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ABOUT THIS JOURNAL

The Journal of Neurobehavioral Sciences (JNBS) is a peer-reviewed open-access neuroscience journal without any publication fees. All editorial costs are sponsored by the Üsküdar University Publications and the Foundation of Human Values and Mental Health. Each issue of the Journal of Neurobehavioral Sciences is specially commissioned, and provides an overview of important areas of neuroscience from the molecular to the behavioral levels, delivering original articles, editorials, reviews and communications from leading researchers in that field.

JNBS is published electronically and in the printed form 3 times a year by Uskudar University.

The language of JNBS is in English. However, our editorial office provide Turkish abstracts in addition to English for each article.

Aims & Scope

The scope of the journal is broad. It covers many disciplines and spans molecules (e.g., molecular neuroscience, biochemistry) through systems (e.g., neurophysiology, systems neuroscience) to behavior (e.g. cognitive neuroscience) and clinical aspects (e.g. psychopharmacology). The journal covers all aspects of neuroscience with an emphasis on translational psychiatry and psychology, as long as the goal is to delineate the neural mechanisms underlying normal or pathological behavior.

Preclinical and clinical studies are equally considered for publication. We also invite manuscripts on the methods of computational modeling of psychiatric and neurological disorders, and treatment outcome.

The journal has a special emphasis on psychiatric and neurological disorders.

However studies on normal human behavior are also considered. Studies on animals and technical notes must have clear relevance and applicability to human disease.

Case Reports that includes recent neuroscientific treatment or diagnosis methods are generally within the scope of JNBS.

Please see our editorial board section for information on specific sections.

In addition, the following two categories are further featured in JNBS:

- Mini-reviews that succinctly survey appropriate areas of current research or theory
- Commentaries that serve as vehicles for brief presentations of new theories, hypotheses, points of view, or critiques of current research

Papers will be selected on the basis of their methodology and negative results are strongly considered for publication.

The average time from submission to first decision is less than 30 days. Accepted articles are published online ahead of print in an average of 40 workdays, and articles are published in print 3-6 months after acceptance.

Please see our Guide for Authors for information on article submission. If you require any further information or help, please email us (jnbs@uskudar.edu.tr)

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Instructions for Authors

Prior to submission, please carefully read and follow the submission guidelines entailed below. Manuscripts that do not conform to the submission guidelines may be returned without review.

Submission

Submit manuscripts electronically (.doc format with including all figures inside) via the online submission system of our website (www.jnbs.org or www.scopemed.org/?sec=gfa&jid=34).

Cumhur Taş, MD PhD

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General correspondence may be directed to the Editor's Office.

In addition to postal addresses and telephone numbers, please supply electronic mail addresses and fax numbers, if available, for potential use by the editorial and production offices.

Masked Reviews

Masked reviews are optional and must be specifically requested in the cover letter accompanying the submission. For masked reviews, the manuscript must include a separate title page with the authors' names and affiliations, and these ought not to appear anywhere else in the manuscript.

Footnotes that identify the authors must be typed on a separate page.

Make every effort to see that the manuscript itself contains no clues to authors' identities. If your manuscript was mask reviewed, please ensure that the final version for production includes a byline and full author note for typesetting.

Types of Articles

Brief Reports, commentaries, case reports and mini-reviews must not exceed 4000 words in overall length. This limit includes all aspects of the manuscript (title page, abstract, text, references, tables, author notes and footnotes, appendices, figure captions) except figures. Brief Reports also may include a maximum of two figures.

For Brief Reports, the length limits are exact and must be strictly followed.

Regular Articles typically should not exceed 6000 words in overall length (excluding figures).

Reviews are published within regular issues of the JNBS and typically should not exceed.

10000 words (excluding figures)

Cover Letters

All cover letters must contain the following:

A statement that the material is original —if findings from the dataset have been previously published or are in other submitted articles, please include the following information:

*Is the present study a new analysis of previously analyzed data? If yes, please describe differences in analytic approach.

*Are some of the data used in the present study being analyzed for the first time? If yes, please identify data (constructs) that were not included in previously published or submitted manuscripts.

*Are there published or submitted papers from this data set that address related questions? If yes, please provide the citations, and describe the degree of overlap and the unique contributions of your submitted manuscript.

*The full postal and email address of the corresponding author;

*The complete telephone and fax numbers of the same;

*The proposed category under which the manuscript was submitted;

*A statement that the authors complied with APA ethical standards in the treatment of their participants and that the work was approved by the relevant Institutional

Review Board(s).

*Whether or not the manuscript has been or is posted on a web site;

*That APA style (Publication Manual, 6th edition) has been followed;

*The disclosure of any conflicts of interest with regard to the submitted work;

*A request for masked review, if desired, along with a statement ensuring that the manuscript was prepared in accordance with the guidelines above.

*Authors should also specify the overall word length of the manuscript (including all aspects of the manuscript, except figures) and indicate the number of tables, figures, and supplemental materials that are included.

INSTRUCTIONS FOR AUTHORS

Manuscript Preparation

Prepare manuscripts according to the Publication Manual of the American Psychological Association (6th edition).

Review APA's Checklist for Manuscript Submission before submitting your article. Double-space all copy. Other formatting instructions, as well as instructions on preparing tables, figures, references, metrics, and abstracts, appear in the Manual.

Below are additional instructions regarding the preparation of display equations and tables.

Display Equations

We strongly encourage you to use MathType (third-party software) or Equation

Editor 3.0 (built into pre-2007 versions of word) to construct your equations, rather than the equation support that is built into Word 2007 and Word 2010. Equations composed with the built-in Word 2007/Word 2010 equation support are converted to low-resolution graphics when they enter the production process and must be rekeyed by the typesetter, which may introduce errors.

To construct your equations with MathType or Equation Editor 3.0:

Go to the Text section of the Insert tab and select Object.

Select MathType or Equation Editor 3.0 in the drop-down menu.

If you have an equation that has already been produced using Microsoft Word 2007 or 2010 and you have access to the full version of MathType 6.5 or later, you can convert this equation to MathType by clicking on MathType Insert Equation. Copy the equation from Microsoft Word and paste it into the MathType box. Verify that your equation is correct, click File, and then click Update. Your equation has now been inserted into your Word file as a MathType Equation.

Use Equation Editor 3.0 or MathType only for equations or for formulas that cannot be produced as word text using the Times or Symbol font.

Tables

Use Word's Insert Table function when you create tables. Using spaces or tabs in your table will create problems when the table is typeset and may result in errors.

Abstract and Keywords

All manuscripts must include an English abstract containing a maximum of 250 words typed on a separate

page. After the abstract, please supply up to five keywords or brief phrases. For the Turkish native speakers JNBS also requires a Turkish version of the abstract and keywords. However this rule does not apply to non-native speakers and our translation office will include the Turkish abstract free of charge.

References

List references in alphabetical order. Each listed reference should be cited in text (Name, year style), and each text citation should be listed in the References section.

In-text Citations

- For two or fewer authors, list all author names (e.g. Brown & Taş, 2013). For three or more authors, abbreviate with 'first author' et al. (e.g. Uzbay et al., 2005).

- Multiple references to the same item should be separated with a semicolon (;) and ordered chronologically. References by the same author in the same year should be differentiated by letters (Smith, 2001a; Smith, 2001b).

- Cite articles that have been accepted for publication as 'in press', include in the reference list.

- Cite unpublished work, work in preparation, or work under review as 'unpublished data' using the author's initials and surname in the text only; do not include in the reference section

The Reference Section:

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Hughes, G., Desantis, A., & Waszak, F. (2013). Mechanisms of intentional binding and sensory attenuation: The role of temporal prediction, temporal control, identity prediction, and motor prediction. *Psychological Bulletin*, 139, 133–151. <http://dx.doi.org/10.1037/a0028566>

- Authored Book:

Rogers, T. T., & McClelland, J. L. (2004). *Semantic cognition: A parallel distributed processing approach*. Cambridge, MA: MIT Press.

- Chapter in an Edited Book:

Gill, M. J. & Sypher, B. D. (2009). Workplace incivility and organizational trust.

In P. Lutgen-Sandvik & B. D. Sypher (Eds.), *Destructive organizational communication: Processes, consequences, and constructive ways of organizing* (pp. 53–73). New York, NY: Taylor & Francis.

Figures

Graphics files are welcome if supplied as Tiff, EPS, or PowerPoint files. Multipanel figures (i.e., figures with parts labeled a, b, c, d, etc.) should be assembled into one file.

The minimum line weight for line art is 0.5 point for optimal printing.

PUBLICATION ETHICS AND PUBLICATION MALPRACTICE STATEMENT (ETHICAL GUIDELINES FOR PUBLICATION)

The publication of an article in the peer-reviewed journal JNBS is an essential building block in the development of a coherent and respected network of knowledge. It is a direct reflection of the quality of the work of the authors and the institutions that support them. Peer-reviewed articles support and embody the scientific method. It is therefore important to agree upon standards of expected ethical behaviour for all parties involved in the act of publishing: the author, the journal editor, the peer reviewer, the publisher and the society of society-owned or sponsored journals.

Uşak University, as publisher of the journal, takes its duties of guardianship over all stages of publishing extremely seriously and we recognise our ethical and other responsibilities.

We are committed to ensuring that advertising, reprint or other commercial revenue has no impact or influence on editorial decisions. In addition, Editorial Board will assist in communications with other journals and/or publishers where this is useful to editors. Finally, we are working closely with other publishers and industry associations to set standards for best practices on ethical matters, errors and retractions - and are prepared to provide specialized legal review and counsel if necessary.

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(These guidelines are based on existing COPE's Best Practice Guidelines for Journal Editors.)

Reporting standards

Authors of reports of original research should present an accurate account of the work performed as well as an objective discussion of its significance. Underlying data should be represented accurately in the paper. A paper should contain sufficient detail and references to permit others to replicate the work. Fraudulent or knowingly inaccurate statements constitute unethical behavior and are unacceptable. Review and professional publication articles should also be accurate and objective, and editorial 'opinion' works should be clearly identified as such.

Authors are required to state in writing that they have complied with the Declaration of Helsinki Research Ethics in the treatment of their sample, human or animal, or to describe the details of treatment.

Data access and retention

Authors may be asked to provide the raw data in connection with a paper for editorial review, and should be prepared to provide public access to such data (consistent with the ALPSP-STM Statement on Data and Databases), if practicable, and should in any event be prepared to retain such data for a reasonable time after publication.

Originality and plagiarism

The authors should ensure that they have written entirely original works, and if the authors have used the work and/or words of others, that this has been appropriately cited or quoted.

Plagiarism takes many forms, from 'passing off' another's paper as the author's own paper, to copying or paraphrasing substantial parts of another's paper (without attribution), to claiming results from research conducted by others. Plagiarism in all its forms constitutes unethical publishing behavior and is unacceptable.

Multiple, redundant or concurrent publication

An author should not in general publish manuscripts describing essentially the same research in more than one journal or primary publication. Submitting the same manuscript to more than one journal concurrently constitutes unethical publishing behavior and is unacceptable.

In general, an author should not submit for consideration in another journal a previously published paper. Publication of some kinds of articles (e.g. clinical guidelines, translations) in more than one journal is sometimes justifiable, provided certain conditions are met. The authors and editors of the journals concerned must agree to the secondary publication, which must reflect the same data and interpretation of the primary document. The primary reference must be cited in the secondary publication. Further detail on acceptable forms of secondary publication can be found at www.icmje.org.

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Proper acknowledgment of the work of others must always be given. Authors should cite publications that have been influential in determining the nature of the reported work. Information obtained privately, as in conversation, correspondence, or discussion with third parties, must not be used or reported without explicit, written permission from the source. Information obtained in the course of confidential services, such as refereeing manuscripts or grant applications, must

not be used without the explicit written permission of the author of the work involved in these services.

Authorship of the paper

Authorship should be limited to those who have made a significant contribution to the conception, design, execution, or interpretation of the reported study. All those who have made significant contributions should be listed as co-authors. Where there are others who have participated in certain substantive aspects of the research project, they should be acknowledged or listed as contributors.

The corresponding author should ensure that all appropriate co-authors and no inappropriate co-authors are included on the paper, and that all co-authors have seen and approved the final version of the paper and have agreed to its submission for publication.

Hazards and human or animal subjects

If the work involves chemicals, procedures or equipment that have any unusual hazards inherent in their use, the author must clearly identify these in the manuscript. If the work involves the use of animal or human subjects, the author should ensure that the manuscript contains a statement that all procedures were performed in compliance with relevant laws and institutional guidelines and that the appropriate institutional committee(s) has approved them. Authors should include a statement in the manuscript that informed consent was obtained for experimentation with human subjects. The privacy rights of human subjects must always be observed.

Disclosure and conflicts of interest

All authors should disclose in their manuscript any financial or other substantive conflict of interest that might be construed to influence the results or interpretation of their manuscript. All sources of financial support for the project should be disclosed.

Examples of potential conflicts of interest which should be disclosed include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or other funding. Potential conflicts of interest should be disclosed at the earliest stage possible.

Fundamental errors in published works

When an author discovers a significant error or inaccuracy in his/her own published work, it is the author's obligation to promptly notify the journal editor or publisher and cooperate with the editor to retract or correct the paper. If the editor or the publisher learns from a third party that a published work contains a significant error, it is the obligation of the author to promptly retract or correct the paper or provide evidence to the editor of the correctness of the original paper.

Duties of editors

(These guidelines are based on existing COPE's Best Practice Guidelines for Journal Editors.)

Publication decisions

The editor of a peer-reviewed journal is responsible for deciding which of the articles submitted to the journal should be published, often working in conjunction with the relevant society (for society-owned or sponsored journals). The validation of the work in question and its importance to researchers and readers must always drive such decisions. The editor may be guided by the policies of the journal's editorial board and constrained by such legal requirements as shall then be in force regarding libel, copyright infringement and plagiarism. The editor may confer with other editors or reviewers (or society officers) in making this decision.

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Editors should recuse themselves (i.e. should ask a co-editor, associate editor or other member of the editorial board instead to review and consider) from considering manuscripts in which they have conflicts of interest resulting from competitive, collaborative, or other relationships or connections with any of the authors, companies, or (possibly) institutions connected to the papers.

Editors should require all contributors to disclose relevant competing interests and publish corrections if competing interests are revealed after publication. If needed, other appropriate action should be taken, such as the publication of a retraction or expression of concern.

It should be ensured that the peer-review process for sponsored supplements is the same as that used for the main journal. Items in sponsored supplements should be accepted solely on the basis of academic merit and interest to readers and not be influenced by commercial considerations.

Non-peer reviewed sections of their journal should be clearly identified.

Involvement and cooperation in investigations

An editor should take reasonably responsive measures when ethical complaints have been presented concerning a submitted manuscript or published paper, in conjunction with the publisher (or society). Such measures will generally include contacting the author of the manuscript or paper and giving due consideration of the respective complaint or claims made, but may also include further communications to the relevant institutions and research bodies, and if the complaint is upheld, the publication of a correction, retraction, expression of concern, or other note, as may be relevant. Every reported act of unethical publishing behavior must be looked into, even if it is discovered years after publication.

Duties of reviewers

(These guidelines are based on existing COPE's Best Practice Guidelines for Journal Editors.)

Contribution to editorial decisions

Peer review assists the editor in making editorial decisions and through the editorial communications with the author may also assist the author in improving the paper. Peer review is an essential component of formal scholarly communication, and lies at the heart of the scientific method. JNBS shares the view of many that all scholars who wish to contribute to publications have an obligation to do a fair share of reviewing.

Promptness

Any selected referee who feels unqualified to review the research reported in a manuscript or knows that its prompt review will be impossible should notify the editor and excuse himself from the review process.

Confidentiality

Any manuscripts received for review must be treated as confidential documents. They must not be shown to or discussed with others except as authorized by the editor.

Standards of objectivity

Reviews should be conducted objectively. Personal criticism of the author is inappropriate. Referees should express their views clearly with supporting arguments.

