting drugs such as chlorpromazine, can exhibit some interventions, which interfere with the process of writing. This work aimed at studying the effect of chlorpromazine on the handwriting via comparing the handwriting of the same person both before and after the event of taking the drug from different technical points of view. The statistical results were found to be highly significant, also it was found that the longer the duration after the drug intake, the more marked the effect on the handwriting. This is due to the effect of chlorpromazine on CNS, namely the neurological deterioration.

INTRODUCTION

The handwriting is not entirely spontaneous or automatic; the writer must constantly to coordinate the performance of writing with its content and with the method by which the writing is to be accomplished. Such behavioral performance involves coordination between the wrist and the arm muscles by certain developed reflexes directed by the brain (Sugishita, 1987).

Centrally acting drugs can exhibit a cer-

tain pharmacological intervention, which interferes with the finely developed or partially developed system of the brain, nerve, and muscle interaction involved in writing. Such interference results in deterioration of the quality of writing. Document examiners are frequently met with the documents, which were signed by intoxicated individuals or those who were under the influence of drugs (Galbraith, 1986).

Questioned document examiners are aware of the role of the brain and nerves,

and muscle on handwriting since the beginning of this century. Analyzing the physiological movement of handwriting necessitates the studying of the physiological relations between brain and handwriting (Osborn, 1929; Harrison, 1958; Hilton, 1982; Conway, 1987; Ellen, 1989). The movements of fingers in fact represent one of the most difficult mechanical problems in anatomy, and the exact actions of the muscles involved are still open to questions. Simultaneous flexion at the metacarpopharyngeal joints, and extension at the interpharyngeal joints of a digit are essential in the fine movements of writing (Peter et al., 1995).

In document examination studies, it is mandatory to carry on the handwriting analysis to the original paper documents - and not their photocopies- as the latter cannot give an adequate idea about the indentation marks exerted by the pen pressure and which could be felt on the paper surface. Also copies fail to evaluate the effects of environmental changes on papers and inks in the purposes of studying aging of documents (Morgan, 1992). Among the most important points of assessment of the handwriting are the following points:

1- Mean Speed of Handwriting :

It is the average rate of pen movement which succeed in performing letters, and sentences, or enough for achievement of writing the whole text, also it may be de-

finied as the number of letters or words which could be written per unit of time (Basalah, 2001).

2- Word Size :

For a given set of writing conditions, each person has an absolute mean size in letter formation, from which he cannot deviate without a deliberately conscious effort, and without decreasing his normal speed of writing (Ruenes, 1967). Each writer sticks to a proportion between tall and small letters, which he has subconsciously selected for himself (Basalah, 2001).

3- Pen Pressure :

It is the force applied on the paper surface as directed by the pen tip. Localization of pen pressure or shading is involuntary, and no writer can deliberately alter localization of his pen pressure without affecting the symmetry of letter formation or at the sacrifice of writing speed (Basalah, 2001). Pressure is characterized by the alteration of tension and release in the up and down stroke, while the stiffening tension or "gripping tension" is a static form of "isotonic" muscular contraction, the polar opposite of which could be slackness (Nevo, 1986).

4- Inter-letter Connection and Inter-word Spacing:

This is the general treatment of the horizontal dimension in a writer's arrangement of his manuscript (Quirke, 1930).

There are theoretically eight broad classifications under which a system of connections may fall into: combining arcade, angle, and garland forms; combining arcade and angle forms; combining arcade and garland forms; exclusively garlanded; exclusively angular; exclusively arcaded; filiform: with indefinite thread-like joining (Moon, 1997).

5- Alignment :

It is the relation between the subsequent letters, which follow each other in the words or the sentence; it is also the relation between written lines and the printed paper lines in the ruled paper, and the imaginary baseline in the unruled paper (Basalah, 2001).

