

THE JOURNAL OF NEUROBEHAVIORAL SCIENCES

Volume-Cilt: 4

Issue Number-Sayı: 2 (Autumn-Sonbahar)

Year-Yıl: 2017

NÖRODAVRANIŞ BİLİMLERİ DERGİSİ



Volume-Cilt: 4
Issue Number-Sayı: 2 (Autumn-Sonbahar)
Year-Yıl: 2017

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Published every 4 months (in Autumn, Winter, Spring), distributed free of charge.
4 ayda 1 (Bahar-Güz-Kış) yayınlanır, ücretsiz dağıtılır.

Yönetim Yeri/Administrative Adress

Altunizade Mah. Haluk Türksoy Sokak No: 14, 34662 Üsküdar/Istanbul

Bilgi Hattı/Contact: +90 216 400 22 22

Web: www.jnbs.org www.uskudar.edu.tr

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Graphic Design/Grafik Tasarım

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Kuzguncuk Mah. Yapraklı Çınar Sok. No:9
Kuzguncuk/Üsküdar/Istanbul
Phone: +90 216 342 22 00 info@korotanim.com
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Printing office/Matbaa

G.M. Matbaacılık ve Tic. A.Ş.
100 Yıl Mah. MASSİT 1. Cad. No:88 Bağcılar / Istanbul
Phone: +90 212 629 00 24
Print Date/Baskı Tarihi: January 2017

**The Journal of Neurobehavioral Sciences (JNBS) is a peer-reviewed open-access neuroscience journal without any publication fees.
Nöro davranış bilimleri dergisi hakemli, açık erişime sahip basım ücreti talep etmeksizin yayınlanan akademik bir nörobilim dergisidir.

**JNBS published both electronically and hard copy printed forms 3 times a year by Uskudar University.
JNBS hem elektronik hem de ciltli baskı olarak yılda 3 kez Üsküdar Üniversitesi tarafından yayınlanır.

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JNBS hem türkçe hem de ingilizce dilinde makale kabul etmektedir.

ISSN:2149-1909

Volume-Cilt: 4
Issue Number-Sayı: 2 (Autumn-Sonbahar)
Year-Yıl: 2017

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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 official language of JNBS is English. However, starting from 2017, our board agreed upon accepting selective turkish articles that make significant impact to the neuroscience literature. Therefore, we encourage researchers to also submit their articles written also in Turkish language. Our editorial office provide Turkish abstracts in addition to English for each article. Please visit our university webpage for instructions written in turkish language (<http://uskudar.edu.tr/tr/dergi/4/jnbs-dergileri>).

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

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).

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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.

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*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:
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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.

Uskudar 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.

Acknowledgement of sources

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.)

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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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Unpublished materials disclosed in a submitted manuscript must not be used

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Privileged information or ideas obtained through peer review must be kept confidential and not used for personal advantage.

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.

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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.

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REVIEW ARTICLE

- 90 **GENETICS OF TRICHOTILLOMANIA**
Can Akpınaroglu, Korkut Ulucan

Year (Yıl) : 2017
Volume (Cilt) : 4
Issue Number (Sayı) : 3
Doi : 10.5455/JNBS.1502108448

Received/Geliş: 07 August 2017
Accepted/Kabul: 22 August 2017

MAINTENANCE TREATMENT TRENDS, THERAPEUTIC OUTCOMES AND THEIR ASSOCIATION WITH CLINICAL FEATURES IN REMITTED BIPOLAR DISORDER

İYİLEŞME DÖNEMİNDEKİ BİPOLAR BOZUKLUKTA SÜRDÜRÜM TEDAVİSİ TRENDLERİ, SAĞALTIM SONUÇLARI VE KLİNİK ÖZELLİKLER İLE İLİŞKİSİ

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Abstract

Fear of Missing Out (FOMO) is an emerging concept related to internet and social media usage. FOMO is described as feeling anxiety when the person does not use social media. Studies showed that FOMO affects well-being negatively. In this study, we aimed to build a Turkish scale for measuring FOMO. For this, 31 items were prepared and in the final scale 22 items were retained. The reliability and validity measures were found to be adequate. For the future studies, we recommend to test the scale also with the adolescent population and to explore the relationship between FOMO and well-being.

Keywords: fear of missing out, internet, social media, addiction

Özet

Gelişmeleri Kaçırma Korkusu (GKK) son yıllarda öne çıkan ve problemleri internet-sosyal medya kullanımı ile ilişkili bir kavramdır. Özellikle genç bireylerde sosyal medya kullanılmadığı zamanlarda ortaya çıkan bir kaygı olarak tanımlanan GKK'nın çalışmalarda iyi oluşu da negatif yönde etkilediği bulunmuştur. Bu çalışmada Türkçe'ye orijinal bir GKK ölçeği kazandırılması amaçlanmıştır. Orijinal olarak 31 maddeyle hazırlanan ölçeğin yapılan analizler sonrası 22 maddesi son haline dâhil edilmiştir. Analizler sonucu ölçeğin geçerlilik ve güvenilirliği yeterli düzeyde bulunmuştur. Gelecek çalışmalarda ölçeğin ergenlere de uyarlanması ve özellikle GKK ile iyi oluş arasındaki ilişkileri tespiti yönelik çalışmaların artırılması tavsiye edilmektedir.

Anahtar Sözcük: gelişmeleri kaçırma korkusu, internet, sosyal medya, bağımlılık

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1. Giriş

İletişim araçları geçtiğimiz on yılda çok hızlı bir yol kat etmiştir. Daha önceden yalnızca bilgisayarlardan girilebilen sosyal medya siteleri; akıllı telefonlar ve hızlı internet sayesinde genç yaşlı hemen herkesin cebinden her yerde erişilebilir hale gelmiştir. Günümüzde Facebook, Twitter ve Instagram gibi uygulamalar sayesinde kullanıcılar birbirlerinin yarattığı içeriklerden anında haberdar olabilmekte, kendileri içerik yaratarak yakınlarına/arkadaşlarına iletebilmektedir. Bunun yanında telefonlara kolayca yüklenebilen Messenger ve WhatsApp gibi uygulamalar da hem karşılıklı hem de bir grubun üyeleri arasındaki bilgi alışverişini kolay ve ulaşılabilir hale getirmiştir.