Acknowledgement of sources

Reviewers should identify relevant published work that has not been cited by the authors. Any statement that an observation, derivation, or argument had been previously reported should be accompanied by the relevant citation. A reviewer should also call to the editor's attention any substantial similarity or overlap between the manuscript under consideration and any other published paper of which they have personal knowledge.

Disclosure and conflict of interest

Unpublished materials disclosed in a submitted manuscript must not be used in a reviewer's own research without the express written consent of the author. Privileged information or ideas obtained through peer review must be kept confidential and not used for personal advantage. Reviewers should not consider manuscripts in which they have conflicts of interest resulting from competitive, collaborative, or other relationships or connections with any of the authors, companies, or institutions connected to the papers.

PREFACE

Dear respected readers,

It is my pleasure to welcome you to a new edition of Journal of Neurobehavioral Sciences. This edition is rich with scientific papers, case reports and editorials. I hope that you experience the high scientific quality we aim while you read this issue.

JNBS has completed his 3rd year with this last issue. Throughout this three-years period we have published more than 50 articles written by authors from all around the world. We are very grateful for the interest of the authors who choose our journal to share their scientific work with the academic society and hope to receive their contribution for the following years. As you may already realize, English language is the submission criteria for JNBS. Starting from next year in order to make contribution to the efforts for doing science and writing with mother language we decide to accept papers with high scientific quality that are written in Turkish language. This

decision was made by our Editorial Board and we do hope that articles written in Turkish language will increase the local reputation of JNBS.

As an important note, with the contribution of articles written in Turkish language JNBS will also become the first academic neuroscience journal in Turkey.

Regarding the status of JNBS among academic communities, we are now at the stage for applying to be indexed in respected academic indexes such as Pubmed. Currently, readers may reach us through Google Scholar, Scopemed and Türk Psikiyatri Dizini.

Lastly, this year was a difficult year for our country, and I do hope that the forthcoming year 2017 may turn out to be a year when we are put on the road to everlasting success and prosperity.

Best Regards,

Nevzat Tarhan, MD.

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ABOUT THIS ISSUE

BU SAYI HAKKINDA

Barış Metin^{1*}

In this last issue of 2016, we encounter quite interesting articles in JNBS. The articles in this issue are generally about diagnosis and treatment of psychiatric and neurological disorders. However, there are other exciting articles on emerging topics in neuroscience such as neuromarketing research. I believe that a neuroscience perspective on neuropsychiatric disorders, combined with topics from emerging areas and multidisciplinary studies widens the reader diversity and provides a multidirectional neuroscience view to the reader. Below, I would like to summarize some interesting contributions from the current issue.

After data showing effectiveness of early interventions in psychiatric disorders, the importance of early diagnosis became more prominent. For instance, for psychosis, it is possible that early diagnosis using several biomarkers could increase quality and effectiveness of healthcare delivered. In a very interesting study published in this issue, Saylan and Yilancioglu aim to distinguish patients with schizophrenia and bipolar disorders based on gene expression data using machine learning algorithms. Although the sample size is small, the results are promising as they show a high accuracy of classification. Such attempts may increase diagnostic accuracy in psychiatry and may especially provide means of preclinical diagnosis.

Isaacs syndrome (also known as neuromyotonia) is a rare but very confusing syndrome. The clinical picture may mimic several disorders and therefore requires a

high level of suspicion. Saeed et al. presents an elderly patient with neuromyotonia. The diagnosis requires recognition of neuromyotonic discharges during needle EMG. Presentation at an older age suggests that clinicians should suspect the disorder at all age groups. I believe that this interesting case would be quite useful for neurologists and EMG specialists.

Neuromarketing research became increasingly popular in recent years and the demand from the market for such studies is increasing. One important development in recent years is the use of neuroimaging modalities in neuromarketing research. In the study of Sadedil et al., the researchers compared effectiveness of anti-smoking messages on packages using EEG. The results show that EEG analysis may provide data that is not available to the conventional survey method. Based on these results, neuroimaging is likely to replace survey method in neuromarketing research in near future.

Finally, I would like to mention a very interesting report of Unsalver et al. The authors present a first-episode psychosis patient successfully treated with rTMS. The treatment method was started because the patient was not responsive to conventional neuroleptics. Interestingly the authors report that the patient is in remission after 8 months of rTMS treatment. By now, rTMS has FDA approval for treatment of depression, however data from several studies indicate that the method may be approved for other indications in near future.

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CLASSIFICATION OF SCHIZOPHRENIA AND BIPOLAR DISORDER BY USING MACHING LEARNING ALGORITHMS

BİPOLAR BOZUKLUK VE ŞİZOFRENİ HASTALIĞININ MAKİNE ÖĞRENMESİ ALGORİTMALARI KULLANILARAK SINIFLANDIRILMASI

Cemil Can Saylan¹, Kaan Yilancioglu^{2*}

Abstract

Data mining based investigations of disease mediating factors and related potential diagnostic biomarkers using genomic information obtained from gene expression analysis tools become very informative and useful. In the present study, public Gene Expression Omnibus (GEO) genome wide expression dataset (ID: GSE12654) consisting of schizophrenia, bipolar disorders patients besides normal groups were analyzed by using different classification algorithms including kNN, naïve bayes and decision tree. A set of most differentially expressed genetic features ($p < 0.05$) were used for creating the classifiers which can predict disease states in test set with high accuracy. Data mining tools are suggested to be applicable for developing genome-based diagnostic biomarkers.

Keywords: Data Mining, kNN, Naive Bayes, Decision Tree

Özet

Gen ifadesi çalışmaları sonucunda elde edilen genomik bilgiler, data madenciliği temelli çalışmalarda, hastalık oluşturuvcu faktörlerin ve bu hastalıklar ile ilişkili potansiyel teşhis biomarkörlerinin bulunması açısından oldukça kullanışlı ve bilgi vericidir. Bu çalışmada, Gene Expression Omnibus (GEO) veri bankasından alınmış, tüm genom ekspresyon verisi (ID: GSE12654) kullanılmıştır. Veri normal grupların yanısıra, bipolar ve şizofreni hastalarının gen ifadesi bilgisini içermektedir. kNN, naïve bayes ve decision tree bilgisayarlı öğrenme algoritmaları kullanılarak veri analizi gerçekleştirilmiştir. Gruplar arasında istatistiksel olarak anlamlı bir şekilde ($p < 0.05$) farklı eksprese olmuş bir grup gen kullanılarak klasifikasyon yapılmıştır ve gruplar yüksek doğruluk oranında tahmin edilmiştir. Genom tabanlı teşhis biyomarkörlerinin bulunması açısından, veri madenciliği tekniklerinin yararlı ve uygulanabilir olduğu görülmektedir.

Anahtar Kelimeler: Veri Madenciliği, kNN, Naive Bayes, Decision Tree

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1. Introduction

Schizophrenia is one of the most concerned chronic and severe brain disorders, which interferes managing of emotions, speech and thinking processes. Diagnosis of schizophrenia cannot be made easily, although psychiatrists or other licensed mental health professionals diagnose it through interviews and symptoms which reflect biologically heterogeneous characteristics.

Bipolar disorder is identified with extreme mood swings from depression to mania and manic depressive disorder. Causation of bipolar disorder has not been understood entirely, however genetic and environmental factors are thought to have some roles. Diagnosis of the disease mostly relies on clinical examinations.

In order to predict individual disease risk, diagnostic classification of brain disorders might be used by interpreting brain visualization and genetic variation analysis results. This approach has been gained importance for finding potential diagnostic and prognostic biomarkers. Modified statistical methods, which are combined by genomics, have been held in more research activities since the strong genetic associations were demonstrated for various diseases (Orri, Pettersson-Yeo, Marquand, Sartori, & Mechelli, 2012).

In this decade, Microarray and Next Generation Sequencing (NGS) platforms have come into prominence in analyzing genomic data with machine learning algorithms, which have been suggested to be successfully utilized in training classifiers to decode genetic profiles of interest from genomic data (Lu & Han, 2003).

Presently, genomic information is used for classification of patient with brain disorders. In a previous study, it was demonstrated that SVMs can classify both bipolar and schizophrenia from normal subjects with high accuracy by using gene expression data (Struyf, Dobrin, & Page, 2008). Beside this, Genome-Wide Association Studies (GWAS) are also used to classify on bipolar disorder (Emamian, Hall, Birnbaum, Karayiorgou, & Gogos, 2004). It is believed that reciprocal action of genetic predisposition and environmental factors play a role as developmental effects play in bipolar disorder and schizophrenia.

In this article, we present an examination of publicly available microarray gene expression data by using machine learning methods to classify schizophrenic and bipolar disorder individuals respectively.

2. Data and Analysis methods

2.1. Data

Microarray expression data set (ID: GSE12654) is available in GEO database (Iwamoto, Kakiuchi, Bundo, Ikeda, & Kato, 2004). The dataset was divided into three groups as schizophrenia, bipolar disorders patients and control groups. The samples correspond to 3 bipolar and 4 controls, 4 schizophrenia and 4 controls for testing, 8 bipolar disorder and 11 controls and 9 schizophrenia and 11 controls for training. For each subject, demographic and clinical information were described in the original paper (Iwamoto et al., 2004). The gene expression data was obtained using Affymetrix Human Genome U95 Version 2 oligonucleotide arrays containing 54,676 probe

sets (Affymetrix, Santa Clara, CA). Probe level data was normalized using the robust multi-array average (RMA) method (Wu & Irizarry, 2005). The data set includes the RMA value of each probe set as a numerical feature. All computational analyses were done by using R (v3.2.2) [R core team, 2013]. For microarray data preparation "LIMMA" package was used (Ritchie et al., 2015).

2.2. K Nearest Neighbor Classification Algorithm (K-NN)

The k-Nearest Neighbor (k-NN) is one of the most commonly used non-parameter algorithms, which can be used for predicting test samples according to training model, which finds nearest neighbors to the test samples (Geva & Sitte, 1991). The classification method has been applied by using RapidMiner 7.0 data mining software [RapidMiner 7.0, 2006].

2.3. Decision Tree Algorithm

Decision tree algorithm is a commonly used method in data mining studies (Holzinger, 2015). It has been used as tree-shaped model, which has more limpid representations of results compared with other classification methods. The aim is to create a model that classifies the target attribute based on input variables of training set.

2.4. Naive Bayes algorithm

Naive Bayes Algorithm classifies samples based on Bayesian rule (Domingos & Pazzani, 1997). Its name comes from the strong (naïve) statistical independence assumptions. Beside this, it often works remarkably well in practice. Naive Bayes assumes nominal features, which means that numerical features must be discretized prior to running Naive Bayes. Naive Bayesian model can build with uncomplicated repetitive parameter estimation which makes it especially useful for very large datasets. The Naive Bayesian classifier is widely used because it often outperforms more complicated classification methods.

3. Result and Discussion

3.1. Expression Analysis

In schizophrenia, 437 differentially expressed probes 99- (p-value < 0.05) were extracted among 54,676 parallelly controlled with GEO2R (Sean & Meltzer, 2007). Top 20 probes were manually evaluated and LRRFIP1 and ABCA2 genes were found related with schizophrenia disorder according to previous literature. LRRFIP1 is described as a transcriptional repressor, which may regulate expression of the TNF gene (Suriano et al., 2005) which is implicated in synaptic formation and scaling, long-term potentiation, and neurogenesis (Bilbo & Schwarz, 2009), and was found to be associated with schizophrenia (Morar et al., 2007). ABCA2 was enriched for brain-critical exons which are highly expressed in human brain under strict purifying selection. The significant enrichment within 'Brain-Critical Exons' implicates the pathogenic potential of the hub gene, ABCA2, also found in co-expression network of prenatal frontal cortex in schizophrenia disorder (Wang et al., 2015).

For bipolar disease, 325 differentially expressed probes (p -value <0.05) were extracted. We manually evaluated top 20 differentially expressed probes. NCAM1 and ARHGAP4 were found to be associated with bipolar disease. NCAM1 is expressed in both neurons and glial cells with functions in cellular migration, cell recognition, synaptic plasticity (Kiss & Muller, 2001) and central nervous system development (Ronn, Hartz, & Bock, 1998). In bipolar disease patients, secreted isoform of NCAM1 is increased in the hippocampus whereas the concentration of a proteolytic cleavage isoform of NCAM (cNCAM) was not changed in the brain of patients with bipolar disease patients but increased in schizophrenia (Vawter, Howard, Hyde, Kleinman, & Freed, 1999; Wood et al., 1998).

Some of the proposed genetic markers involving SEC24C, PGLYRP1, ARHGAP4, RPL22, SLC6A11, and SYK together were described as the "switchboards" were proposed as targets for drug development for bipolar disease (Lee et al., 2011). These genes were also found in our differentially expressed probes list.

3.2. K-NN Classification and Classifier Performance

For classification, top 325 most differentially expressed genes ($p < 0.05$) between control ($n=11$) and bipolar ($n=8$), and 437 ($p < 0.05$) most differentially expressed genes between schizophrenia ($n=9$) and control ($n=11$) were used to train the model. For validation, same gene set was used in the test data from 4 controls and 3 bipolar patients, and 4 controls and 4 schizophrenia patients. According to results, prediction accuracy was found on testing data as ~86%. Results were shown in Table 1, Table 2 and Table 3 individually for each group.

Table 1: k-NN classification of Bipolar disorder patients. Table shows confusion matrix of classifier on testing data for bipolar disorder patients.

	True Control	True Bipolar	Class Precision
Pred. Control	4	1	80.00%
Pred. Bipolar	0	2	100.00%
Class Recall	100.00%	66.67%	Accuracy: 85.71%

Table 2: k-NN classification of Schizophrenia patients. Table shows confusion matrix of classifier on testing data for schizophrenia patients.

	True Control	True Schizophrenia	Class Precision
Pred. Control	4	1	80.00%
Pred. Bipolar	0	2	100.00%
Class Recall	100.00%	66.67%	Accuracy: 85.71%

3.3. Decision Tree Classification and Classifier Performance

In order to apply decision tree classification method on bipolar disorder, same dataset has been trained as in k-NN classification method. According to the tree shown in Figure 1, it is shown that NCAM1 (41289_at) and ARHGAP4 (39649_at) genes were shown to be important in classifying the disorder. Decision tree model classifies bipolar and control patients with high accuracy on testing data as ~86% shown in Table 3. In addition, k-NN and decision tree model results were found to be similar.

For schizophrenia, GUCY2C (34450_at) and C2orf72 (39394_at) genes were shown to classify the disorder successfully by using decision tree demonstrated in Figure 2. GUCY2C gene is a paralog gene to GUCY1A2 that is previously shown to be associated with schizophrenia [23]. Decision tree model classifies schizophrenia and control patients at accuracy on testing data as 62.5% shown in Table 4.

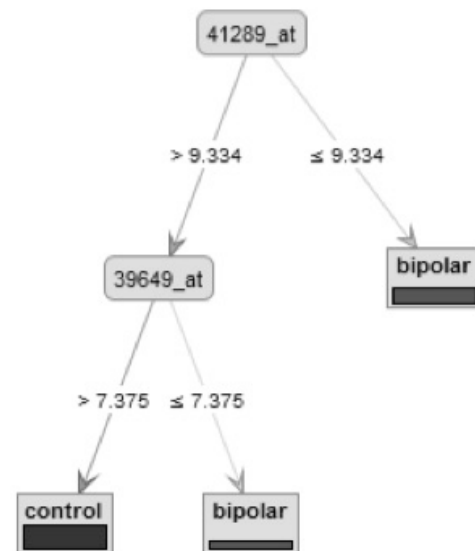


Figure 1: Decision tree classification of bipolar disorder. 41289_at and 39649_at probes represent to NCAM1 and ARHGAP4 genes respectively. Bipolar patients are determined as ≤ 9.334 expression level of NCAM1 and ≤ 7.375 expression level of ARHGAP4. Control is determined as > 7.375 expression level of ARHGAP4.

Table 3: k-NN classification of Bipolar disorder patients. Table shows confusion matrix of classifier on testing data for bipolar disorder patients.