6- Writing Skill Level:

Trials in keeping harmony, proportion, and arrangement both in the vertical and the horizontal axes, which could reflect the artistic feeling of the writer, all augment increasing the skill level. There are actually multiple creations between the top and the bottom of the handwriting (Basalah, 2001). The man who gabbles his words in jerky phrases, cannot provide good spacing in his manuscript (Behrendt, 1984).

7- Initial and terminal strokes:

In the spontaneous free handwriting, the writer may raise the used pen at the terminal stroke of the written word pro-

ducing weak and thin stroke. The same can be applied to the initial stroke where writing movement may be initiated freely on touching the paper surface, then the stroke thickness increased gradually (Basalah, 2001).

8- Angle of Slope :

Each person has adopted a distinctive degree of slope in his handwriting, which may be indeed varied within narrow limits by certain factors, but constant for a given mental status (Quirke, 1930). Determination of basic mean angle of slope is of inconclusive value as a determinant of identity in handwriting (Osborn, 1964).

9- Direction of Handwriting:

The manner at which the writer tend to put the letter dots, is either in the same direction of the handwriting, or in the opposite direction in a regression manner (Howard, 1986).

10- Writing Errors:

The incorrectly spelled words or exhibited confusion which could be attributed to the effect of hypnosis for example, the writer attempts to do corrections with subsequent errors taking the form of letter negligence (omissions), retouchings, or overwritings (Gay, 1970).

Chlorpromazine and Handwriting:

Chlorpromazine was the first phenothiazine antipsychotic drug introduced in

1953, and used in treatment of schizophrenia, mania, and severely agitated behavior (Dollery, 1999-b). Attempts at correlation of plasma concentrations of chlorpromazine or its metabolites with clinical responses have not been successful especially until 1984, and it is not yet possible to state the concentrations in plasma that are likely to be associated with optimal clinical response (Cohen et al., 1992). Haase (1981), proved a strong relationship between the antipsychotic drugs and fine motor extrapyramidal disturbances using the Haase's handwriting test. He compared the handwriting specimens before and during the treatment with the antipsychotic drugs. In another study taken by Kuentler et al. (1999), a reduction of handwriting area and D2 receptor occupancy were found. This correlation in cases under treatment with typical and atypical neuroleptic drugs was linear and statistically significant.

This work aimed at studying the changes in the main points of examination of the handwriting, as a result of taking a centrally acting drug, which is the "chlorpromazine".

SUBJECTS AND METHODS

In this study, 20 right-handed adults male were included by their handwritings; all of them were selected from the patients under regular doses of chlorpromazine

treatment due to different types of psychoses (but not Parkinsonism) -as diagnosed by the neuropsychiatrists-. Samples of writings were taken before and after the intake of a dose of the drug. Time elapsed after intake of the last dose was estimated as a point of comparison where samples were also taken 2 and 4 hours after last dose, all the cases were among those who are following up their illnesses in Kasr el Aini hospital, either in the outpatient or the inpatient clinics. All cases were examined to exclude any general or local disorders, which may be suspected to affect the writing process; all of them were proved to be free. Every subject was asked to present an old document having been handwritten before the start of treatment with the chlorpromazine, and a part of this document (about 4-5 lines) with its exact verbal contents was asked to be written by the same person under the current circumstances. In all cases, the writing position was tried to be as standardized as possible regarding the posture of the writer and his position in front of the desk. The pen used was the same in all cases to facilitate the fine changes in the handwriting features.

RESULTS

Assessment of the writing skill level in cases under chlorpromazine treatment is displayed in the table in the next page from different points of view, showing

the results of the comparative analysis of physiologic features before starting the treatment, 2 hours, and 4 hours after the intake of one of the doses of the drug. According to these findings, it was noticed that 2 hours after the drug intake there was a highly significant increase in pen pressure, as well as a significant increase after 4 hours. Whereas for the alignment, changes were insignificant except in the sample taken 4 hours after drug intake. The results of noticing the angle of slanting revealed the occurrence of slanting towards the right side 2 hours after taking the drug, while this was not significant and the angle of slanting was not affected 4 hours post-intake; also slanting towards the opposite direction was noticed but no statistically significant except 4 hours after drug intake. The inter-letter connection was disturbed yet insignificant 2 hours after drug intake, but statistical results turned to be significant 4 hours post-intake. On the other hand, 2 hours after the drug intake, there were significant retouchings, which were insignificant statistically after 4 hours. Using the paired T-test, the time taken for handwriting at 2 hours was set, and compared with the time taken for the same quantity of writing after 4 hours, the difference was significant statistically.