Sosyal medyanın bu şekilde hızlı ve etkili bir yaygınlaşma göstermesi çeşitli ruhsal bozuklukların ortaya çıkmasını da beraberinde getirmiştir. İnternet bağımlılığı, internetin yaygınlaşp her eve girmesinden sonra tartışılan bir bozukluk olmaya başlamıştır. Klinik olarak internet bağımlılığı, internetle aşırı meşgul olma, internette aşırı zaman geçirme, internette geçirilen zamanı azaltmada başarısız olma, internete giremediğinde huzursuz olma ve internete girince amaçladığından daha fazla kalmak olarak tanımlanmaktadır (Beard, 2005). Bunun yanında internete girmek için yalan söyleme, internet yüzünden sosyal, akademik ve iş yaşamında başarısız olma ve interneti hayatın sorunlarından kaçmak için kullanmak da destekleyen kriterler arasındadır. Ancak internet bağımlılığı henüz genel-geçer tanı kılavuzlarına (ör. DSM-V) girmediğinden tanı kriterleri kesin olarak belirlenebilmiş değildir. Bu durum da rahatsızlığın gerçek prevalansının belirlenebilmesini zorlaştırmaktadır (Cash et al., 2012).

İnternet bağımlılığının tanımlanmasından sonra literatüre kazandırılan bir diğer terim ise gelişmeleri kaçırma korkusu (GKK; ing: Fear of Missing Out) dur. Bu durum özellikle bilgilerin anlık olarak güncellendiği sosyal medya platformlarını aşırı kullanmayı tanımlamaktadır. İlk kez Przybylski tarafından kişinin kendi yokluğunda başkalarının eğlenceli zaman geçirdiğini düşünmesi ve bu durumun da rahatsızlık yaratması olarak tanımlanmıştır. Bu kavramın daha sonraki çalışmalarda kişilerin davranışlarını belirlemede oldukça önemli olduğu bulunmuştur. GKK ile ilgili çalışmalar yeni olsa da olgunun ruh sağlığı ve iyi oluş açısından belirleyici olduğu izlenimi literatürden edinilmektedir. Örneğin GKK, motivasyonu düşük bireylerin sosyal medyada fazla zaman geçirmesini sağlayan bir etken olarak karşımıza çıkmaktadır (Alt, 2015). Başka bir çalışmada da GKK'nın daha yüksek alkol tüketimi ve alkole bağlı negatif davranışla ilişkili olduğu bulunmuştur (Riordan, Flett, Hunter., Scarf, & Conner, 2015). İlginçtir ki, artmış sosyal medya kullanımının azalmış iyi oluşla ilişkili olduğu bulunmuştur (Verma & Kumari, 2016).

Yukarıda verilen bilgiler ışığında, ruh sağlığı ile yakın ilişkili olan GKK'nın özellikle genç bireylerde doğru ve güvenilir bir biçimde ölçülmesi gerekliliği belirmektedir. Şu an dünyada ve Türkiye'de en çok kullanılan ölçüm aracı Przybylski tarafından geliştirilen ve 10 maddeden oluşan GKK ölçeğidir. Ölçek Türkçe 'ye Gökler ve ark. tarafından 2016'da uyarlanmıştır. Bu ölçekte toplam 10 madde olması nedeniyle daha fazla maddeli GKK

ölçeklerine ihtiyaç duyulabilmektedir. Ayrıca var olan ölçeğin esas kısıtlılığı, akıllı telefon kullanımı ve sosyal medya kullanımı ile ilgili herhangi bir madde içermemesi, bunun da geçerlilik açısından sorular uyandırmasıdır. Sosyal medya platformlarının günden güne değişmesi ve bireylerin sosyal medya kullanımının da buna bağlı şekil değiştirmesi güncel ölçeklere ihtiyacı artırmaktadır. Bu çalışmada güncel sosyal medya deneyimlerine uygun, orijinal bir GKK ölçeğinin geliştirilmesi hedeflenmiştir.

2. Bulgular

2.1. Madde havuzu ve hazırlanışı:

GKK'nın farklı boyutlarını yansıtacağı düşünülen 31 madde ilk planda hazırlandı. Maddelerin ön görülen alt boyutları şu şekildeydi: Genel, Sosyal, Güvenlik/Haber, İş/Okul. Bu farklı boyutlar şu anda var olan GKK ölçeğinde bulunmamaktadır. Bu çalışmada alt boyut eklenerek, GKK'nın farklı boyutlardan oluştuğu hipotezi de test edilmiştir. Maddeler "Telefonumu düzenli olarak kontrol etmezsem" cümlesi ile başlamakta ve "Kaygı hissederim", "Huzursuz olurum" gibi ifadelerle bitmekteydi. Ölçek 5'li Likert tarzında hazırlanmış ve katılımcılardan her maddeye ne kadar katıldıklarını belirtmeleri istenmiştir.

2.2. Katılımcılar:

Ölçek katılımcılara internet yoluyla ulaştırıldı. Bunu için hazırlanan internet sitesi e-postalar yoluyla yayılarak katılımcı bulunmaya çalışıldı. Ölçeği yaşları 19 ile 73 arası değişen 626 kişi (172 erkek, 454 kadın) ölçeği doldurdu (ortalama yaş=32).