	True Control	True Bipolar	Class Precision
Pred. Control	4	1	80.00%
Pred. Bipolar	0	2	100.00%
Class Recall	100.00%	66.67%	Accuracy: 85.71%

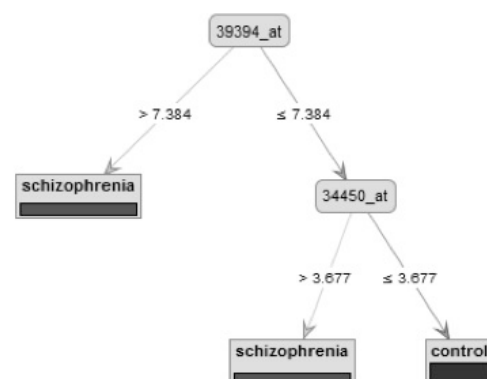


Figure 2: Decision tree classification of schizophrenia and control samples. 39394_at and 34450_at represent to GUCY2C and C2orf72 genes respectively. Schizophrenia patients are determined as > 7.384 expression level of GUCY2C and > 3.677 expression level of C2orf72. Control is determined as ≤ 3.677 expression level of ARHGAP4.

Table 4: Decision tree classification of Schizophrenia. Table shows confusion matrix of classifier on testing data for Schizophrenia patients.

	True Control	True Schizophrenia	Class Precision
Pred. Control	3	2	60.00%
Pred. Schizophrenia 1		2	66.67%
Class Recall	75.00%	50.00%	Accuracy: 62.50%

3.4. Naive Bayes Classification and Classifier Performance

Naive Bayes classification was applied to the same probe set which was used in previous analyses. Test group includes 4 controls with 3 bipolar patients, and 4 controls with 4 schizophrenia patients. Accordingly, results were shown on Table 5 and Table 6. k-NN and Naive Bayes classification methods demonstrated similar accuracy on bipolar and schizophrenia classifications.

Table 5: Naive Bayes classification of Bipolar disorder. Table shows confusion matrix of classifier on testing data for bipolar patients.

	True Control	True Bipolar	Class Precision
Pred. Control	3	0	100.00%
Pred. Bipolar	1	3	75.00%
Class Recall	75.00%	100.00%	Accuracy: 87.71%

Table 6: Naive Bayes classification of Schizophrenia. Table shows confusion matrix of classifier on testing data for Schizophrenia patients.

	True Control	True Schizophrenia	Class Precision
Pred. Control	3	0	100.00%
Pred. Schizophrenia 1		4	80.00%
Class Recall	75.00%	100.00%	Accuracy: 87.50%

4. Conclusions

Differentially expressed genes used as classifying features might be useful for revealing important genes and gene families associated with schizophrenia and bipolar disease. More importantly the classifier method might be applicable for developing effective Microarray-based diagnostic tests.

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PSYCHOSOCIAL CORRELATES OF BEHAVIOURAL PROBLEMS IN CHILDREN WITH ADHD IN SPECIAL SCHOOLS IN PAKISTAN

PAKİSTAN'DAKİ ÖZEL OKULLARDA OKUYAN ADHD'Lİ (DİKKAT EKSİKLİĞİ HİPERAKTİVİTE BOZUKLUĞU) ÇOCUKLARDAKİ DAVRANIŞ PROBLEMLERİNİN PSİKOSOSYAL BAĞLANTILARI

Hina Mir¹, Muhammad Akram Riaz², Muhammad Sami Bilal³, Naila Batool⁴

Abstract

To determine the psychosocial correlates of behavioural problems in children with ADHD. Moreover to determine gender differences in psychosocial correlates of behavioural problems in children with ADHD. Total 300 children with ADHD including 150 males and 150 females children were selected in different cities of Pakistan. Purposive sampling technique was applied for collection of data. Multidimensional Scale of Perceived Social Support, WHO Quality of Life Scale and Strengths and Difficulties Questionnaire were used. Descriptive statistics, Pearson correlation and independent sample t-test were applied for hypotheses testing. SPSS software version 20 was used for data analysis. Results revealed that social support and quality of life were negatively related with behavioural problems among children with ADHD. Gender differences revealed that male ADHD children were higher on behavioural problems as compared to female that were higher on social quality of life. The study concludes that social support and quality of life have negative association with behavioural problems among children with ADHD. By providing better social support and quality of life mental health of ADHD children can be increased and behavioural problems can be reduced in them.

Keywords: Social support, ADHD, Quality Of Life, behavioural problems, gender, psychosocial correlates.

Özet

ADHD'li çocuklardaki davranış problemlerinin psikososyal yönlerini ve bu özelliklerle bağlantılı cinsiyet farklılıklarını belirlemek amacıyla Pakistan'ın farklı şehirlerinden 150'si erkek, 150'si kız olmak üzere toplam 300 ADHD'li çocuk seçilmiştir. Verilerin toplanması için amaçlı örnekleme tekniği uygulanmıştır. Çok Boyutlu Algılanan Sosyal Destek Ölçeği, WHO Yaşam Kalite Ölçeği ile Güçler ve Güçlükler Anketi kullanılmıştır. Hipotez denemesi için betimleyici istatistikler, Pearson korelasyonu ve bağımsız grup T testine başvurulmuştur. Veri analizi için SSPS (Sosyal Bilimler İstatistik Programı) yazılımının 20. versiyonu kullanılmıştır. Elde edilen sonuçlar, sosyal destek ve yaşam kalitesinin ADHD'li çocuklardaki davranış problemleriyle ters korelasyonlu olduğunu göstermiştir. Cinsiyet farklılıkları, ADHD sorunu olan erkek çocuklardaki davranış problemlerinin sosyal yaşam kalitesi daha iyi olan kız çocuklarına oranla daha yüksek olduğunu ortaya koymuştur. Yapılan bu çalışma, sosyal destek ve yaşam kalitesi ile ADHD'li çocukların sergilediği davranış problemleri arasında negatif ilişki olduğu sonucunu çıkarmıştır. Buna göre, daha iyi bir sosyal destek ve yaşam kalitesi temin edilmesi halinde ADHD'li çocukların zihin sağlığı geliştirilebilir ve yaşadıkları davranış problemleri azaltılabilir.

Anahtar Kelimeler: Sosyal destek, ADHD, Yaşam Kalitesi, Davranış Problemleri, Cinsiyet, Psikososyal Bağlantılar

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1. Introduction

Attention deficit hyperactivity disorder (ADHD) is the current diagnostic terms used to describe children who present with pronounced and incapacitating difficulties in sustaining attention, modulating activity level and regulating impulses across a number of social contexts such as the family, school and peer group (DSM-5, 2013). In clinical settings, about half of children diagnosed with ADHD qualify for co-morbid diagnoses of either oppositional defiant disorder or conduct disorder (DSM-5, 2013). The psychosocial environment influences the degree to which children with such biological vulnerabilities learn to regulate their attention, activity and impulsivity, or the degree to which such difficulties can be tolerated and managed by members of the child's social system without entailing adverse social consequences (Batool et al., 2014).

A diathesis-stress model of ADHD suggests that families, schools and peer groups which contain family factors in ADHD and emotional disorders members who are intolerant and punitive of inattention, over activity and impulsivity, and who offer limited structured and supportive opportunities for developing self-regulation skills, probably maintain or exacerbate ADHD symptomatology in vulnerable youngsters (Briscoe-Smith & Hinshaw, 2006). In contrast, social systems which contain members who are more tolerant of inattention, over activity and impulsivity, and which offer structured and supportive opportunities for developing self-regulation skills, probably help youngsters vulnerable to ADHD symptomatology to learn self-regulatory skills. Currently the most effective treatment programmes are multimodal, and include psychostimulant therapy to directly address the biological vulnerability to inattention, overactivity and impulsivity, while concurrently training parents and teachers to offer youngsters with ADHD highly structured, supportive and non-punitive opportunities on a daily basis to learn and practice self-regulation (Carr, 2012).

Compared with children without ADHD, children with ADHD have greater difficulties in behavioral, social, and academic functioning and poorer quality of life. Their parents experience more parenting stress, and their mothers are more likely to report symptoms of anxiety and depression (Carr, 2006a). Families of children with ADHD are more likely to report adversely on family activities and parental emotions than families of children without ADHD (Carr, 2006a). Children with insufficient, fragmented, or poor-quality sleep have increased impulsivity, hyperactivity, and aggressiveness as well as problems with mood, academic performance, and neurocognitive functioning (Carr, 2006a). It has thus been postulated that children with ADHD and sleep problems could have poorer cognitive and behavioral outcomes than children with ADHD alone (Carr, 2006b).

Many studies conducted in the past few years in western countries, about ADHD children provided information about their own regions and countries (Chandler, 2014). However, in Pakistan, the work on ADHD children is not sufficient. Due to the poor socio economic status, illiteracy, parental illiteracy and other circumstances, children of Pakistan faced a number of problems including

hyperactivity and inattentive behavior and outcome of these problems like behavioral problems, and poor quality of life. The prevalence of ADHD in Pakistan in one study has been found to be around 2.49% (De Graaf et al., 2008). Children with ADHD, compared to children without ADHD, were more likely to have major injuries (59% vs. 49%), hospital inpatient (26% vs. 18%), hospital outpatient (41% vs. 33%), or emergency department admission (81% vs. 74%) (De Graaf et al., 2008). Rates of ADHD diagnosis increased an average of 3% per year from 1997 to 2006 and an average of approximately 5% per year from 2003 to 2011 (Diener & Biswas-Diener, 2008). Boys (13.2%) were more likely than girls (5.6%) to have ever been diagnosed with ADHD (Diener & Biswas-Diener, 2008).

On the basis of previous literature the following hypotheses were formulated;

1. There is negative relationship between social support, quality of life and behavioral problems among children with ADHD.
2. Male children with ADHD are higher on behavioral problems as compared to female children.

2. Methods

2.1. Participants

The sample of the present study consisted of children diagnosed with ADHD (N = 300). Both male children and female children were included in the sample. Purposive sampling technique was used. Ages of children of the sample group ranged between 12 to 16 years and they were studying in standard levels between 5 to 10. Age range is 12-16, from class 5th-10th. Only those children were selected who were meeting the DSM-V criteria of ADHD. Those children who had co-morbid medical conditions were excluded from the study.

2.2. Psychometric Instruments:

1. Multidimensional Scale of Perceived Social Support was used to assess social support of these 300 children (Goodman, 1997). It is 12-item self-reporting instrument measuring perceived support from three domains: family, friends, and significant other. Respondents scored on a 7-point Likert-type scale for each item ranging from "very strongly disagree" to "very strongly agree". It is a validated and frequently used instrument in Pakistan (Hussain, 2014).
2. WHO's Quality of Life Scale was used to assesses person's perception of quality of life (Karim et al., 1998). It consists of 26 items. There are four subscales of the scale including physical quality of life, psychological quality of life, level of independence and social quality of life. It is a 5 point Likert-type scale for each item "strongly disagree" to "strongly agree". It is a validated and used instrument in Pakistan (Mir, 2014)
3. Strengths and Difficulties Questionnaire is a questionnaire measuring behavioural problems

in children with age of 4-16 years (Patel, 1992). It consists of 26 items in five different domains including negativity, hyperactivity, inattention, anxiety and negative mental health. It is 3 point Likert-type scale for each item "disagree" to "agree". It is a validated and used instrument in Pakistan (Pavot & Diener, 2003).

2.3. Methodology

Children were randomly selected from different Private and Public Schools from cities of Pakistan. Cities included Islamabad, Haripur, Quetta, Murree and Gujranwala. Those schools were selected where access was attained and granted by school authorities. The school children were approached in their respective institutions to collect the information. Teachers, guardians, parents of children and participating children were informed about the purpose, significance, and implications of the study. They were ensured of the confidentiality as to the information obtained from research and reassurance was given to keep their personal identities concealed. Then written informed consent was obtained from the participant children after explaining full scope of study before administering the questionnaires. There was great difficulty to acquire data from children suffering from ADHD as children with ADHD find it difficult to cooperative or express. And since most of the children were school based, searching out for children suffering from ADHD was a tenacious task.

3. Results

The present study aimed to investigate the relationship between social support, quality of life and behavioral problems among children with ADHD. Statistical Package for Social Sciences (SPSS) version 14 was used to statistically analyze the collected data. Correlation, t-statistics and alpha reliability were applied to evaluate the hypothesis of the study.

Table 1: Psychometric Properties for all Study Variables

Variables	Items	M	SD	Range	α
Peer group	4	10.11	2.82	2-15	.70
Family support	4	11.18	2.71	1-16	.79
Significant other support	4	10.39	2.53	4-15	.72
Social support	12	31.75	5.60	18-42	.81
Physical quality of life	7	16.65	3.65	4-23	.71
Psychological quality of life	6	15.05	3.22	5-23	.75
Social quality of life	3	7.90	1.71	4-11	.80
Environmental quality of life	8	16.84	3.38	9-27	.77
Quality of life	26	65.34	7.85	48-82	.78
Negativity	8	7.73	2.87	1-13	.65
Hyperactivity	6	2.52	1.03	1-4	.76
Attention	4	2.22	1.29	1-6	.73
Anxiety	2	20.32	4.02	7-29	.81
Mental health	5	39.5	7.77	34-45	.72

In the results Table 1 shows psychometric properties for all study variables. Results revealed that all the variables used in study were reliable.

Table 2 shows that peer group has significant positive relationship with social support, family support, significant others support, physical quality of life, psychological quality, level of independence, and social quality of life whereas significant negative relationship with negativity, hyperactivity, inattention and negative mental health. Family support have significant positive relationship with significant other support, social support, physical quality of life, psychological quality of life, level of independence, and social quality of life whereas significant negative relationship with negativity, hyperactivity, inattention and negative mental health. Significant other support has positive significant relationship with social support, physical quality of life, social quality of life, level of independence and social quality of life whereas significant negative relationship with negativity, hyperactivity, inattention and negative mental health. Social support has significant positive relationship with physical quality of life, psychological quality of life, level of independence, and social quality of life whereas significant negative relationship with negativity, hyperactivity, inattention and negative mental health. Physical quality of life has significant positive relationship with psychological quality of life, level of independence, and social quality of life whereas significant negative relationship with negativity, hyperactivity, inattention and negative mental health. Psychological quality of life has significant positive relationship with level of independence, and social quality of life whereas significant negative relationship negativity, hyperactivity, inattention and negative mental health. Level of independence has significant positive relationship with social quality of life whereas significant negative relationship with negativity, hyperactivity, inattention and negative mental health. Social quality of life has significant positive relationship with quality of life whereas negative relationship negativity, hyperactivity, inattention and negative mental health. Quality of life has significant negative relationship with negativity, hyperactivity, inattention and negative mental health. Negativity has significant positive relationship with significant negative relationship with hyperactivity, inattention and negative mental health. Hyperactivity has significant negative relationship inattention and negative mental health. Inattention has significant negative relationship with negative mental health.

Table 3 from the study indicated gender differences in psychosocial correlates and in behavioural problems among children with ADHD. Results indicated that male were significantly higher on hyperactivity and anxiety whereas female were high on social quality of life. On peer group, family support, significant other, social support, physical quality of life, psychological quality of life, environmental quality of life, quality of life, negativity, attention and mental health results were non-significant.