DISCUSSION

Drugs that act upon the central nervous

system influence the lives of everyone, everyday, these agents are invaluable therapeutically as they could produce specific physiologic psychologic effects (Bloom, 1985). It is generally assumed that pharmacologic intervention by centrally acting drugs may interfere with the finely developed or partially developed system of brain, nerve, and muscle interaction involved in writing, this results in deterioration of quality of writing (Doud, 1975). Virtually, antipsychotic drugs block dopaminergic receptors and inactivate dopamine neurotransmission in the basal ganglia and limbic portions of the forebrain; some also interact with serotonergic, and α -adrenergic receptors. Particular attention is always paid to chlorpromazine, the oldest representative of the phenothiazine thioxanthene group of antipsychotic agents (Leysen et al, 1994). Absorption of tablets of chlorpromazine is erratic; peak concentration in plasma is attained in about 2 to 4 hours after ingestion. Disappearance of chlorpromazine from plasma includes a rapid distribution phase (about 2 hours), and a slower early elimination phase (about 30 hours), but markedly variable values have been reported (Sedvall, 1992). Attempts to correlate plasma concentrations of chlorpromazine or of its metabolites with clinical responses have not been successfully stated especially until 1984, and it was not yet possible to state the concentration in plasma that is likely to be associated with optimal clinical re-

sponse until Cohen et al. (1992) made their research work. Under the effect of drugs, the neuromuscular equation of the writer is still reflecting his pattern of handwriting, which is stored in his brain, denoting that it is his own handwriting but, as a result of certain circumstances, there is difficulty in the ability to control the handwriting instrument with consequent changes in the handwriting features. This was mainly why this research was thought of, in order to state the changes occurring in the main features of the handwriting as a result of taking chlorpromazine.

In the present work, the time taken for handwriting after intake of the usual dose of chlorpromazine was significantly increased as a result of the slower speed of writing ($P=0.00$ after 4 hours) in accordance with Dhawan et al. (1969).

As regards the alignment; the post-chlorpromazine noticing of the handwriting demonstrated significant late disturbed alignment ($P=0.03$) at 4 hours post-intake, and early retouchings after 2 hours ($P=0.02$), all these changes are compatible with Basalah (2001). Further investigations showed heavier pen pressure ($P=0.01$) at 2 hours post-intake, whereas $P=0.02$ at 4 hours post-intake, this is agreed with Jacobbi and Maxion (1975) who reported a reduction in the speed of the arm-hand movements with neuroleptic drugs (Bal-

dessarini, 1991). Also the reduced speed of handwriting results in subsequent increase of pen pressure because they are indirectly proportionate to each other. The inter-letter connections were of significant irregularity ($P=0.05$) at 4 hours in contrast to Basalah (2001) who mentioned absent-letter connections, where this could be contributed to the tolerance to chlorpromazine due to long-term therapy, which does not result in great deterioration in the conscious level. The latest parameter to be affected is the direction of handwriting as it became to the opposite direction of normal writings after 4 hours of drug intake ($P=0.03$). Concerning the retouchings, they are due to mild tremor, this was in agreement with Kustner and Muller, (1985) who explained this as an extrapyramidal side effects of neuroleptic drugs.

CONCLUSION

From this work, it is concluded that it is to consider the effect of chlorpromazine on the handwriting while examining a document by the forensic examiner, not to be misled by the drug intake and judge the document as not written by the same person due to the fact that both documents could have been written one with and the other without having the drug in blood, and subsequently affecting the CNS actions including the basic characteristics of hand writing.