2.2. Açıklayıcı Faktör Analizi (AFA):

Ölçeğin faktör yapısını ortaya koymak amacıyla açıklayıcı faktör analizi uygulandı. Verilerin faktör analizi için uygunluğunu araştırmak için, Kaiser-Meyer-Olkin (KMO) katsayısı ve Barlett küresellik testi uygulandı. Faktör analizine uygunluk için Kaiser-Meyer-Olkin (KMO) .60'dan yüksek ve Barlett Testi'nin hesaplanan ki-kare değerinin istatistiksel olarak anlamlı çıkması aranmaktadır (Büyüköztürk, 2004). (KMO) Örneklem Uygunluk katsayısı .94 ve Barlett Sphericity Testi χ^2 değeri ise 9708,785 ($p < .000$) olarak hesaplandı. Bu sonuçlar verilerin faktör analizi için uygun olduğuna işaret etmektedir. Yapılan ilk analiz sonucunda öz değeri 1 ve üzerinde olan 6 faktör bulunmuştur. Birinci faktörün toplam varyansın % 35'ini açıkladığı görülmektedir. Diğer faktörlerin toplam varyansa katkılarının düşük olması nedeniyle ölçeğin tek faktörlü olarak değerlendirilebileceğine karar verilmiştir. Tablo 1'de ilk analize ilişkin bulunan öz değer ve açıklanan varyans oranları verilmiştir. Literatürde faktör yükleri .30 ve üzeri olan maddelerin ölçekte tutulabileceği ancak .45 ve üzeri olan maddelerin tercih edilmesinin daha iyi olacağı belirtilmektedir (Çokluk, Şekercioğlu & Büyüköztürk, 2010). Bu çalışmada da faktör yükleri .45'in üzerinde olan maddeler tercih edilmiştir. Buna göre faktör yükü .45 altında olan ya da birden fazla faktörde yer alan 9 madde ölçekten çıkarılmıştır. 31 maddeyle başlanan analizlere 22 maddeyle devam edilmiştir. Ölçeğin 22 maddelik son hali AFA ile tekrar incelenmiş ve Tablo 2'de geliştirilen 23 maddelik ölçeğin KMO değeri, Bartlett's testi, açıklanan varyans oranı ve faktör yükleri verilmiştir.

Tablo 1: FOMO Ölçeği İlk Faktör Analizi Sonuçları

Faktör	Özdeğer	Açıklanan Varyans	Toplam Açıklanan Varyans
1	10,892	35,135	35,135
2	2,308	7,444	42,579
3	1,746	5,632	48,211
4	1,392	4,490	52,701
5	1,260	4,064	56,765
6	1,243	4,008	60,773

Ölçeğin 22 maddelik son hali AFA ile tekrar incelenmiş ve Tablo 2’de geliştirilen 23 maddelik ölçeğin KMO değeri, Bartlett’s testi, açıklanan varyans oranı ve faktör yükleri verilmiştir.

Tablo 2: FOMO Ölçeği Faktör Yükleri ve Açıklanan Varyans

No	Ölçek Maddeleri	Faktör Yüğü
1.	Önemli bir şeyi kaçırma ihtimalinden dolayı korku duyarım.	,773
2.	Huzursuz olurum.	,751
3.	İçim rahat etmez.	,750
4.	Kayıgı hissederim.	,713
5.	Meraklanırım.	,693
6.	İşyerimdeki/okuldaki güncel gelişmeleri takip edemeyeceğimden korkarım.	,692
7.	Sosyal gündemden kopacağım için endişe duyarım.	,686
8.	Rahatsız olmam.*	-,678
9.	Eğlenceli bir şeyleri kaçıracağımdan korkarım.	,652
10.	Yükümlülüklerimi yerine getirmede aksaklıklar olacağından kaygılanırım	,652
11.	Grup dışında kalacağımdan korkarım.	,647
12.	Önemli bir görüşmeyi kaçırma ihtimali beni rahatsız eder.	,646
13.	İş veya okuldan gelecek önemli mesajları kaçıracağımdan endişe duyarım	,632
14.	Çevremde olabilecek tehlikelerden (terör, doğal afet vs.) haber alamayacağım için kendimi huzursuz hissederim.	,595
15.	Ulaşamayacağım için kaygı duyarım.	,588
16.	Aklım telefonumda kalacağı için işime odaklanamam	,578
17.	Arkadaşlarının bensiz buluşma ihtimallerinden dolayı endişe duyarım	,574
18.	Sosyal aktiviteleri kaçıracağımdan korkarım.	,553
19.	Sosyal medya paylaşımlarıma gelen yorumları göremeyeceğim için mutsuz olurum.	,532
20.	Patronumun bana ulaşamayıp öfkeleneneğinden endişe duyarım.	,522
21.	Yakınlarımla başına bir şey geleceğinden korkarım.	,516
22.	Bir şey kaçırma endişesi duymam.	*-,487
Açıklanan Toplam Varyans		% 40,618
Özdeğer		8.936

* Tersten kodlanan maddeler

3. Güvenirlik

Ölçeğin güvenirliliği Cronbach alfa iç tutarlık yöntemiyle araştırılmıştır. Buna göre ölçeğin güvenirliliği .88 olarak bulunmuştur. Literatürde ölçeğin güvenirlilik katsayısının .70 olması güvenirlilik açısından yeterli görülmektedir (Tavşancıl, 2002). Bu ölçüte göre ölçeğin güvenirlilik düzeyinin oldukça yüksek olduğu söylenebilir. Ayrıca ölçeğin maddelerinin toplam puanı tahmin etme gücünü belirlemek üzere madde analizi yapılmıştır. Büyüköztürk (2004)’e göre, madde-toplam korelasyonu test maddelerinden alınan puanlar ile testin toplam puanı arasındaki ilişkiyi gösterir. Diğer bir deyişle bir ölçekteki her bir maddenin benzer davranışları ölçtüğünü kanıtlar. Korelasyon katsayısı. 30 ve daha yüksek olan maddelerin, ölçeği temsil gücünün yeterli olduğu kabul edilir. Bu

çalışmada madde toplam korelasyonu değerlerinin. 40 ile .73 arasında değiştiği görülmüştür. Elde edilen bu bulgu da ölçek maddelerinin ölçeği temsil güçlerinin yeterli olduğunu göstermektedir.