Table 2: Correlation between Study Variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Peer group	-	.23*	.19*	.59**	.33**	.24*	.25**	.19*	.33**	.32**	-.19*	.19*	-.19*	.33**
2. Family Support		-	.48**	.71**	.28*	.24*	.38*	.36**	.53**	-.20*	-.25*	.30**	-.26*	.33**
3. Significant Other Support			-	.76**	.32**	.23*	.41*	.32**	.32**	.29**	.22*	.19*	-.26*	.30**
4. Social support				-	.45**	.19*	.30**	.40**	.28**	.25**	.28**	.19*	.30**	.45**
5. Physical quality of life					-	.20*	.33**	.32**	.58**	.30**	-.22*	.24*	.66**	.67**
6. Psychological quality of life						-	.32**	.19*	.68**	-.19*	.23**	.19*	.55**	-.25*
7. Level of independence							-	.25**	.27**	-.21*	-.22*	.32**	-.20*	-.22*
8. Social quality of life								-	.69**	.21*	.24**	.23*	.46**	.35**
9. Quality of life									-	.23**	.32**	.33**	.67**	-.23*
10. Negativity										-	.19*	.28*	-.19*	.67**
11. Hyperactivity											-	.19*	.30**	.56**
12. Inattention												-	.23*	.23*
13. Anxiety													-	.26*
14. Negative mental health														-

*P < .05, **p < .01

Table 3: Gender Differences for all Study Variables

Variables	Male (n = 150)		Female (n = 150)		t(298)	Cohen's d
	M	SD	M	SD		
Peer group	10.07	2.89	10.16	2.78	.14	.03
Family support	11.48	2.09	10.86	3.25	1.01	.23
Significant other support	10.28	2.30	10.52	2.81	.41	.09
Social Support	31.87	5.07	31.60	6.23	.21	.04
Physical quality of life	16.59	3.45	16.71	3.91	.14	.03
Psychological quality of life	15.23	3.33	14.84	3.14	.54	.12
Level of independence	6.91	1.56	8.52	1.54	.81	1.04
Social quality of life	17.21	3.45	16.41	3.29	1.03	.24
Quality of life	62.45	8.32	64.66	7.72	2.81*	.62
Negativity	7.97	2.54	7.44	3.22	.81	.18
Hyperactivity	2.73	.73	2.28	1.25	1.97*	.44
Attention	2.30	1.17	2.13	1.41	.59	.13
Anxiety	20.70	3.82	19.89	4.24	1.99*	.20
Mental Health	39.50	7.77	12.11	2.3	.34	7.13

*P < .05

4. Discussion

The present study is designed to investigate the psychosocial correlates of behavioural problems among children with ADHD in few selected school in various cities of Pakistan. The results showed that the questionnaires used in the study were reliable. Pearson Correlation was employed and results revealed a significant negative correlation between social support and quality of life with behavioural problems among children with ADHD. The findings were approved by researches that social support and quality of life has largely impact on the life of children

with ADHD (Schachar & Tannock, 2002). The findings were approved by researches that those with ADHD have greater difficulties in behavioral, social, and academic functioning and poorer quality of life. Their parents experience more parenting stress, and their mothers are more likely to report symptoms of anxiety and depression. Families of children with ADHD are more likely to report adversely on family activities and parental emotions than families of children without ADHD (The WHOQOL Group, 1995).

Findings of our research revealed that male children with ADHD were higher on behavioral problems as compared to female children. Result also indicated that male children scored significantly higher on hyperactivity and anxiety as compared to female that were higher on social quality of life. The findings of our study was supported by previous researches that boys are about three times more likely than girls to have symptoms of ADHD (Zimet et al., 1988). ADHD is more common among boys than among girls; pre-adolescents than adolescents; and urban than rural children. In clinical settings, about half of children diagnosed with ADHD qualify for co-morbid diagnoses of either oppositional defiant disorder or conduct disorder (Zito et al., 2007).

5. Conclusion

Findings showed that social support and quality of life are correlates of behavioural problems among children with ADHD. Therefore, increasing social support and quality of life of ADHD children can results in lower behavioural problems in them. It is important to let the parents and educators know that if their students or children are in the condition of hyperactivity and lack of attention, they need to be more attention as it is more possibility to have ADHD too. Although, the result indicated that there is a significance difference on gender in behavioral problem.

If the individuals have the symptoms of ADHD such as, lack of attention and hyperactivity, also affecting many aspects of his/her life functioning. Educators and parents stand an important role to encourage seeking for help and treatment. Therefore, this study can be useful for students, researchers, psychologist, counselor and health professionals who are interest to investigate the problems of ADHD children.

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COMPARISON OF CONVENTIONAL MARKETING RESEARCHES AND NEUROMARKETING RESEARCHES IN REGARD TO THE EFFICIENCY OF MARKETING MESSAGES

PAZARLAMA MESAJLARININ ETKİNLİĞİ AÇISINDAN GELENEKSEL PAZARLAMA ARAŞTIRMALARI İLE NÖROPAZARLAMA ARAŞTIRMALARININ KARŞILAŞTIRILMASI

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Abstract

The applications of neuroscience studies carried out to assess the mental processes, for the use of marketing, led to the “neuromarketing” concept. Although neuromarketing is a concept that has field of application, yet it has not been discussed adequately on scientific basis. This study is intended to be a data source providing information about the usability of neuroscience in marketing. For this purpose, the visual messages on the cigarette packages, a part of the smoking cessation campaign of the Ministry of Health, are examined according to neuroscience techniques (EEG) and one of the conventional research techniques (online survey) and the results are compared in regard to their efficiency.

Keywords: Neuromarketing, Marketing researches, EEG, Event-related potentials, ERP, late positive potentials, LPP

Özet

Zihin süreçlerini değerlendirebilmek için yapılan nörobilim çalışmalarının, pazarlama alanında kullanılmasına yönelik uygulamalar “nöropazarlama” kavramını doğurmuştur. Nöropazarlama, sektörde uygulama alanı olan bir kavram olmakla birlikte bilimsel bir temelde yeterince tartışılmamıştır. Bu çalışma, nörobilim araştırmalarının pazarlama alanında kullanılıp kullanılmayacağına yönelik kaynak bir veri olma amacındadır. Bu amaçla Sağlık Bakanlığı’nın hazırladığı, sigara bıraktırmaya yönelik kampanyanın bir parçası olan, sigara paketleri üzerindeki görsel mesajların karşılaştırmalı olarak hem nörobilim teknikleri(EEG) hem de geleneksel araştırma tekniklerinden biri ile (online sörvey) incelenmiş ve sonuçları etkinliklerine göre karşılaştırılmıştır.

Anahtar Kelimeler: Nöropazarlama, pazarlama araştırmaları, EEG, Olay ilişkili Potansiyeller, Geç Pozitif Potansiyeller

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1. Introduction

Every enterprise needs some data. These are private data apart from general public data, and usually concerns marketing decisions. Marketing research is effective in terms of collecting these data and creating strategies (Aaker et al., 2004). Kotler described marketing research as "collecting, analyzing, and reporting the data, in regard to a certain situation an enterprise encounters, in a systematic design. (Kotler & Armstrong, 2006). Data obtained by marketing researches are used for decisions of the enterprise (Haring, 1936). Researches, in which subjective data is collected, help managers in their corporate decision-making processes (Zikmund, 1994).

While the research problem is concerned with obtaining data to solve the issue, the business problem is concerned with the action to realize the solution (Smith & Albaum, 2012). Boone and Kurtz, handling marketing in regard to its contribution to the business, described marketing as the most important function supporting the success of enterprises. (Mucuk, 2000). Marketing is the management process of strategies raising awareness by maintaining fiduciary relationships with customers (Doyle, 2003). In order to promise value, and thus, draw new customers, and to satisfy customers for retention, marketing strategies are developed (Armstrong & Kotler, 1999). These strategies are based on the data obtained by marketing researches. Research methods and techniques also used in marketing researches evolved through several phases from past to present.

In 1920s, studies on communication were initiated and reached up modern-day going through various stages. Data collection methods and techniques play a crucial role in interpreting data, planning marketing activities, and developing strategies. These data collection methods showed an alteration parallel to scientific variation from qualitative to quantitative. The qualitative researches in 1950s were lowered and replaced by quantitative researches in 1970s. In our day, it is discussed if the neuromarketing studies will find a place in marketing field. The reason of this discussion is, as Morin stated, conventional marketing research methods and techniques are unsuccessful in testing and predicting the efficiency of any investment. Customers'/subjects' will and ability to express how they feel with this commercial, affects the research results (Morin, 2011). The consumer will definitely not respond as "I buy this Louis Vuitton bag because I like showing off and I want to show my friends that I can pay \$500 for a purse". She may even be unaware of this. Most of the time, this is the case while the brain decides for purchasing (Lindstrom, 2013). They can only state that they are aware of it. Awareness includes the present and recognized feelings, thoughts, attitudes, and excitements (Avant & Helson, 1990). The mental processes accepted as conscious are: recollective, realistic, significant, and oriented processes (Ersevım, 2008). However, nearly most of the mental activities are actualized unconsciously (Eagleman, 2014). The subconscious includes all mental processes except for conscious perception and it is quite hard for it to reach conscious (Yanbastı, 1996). According to neuroscience researches, 95% of brain processes including the emotional ones are handled at unconscious

level (Treutler et al., 2010).

Neuroscience is a neural system study which is responsible for the biological ground of behavior (Plassmann et al., 2012). Mesulam states that scientists that work in neurology and psychiatry areas are trying to understand how human brain succeeds in facts such as language, memory, motivation, attention, and conscious (Tanrıdağ, 2004). Cognitive neuroscience, one of the branches of neuroscience, investigates the neural mechanisms behind circumstances such as mind, emotion, memory, and decision making (Filipe, 2010). Neuromarketing uses neuroscience in order to understand what exist in the consumers' minds. Not the declaration of the subjects but their brain images are examined in neuromarketing researches. Researches are divided in two groups; "academic" and "private". Both researches use the scientific research methods. Marketing researches are private researches (Wimmer & Dominick, 1994). "The researches in Health area are collected in four groups: clinical researches, epidemiological researches, animal researches, and system-model researches" (Oğuz, 1997). Neuromarketing researches use non-invasive clinical research methods.

Conventional marketing researches are based on the declarations of the participants. In quantitative researches, the answers of the participant to direct questions he was asked are determinant, whereas in qualitative researches deep thoughts are set forth. In researches based on declarations, revealing the real thought of the participant depends on both the participant's willingness to answer and the skills of the researcher. As Kumar said, the personal values, beliefs, and behaviors may affect interpreting the statements of the participants with different value system (Kumar, 2000). In marketing researches based on participant statements, the participants may assume there is a true answer for the question, thus, may give the answer he thinks that may be correct instead of his own. The participant may be unaware of his real thoughts. The participant may need to hide the truth. Yet it is not known if neuromarketing researches can be a solution for these problems.

Critizing the customer satisfaction researches' being handled by quantitative method, Dedeoğlu says that, quantitative researches became a publication criteria in academic literature. Dedeoğlu states that qualitative researches are more effective compared to quantitative researches as the area is continuously getting complicated and the consumer behaviors continuously become unpredictable (Dedeoğlu, 2002). For the very reason, it is worked out to understand if neuromarketing can be a third alternative in understanding consumer behaviors.

2. Neuromarketing Concept

In 1980s, the lifestyles of customers, their buying habits, demands, and needs were determining marketing and communication planning of the enterprises. Those were the years when customer oriented marketing planning began to come into play (Yeygel, 2007). Neuromarketing concept was released during customer oriented marketing period as a result of the need in understanding the real

feelings and thoughts of the customers and the decision-making processes.

Neuromarketing is a field where neuroscience methods are applied in order to understand and analyze human behaviors (Vecchiato, 2011). The brain scanning devices used by neuromarketing were already being used by several specialists, mainly by psychologists, since 1980s. The brain scanning devices, which are used to determine the part of the brain where there is activity after using antidepressants, and to understand how the brain activates while lying, are used in neuromarketing area (Tüzel, 2010). Neuromarketing is a sub-branch of neuroscience focusing on the structure and function of brain (Aytekin & Kahraman, 2014).

The objective of neuromarketing studies is to find the relation between the behaviors and neuronal system in the presence of marketing stimuli, thus, different sections of the brain are being analyzed. Neuroimaging techniques are used to test any hypothesis and the influence of marketing stimuli on the consumer brain (Bercea, 2012). According to Yücel and Çubuk (2014), one of the youngest sciences to be used in understanding the needs of people and observing the influence of emotional responses, mind, heart, and feelings on decision making, is neuromarketing.

Touching on neuro and marketing concepts which name this field; the term "neuro" is about the neurological processes transforming external stimuli to conscious or subconscious thoughts by using the five senses; sight, touch, sound, taste, and smell (Knight, 1999). Neurology is defined as "the neural system study concerning the biological bases of consciousness, perception, memory, and learning". Neurology, trying to understand the reasons why decision-takers do not react the same way under all conditions and which factors are effective, examines how the brain works under which circumstance (Soydal et al., 2010). Examining the sensual, cognitive, and emotional stimuli is important to understand brain's dynamic structure released during these functions. Emotional processes are one of the most complex functions of the brain (Güntekin, 2014). Green's dual-process theory relating the dual process of brain, also called emotional and mentalist systems (Eagelman, 2014), states that, non-pragmatic judgments come up with self-driven emotional responses, as a result of pragmatic ethical judgments (Skulmowski et al., 2014). Freud claimed that various forms of human behaviors are related to secret processes. This statement of Freud is the first systematic step to understand how the secret processes of brain directs thoughts and behaviors (Eagelman, 2014). Neuromarketing uses neuroscience discipline that works to reveal the secret process of human brain. Through neuromarketing researches, the reactions and mental state of the person meeting marketing message are examined in regard to neurology (Özdoğan et al., 2008).

Neuromarketing researches may be evaluated in 3 categories; based on the metabolic activity in brain, based on the electrical activity in brain, and techniques with no activity in brain (Bercea, 2012). The most commonly used techniques are eye tracking, fMRI, and EEG. Methods such as PET and SPECT, which are based on metabolic activities

in brain, are not commonly used because of exposure to radiation and concerns about its possible long-term effects (Şenol & Öncüoğlu, 1998). fMRI, is favorable in regard to spatial resolution (image's capability to make out different points), and it can precisely detect the area where the activity occurred (Lee et al., 2009). With the EEG technique, the changes can be tracked by a 5-second epoch (Astolfi et al., 2009). Among these techniques; EEG is the one with high temporal resolution, whereas fMRI is the one with high spatial resolution. Neuromarketing researches puts forward facts such as; store experiences, the influence of background music, commercial tests, slogan determination, web site design and usability tests, package designs, as well as determining the important points in a video, identifying if the stimuli are noticed and which one is noticed first.

We have more than 100 billion neuron and trillions of synaptic connections. These neurons and synaptic connections enliven in the presence of any stimulus (such as commercials) and produce a measurable small electrical current (Morin, 2011). EEG; measures the alteration by millisecond, attaching electrodes to the scalp. It is capable of measuring a millisecond alteration. Hence, it perceives the short neuronal resurgence. The number of electrodes used is directly proportional with resolution (Ariely & Berns, 2010). Electrophysiological studies, in which the electrical activity in the brain and the brain function are measured, became popular by Hans Berger's studies in 1929s (Finger, 1994). "Event-related potential" term is used to define the brain responses regarding a certain event. In 1935-1936, Pauline and Hallowell Davis, recorded the first ERP responses in awake people, the results of which are accepted to be clear and reliable (Luck, 2005). Event-related potentials are categorized in two types. One of them is the early waves or components which reach a peak in 100 ms after the stimulus. These ERPs are called "emotional" or "exogenous". The other one is the late ERP components, which is called "cognitive" or "endogenous". This component reflects the behavior during data processing (Sur & Sinha, 2009). Late positive potentials (LPP) are reliable electrophysiological responses showing emotional perceptions of people. LPP, is the most frequently used event-related potential component used for feelings and emotional regulation (Moran et al., 2013). Event-related potential technique not only enables the researcher to make time wise resolution recording but also enables measuring processes such as perception and attention (Woodman, 2010).

There are different opinions regarding the use of neuroscience techniques in marketing (Ural, 2008). According to some marketing academicians, neuroscience is "scary" and the use of neuroimaging methods in marketing area is "unattainable". However, many academicians in marketing area, work in universities that have neuroimaging facilities (Lee et al., 2007). Apart from the critics towards the applicability of neuromarketing, there are also critics towards its objective. It is claimed that neuroscanning can be used to capture people's brain and for commercial purposes (Lindstrom, 2013). There are several different views telling that the aim of neuromarketing is not to capture the brain, to the

contrary, it helps decision-makers understand themselves and the intentions of the companies. Neuromarketing reveals how the brain decides while the consumer purchases something. Therefore, neuromarketing aims to understand the urge behind purchasing (Yücel & Çubuk, 2013). Neuromarketing, helps these target people to understand their decision-making processes. By this way, people can evaluate how companies manipulate them (Renvoise & Morin, 2012). On the other hand, there are also non-commercial advertorial messages. There are numerous campaigns which work up to change people's self-harming behaviors. Developing the ability to convince people not to text while driving or not to smoke are some good examples to this. Morin believes that neuromarketing meets this need (Morin, 2011).

