

**Behavioral Studies of Excessive Internet Users'
Cognitive Functions**

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过度网络使用者认知功能的行为学研究

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中国科学技术大学学位论文相关声明

本人声明所呈交的学位论文,是本人在导师指导下进行研究工作所取得的成果。除已特别加以标注和致谢的地方外,论文中不包含任何他人已经发表或撰写过的研究成果。与我一同工作的同志对本研究所做的贡献均已在论文中作了明确的说明。

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摘要

过度网络使用（Excessive Internet Use，简称 EIU），也被称为“网络成瘾”（Internet addiction）或“病态网络使用”（Pathological Internet Use）。该症状最基本的表现是网络使用者无法控制自己使用网络的行为，并最终导致心理、人际交往和学习/工作上的困难。过度网络使用已经成为了一个在全世界范围内产生严重影响的社会问题，并得到了许多心理学家、教育工作者和公众的关注。但是以前的研究者主要使用问卷调查的方法，来研究过度网络使用的评价标准、流行病学和精神疾病症状等的方面，几乎没有严格的实验研究来评价过度网络使用者的认知功能，而这种研究本可能为过度网络使用的治疗和干预提供有效的帮助。在本论文的各项实验研究中，我们比较了过度网络使用者和正常对照者在决策、抑制、执行控制和情绪任务中的成绩，并得到了一些有趣的结果。此外，过度网络使用者的行为与药物滥用者和病理性赌博者非常相似，有些研究者认为过度网络使用是行为成瘾（behavioral addiction）中的一种。在本论文的各项研究中，我们讨论了过度网络使用与其他成瘾行为之间的联系。

在本论文的实验研究 I 中，我们使用了一个赌博任务（衣阿华赌博任务的修改版）和一个 go/no-go 任务，来分别研究过度网络使用者的决策（decision-making）能力和对优势的、习惯性反应的抑制能力（prepotent response inhibition）。过度网络使用者在赌博任务中的成绩显著差于正常对照者，说明前者的决策能力存在缺陷，他们不能有效权衡那些短期带来利益但长期导致损失的选择。进一步的分析表明，过度网络使用者并不是不能学会任务中的奖惩规则，他们只是比正常对照者学得更慢。前人在对药物成瘾和病理性赌博患者的研究中发现了类似的结果，因此，这一结果表明过度网络使用和其他成瘾行为之间可能存在联系。有趣和令人吃惊的是，与其他成瘾患者的表现不同，过度网络使用者在 go/no-go 任务中 no-go 条件下的正确率更高。但是这一结果并不能反映过度网络使用者在日常生活中难于抑制上网行为的表现，因此，有必要设计更为特异性的抑制功能任务来测量过度网络使用者在面对网络相关提示刺激时的优势反应抑制能力。

在本论文的实验研究 II 中，我们专门研究了过度网络使用症状中的一个子类

——过度电脑游戏（Excessive computer game playing, ECGP）。目前几乎没有关于过度电脑游戏会对玩家认知功能造成负面影响的实验研究。在本研究中，我们比较了曾经沉迷于电脑游戏的玩家（前高分组）、目前仍旧沉溺的玩家（现高分组）和正常对照三组受试者完成一个多目标追踪任务（Multiple Object Tracking Task, 简称 MOT）的成绩。前高分组的成绩显著好于对照组，表明电脑游戏可以提升玩家的空间视觉能力。现高分组的成绩显著差于前高分组，这一更重要的结果说明过度电脑游戏的确是认知功能的损伤相联系的。