4. Tartışma

Çalışma sonunda 31 maddelik hazırlanan GKK ölçeğinin 22 maddesi ölçeğin son haline dâhil edilmiştir. Bu 22 maddelik ölçeğin geçerlilik ve güvenilirliğinin yeterli olduğu bulundu. Son dâhil edilen maddeler incelendiğinde başlangıçta oluşturulan her dört alt boyuttan da maddeler olduğu görüldü. Bu durum da GKK’nın çok boyutlu olduğu hipotezini desteklemiyordu. Bu durum özellikle sosyal medya kullanmayı tetikleyen kaygının duruma özgü olmadığını ve genel olarak her durumda kendini gösterdiğini düşündürmektedir.

Çalışmamızın olası kısıtlılıklarından biri ilköğretim öğrencilerinde uygulanamamış olmasıdır. Mevcut ölçek 18 yaş üstü için kullanıma uygundur ancak ergenlerde kullanmak için ileri çalışmalara ihtiyaç duyulmaktadır. Ergenlerdeki GKK’yı ölçmek de klinisyenler ve eğitimciler açısından oldukça önemlidir. Bunun nedeni akıllı telefonların ergenler, hatta ilköğretim öğrencileri tarafından da oldukça yaygın kullanılmasıdır. Bu yaş grubundaki çalışmalar, GKK’nın problemli sosyal medya kullanımı ile ilişkili olduğunu ortaya koymaktadır (Vanden Abeele, & van Rooij; 2016). Bu nedenle gelecek çalışmalarda Üsküdar GKK ölçeği ergenlere de uygulanarak geçerlilik ve güvenirliliği tespit edilmelidir.

Çalışmamızın bir diğer kısıtlılığı da iyi oluş hakkında bilgi toplanmamış olmasıdır. Çalışma temel olarak bir ölçek geliştirme çalışması olduğundan ve özellikle de verilerin çevrimiçi toplanması nedeniyle çok çeşitli veri toplanması mümkün olmamıştır. Her ne kadar GKK problemli sosyal medya kullanımına yol açan bir faktör olarak nitelense de, sosyal medya kullanımının kişisel iyi oluşa ne derecede etki ettiği, sağlıklı ve problemli sosyal medya kullanımını arasındaki farklar tam olarak ayırt edilememektedir. Özellikle psikologlar, psikiyatristler ve eğitimciler açısından yol gösterici olması bakımından iyi oluş önemli bir araştırma konusudur. GKK ve sosyal medya kullanımının iyi oluşa etkisi ve nasıl etki ettiği daha çok çalışma kullanılarak araştırılmalıdır.

Teşekkür: Çalışmanın istatistiksel analizinde yardımcı olan Doç.Dr. Tayfun Doğan’a ve veri toplama aşamasındaki yardımlarından dolayı İstanbul Özel Çınar Fen Lisesinden; Dilanur Ağır ve Şevval Hüma Selçuk’a teşekkür ederiz.

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EK1: ÜSKÜDAR FOMO ÖLÇEĞİ

No	Telefonumu düzenli olarak kontrol etmezsem.....	Hiç katılmıyorum	Katılmıyorum	Biraz katılıyorum	Katılıyorum	Tamamen katılıyorum.
1.	Önemli bir şeyi kaçırmaya ihtimalimden dolayı korku duyarım.	1	2	3	4	5
2.	Huzursuz olurum.	1	2	3	4	5
3.	İçim rahat etmez.	1	2	3	4	5
4.	Kaygı hissederim.	1	2	3	4	5
5.	Meraklanırım.	1	2	3	4	5
6.	İşyerimdeki/okuldaki güncel gelişmeleri takip edemeyeceğimden korkarım.	1	2	3	4	5
7.	Sosyal gündemden kopacağım için endişe duyarım.	1	2	3	4	5
8.	Rahatsız olmam.*	1	2	3	4	5
9.	Eğlenceli bir şeyleri kaçıracığımdan korkarım.	1	2	3	4	5
10.	Yükümlülüklerimi yerine getirmede aksaklıklar olacağından kaygılanırım	1	2	3	4	5
11.	Grup dışında kalacağımdan korkarım.	1	2	3	4	5
12.	Önemli bir görüşmeyi kaçırmaya ihtimali beni rahatsız eder.	1	2	3	4	5
13.	İş veya okuldan gelecek önemli mesajları kaçıracığımdan endişe duyarım.	1	2	3	4	5
14.	Çevremde olabilecek tehlikelerden (terör, doğal afet vs.) haber alamayacağım için kendimi huzursuz hissederim.	1	2	3	4	5
15.	Ulaşılamayacağım için kaygı duyarım.	1	2	3	4	5
16.	Aklım telefonumda kalacağı için işime odaklanamam	1	2	3	4	5
17.	Arkadaşlarımın bensiz buluşma ihtimallerinden dolayı endişe duyarım	1	2	3	4	5
18.	Sosyal aktiviteleri kaçıracığımdan korkarım.	1	2	3	4	5
19.	Sosyal medya paylaşımlarıma gelen yorumları göremeyeceğim için mutsuz olurum.	1	2	3	4	5
20.	Patronumun bana ulaşamayıp öfkeleneyeceğinden endişe duyarım.	1	2	3	4	5
21.	Yakınlarımın başına bir şey geleceğinden korkarım.	1	2	3	4	5
22.	Bir şey kaçırmaya endişesi duymam.*	1	2	3	4	5

* 8. ve 22. maddeler tersten kodlanmaktadır.