Discussions on the applicability and objective of neuromarketing researches still continue. Our research presents the applicability of neuroimaging methods in neuromarketing area. In this research, conventional marketing researches and neuromarketing researches are compared on the same campaign message and the efficiency of the results are defined in accordance with the campaign objective. The same campaign message is examined first by using conventional research methods, and then by neuromarketing techniques. Thus, data showing which method shapes the subjects' real attitudes and behaviors is achieved, enabling to make comparison.

This study examines if conventional research or neuromarketing research works to obtain the required data while determining the marketing message. The answer to "Does conventional research or neuromarketing research work to obtain necessary data while determining the marketing message?" question is searched for. This study does not cover all of the smoking cessation campaigns in Turkey by the Ministry of Health. The campaign handled in this research is limited with the messages on the cigarette packages. It does not examine the decision process of smoking cessation and the reasons of its realization.

3. Materials And Methods

3.1. Participants

Neuromarketing Research; 22 people in the control group, and 22 people in the experimental group, 44 volunteers in total participated EEG shooting. Following the elimination of the ones which cannot be included in evaluation because of bad shooting quality or other technical reasons, the shots of 22 people from the experimental group and 19 people from the control group were included in the analysis. 20 of the participants were female and 21 were male. The age range of the participants is 18-25.

A group of 15 subjects is enough to receive accurate results in experimental researches (Arli & Nazik, 2001). The experiences of the researcher, previous data or pilot data can be utilized in sample size determination (Demirel & Güler, 2010).

Conventional Marketing Research: The target population of this research, depending on the "starting age of smoking" data of TUIK, is the 16-74 age range internet

users. The population of 16-74 age range internet users was calculated as 30.350.437. Online survey technique was used in the research. The online survey form was sent to participants via e-mail and social media. Non-random sampling method was used for this research. The target population of the research was 30.350.437. The sampling size was calculated as 384 with 95% confidence interval and ± 0.05 sampling error.

3.2. Stimulus, Materials and Design

Neuromarketing Research: In the research, one of the neuroimaging techniques, EEG, was used. Late positive potentials (LPP) are reliable electrophysiological responses showing emotional perceptions. LPP, is an event-related potential component used most for emotions and emotional regulation (Moran et al., 2013). Event related potential technique provides the researcher the opportunity to make precise time wise resolvable recording as well as measuring processes such as perception and attention (Woodman, 2010). In the research, the late positive potential was calculated as the average activity within 450-750 ms time frame after the stimulus is shown (Wölfling et al. quoting from Schupp et al., 2011). The research was made by using 32-channel EEG device. The experiment design was prepared with Open Sesame (2.9.2) software. The research was made in the Neurotechnology and Bioinformatics Laboratories.

The sequence of the images shown were prepared pseudo-random, thus, each participant was shown the images in the same sequence.

After each independent variable, corresponding images for "I want" and "I don't want" responses. 14 dissuasive images, 14 dissuasive texts, 14 encouraging images and following these, "I want" and "I don't want" visuals were shown respectively. In the research, two stimuli were shown for each of the 3 experimental cases and 14 studies were made, which means 84 (2x3x14) pictures were shown in total. Besides, including the experimental manipulation comprising the motivations of willingness and unwillingness for cigarette, following these images, the experiment was completed with 168 tests in total.

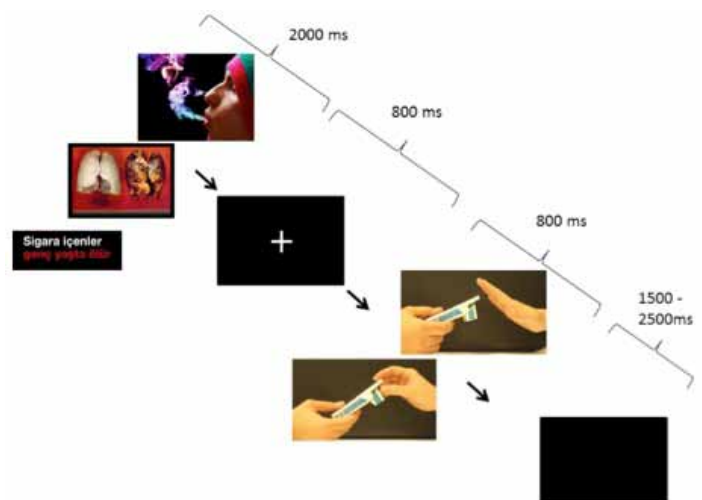


Figure 1: Experiment design template

The experiment design is shown in Figure 1. The experiment is designed to show encouraging and dissuasive stimuli for 2000ms, fixation dot for 800ms, and I want/don't want stimuli for 800ms.

Conventional Marketing Research; The quantitative research method is used. Online survey technique is used to collect data.

4. Analysis

4.1. Neuromarketing Research

In the research, the late positive potential (LPP) waves pre-defined in literature were analyzed in order to measure the motivations of the participants. Event related potentials are related with metacognitive processes such as; memory, expectation, and attention. For the analysis, the average electrical activity between 450 and 750 and in Fz, Cz, and Pz electrode sections are calculated. All analyses were completed with Brainvision Analyser 2.01 software and the results were analyzed as 3x2x2 (3 experiment status, 2 "I want/don't want" responses, and 2 work groups) in SPSS software by using repeating ANOVA analyses. Equal number of healthy volunteers grouped according to their genders and ages, were included in this research in order to examine the specificity of the findings to smokers. Following ANOVA, post-hoc bonferroni correction was applied in order to determine main effects and significant relations. As considered necessary, Greenhouse-Geisser correction was applied. The significant p value was taken as 0.05 and the conformability of the entire data to parametric analyses was confirmed by Kolomogorov-Smirnov test.

4.2. Conventional Marketing Research

The research results are analyzed by using SPSS software. Exploratory factor analysis is made to determine whether the visual groups are diverged into factors in terms of impact score and then the Cronbach's Alpha index is calculated in order to determine internal consistency levels. In the visual groups, item-total correlation analysis is made according to the impact scores, in order to determine the most effective visual material.

Single direction variance analysis is made in the repetition of measurements to compare the impact level of the visuals and ultimately the paired

comparison of impact scores is made by Bonferroni test. The analyses are completed by making single direction variance analysis in order to determine the differentiation of impact scores in regard to smoking status. In the study, the impact level of each visual is measured by 5-likert scale. Accordingly, the likert scores; -2: reduced extremely, -1: reduced, 0: neither increased nor reduced, 1: increased, 2: increased extremely.

5. Results

5.1. Neuromarketing Research

The repetitive ANOVA model (General Linear Modeling) establish in regard to LPP potential, is found to be statistically significant between the electrodes ($F(1.53, 61.18) = 15.92$; $p < .001$, Greenhouse-Geisser revised) and the stimuli ($F(1.97, 90.14) = 11.07$; $p < .001$, Greenhouse-Geisser revised), and also in the interaction where electrode, stimulus types, and approach-avoidance trends are found together ($F(2.82, 112.85) = 2.88$; $p = 0.042$, Greenhouse-Geisser revised). In the post hoc analyses made to examine this triple interaction, a difference is found between stimuli whereas the impact of approach-avoidance behavior is not found.

When the data corrected by Bonferroni is examined, it is determined that the LPP response which occurs after the warning text shown following the smoking motivation stimulus, is higher than the LPP response occurs after the warning picture ($p < .001$). Besides, the LPP potential towards smoking motivation images shown right after warning message, is found to be even higher than the images increasing the desire to smoke ($p < .001$). No difference is determined between the warning images and encouraging images for the desire to smoke in terms of LPP responses. Warning text brings out higher LPP responses compared to dissuasive and encouraging

Table 1: Comparison of negative and positive motivations according to Fz electrode

Electrode	Motivation	(I) Stimulus	(J) Stimulus	Average Difference (I-J)	Standard Error	P Value	95% Confidence Interval	
							Lower Limit	Upper Limit
Ez	Positive	Image	Text	-1.247*	.337	.001	-1.928	-.565
			Encouraging image	.123	.360	.735	-.605	.851
		Text	Image	1.247*	.337	.001	.565	1.928
			Encouraging image	1.369*	.314	.000	.735	2.004
		Encouraging image	Image	-.123	.360	.735	-.851	.605
			Text	-1.369*	.314	.000	-2.004	-.735
	Negative	Text	Text	-.637	.457	.171	-1.561	.287
			Encouraging image	-.156	.346	.655	-.854	.543
		Image	Image	.637	.457	.171	-.287	1.561
			Encouraging image	.481	.463	.305	-.454	1.417
		Encouraging image	Image	.156	.346	.655	-.543	.854
			Text	-.481	.463	.305	-1.417	.454

Notes: * $p < 0.05$

images. Although text is more effective, the aspect of this effect is unknown.

As seen in Cz electrode, just like observed in Fz, when the LPP responses towards smoking motivation are examined, it is determined that the LPP response is higher for images in case there is a warning text manipulating the motivation ($p=.008$). Besides, the LPP response towards text appeared higher than warning images ($p=.035$). When the LPP responses in Cz electrode towards avoidance of smoking are compared, it is determined that the LPP potential of warning text is higher than warning image ($p=.024$) and encouraging image ($p=.034$). According to Cz electrode, the LPP response of dissuasive text towards not smoking motivation is higher compared to the others. It is observed that the smoking motivation of dissuasive text is also higher than the others, and therefore there is no difference in LPP response in terms of "approach" and "avoidance" and that the difference is in the dissuasive image, text, and encouraging image status.

5.2. Conventional Research

The analysis result for dissuasive image, dissuasive text, and encouraging image is given in this table. With the factor analysis, it is intended to calculate the impact score by gathering the visuals under a single group. In the analysis results, it is determined that dissuasive image, dissuasive text and encouraging image materials are grouped properly. Accordingly, for dissuasive images, the percentage of explaining the total variance is calculated as 65.404, the confidence index is 0.959, for dissuasive texts the percentage of explaining the total variance is calculated as 68.904, the confidence index is 0.964, and for encouraging images the percentage of explaining

Table 2: Comparison of negative and positive motivations according to Cz electrode

Electrode	Motivation	(I) Stimulus	(J) Stimulus	Average Difference (I-J)	Standard Error	P Value	95% Confidence Interval	
							Lower Limit	Upper Limit
Cz	Positive	Image	Text	-.896*	.321	.008	-1.544	-.247
			Encouraging image	-.062	.338	.855	-.746	.621
		Text	Image	.896*	.321	.008	.247	1.544
			Encouraging image	.834*	.381	.035	.064	1.604
		Encouraging image	Image	.062	.338	.855	-.621	.746
			Text	-.834*	.381	.035	-1.604	-.064
	Negative	Text	Text	-.852*	.362	.024	-1.584	-.120
			Encouraging image	-.059	.333	.860	-.733	.615
		Image	Image	.852*	.362	.024	.120	1.584
			Encouraging image	.792*	.360	.034	.064	1.520
		Encouraging image	Image	.059	.333	.860	-.615	.733
			Text	-.792*	.360	.034	-1.520	-.064

Table 3: Comparison of Dissuasive Image- Dissuasive Text- Encouraging Image Impacts

	X	ss	KT	sd	KO	F	p	Partial Eta ²
Dissuasive Image Impact Score	-.6730	.6737						
Dissuasive Text Impact Score	-.5694	.6746	78.650	1.304	60.331	258.806	0.000*	0.394
Encouraging Image Impact Score	-.0849	.7553						

* $p<0.05$

Table 4: Comparison of Dissuasive Image- Dissuasive Text Impacts

(I) impact	(J) impact	Average difference (I-J)	sh	p value
Dissuasive Image Impact Score	Dissuasive Text Impact Score	-.104*	.014	.000
	Encouraging Image Impact Score	-.588*	.033	.000
Dissuasive Text Impact Score	Dissuasive Image Impact Score	.104*	.014	.000
	Encouraging Image Impact Score	-.485*	.031	.000
Encouraging Image Impact Score	Dissuasive Image Impact Score	.588*	.033	.000
	Dissuasive Text Impact Score	.485*	.031	.000

* $p<0.05$

the total variance is calculated as 68.893 the confidence index is 0.964.

The one-way variance analysis result of the repetitive measurements performed to compare the impact levels of 3 visuals is given in the table. According to the analysis result, there is no significant statistical difference between dissuasive image, dissuasive text, and encouraging image impact score ($F=258.806$, $p<0.05$)

According to the paired comparison analysis results, there is a significant difference between dissuasive image and dissuasive text in terms of impact score in favor of dissuasive image. The same applies for encouraging image and dissuasive image, in favor of dissuasive image. There is a significant difference between dissuasive text and encouraging image in favor of dissuasive text.

Table 5: Comparison of impact scores according to smoking status

Smoking	Impact Status	X	sh	95% Confidence Interval	
				Lower Limit	Lower Limit
Smoking	Dissuasive Image Impact Score	-.333	.044	-.419	-.247
	Dissuasive Text Impact Score	-.243	.044	-.328	-.157
	Encouraging Image Impact Score	.209	.052	.107	.310
Not Smoking	Dissuasive Image Impact Score	-1.042	.048	-1.135	-.948
	Dissuasive Text Impact Score	-.964	.048	-1.057	-.870
	Encouraging Image Impact Score	-.438	.056	-.548	-.327
Quitted	Dissuasive Image Impact Score	-.765	.074	-.911	-.618
	Dissuasive Text Impact Score	-.562	.074	-.708	-.416
	Encouraging Image Impact Score	-.081	.088	-.254	.091

The one-way variance analysis result of the repetitive measurements performed to compare the impact levels of 3 visuals is given in the table. According to the analysis result, there is no significant statistical difference between dissuasive image, dissuasive text, and encouraging image impact score ($F=258.806$, $p<0.05$).

In the repetitive measurements performed to compare the impact level of the visual on smoking, according to the variance analysis there is a significant difference between the impact scores ($F=276.273$; $p<0.05$), whereas the interaction between the impact score and the smoking habit is not found significant ($F=1.152$; $p>0.05$). According to the analysis result, it is determined that there is a significant difference between the impact scores of the visuals on the individuals with different smoking status ($F=242,030$; $p<0.05$). According to this, dissuasive image, dissuasive text, and encouraging image affects mostly non-smokers however dissuasive text and encouraging image affected smokers least. The difference between the impact scores of the visuals are found statistically significant in the differentiating smoking status ($F=141,041$; $p<0.05$). The impact score statistics for smoking status differentiation are shown in the table. Among the smokers, non-smokers and quitters the visual with the highest impact score is dissuasive image and the second is the dissuasive text. Accordingly, in all three groups the dissuasive image is found to be more effective than dissuasive text.

6. Discussion

When neuromarketing and conventional research results are compared, it is determined that the brain analyses results are different in some extend. According to participants' declaration images are more effective, however according to brain analyses, text is more effective. In the brain views and declarations of the participants it is determined that the stimuli exposure differ between smoker and non-smoker participants. Non-smokers declared that they are affected by the dissuasive messages, however, their brain views showed that they are not.

In this research, although it became evident that the

smokers are affected by the dissuasive messages on cigarette packages, we do not know if this influence will turn into smoking cessation behavior or not. At the end of the day, will the desire of smoking – which is related to addiction- or their concerns about its negative influence to their health, win? The research that Lindstrom made with fMRI showed that the nucleus accumbens of the smokers activates over a dissuasive message and that it encourages smoking apart from suppressing the desire to smoke (Linstrom, 2013). According to this research made by Linstrom, messages dissuasive for human brain actually creates smoking motivation. However the statements show that these messages encourage them in smoking cessation. In our study, smokers stated that the warnings on the cigarette packages are not dissuasive. However in our research, they stated that they are not. The reason of the difference between the statements may be cultural diversity. According to Linstrom, the reason of their saying “yes” to the “Are these messages dissuasive?” question was that they thought it was the correct answer or the answer which the research wants to get. Besides, it was because of the feeling of guilt as they knew smoking is bad for health. The source of the feeling of guilt may vary culture to culture. In our culture, “nothing happens to me” is a common thought and it is more determinative in our life styles.