Score	Pen Pressure						Alignment						Angle of Slanting						Inter-Letter Connection						Retouchings						Time Taken													
	1	2	3	4	5	P	1	2	3	4	5	P	1	2	3	4	5	P	1	2	3	4	5	P	1	2	3	4	5	Mean	±S.D.	P												
Before Drug Intake	0/20	1/20	16/20	3/20	4	5	0/20	4/20	2/20	0/20	0	0	0/20	10/20	1	5/20	4/20	-	0	0/20	1	1	14/20	1	0	1	2	5/20	2	1/20	3	1/20	4	0	1/20	5	0	0.49	4.84±3.16	0.00				
	0	8	8	3	0	0.01	17	3	2	2	1	15	10	1	6	0	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.07	3.9±3.7	0.07				
Time after drug intake	0	8	10	7	3	0.02	15	3	2	2	1	17	10	1	6	0	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	4.84±3.16	0.00	
	0	8	10	7	3	0.02	15	3	2	2	1	17	10	1	6	0	0.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	4.84±3.16

The total number of subjects is 20

P value is compared in all cases with the handwriting before taking the Chlorpromazine usual dose.

P < or = 0.05 is significant

P > 0.05 is insignificant

Pen Pressure:

- 1: very heavy
- 2: Heavy
- 3: Medium
- 4: Light
- 5: Very light

Alignment:

- 1: Absent or Letter Alignment
- 2: Word Alignment
- 3: Sentence Alignment
- 4: The whole line Alignment
- 5: The whole lines Alignment

Angle of Slanting:

- 1: Left slanted
- 2: Vertical
- 3: Right slanted

Inter-Letter Connection:

- 1: Absent
- 2: Present and Irregular
- 3: Present and semi-regular
- 4: Regular

Retouchings:

- 1: 1 retouching
- 2: 2 retouchings
- 3: 3 retouchings
- 4: 4 retouchings
- 5: 5 retouchings

Time Taken: The time is calculated in minutes

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دراسة تأثير عقار الكلوربرومازين على خطوط الكتابة اليدوية

المشركون في البحث

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تم فى هذه الدراسة تجميع عينات خطية عديدة لبعض المرضى الذين يعانون من أمراض نفسية وعصبية مختلفة يجمع بينهم أنهم من الذين يتناولون دواء الكلوربرومازين بانتظام كعلاج لأمراضهم النفسية، وأيضاً أنهم من المترددين على مستشفى المنيل الجامعى لتلقى العلاج أو متابعة الحالة المرضية. وقد أجريت دراسة تحليلية مقارنة لخطوط هؤلاء المرضى من أوراق قديمة بخطوطهم قبل حدوث المرض وبالتالي الخضوع للعلاج بالكلوربرومازين، وبين عينات أخرى للكتابة أخذت بعد الخضوع للعلاج بهذا الدواء، وقد اعتمدت الدراسة التحليلية على دراسة ضغط الأداة الكتابية، السرعة الكتابية، حجم وشكل الحروف، الإصطفاف، المسافات البينية بين الكلمات وبين الحروف، زاوية الميل، المسحات القلمية، إجهاد الكتابة أو الإرتداد، بداية ونهاية الجرات، والأخطاء الكتابية فى صورة إهمال بعض الحروف أو محاولات التصحيح.

قد أثبتت هذه الدراسة أن تناول دواء الكلوربرومازين قد أحدث تدهوراً عصبياً واختلافات جسيمة فى المواصفات الخطية للشخص بعد بدئه فى تناول دواء الكلوربرومازين، وقد ظهرت هذه التغيرات فى صورة إحداث صغراً وتقلباً ملحوظاً فى حجم الكلمات مع وجود بعض الارتعاشات فى اليدين أثناء الكتابة ثبتت بالفحص التحليلى.

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