Year (Yıl) : 2017
Volume (Cilt) : 4
Issue Number (Sayı) : 2
Doi : 10.5455/JNBS.1496152464

Received/Geliş 01.06.2017
Accepted/Kabul 01.06.2017

EEG FINDINGS DURING FLOW STATE AKIŞ DURUMUNDA EEG BULGULARI

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Abstract

Flow state emerges when a person engages in autotelic activities, which are both enjoyable and challenging. While studies generally focused on qualitative data of flow state, a few were conducted on psychophysiological basis of it. Present study aimed to investigate EEG correlates of flow. Twenty participants preliminarily filled out Flow Short Scale Turkish Version and completed a ping-pong game at two levels (slow boring and fast-flow) during EEG recording. The results revealed that theta power was significantly greater for all regions during flow condition compared to non-flow condition and delta power was significantly greater during flow on central and parietal regions. There is no difference between flow/non-flow conditions for coherence. A positive correlation was found between delta and theta powers and subscales scores of Flow Short Scale. The increases in these theta and delta frequency bands could be important indicators of flow state. The coherence results revealed that interhemispheric synchronization was not modified by flow. If confirmed with multiple tasks and in clinical groups, EEG correlates of flow state could be useful increase performance and well-being.

Keywords: flow state, EEG, theta, delta, coherence

Özet

Akış, kişilerin zorlayıcıken aynı zamanda eğlenceli olan ototelik aktiviteleri gerçekleştirmesi sırasında ortaya çıkar. Akış ile ilgili çalışmalar genellikle kalitatif yöntemlere yoğunlaşırken, akışın psikofizyolojik temelleri üzerine çok az çalışma yapılmıştır. Bu çalışma akışın nöral temellerini araştırmayı amaçlamaktadır. Çalışma kapsamında 20 katılımcı Akış Kısa Ölçeği Türkçe Versiyonu tamamladıktan sonra, EEG kaydı süresince yavaş (sıkıcı) ve hızlı (akış) olmak üzere iki farklı seviyede ping-pong oyunu oynamışlardır. Sonuçlarına göre akış koşulunda akış olmayan koşula göre, teta gücü tüm bölgelerde daha yüksek ve delta gücü ise santral ve parietal bölgelerde daha yüksektir. Koherans için koşullar arasında anlamlı bir farkında bulunamamıştır. Teta ve delta bantları ile Akış Kısa Ölçeği alt ölçekleri arasında pozitif korelasyon saptanmıştır. Teta ve delta bantındaki artış akış durumunun önemli göstergeleri olabilir. Sonuçlar farklı paradigmlar ve hasta gruplarında tekrarlandığı durumda, akış durumunun elektrofizyolojik temelleri performansı ve iyi oluş halini arttırmak için kullanılabilir.

Anahtar Kelimeler: akış durumu, EEG, teta, delta, coherence

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1. Introduction

Csikszentmihalyi (1975) has brought forward a question: "why do people continue doing activities that are time-consuming and dangerous?", and he started to do research about the concept of flow state. Flow state and autotelic activity are interchangeable concepts meaning that a person does an activity for the sake of doing an activity. In other words, doing an autotelic activity is worth doing. A person drives because he/she likes driving, or a person teaches a language because he/she likes teaching etc. Autotelic activity includes difficulty to a certain extent, and the person is obliged to challenge with difficulty. Thus, a person who does an autotelic activity is fully engaged with the activity, and he/she has to use full capacity to achieve it. Meanwhile, the person gets positive feedback with regard to doing the activity, and he/she is able to estimate the results of the autotelic task in a realistic way (Csikszentmihalyi, 1975). The person who does the autotelic activity is more pleased with the way of doing the related task than what specific task she/he is doing (Csikszentmihalyi, 1999). Several studies have associated doing leisure activities, hobbies, and adventurous activities with flow-state ranging from employees to late-adults (Csikszentmihalyi & LeFevre, 1989, Myllykangas et. al, 2002, Elkington 2011, Chilton 2013, Boniface, 2000). Flow is a mental state that emerges when a person does enjoyable and challenging activities. However, there is different body of research suggesting that flow state is not related to hobby activities and positive well-being. These studies showed that positive well-being and flow-state are negatively correlated, and hobby activities do not have meaningful effect on the flow state (Heo et. al, 2010). Alternatively, the meaning of occupation has a significant effect on the probability of experiencing flow state, and in this respect, it promotes psychological well-being (Wright et. al., 2007).

The occupation and doing a task are different concepts within the framework of the flow-state. Occupation is something that a person is fully engaged with and is doing in a passionate way (Seligman, 2007). Thus, it can be said that a person prefers occupation instead of a task when he/she experiences a flow state. Csikszentmihalyi (2005) asserts that a person who is pleased with doing occupation can experience the flow state. It is required to get positive feedback via doing open-targeted, hard, purposeful occupation in order to get pleased. Csikszentmihalyi named this situation as "tidy conscious" in which a person focuses on purposeful occupation in a self-controlling way, thus it contributes to self-consolidation (Csikszentmihalyi et. al., 2005). Csikszentmihalyi (1990) defines the nine characteristics of flow state as follows:

- Concentration on the task in hand: Being concentrated via focusing attention on "occupation" and "moment",
- Challenge-skill balance: Being adjusted to the occupation,
- Action awareness merging: Awareness of occupation,
- Loss of self-consciousness: Loss of self-reflective consciousness,
- A sense of control: Feeling of control, ability to predict the next stage of occupation, and necessary problem-

solving principles,

- Transformation of time: Perversion of temporary activity (ex. Feeling of faster time elapse than normal),
- Autotelic Experience: Experiencing rewarding activity, reaching the goal of activity with the enjoyment.
- Clear Goals: this corresponds to the balance between perceived ability and task requirement as described by Csikszentmihalyi's (1975) in his original model of the flow state.
- Unambiguous Feedback: Clear and immediate feedback about ongoing occupation.