Rapaille claims that using the survey method is inadequate to investigate consumer behaviors, as the products are encoded in different ways in the subconscious of people from different cultures/countries. Rapaille conducts a discovery session in order to reveal the subconscious of the participants. The discovery sessions and their outcomes are criticized as they do not include any scientific proofs. This study supports Rapaille's “traditional marketing research findings differ by culture” argument in his cultural codes theory.

In a research, it is determined that visuals comprising emotion bring out higher LLP responses compared to neutral visuals. The reason why LPP responses come up high is that visuals comprising emotion causes autonomic stimulation. This supports the fact that intuitive systems utilize simple survival behaviors in LPP responses (Moran, Jendrusina and Moser, 2013). Pratto and John handled this state of brain to survive, in regard to automatic vigilance effect. According to this, a person consistently and automatically evaluated the stimuli around. These stimulants are evaluated in two simple categories: positive and negative. Attention's focusing on negativity stems from the importance of the organism's identifying vital stimulants (Arikan, 2012). In this study, is it possible to explain the high LPP responses of smoking participants by the simple surviving behavior?

The reason of the participants' statements being different than brain waves, must be investigated. Did they make different statements as they are not aware of their real thoughts? Or did they want to hide the truth? Did smokers think that telling they are affected by the stimuli while smoking would be comprehended as incoherent? Did non-smokers think that telling they are not affected would not be wrong? Can the old and new brain structures explain why declarations and brain images are different

from each other? For instance; is it possible that the old brain disregarded the images on the cigarette packages as it is not himself who died/got sick? In a research, it is determined that emotional images on the packages create higher LPP responses compared to neutral images. The reason of high LPP reasons is hat emotional images cause involuntary arousal. This supports the idea that instinctual systems use simple acts of survival in LPP responses (Moran et al., 2013). In this research, is it possible to explain the high LPP responses of smoker participants with simple acts of survival? We can ask these questions to neuroscience, which examines the relationship between behaviors and neuroscience, hence, develop strategies in line with this data.

Despite the fact that neuromarketing applications have some challenges, it is clearly seen that these studies can be made. These challenges derive from the necessity of different disciplines working together. It must be set forth which researches can be applied in neuromarketing field. The problems we come across in statement-based research methods can be solved by using the neuroscience research methods. The marketing specialists should benefit from the neuroscience literature and application methods. By this research, it is proved that neuroscience research methods can be applied to marketing and that it is better to ground on the data acquired by neuroscience methods while creating a marketing strategy.

The cases in which conventional marketing researches should work with neuroscience should be determined. Yet there is no literature prepared according to scientific criteria in the neuromarketing field. While developing marketing strategy, which neuromarketing method should be used for which purpose, must be set forth. A neuromarketing literature including the application techniques of these methods must be prepared. This literature must cover the neuroscience literature and experimental research principles setting forth the methodology and scientific validity of neuromarketing researches –such as; “if the advertising material is effective or not”, “which presentation is more re-collective”, “if it is appreciated or not”- that has field of application in the sector.

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ON CULTURE, BIASES, BRAIN WASHING, BEHAVIOR CHANGING, PUBLIC OPINION AND SIMILAR

KÜLTÜR, ÖNYARGI, BEYİN YIKAMA, DAVRANIŞ DEĞİŞTİRME, KAMUOYU VE BENZERLERİ HAKKINDA

Levon Antikacioglu¹, Nevzat Tarhan¹

Abstract

This is an approach proposal to the assessment and extinction predictability, through a “Brain electro-Activity Map” to Culture, Biases, Brain Washing, Behavior Changing, Public Opinion and similar. In this paper, we tried to propose an approach through a “Brain Electro Activity Map” to predict the assessment and modification possibility of Culture, Biases, Brain Washing, Behavior Changing, Public Opinion and similar. Because according our opinion, technically there is not any Neuro-Physiological difference between their acquisition and extinction. We introduced some new concepts which are “flexophrenia-sclerophrenia” and “facilitated and automated connectomes” which are always in need of expression-activity with strongly invasive components. Then by the combination of the above three concepts, with the well-known old “need of stimulation” (which is an implicit form of accepting the presence of a “need of activity-expression”), we asserted that all the above mentioned behavioral patterns’ onsets, durations, resistances, changes, can be approached, predicted and changed, in a similar way to each other’s and, can be traced as well, through the implementation of the “Brain Electro Activity Map”.

Keywords: Culture, Biases, Brain Washing, Behavior Changing, Public Opinion, Therapy

Özet

Bu makale, oluşturulabilecek bir “Beyin Elektro Aktivitesi Haritası” vasıtasıyla, Kültür, Peşin Hüküm, Beyin Yıkama, Davranış Değiştirme, Kamuoyu ve benzeri konuların oluşturulması, sönmesi ve öngörülebilmesi konularına bir yaklaşım hakkındadır.

Yazıda, oluşturulacak bir “Beyin Elektro Aktivitesi Haritası” vasıtasıyla yaklaşımı önermemizin sebebi, kanaatimize göre, bunlar arasında Nöro Fizyolojik mekanizma açısından teknik olarak, onların edinimleri ve sönmeleri konusunda, herhangi bir farkın olmadığı kanaatinde olmamızdır.

Bu arada, “fleksofreni-sklerofreni” ile, güçlü bir şekilde istilacı komponentlere sahip olan ve her daim kendini ifade etme ihtiyacında olan “kolaylaştırılmış otomatik konnektomlar” gibi yeni kavramları da ortaya attık.

Böylelikle, yukardaki kavramların ve, çok iyi bilinen “uyarılma ihtiyacı” (ki aslında aktivite ve ifade ihtiyacının zımni ifadesinden başka bir şey değildirler.) olgusunun kombinasyonları ile, yukarda adı geçen kavramların hepsinin de, oluşumları, sönmeleri, tamamen yok olmaları, ve tüm bunların öngörülebilmelelerinin, mümkün olabileceğini ileri sürmeyi önerdik.

Anahtar Kelimeler: Kültür, Peşin hüküm, Beyin yıkama, Davranış değiştirme,

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1. Introduction

This is an approach proposal to the assessment and extinction predictability, through a "Brain electro-Activity Map" to Culture, Biases, Brain Washing, Behavior Changing, Public Opinion and similar.

A healthy organism, at the beginning of his life, hypothetically possesses the ability, of interacting with his environment and, of learning from his experiences, in a multipotent way (Draganski, B. et al., 2004). If the inner or outer conditions change, the brain also can, easily shift his interaction, in accordance with the circumstantial requirements: we propose to name this mentally flexible Neuro-Physiological state as a "flexophrenic mental state"; in such a state, the mind is extremely malleable and pliable. In this respect a healthy teen-ager, is undoubtedly in a "flexophrenic mental period".

On the other hand, over the time, either for biological ageing or occupational restrictions which are molded by the routinized monotone daily life, the individual's interaction with his environment, becomes less variable. Thus the brain, to cope with the basic daily needs, reduces his activities to its minimally necessary connectomes only. In time this attitude, gets increasingly rigidified, solidified. We propose to call this Neuro-Physiological state, as a rigidified or "sclerophrenic mental state". In this sense, a retired senior with no hobbies or similar, even if not demented, is a typical example for a sclerophrenic subject. In this phase the individual is in difficulty of perceiving and reacting as like the young do.

We propose that the difference between these two different mental states, can be detected through some futuristic neuroimaging devices (like some variation of an qEEG or simply by some new softwares added to the evaluative power of the presently implemented similar technologies, just to amplify its sensibility): "We hypostasize that, while we present different problem solving situations to the subjects, at least at their initial state of evaluating and analyzing the stimuli, in the flexophrenics, more connectomes will be triggered in respect to sclerophrenics". Then if necessary, although remained within the frames of the predetermined "facilitated and automated connectomes" (FACs)", will express themselves through richer behavioral diversity too.

In other terms the flexophrenics, while exposed to triggering stimuli, will react through more areas of their brain, in comparison to the sclerophrenics. Because the sclerophrenics, either by their natural preferences or their life requirements, will tend to manifest themselves repetitively "just through the same few cerebral structures", regardless of the variety of the problems exposed to them. In other words, they will react, like a mentally limited individual, who cannot perceive the stimuli's crucial details properly and, responds to any of them in a stereotypic way.

Lastly, we would introduce a third concept; the "facilitated and automated connectomes" (FACs). By this term we intend, the entire neuroplastic assembly of our behaviors (functional connectomes), oriented either willingly-unwillingly, consciously-unconsciously toward a

given target or, for the need of their expression. In this sense, just to give an example, perhaps our biggest FAC is our personality.

We propose to consider that "all the behavioral patterns that get reinforcement and inevitably become repetitive, in the same time, are inescapably FACs". Once initiated in some way, they unchain themselves and when necessary, step by step proceed to the next phases of the behavioral set. In this sense, all the performances related to traditions, cultures, habits, attitudes, beliefs, personalities, opinions, biases and similar are FACs.

2. Discussion

2.1.1. On the Features of FACs

Life equals activity. Even the inactive state of an organism, is achieved by its active intervention. We cannot imagine any functional gap in our vegetative system. Whatever seems to be inactivity. in our lower brain is nothing more than an actively suppressed process. There is no evidence that the same rule is not valid for our cortical activities too.

2.1.1.1. Need of activity-manifestation-expression of FACs

As a consequence, we must accept that any learned material, after being converted into a FAC, by its nature, needs to express-manifest his existence. In other words, any FAC is always in "need of self-expression/manifestation", as much as the other vital, vegetative functions are.

(Because of the FACs' close relation with the "learning processes, memory and similar topics", we suggest further readings of the colossal work of H. Ebbinghouse (Ebbinghaus, H., (913) and other contemporary resources (Crowder, R. G., 2014) for they remain beyond this manuscript's limits and purposes.)

2.1.1.2. Invasivity

FACs are invasive. Even if some of their constituent parts go missed, they tend to be self-defensive and insistently surviving. They tend to invade and fill the missing parts' functions. Thanks to this ability, the individual doesn't get negatively affected by the lacking faculties.

A person, if trusts to his friend, he/she normally doesn't change his mind even if sometimes the friend does really cheats him. Or vice versa, you continue to distrust a person, even if sometime he says also the truth. A highly reputable company is always perceived as reputable. In the same way a company with a bad reputation, finally, even if at the end day creates a really excellent product to a very convenient price; you still continue to refuse the offer. These all are examples for the invasivity of a FAC.

2.1.1.3. Persistence and resistance to changes of FACs.

Under normal conditions FACs have a strong resistance

to altering interventions; Because, a material, the more is learned the more is old, the more is generalized, the more is connected to several aspects of our life, the more are the hooks where our memories can be hanged, the more difficult is its cancellation (Ebbinghaus, H., (1913) (Crowder, R. G., 2014) (Antikacioglu, L. (2015). These characteristics of a learned material, give a persistency and resistance against destroying interventions.

Our memories are mostly stored in an interrelated and interweaved form across the entire cerebrum. This is the reason of why memories don't reside in specific locations only, but instead are distributed everywhere, according the characteristics they have. It looks that these sophisticated neuronal interconnections, by nature, have the tendency of undertaking the functions of the damaged parts, and of continuing to execute their predetermined knowledge in accordance with the big picture. These all, are knowledge on scholar textbooks. As much as the information is still capable enough to fill the missing gaps, the brain fills them all, and continues to be efficient as before.

The above mentioned mechanism explains why our personalities have continuity. Explains why minor attacks to believes, opinions, biases, habits don't easily change and insist to survive.

The same fact explains also why old habits, phobias, compulsions, obsessions, childhood sentiments toward our sweet-hearts, the practiced old professions, love for family members with which we have always been in close relation, are not easily changed or forgotten.

2.1.1.4. Subsequent Interruptions and/or discontinuities

In course of time if in our daily life any discontinuity happens, flexophrenics, easily shift their FACs and adapt themselves to alternative FACs, or if necessary they can form completely new FACs because they still have the organic capability to do it. It depends on where they stay on the scale of flexophrenia-sclerophrenia and other parameters.

The sclerophrenics instead, cannot even be aware of the changes or, even if they do, it is very likely that, they cannot replace them with new FACs.

However, the general rule is that by the strength of discontinuity or suppressing powers, FACs can extinguish through the same rules of the psychology of forgetting.

2.2.1. The well-known "need of adequate stimulation" to prevent "stimulus deprivation" is in close relation with our FACs.

It is well known that "stimulus deprivation" has extremely harmful effects. Experiments made on stimulus deprivation (Orne, M. T., 1962), sensory deprivation (Solomon, P. at al., 1961) are quite old and interesting. In experimental situations, researchers have documented hallucinations, paranoid thoughts, psychotic reactions, psychological instability etc.

So we first have our natural biological vegetative infrastructures which are, in need of stimulation-

manifestation thus, in need of adequately "being active".

Subsequently we have the learned, added, gained structures, namely our FACs. These attitudinal, behavioral components are tied in a personally unique way, to our other cortical and subcortical activities as well.

An example to gained FAC is the subjects' entire life style. If you withhold a person from getting his normal stimuli, and manifesting his everyday life style, he falls in serious trouble:

In fact, it is beyond doubt the presence of physical and psychological deteriorative effects of long periods of imprisonments.

Many people cheat his/her spouse but only a few of them divorce them. So there is nothing contradicting our FACs' need of manifestation. This attraction of adventure, up to a certain point can be strong. But then the FACs take again the stage, the adventurer turns back to home. After all, cannot miss the years spent with his/her lovely spouse's companionship, even if can dare to think that the new one, is better than his/her partner. If their relation hadn't been converted into a FAC, everybody every time, at a minimal possibility would abandon his regular relation and would run to the arms of the better one. But almost nobody does it; because for them since long ago their relation had already been converted into a FAC. Their adventure is temporary. (In neurophysiological technical terms is as a result of inhibition because of over stimulation.)

The immigrants going to new lands normally tend to go near the same minority groups. Of course, there are many reasons behind their decision: security, cooperation, collaboration, communication facilities etc., but another reason which is always ignored, is the need of expression of their FACs. (In fact, members of any other minority group also, are satisfying their similar basic needs, although all of them in their own minority groups and in a different way and style.) So the problem doesn't stand in only the need of satisfaction of a given need, instead, stands on how and where to satisfy it and to manifest his own customary FAC.

In sportive games, every other motive aside, the important one, is the need of expression of one's own FAC which is nested in the emotional and mental expressions, related to the game situation of their team's game and, related to their close sustainers etc. In this way they satisfy their FAC's "need of adequate stimulation" to prevent their "stimulus deprivation" and manifest themselves properly.

If you are once a sustainer of a certain political tendency, very likely you will lifelong be, the sustainer of the same tendency, unless there is some very striking change. The uncertain and labile citizens, who can change their opinions, are usually a small part of the population. Your FAC is made of the political environment of that specific party, and being with them will consent you the possibility of repetitively sharing your opinions among alike minded citizens. In this way you satisfy your FAC's "need of adequate stimulation" to prevent their "stimulus deprivation" and manifest themselves properly

Most of the times, when you buy your daily newspaper,

you do not buy it to see what are on the news, because very probably you, through some other means, have already heard what has happened, or at least, you can be informed from a variety of other means too. Nevertheless, you buy your favorite one, just to check, share and confront your opinions with alike minded ones, of the "same political tendency". You desire to read the same interpretations, which in reality you already know. The fact is that, every other people who is a sustainer of your same opinion, all together form, your and their, FAC constellation. In this way you satisfy your FAC's "need of adequate stimulation" to prevent their "stimulus deprivation" and manifest themselves properly.

You eventually do not even look to the opposite media, just because they are not part of you FAC.

All the above mentioned behavioral patterns' assessment and change predictability, can be obtained from a normative database of our working brain; its electrical activity.

2.3. What is the exact relation between FACs and Culture, Public Opinion, Biases, Brain Washing, Behavior Changing, and similar?

We already mentioned that any newly assessed relation-interaction, by our Central Nervous System, tends to convert itself, into a FAC which in turn ends up to be "in need of expression-manifestation".

On the other hand, our nervous system doesn't work according "labels-names", given by humans. "Culture", "biases", "brain washing", "behavior changing", "therapy", "public opinion" etc., are all names, labels and concepts created, categorized by humans. The nervous system instead functions, just within the Neuro-Physiological principles. In fact, any stimulus, either simple (for instance tactile) or complex (for instance, any bias or cultural motive) if surpasses the excitability threshold, the neurons perceive it and learn, otherwise they do not. Then as a natural consequence, like any other FAC, they need to be stimulated-manifested, no matter how we name them.

This is the simple reason beyond our assertion that FACs rules are equal for any of the above concepts and for many others too.

2.3.1. FAC and Culture

The people prefer to stay within their own cultural milieu; because they satisfy their need of expression.

In vacations, after a short happy period, we begin to look for our familiar tastes. We all know that anybody in need of distracting himself from his boring routine daily life, goes to a leisure travel. He/she first, is oriented to novelties, exotic tastes, foods, smells, views, customs, and practices and is highly probable that is also happy of that. But then, after being relate of novelties, which varies according the personal differences, begins to miss his familiar milieu. The more phlexophrenics, tend to resist longer, to the new circumstances, in regard the sclerophrenics. (We propose that it would be interesting to test our

hypothesis, and, predict the difference of resistance to novelties, by measuring the subjects' activities to new situations, through our imaginary futuristic device. Here probably stands the explanation of why, even if we spend the nights in five stars' excellent hotels, we begin to miss our "home, home sweet home". It is simply the need of expression of our familiar behavioral patterns, with which we get used to live, since our childhood.

This is why "culture" is a perfect FAC, a perpetually self-conserving set of patterns, always in need of expression-manifestation.

2.3.2. FAC and Biases

Biases, undoubtedly are, strongly learned and reinforced and are in strong need of expression-manifestation.

They give us great satisfaction. Especially when we share those feelings and ideas with similarly oriented minds. Needless to say, by repetition, they become even stronger and stronger. They are another example of a perpetually self-conserving set of patterns in strong need of expression-manifestation. Thus they can perfectly be accepted as typical FACs.

2.3.3. FAC and Public Opinion

All the FACs are of extreme importance, especially if they are shared with others. In this sense they don't have any difference from the biases. Imagine large crowds sharing the same opinion; it would be extremely easy to manipulate and guide all of them toward preferred targets. In an important football game assisted by tens of thousands of people in a stadium, would be enough even the smallest spark – misleading word, phrase, opinion etc. -, to set off a dangerous confusion and, push the people toward criminal activities. In fact, in the past we have documented, even a football war in 1970, between Honduras and El Salvador, with almost more than 4000 people killed. The real responsible is the need of expression of their FACs. If it hadn't existed some background of predisposing aggressive FACs, in other words certain types of public opinions toward the rival counties, the game's problem in itself wouldn't be enough to initiate such a consequence. As far as we know there are no other wars documented as a consequence of an international sportive game.

The conversion into a FAC of a public opinion is a very important matter for the manipulation of the crowds. Is extremely useful for the politicians; as politicians do care too much, informing/misinforming the public, in order to convince them to behave in the way they desire, they first, prepare their supporters to their (to the politicians') desired target. For they normally prepare gradually their audience, to later convince them on some arguments, that at a first impact, probably wouldn't be so easily acceptable, if they hadn't had a preparatory phase. Once the members are prepared, brewed and convinced (FACs assessed), huge quantity of people can be manipulated with almost no effort. Thanks to the automated need of expression of the previously assessed, preparatory FACs.

2.3.4. FAC and Brain Washing

The term has always been mysterious and interesting and often connected to conspiracies. If we examine it by a close attention, it can perfectly look as a different fact from the stand point of psychology, social psychology or social psychiatry etc. But, if we consider the brain washing process, from the stand point of neurophysiology, it cannot be considered as a different process, then the other learning processes. By reinforcement, any behavioral pattern can be converted into a FAC and, be in need of manifestation-expression themselves.

According "The free Dictionary" the definition is":

"1. Intensive, forcible indoctrination, usually political or religious, aimed at destroying a person's basic convictions and attitudes and replacing them with an alternative set of fixed beliefs.

2. The application of a concentrated means of persuasion, such as an advertising campaign or repeated suggestion, in order to develop a specific belief or motivation." (American Heritage® Dictionary of the English Language, Fifth Edition. 2011)

In this sense, no matter what is the content of the material thought to the person (with full time engagement). The only difference is that the brain washing processes take place by bombarding the subject 24/7 through materials supporting, justifying and confirming each other. So the brain washed person does not have any other possibility of behaving in an alternative manner, just because doesn't even have a time gap, to occupy his mind with a different material. For us this is nothing more than a FAC which later, will be in need of expression-manifestation. The only thing that is different is the condition and intensity of the assessment process. But the principles are identical. Once adequately assessed they are in strong need of expression-manifestation.

2.3.5. FAC and Behavior Changing, Therapy and similar

Here we have another example of a differentiated form of usage between terminologies which in reality are describing the same phenomena. Behavior changes, therapies are terms used by clinicians. But behavioral changes or therapies are simply based on learning principles. And in Neuro-Physiological terms, all kind of neurological processes inescapably should process through the same Neuro-Physiological principles.

Any material once strongly learned has no change to escape: gets converted into a FAC and, is in need of expression; no matter whether you name it therapy, behavior change, modeling or skill acquisition. Once we intervene to achieve a therapy or behavior change, if it becomes successful, it turns to be in strong need of expression-manifestation, and the patient gets cured or the behavior modified.

2.4. What and how are the relations between "flexophrenia- sclerophrenia-FAC and the need of expression-expression-stimulation" and "culture-

biases-public opinion-brain washing-therapies and similar"?

Our assertion is that, if we understand on where the individual stands in a "Brain Electro Activity Map" and how much an individual is "Flexophrenic or Sclerophrenic" we should possibly able to "predict" to what extend a FAC, in which type of individuals can be assessed, removed, softened, changed, reversed etc.

Through the same interactivity, it is possible to explain many aspects of "culture-public opinion-brain washing-therapies and similar" because their underlying Neuro-Physiological mechanisms are all the same; One rule fits to all.

2.5. Are there proofs confirming our assertions?

Yes, there are many proof in nature itself. Some of them have already been mentioned above.

This is the reason of why minor, or in some cases even major injuries or traumatic cases, our cerebrum is not too much affected. Most of the times, minor cerebrovascular problems, do not create big problems for the patient in their major life styles; because the remainder parts of the cerebrum undertake the problematic tissues' duties. For the duties pertaining to specific small cerebral parts, if anatomo-physiologically possible, are reorganized within the bigger picture of their major life style. For our life style's various aspects, piece by piece are deployed to every cerebral parts.

Consider for instance the mildly demented cases; Even if they find difficulty in remembering recent materials, many of them can still perform their profession skillfully; for their old profession have been rooted as a FAC since many years. As a consequence, a few details changed in their entirety, do not affect the normal functionality of their routinized task.

We cannot easily beat the paranoid thoughts of an individual; for since long time, those thoughts have been repeated, mentally ruminated and, turned to be their FAC. Rational comments and suggestions that we direct to them, remain just as unimportant details in confront of the huge organizational mental structure that they have weaved.

Ardent sustainers of any kind of thoughts and beliefs, do not change their mind with occasionally influencing criticisms; for their thoughts and believes are embraced by the integrity of their entire mental constellation; these constellations are their FACs.

Older psychiatric cases do resist more than the new ones to therapeutic changes, just because the older ones have a deeper patternal structure and, their FACs are more resistant to changes.

2.6. Where stands the predictability of the FACs' assessment, extinction and modification?

To predict the assessment, extinction and modification of any of the above mentioned FACs, we simply have to build-up a database of healthy-unhealthy subjects based

on the cerebellar electrical activity and create a "Brain Electro Activity Map".

Some device similar to the EEG/qEEG technology, or a variant of them, but equipped by a superior sensibility, would probably be sufficient.

Based on the collected data and, the conditions under which they have been collected, we can predict a variety of eventual outcomes concerning the formation, alteration of extinction of the above mentioned conditions, which in reality do not differ from each other's'.

Then for instance, we can hypothesize that; a) Young flexophrenics will be more open to changes than older ones. b) The relatively younger sclerophrenics will be more open to changes than older ones. c) The old FACs will be more difficult to remove. d) The more inclusive ones will be more invasive, thus, difficult to remove. e) The old FACS will be stronger than the new ones. f) The old but unnecessary FACs, will be weaker in confront of newer but necessary ones. g) FACs, will result to be unrelated to their functionality; unnecessary FACs will result sometimes to be stronger than the necessary ones. h) Etc.

3. Conclusion

It will be very useful to build-up a "Brain Electro Activity Map (BEAM)", through a futuristic device or through the adaptation of the actual ones for our special needs (some form of a qEEG), to figure out the flexibility degree of the cerebrum.

Such a BEAM can then be implemented as a tool to figure out the individual's reactions to opinions, biases, reactions to cultural changes, their open mindedness or readiness to psychotherapeutic procedures, to brain washing, to behavior changing interventions, and similar.

According our proposal, these all are FACs and are gained with the same Neuro-Physiological principles, and their acquisition's underlying mechanisms do not differ from each other's. Additionally, through the same database, the abovementioned FACs' assessments and modifications, can perfectly be predicted, manipulated, and in the meanwhile changes in them, step by step tracked.

It can be applied either to individuals or groups.

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A 72 YEAR OLD MAN WITH ISAACS' SYNDROME: A RARE ENTITY WITH DIFFERENT O

72 YAŞINDAKİ ISAAC SENDROM'LU ADAM: FARKLI SONUÇLARI OLAN NADİR BİR OLAY

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Abstract

Neuromyotonia is a neuromuscular hyperexcitability disorder characterized by muscle stiffness caused by continuous muscle fiber activity. It is an immune mediated disorder with elevated antibody level against presynaptic, voltage gated potassium channels, either as isolation or as a paraneoplastic process. Symptoms usually include muscle twitching during rest (myokymia), cramps, pseudomyotonia (delayed relaxation), increased sweating, and sometimes motor weakness. In this case report, we present a seventy two year old man who presented with pain in both thighs for one month. It gradually became worse to involve feet and chest. His brain CT scan showed features of brain atrophy. EMG showed fasciculation along neuromyotonic discharges with characteristic wave in frequency and amplitude typical of Isaacs syndrome. Potassium channel antibodies were very high. Diagnosis of Isaacs syndrome was made. He was followed up for two months with treatment by three day course of methyl prednisolone followed by oral steroid and methotrexate with much improvement. This is the first case of Isaacs syndrome in Kurdistan.

Keywords: Issacs, Syndrome, Myokymia, Neuromyotonia, Neurology, Motor, Disorders, Hyperexcitability

Özet

Nöromiyotoni, sürekli kas lifi hareketinden kaynaklı kas gerginliğiyle kendini belli eden nöromüsküler bir hipereksitilabite bozukluğudur. Bu rahatsızlık, voltaja duyarlı, presinaptik potasyum kanallarına karşı gerek izolasyon gerekse paraneoplastik bir süreç görevi üstlenen yüksek antikor seviyesine sahip immün aracılı bir bozukluktur. Belirtileri arasında kasların rahatlama hareketi esnasında kas çekilmesi (miyokimi), kramplar, psödomiyotoni (kas gevşemesinde gecikme), aşırı terleme ve bazen de kas güçsüzlüğü sayılabilir. Bu olgu sunumunda, bir ay boyunca her iki uyluğunda ağrı tespit edilen yetmiş iki yaşında bir erkek hastayı incelemekteyiz. Buna göre hastalık, ayaklara ve göğüs bölgesini de içine alacak şekilde git gide kötüleşmiş durumdaydı. Çekilen beyin tomografisinde, beyin atrofi olduğu ortaya çıkmıştı. EMG sonuçları, tipik Isaacs Sendromu belirtisi olan karakteristik dalga sıklığı ve genişliği tespitiyle bağlantılı olarak nöromiyotonik boşalım boyuncası fasikülasyon (kas seğirmesi) bulgusuna işaret etmekteydi. Ayrıca, potasyum kanalı antikor miktarı oldukça yüksek seviyede idi. Sonuç olarak hastaya Isaacs Sendromu teşhisi kondu. Hasta iki ay boyunca üç günlük süreyle önce metil prednizolon, sonrasında da oral steroid ve metotreksat tedavisi uygulanarak takip altına alındı ve bu süre zarfında hastanın durumunda önemli ölçüde iyileşme gözlemlendi. Bu klinik olay, Kürdistan'da kaydedilen ilk Isaacs Sendromu vakasıdır.

Anahtar Kelimeler: Issacs Sendromu, Miyokimi, Nöromiyotoni, Nöroloji, Kas Hareketi Bozuklukları, Hipereksitilabite.

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1. Introduction

Isaacs syndrome is a neuromuscular disorder characterized by muscle stiffness caused by continuous muscle fiber activity (Newsom-Davis & Mills, 1993a). Voltage-gated potassium channels (VGKCs) are the targets (Doi et al., 2011). Hyper excitability of the peripheral nerve can be induced by antibodies suppressing voltage-gated outward K(+) currents (Arimura & Watanabe, 2010). The first case of Isaacs' syndrome (also known as acquired neuromyotonia) was diagnosed in 1961 when two men presented with persistent, generalized muscle stiffness, in addition to electromyography which showed spontaneous, rapid discharges of motor-unit potentials (Gonzalez et al., 2008).

2. Case Report

A 72-year old man presented with pain in both thighs for 1 month. It started gradually within few days. It later became severe disturbing sleep, relieved only modestly by pain killers. After 3 weeks, the pain involved both feet and chest. Furthermore, he developed fever and rigor, cough, and sputum with radiological features consistent with chest infection. He is Ex-smoker; quit before 5 years. He was a sheep seller. No family history of similar condition. Moreover, he is a known case of Hypertension and Atrial fibrillation for 3 years for which he is on candesartan and amiodarone, respectively.

Vitals were within normal. Consciousness, mental state, tone, power, reflexes, sensory, cerebellar signs and cranial nerve exam. were all normal. He had muscle fasciculation (myokimia) in both thighs (see video 1a) with severe tenderness. A full blood count revealed an erythrocyte sedimentation rate of 24 and Hematocrit 47% and negative CRP. Creatine kinase was normal. EEG was normal. Brain CT and MRI scan showed exaggerated periventricular white matter hypodensity, with normal CT scan of chest, abdomen and neck. LP was normal. Muscle biopsy was normal. Liver, renal, and thyroid function tests were also within reference limits. Potassium gated channel antibodies were very high. Nerve conduction studies were normal. EMG showed fasciculation along with neuromyotonic discharges with characteristic wave in frequency and amplitude typical of Isaacs' syndrome (look at video 2). Serum calcium, vitamin D, iron and ferritine, and phosphate levels were normal. ECG showed only left axis deviation. Moreover, antinuclear antibodies (ANA), anti double strand antibody, anti cytoplasmic antibodies (ANCA), CEA and CA 19-9, anti-SSA (Ro) Ab and anti-SSB (La) ab were all negative. Additionally, Hepatitis screen, HIV, VDRL, anti brucella and toxoplasma antibodies were negative. Protein electrophoresis showed a slight increase in gamma globulin. Bone marrow aspiration showed hypercellular state. OGD and colonoscopy were normal. The patient received methylprednisolone vial 500mg for 3 days, followed by oral steroid (prednisolone) 60mg daily for a month, then tapered weekly and meanwhile methotrexate started 7.5 mg once a week with folic acid, vitamin D and carbamazepine. The patient became free of symptoms in two months.