Ongoing researches have shown that, flow state helps a person to define real self, to develop problem-solving skills and insight (Warren, 2007, Lee, 2013). Another research from South Korea proposes that there is a high probability of experiencing flow state for students who have high level of procrastination. However, results propound that the academic success can be predicted via flow state instead of procrastination. Although procrastination and flow state have positive correlation, procrastination is not the predictor of academic success (Lee, 2005). On the other hand, flow state is effective in developing positive attitude toward game advertisements, and it provides an opportunity to self-actualization (Hernandez, 2011 and Nesbit, 2006).

Interestingly, there are a few studies on the psychophysiological base of flow state. Mansfield et. al. (2012) reported that there was no correlation between flow state and heart rate. In another study, Kramer (2007) examined the relationship between electrical activation patterns in the cortex and flow-based performance on a motor response task. Left temporal alpha activity was found to be a predictor of performance. In addition, the theta power (4-8Hz) and the mid-beta power (16-20Hz) were also related to performance. Similar research using a visuo-motor task showed that, during flow state, there was increased low-beta (12-15 Hz) power in the sensorimotor cortex together with beta band synchronization between the prefrontal and sensori-motor cortex and de-synchronization between the other areas (Kock, 2014). Another functional near infrared spectroscopy study explored brain metabolism during flow state and found that flow state is associated with increased prefrontal oxygenated hemoglobin (Yoshida et al., 2014).

Although these studies give important knowledge on EEG features associated with flow state, inconsistency of the findings prompts further studies. In this study, we aimed to induce flow state using different speed levels of the classical Ping-Pong game. This method is used because studies showed that people are more likely to experience flow state if the game or event is adjusted with the level of skill (Procci et al., 2012).

2. Method

2.1. Participants

Twenty (13 females, 7 males), right-handed (mean age: 24±4.83 years, age range: 20-35) participants were recruited with no history of any neurological and

psychiatric disease. Participants' daily PC playing time are changing between 1 and 3 hours (mean: 1.55 ± 0.6 hour). The study protocol was approved by the local Ethics Committee and was performed in accordance with the Declaration of Helsinki. All the participants were informed about the study procedures and provided written informed consent.

2.2. Psychological Assessments

All participants filled out self-report questionnaires, including Turkish version of Flow Short Scale. The Flow Short Scale was developed by Rheinberg, Vollmeyer and Engeser (2003) in Germany and adapted for Turkish by Isigüzel and Çam (2014) and consists of eighteen items rated on a seven-point Likert-type self-assessment scale.

2.3. Procedure

Participants completed a ping-pong game at two speed levels. The speed was determined based on a pilot study. Slow condition was rated as boring during most participants during the pilot study, whereas the fast condition was rated as enjoyable. The order of conditions were counterbalanced across participants. Each condition took approximately 2 minutes.

2.4. EEG data collection and preprocessing

Dimly lit room was provided to participants during data collection. EEG data and subjects were observed by EEG technician to minimize drowsiness and excessive head motion during recording. EEG data collection was accomplished using BrainVision actiCHamp amplifier (Brain Products Inc. Munich, Germany) which was connected to a 32-channel actiCAP (Brain Products Inc. Munich, Germany) sampled at 1000Hz.

The data were processed using BrainVision Analyzer software (Brain Products GmbH., Gilching, Germany). The data were down sampled to 250 Hz to ease computations. Down sampled and filtered data was re-referenced to average of the two mastoid electrodes. Resulting signals were filtered with a 0.5 Hz high-pass filter and a 30 Hz low-pass filter with 24 dB/octave roll-off to minimize high and low frequency artifacts. Artifact detection was used visually to exclude artifacts caused by muscle, eye and head motion. In order to correct ocular artifacts, independent component analysis (ICA) was performed. Non-overlapping segmentation with 2.0 s epochs was performed to the acquired data. The second artifact rejection and then fast-fourier transforms were used.

2.4.1. Power

Each participant's data were averaged across the acquired epochs for each electrode, and the mean absolute power was calculated for each frequency bands: Delta (0.5 – 4 Hz), Theta (4 – 8 Hz.), Alpha1 (8 – 10 Hz.), Alpha2 (10 – 12 Hz.), Beta1 (12 – 20 Hz.), Beta2 (20 – 30 Hz.). A natural log transform was computed for all EEG power variables. Electrodes were grouped to create 4 region of

interest: frontal (F7, F3, Fz, F4, F8), central (C3, Cz, C4), parietal (P7, P3, Pz, P4, P8), and temporal (T7, T8).

2.4.2. Coherence

Inter-hemispheric coherence was calculated for previously defined all bands. Inter-hemispheric coherence was assessed between the pairs F3-F4, C3-C4, P3-P4, and T7-T8.

2.5. Statistical Analysis

All statistical analyses were conducted using statistical package for the social sciences version 22 (SPSS, SPSS Inc. Chicago, USA). Grand average within each group was compared with general linear model (GLM). When normality assumption was violated non-parametric test was used (Delta, Beta1, Beta2), and when assumption of sphericity or homogeneity were violated the Greenhouse-Geisser was performed. Significant main effect were followed up with post-hoc comparisons.

We examined difference in power between conditions via repeated-measure ANOVA for each frequency bands. Each omnibus ANOVA included two within subject factor (condition: flow and non-flow), and (region: frontal, temporal, parietal, central). Group difference in inter-hemispheric coherence was examined via repeated-measure ANOVAs for each frequency band. Omnibus ANOVAs was performed included two within factors (condition: flow, non-flow), and (region: F3-F4, C3-C4, P3-P4, T7-T8). In addition, the correlations between the mean powers of the frequency bands and flow scales were also calculated. In the correlation analyses, Spearman non-parametric correlation coefficient was used, because the scores of the flow scale and powers in some frequency bands did not distributed normally.