3. Discussion

Radioimmunoassay of radioisotope labeled alpha-dendrotoxin-VGKCs solubilized from rabbit brain was first method to identify antibodies to voltage-gated potassium channels (VGKC). Only a proportion of patients with acquired neuromyotonia (Isaacs' syndrome) were found to have detectable antibodies (Watanabe, 2013a).

From the electrophysiological results it was seen that antibodies may decrease channel density rather than directly blocking the kinetics of VGKCs. The site of origin of spontaneous discharges, from electrophysiological, pharmacologic and immunologic studies, is located principally in the distal portion of the motor nerve (Watanabe, 2013b).

Demonstration of antibodies against voltage-gated potassium channels suggest the autoimmune basis of this disorder, from any cause, paraneoplastic or acquired (Newsom-Davis & Mills 1993; Newsom-Davis et al., 2003). The most commonly associated neoplasms are thymoma, small cell lung cancer, and Hodgkins lymphoma (Walsh, 1976).

Muscle cramp, slow relaxation following muscle contraction, and excessive sweating (hyperhidrosis) are the main symptoms of Isaacs' syndrome (Arimura & Watanabe, 2010; Watanabe, 2013; Kim et al., 2013). Patients almost always, develop persistent muscle contraction, which is often worse following exercise myokimia, generalized, and fasciculations are also common (Béquet et al., 1997; Maddison, 2006). Voltage-gated potassium-channel antibodies are detected in around 40% of patients with Isaacs' syndrome (Maddison, 2006).

Electromyography shows features of spontaneous, continuous, irregularly occurring doublet, or multiplet single motor unit (or partial motor unit) discharges, firing at a high intraburst frequency as well as myokymic and neuromyotonic discharges. Fasciculations and fibrillation potentials are also frequent (Newsom-Davis & Mills, 1993b).

Myokymia, pseudomyotonia and contracture of hands and feet are the main features of Isaacs' syndrome... Clinical features and classic electromyographic findings establish the diagnosis of Isaacs' syndrome. Moreover, a proportion of cases have positive serum antibodies against Voltage-Gated Potassium Channels (VGKCs) (Sukajintanakarn et al., 2006).

The main lines of treatment are plasma exchange and intravenous immune globulin; other potentially effective treatments include phenytoin, carbamazepine, acetalozamide and diazepam (Newsom-Davis & Mills, 1993a; Issa et al., 2011). Remission usually occurs after 13 months (8-18 months) at which treatment can be stopped (Newsom-Davis & Mills, 1993b). Treatment by immunoadsorption plasmapheresis also reported (Nakatsuji et al., 2000).

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HYPERGLYCAEMIC DISSOCIATIVE FUGUE IN AN ELDERLY- A RARE CASE REPORT

YAŞLI BİR İNSANDA HİPERGLİSEMİK DİSOSİYARİF FÜĞ – NADİR GÖRÜLEN BİR OLGU SUNUMU

Sudharani P Naik¹, Dushad Ram², Vikas Naik³

Abstract

Inadequate control of diabetes may impair cognitive function, but there is no report of dissociative symptoms. Here we are reporting a case of repeated dissociative fugue associated with hyperglycaemia.

Keywords: Hyperglycaemia, Dissociative fugue

Özet

Yeteri kadar kontrol edilmeyen diyabet bilişsel işlevlere zarar verebilir, fakat çözümleri belirtilerle ilgili herhangi bir rapor bulunmamaktadır. Biz bu raporda, ikinci tip diyabeti olan yaşlı bir hastadaki hiperglisemi bağlantılı tekrar eden bir disosiyatif füğ vakası sunacağız. Muhtemel nörobiyolojik mekanizmaların üzerinde de durulacaktır.

Anahtar Kelimeler: Hiperglisemi, Disosiyatif füğ

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1. Introduction

The prevalence of functional dissociative disorder is about 0.2% (Sharon, 2010). Organic dissociative syndrome is reported with use of medications, drugs of abuse and medical illnesses (Slater, 1965; Good, 1993). Inadequate control of diabetes may cause cognitive impairment, but so far there is no report of dissociative symptoms (Good, 1993). In a case report dissociative syndrome was observed in a non-diabetic hypoglycaemic patient (Ramli et al., 2009). Here we are reporting a case of hyperglycaemic dissociative fugue in an elderly patient with type II diabetes mellitus.

2. Case Report

Index patient, Mr KS, 73 years old, Hindu married male of urban background, was referred from department of medicine. For last one year, he had more than ten episodes of travelling away from home without any reason. The Episode would last for a few hours when he interact normally with others, but do not recognise familiar people and behave like a stranger but do not misbehave. He would not reveal his identity, but takes care of himself. Once the episode is over, he would realise that he is away from home and could not ascertain the reason and other details of travel. Because of these episodes, family members were worried about his safety and did not allow him to go out of home alone. After each episode, he consulted his physician when examination did not reveal any abnormality, except for random blood sugar level between 300-375 mg/dl. Type II diabetes was detected three years back and he was on tablet Metformin 500 mg before breakfast & diet control, and blood sugar level were in normal range. Each time physician tried to readjust the dose, but due to hypoglycaemic symptoms dose reverted to the previous dose (Metformin 500 mg). For initial two years of his illness the compliance was good, but later he would miss the dose. In the last visit physician discovered that such episode occurred following missing the dose of medication. He was then advised for psychiatric evaluation. There was no history of epilepsy, other physical illness, severe traumatic life event or abuse, memory loss apart except for the episodes, use of other medication, substance use or any other psychiatric disorder at the time of presentation or in the past.

Physical examination revealed thin build, BP 126/86 mmHg; pulse 80/min. Systemic examination, including fundoscopy did not reveal any abnormality. Random blood sugar was 364 mg/dl, and haemoglobin A1c was 5%. Other investigations such as blood urea, serum creatinine, liver function test, lipid profile were within normal range. Detailed mental status examination and psychological evaluation of memory, executive function and intellectual function did not reveal any abnormality. The patient was concerned about these episodes as family member were worried about him. As per the International Classification of Mental and Behavioural Disorders, 10th version, a diagnosis of organic dissociative disorder was made. Since episodes were following the missing dose, counselling was done for possibility of occurrence of such

episode if patient missed the anti-diabetic medication, nature of illness, the need for compliance & control of diabetes and possible consequences of uncontrolled diabetes. The family member was also explained about safety issues that may arise during episodes, the possibility of occurrence of such episode if patient missed the anti-diabetic medication and advised to supervise medication intake if necessary. Patient compliance improved and no further episodes were reported.

3. Discussion

This case report highlights the role of hyperglycaemia in a dissociative syndrome that may be overlooked by physicians, until it results in significant consequences. Traditionally dissociation is considered as an escape from overwhelming distress with partial or complete loss of control on voluntary actions or alienation of oneself or external world (Holmes & Brown, 2005). Possible biological factors implicated in pathogenesis include reduced perfusion in inferior prefrontal and anterior temporal regions in the right hemisphere and abnormal functioning of the Hypothalamo-Pituitary-Adrenal dysfunction, Glutamate/N-Methyl-D-Aspartate (NMDA) receptor, Serotonin (5-HT_{2a}, 5-HT_{2c}), Gama-Amino Butyric Acid (GABA), and Opioid receptors (Somer, 1964; Winnock 2002).

Though diabetes may impair attention, speed of information processing, motor skills, working memory, the mechanism involved in the occurrence of dissociative fugue is unknown (Sommerfield et al., 2004). NMDA receptor that plays important role in cognitive impairment in other disorder (e.g. Alzheimer dementia) appears to play a role in causation of dissociative symptoms. Diabetes can induce NMDA receptor subunit composition resulting in cognitive impairment, and NMDA-receptor antagonists have shown to improves cognitive in over activation (Gardoni et al., 2002; Rammsayer, 2001). On other hand activation of NMDA receptors in the dorsal vagal complex lowers glucose production, and it involved in glucose stimulated insulin secretion from beta cells (Marquard et al., 2014). Role of GABA and 5HT₂ is unclear. The activation of GABA (A) receptors decreased insulin secretion and GABA (B) receptor antagonist increase insulin release in islets type 2 diabetic (Taneera et al., 2012). GABA synthesis is impaired in hyperglycaemic state (Aerts et al., 2001; Winnock 2002). GABA-A antagonism and 5-HT_{2a/2c} agonism can induce dissociative-like symptoms (D'Souza et al., 2006). 5-HT_{2A} receptors are implicated in the molecular mechanisms of anti-diabetic medication (Sarukhanyan & Barkhudaryan 2011). Hyper activation of the HPA axis is also reported in diabetes (Ramli et al., 2009). Thus in isolation or in combination of above pathophysiology, hyperglycaemic state may result in dissociative symptoms.

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REPEATED TRANSCRANIAL MAGNETIC STIMULATION AS A SUCCESSFUL AUGMENTATION STRATEGY IN A PATIENT WITH FIRST EPISODE PSYCHOSIS

BİR İLK ATAK PSİKOZ OLGUSUNDA BAŞARILI BİR TEDAVİ GÜÇLENDİRME YAKLAŞIMI OLARAK TEKRARLAYICI TRANSKRANİYAL MANYETİK UYARIM TEDAVİSİ

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Abstract

Repeated transcranial magnetic stimulation (rTMS) is a non-invasive brain stimulation method that may be preferred as an augmentation strategy for psychiatric patients who may not have responded well enough to psychotropic drugs. In psychoses rTMS may act via changing cortical excitability, connectivity and plasticity. rTMS may induce transcallosal inhibition and antipsychotic drugs may extend the duration of this inhibition. We present a first episode psychosis patient initially unresponsive to antipsychotic treatment, in whom 20 sessions of right 1Hz rTMS augmentation resulted in clinical response and who remained in remission by the 8th month of treatment. We suggest that rTMS is a well-tolerated treatment that may not be reserved only for treatment resistant patients but may also be considered early on in the management of psychiatric disorders.

Keywords: Repeated Transcranial Magnetic Stimulation, augmentation, first episode psychosis, antipsychotic augmentation

Özet

Tekrarlayıcı transkraniyal manyetik uyarım tedavisi (tTMU), psikotrop ilaçlara yeterli alınamamış psikiyatrik hastalıklarda, tedaviyi güçlendirme amacıyla tercih edilebilecek, invazif olmayan bir beyin uyarım yöntemidir. Psikoz olgularında, tTMU, kortikal uyarılabilirliği, konnektiviteyi ve plastisiteyi değiştirerek etki ediyor olabilir. tTMU transkallosal inhibisyonu indükleyebilir ve antipsikotikler bu inhibisyonun süresini uzatabilir. Bu makalede, ilk antipsikotik ilaç tedavisine yanıtızsız bir ilk atak psikoz olgusunda, 20 seans 1Hz sağ tTMU güçlendirmesiyle klinik yanıt gözlenen ve tedavinin 8. ayında remisyonu devam eden bir olguyu sunuyoruz. tTMU'nun sadece tedaviye dirençli olguların tedavisinde değil, aynı zamanda, psikiyatrik bozuklukların erken dönem tedavisinde klinisyenin düşünebileceği umut vaat eden bir yöntem olduğunu öneriyoruz.

Anahtar Kelimeler: tekrarlayıcı transkraniyal manyetik uyarım, güçlendirme, ilk atak psikoz, antipsikotik güçlendirme

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1. Introduction

Repeated transcranial magnetic stimulation (rTMS) is a non-invasive brain stimulation method that may be preferred as an augmentation strategy for psychiatric patients who may not have responded well enough to psychotropic drugs (Mishra et al., 2011). Coil placement and stimulation parameters may be changed in different psychopathologies. Low-frequency stimulation (1Hz) decreases cortical excitability and therefore may be suitable for psychopathologies like psychosis that has been suggested to have decreased cortical inhibition (Sayar et al., 2015).

We present a first episode psychosis patient initially unresponsive to antipsychotic treatment, in whom 20 sessions of right 1Hz rTMS augmentation resulted in clinical response and who remained in remission by the 8th month of treatment.

2. Case

25 years old male single depot worker came to our outpatient psychiatry clinic with complaints of feeling unhappy, restlessness, fearfulness, thoughts of being followed, fear of being harmed and hearing tingling sounds. His mother told that he became introverted, got dull, talked about receiving personal messages via television and was afraid someone would harm him and his family. He had thoughts of his telephone being tape-wired. He believed his boss had given money to third parties to make news about him and that he was fired because of these gossips.

His symptoms started 6 weeks before his admission to our outpatient clinic. Before his symptoms started his brother was sent on a work mission as a soldier to a city in eastern Turkey and he got anxious and felt intense fear for his brother. He was admitted to the emergency psychiatry service of a hospital with generalized anxiety, intense fear and agitation. He was started on olanzapine 10mg/day after being monitored for a day at the emergency department with a diagnosis of Acute Psychotic Episode. Two weeks later olanzapine was changed to risperidone 4mg/day and biperiden 2mg/day because his symptoms didn't change. When we examined the patient by the fourth week of risperidone treatment, he still had ideas of reference, delusions of persecution and auditory hallucinations and therefore we added pimozide 2mg to augment his treatment. He developed extrapyramidal symptoms of rigidity in both upper extremities and his symptoms did not resolve, therefore pimozide was withdrawn from the treatment and risperidone 4mg/day and biperiden 2mg/day were augmented with 20 sessions of 1 Hz rTMS over the right dorsolateral prefrontal cortex. He tolerated rTMS very-well without any side-effects. His PANSS scores dropped from "115" to "18" by the 20th session and to "8" 8th months after rTMS.

3. Discussion

We presented a first episode psychosis patient unresponsive to two antipsychotic trials who has responded well to rTMS treatment and who remained in

remission by the 8th month of treatment. Data concerning the use of rTMS for the treatment of psychiatric diagnoses other than major depressive disorder like schizophrenia has been accumulating in the past few years (Sayar et al., 2015).

In psychoses rTMS may act via changing cortical excitability, connectivity and plasticity (Hasan et al., 2013; Sayar et al., 2015). It has been reported that cortical inhibition is reduced in schizophrenia (Rogash et al., 2014). rTMS may induce transcallosal inhibition and antipsychotic drugs may extend the duration of this inhibition (Liu et al., 2009; Sayar et al., 2015).

Antipsychotics show their effects by 3 weeks as explained by the depolarization block hypothesis and therefore it might be argued that the patient might have responded if the clinicians had waited a little longer (Pucak & Grace, 1994). However, depolarization block hypothesis has been refuted by early onset and progressive accumulation hypothesis which shortly suggests that antipsychotic effects can be observed clinically in the first few days of treatment (Agid et al., 2006). Our patient had not shown any signs of improvement in the first weeks and it is probably predominantly cortical inhibitory effects of rTMS that resulted in clinical amelioration of the patient in the first place. The patient must have stayed in remission by the 8th month with only risperidone because of the progressive accumulation of the drug's effects.

Untreated psychosis may cause neurodegeneration, therefore finding the best treatment available to fully control the symptoms of a first episode psychosis patient is important for further preservation of neuronal reserve (Anderson et al., 2014). Use of rTMS for treatment of schizophrenia has not been approved by FDA yet and it is still an investigational treatment modality, therefore individual cases like ours will be contributing to the efficacy and safety database of rTMS in schizophrenia.

rTMS is safe and tolerable in patients with pathologic positive sensory phenomena (Muller et al., 2012). What is more rTMS may have positive effects on neuroplasticity (Nakamura et al., 2015). We suggest that rTMS may be a promising treatment augmentation option for first episode psychosis patients due to its tolerability and probable effects on neuroplasticity which may help preserve brain tissue and maybe help improve the dysfunctional connectivity of psychosis. rTMS is a promising treatment tool that may not be reserved only for treatment resistant patients but may also be considered early on in the management of various psychiatric disorders.

Authors' Disclosure: rTMS has not been approved by FDA for the treatment of schizophrenic syndromes and it is still an investigational treatment procedure for these syndromes. The mentioned patient has given written informed consent for the application of rTMS regarding this.

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