3. Results

3.1. Power

There was a significant main effect of condition at only theta band ($F(1, 19) = 13.91, p < 0.05$; see figure 1). Mean EEG power was significantly higher at flow condition ($M = 12.405, SE = 1.09$) than non-flow condition ($M = 11.303, SE = 1$). In addition, at theta, we observed a significant interaction effect between condition and region ($F(3, 57) = 5.01, p < 0.05$) and a significant main effect of region ($F(3, 57) = 61.41, p < 0.001$). Follow-up analyses indicated that mean EEG power was statistically different at all regions of interest (frontal = $t(19) = 2.48, p < 0.05$, temporal = $t(19) = 2.28, p < 0.05$, central = $t(19) = 4.57, p < 0.01$, parietal = $t(19) = 4.31, p < 0.01$). Delta, Beta1, and Beta2 bands were analyzed using Wilcoxon-signed rank test because of violation of normality assumption. Wilcoxon test revealed that, there was significant difference between conditions at frontal ($z = -2.69, p < 0.01$), central region ($z = -3.73, p < 0.01$), and parietal region ($z = -3.17, p < 0.01$) at delta frequency band with greater delta power during flow state. On the other hand, temporal delta power was not significantly different between conditions ($p = 0.9$).

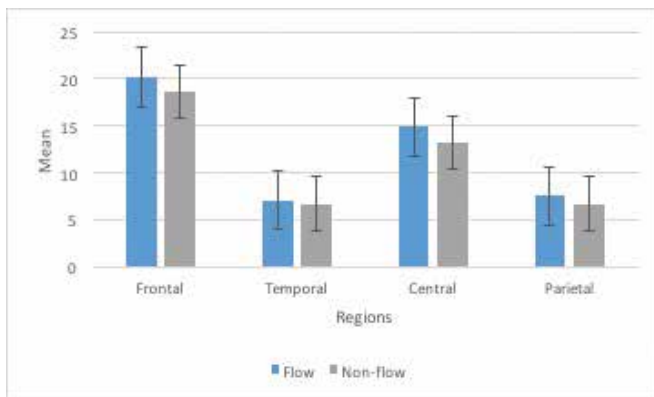


Figure 1: The mean EEG powers at flow and non-flow conditions in theta band.

3.2. Coherence

Two-way repeated ANOVA and Wilcoxon signed-rank test revealed that neither main effect of condition nor interaction effect between conditions and regions of interests were not significant at any band frequency, after bonferroni correction for multiple comparisons.

3.3. Correlations

The correlations were performed only between theta and delta frequency bands and flow scale, because the effect of the flow condition is only significant in these frequency bands. The correlation results showed that there was a positive correlation between frequency bands and subscales scores of Flow Short Scale, namely absorption, enjoyment and intrinsic motivation subscales (see table 1).

Table 1: Results of Correlational analysis

		Absorption	Enjoyment	Intrinsic Motivation
Delta frontal	C.C.	0,36	0,40	0,37
	Sig	0,11	0,08	0,11
Delta temporal	C.C.	0,47*	0,40	0,24
	Sig	0,04	0,08	0,30
Delta central	C.C.	0,61**	0,63**	0,42
	Sig	0,00	0,00	0,07
Delta parietal	C.C.	0,45*	0,46*	0,21
	Sig	0,05	0,04	0,37
Theta frontal	C.C.	0,22	0,33	0,38
	Sig	0,35	0,16	0,10
Theta temporal	C.C.	0,42	0,39	0,35
	Sig	0,07	0,09	0,13
Theta central	C.C.	0,32	0,45*	0,50*
	Sig	0,16	0,04	0,02
Theta parietal	C.C.	0,34	0,49*	0,43
	Sig	0,15	0,03	0,06

C.C.=correlation coefficient

4. Discussion

This study shows that the main effect of condition is only found on theta and delta band frequencies, which is significantly higher on flow than non-flow condition. For theta band, condition effect was significant for all regions. On delta band, a significant difference was found between

conditions and only central and parietal regions where during flow delta activity is greater than non-flow. However, there is no significant difference between conditions for coherence, which means that interhemispheric synchronization was not modified by flow.

Increased theta activity during flow can be explained from a number of perspectives. First, theta activity indicates encoding process of data into short-term (Vertes, 2005) and long-term memory (Klimesch, 1999). High theta activity in frontal midline (Fz) may also be a predictor of concentration, sustained attention and at the same time relaxation (Kubota et al., 2001). Laukka et al.(1995) proposed that theta increases, as a function of learning process, which may be related to decreased effort allocation. Kock (2014) proposed that performing a task require two phases. First phase is learning stage in which resources, like attention, are fully used to make associations. Second stage is automaticity in which motor responses elicit unconsciously and with little mental effort (i.e, flow). During flow, brain uses minimum resources to reach maximum performance and this state may be associated with slow theta activity. In our study, therefore, high theta activity may indicate concentration and relaxation. Interestingly, it has been shown that theta power decreases after errors (Laukka et al.1995). After every error, a new adjustment is made to reach competence and competence in turn will be associated with increased theta activity.

Second explanation may be related to satisfaction. Theta activity may reflect pleasure and an innate tendency to reach highest joy and one's peak capability because of satisfaction (Horan, 2009). One of the flow dimensions is having an autotelic experience, which means someone does a task accompanied by an intrinsic reward, namely enjoyment (Jakson & Marsch, 1996). Therefore, increased theta power on our subjects showed that they had autotelic experiences. It can be also suggested that theta activity are related to dopamine signals that play a role in synchronization between frontal cortex and hippocampus (Benchenane et al., 2010).

The results also showed a greater delta powers in frontal, central and parietal regions during flow state compared to non-flow. The delta activity is generally considered as an inhibitory type oscillation. For instance, it has been claimed that frontal delta activity increases during several tasks such as Sternberg and Go/no-go; and they may correspond to inhibition of sensory afferents (Harmony et al., 2013). Inhibition of sensory inputs can play a role for better performance by increasing concentration (Harmony et al., 2006). In our task, we assumed that the participants have used a similar strategy: the sensory inputs were ignored, while the level of concentration increased.

It should be noted that there are not many reliable reports on EEG during flow state. In addition to that, there is substantial inconsistency among existing EEG studies during flow state. For instance, Kock (2014) mainly reported low-beta power during flow state. Kramer (2207) reported that left temporal alpha power could be used as a predictor of performance. Despite this, there is considerable methodological heterogeneity among studies. For instance, Kramer used a single flow condition and aimed to find predictors of higher performance. In

addition, only two temporal electrodes were used for EEG recording. In addition, Kock also used performance data to separate flow from non-flow conditions. However, in our study we assumed that task speed is a determinant of slow state. Similar speed manipulations were also used previously in other experiments (Yoshida et al., 2014). In this way, different flow states can be induced and each states require different cognitive resources.

Our research has a number of limitations. First, we only tested young students who enjoy video games. The EEG representation of flow can be different in other populations, such as older people or people who do not like video games. Otherwise, only one type of task was used. In the present study, we only investigated the effect of speed level on flow states. Limited number of EEG-flow studies indicates that EEG findings during flow may be task dependent. Third, we did not use performance monitoring to determine the most effective flow conditions. A different analysis method could be done by including only the EEG during very high level of performance. To overcome these difficulties, future studies should test different samples with multiple tasks and may analyze EEG by considering the performance.

Finally, flow state is a condition that boosts the performance and well-being. Flow is a desirable state for people whose works are based on their performance, for instance athletes, musicians, artists etc. Behind an obligatory work, experiencing flow comes with enjoyment and intrinsic motivation. In Maslow's hierarchy, self-actualization is last step to reach. Therefore, feeling good as doing one's best could be a purpose of life. Otherwise, flow measures are limited to qualitative scales or questionnaires with some methodological problems: Interrupting flow process in order to take instant information from participants and interviewing with participants after a while from flow moment (Rettie, 2001). Given the limited number of studies on EEG during flow, it is difficult to reach a general conclusion. However, our results indicate that theta and delta bands could be important predictors of flow state. We definitely need more EEG studies to better understanding EEG correlates of flow studies, while other studies should focus on using EEG knowledge to increase performance and well-being via methods such as neurofeedback.

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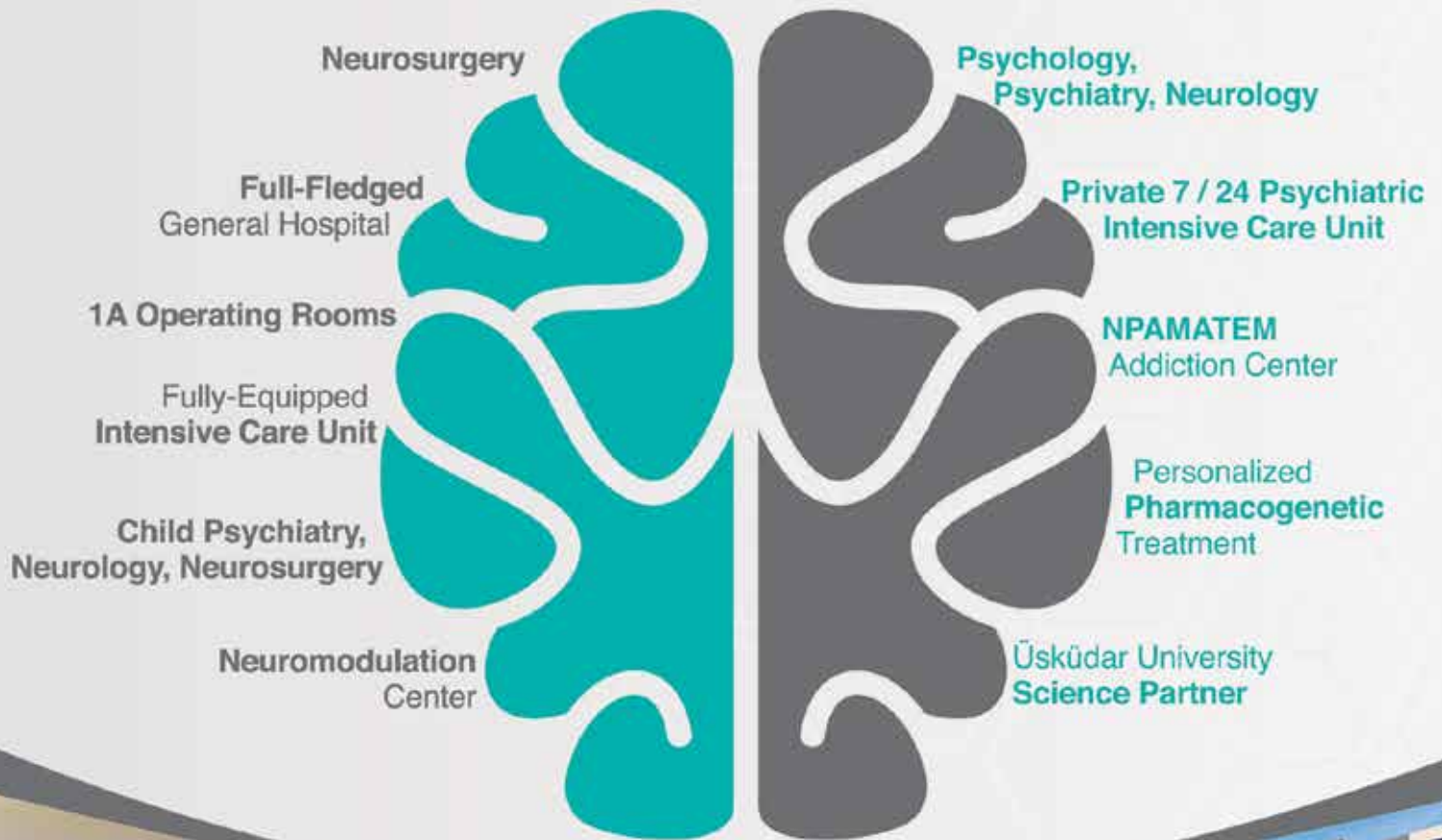
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