在本论文的实验研究III中，我们进一步研究了过度网络使用者的情绪、抑制、决策和执行控制能力。我们采用了生活满意程度自评量表和 Zung 抑郁量表来评价受试者的情绪状态，并使用更为详细的 SCL90 和 WHOQOL-BRIEF 问卷调查过度网络使用者的情绪和精神状态。在研究 I 中，我们已经测量了过度网络使用者对优势、习惯性反应的抑制能力。在本研究中，我们进一步使用了 CFQ 和 WBSI 这两个问卷分别研究过度网络使用者对外界干扰的抑制（Resistance to Distractor Interference）和对内在记忆干扰的抑制（Resistance to Proactive Interference）能力。研究 I 的结果显示过度网络使用者的决策能力存在缺陷，他们学习任务奖惩规则的速度较慢。在本研究中，我们使用了更多的决策任务来探查过度网络使用者的决策能力，包括测量受试者是否过于重视眼前利益而忽视长远利益的 Kirby 和 Richards 折扣任务；和研究受试者冒险行为的剑桥赌博任务（Cambridge Gambling Task）。在本研究中，我们还使用了威斯康星卡片分类任务（WCST）来研究过度网络使用者的执行控制能力（executive control）。本研究的数据仍旧在统计分析中，我们将在以后报告。

本论文的研究是使用实验手段，来检测过度网络使用者认知功能的良好开端。研究的结果有助于过度网络使用的诊断，以及评价过度网络使用者的沉溺及康复程度。为进一步研究过度网络使用者的认知功能改变的脑机制，以及年龄、性别、教育和文化背景等因素的影响等重要课题，打下了基础。

本论文的一些研究工作得到 CNS Spectrum 杂志的评审人的好评，如实验研究 I 的工作是“对一个新领域的探索。当网络成瘾（过度网络使用）已经成为了一个越来越受人关注的领域时，本研究增加了人们对这一问题的本质的理解，有助于弄清楚问题发生的原因。这是第一个比较过度网络使用者患者与其他成瘾行

为之间决策功能的异同的研究…”（英文原文请见论文末尾的“对实验研究 I 对应文章的评审人意见”）

本论文的实验研究 I 已经被 CNS Spectrum(影响因子 2007 年为 2.222)接受；实验研究 II 发表在 *Cyberpsychology & Behavior* (2008, 11: 545-548, 影响因子 2007 年为 1.368)上；实验研究 III 目前正处于结果整理和研究论文写作阶段。

关键词： 过度网络使用、过度电脑游戏、决策、抑制、执行控制、情绪

Abstract

Excessive Internet use (EIU), also described as Internet addiction or pathological Internet use, is defined as an individual's inability to control his or her use of the Internet, which eventually causes psychological, social, academic, and/or work difficulties in life. EIU has already become a worldwide serious social problem and has attracted much attention from psychologists, educators, and the public. By using survey approaches, several studies focused on aspects such as assessment criteria, epidemiology, and psychiatric co-morbidity of EIU. However, limited data from experimental studies are available on cognitive functions of excessive Internet users (EIUsers); such studies may provide the development of EIU treatment and prevention strategies. In the studies described in this dissertation, we studied emotion, inhibition, decision-making and executive control functions of EIUsers, and we got some interesting results. Moreover, EIUsers' behavior is much like that of drug abusers' and pathological gamblers'. Some researchers suggested EIU as a kind of behavioral addiction. Thus, cognitive links between EIU and other addictive behaviors were also discussed.

In the first study, we examined EIUsers' functions of decision-making and prepotent response inhibition. Two groups of participants (EIUsers and controls) were compared on these two functions by using a Gambling Task (a modified Iowa Gambling Task) and a Go/no-go Task, respectively. The findings from the Gambling Task indicated that EIUsers have deficits in decision-making function, which are characterized by a strategy learning lag rather than an inability to learn from task contingencies. Interestingly and surprisingly, different from patients with other addictive behaviors, EIUsers showed higher accuracy under the no-go condition in the go/no-go task.. However, EIUsers could hardly suppress their excessive online behaviors in real life. Their ability of inhibition still need to be further studied with more specific assessments. These results showed some similarities and dissimilarities

between EIU and other addictive behaviors such as drug abuse and pathological gambling.

In the second study, we focused on excessive computer game playing (ECGP), a subtype of EIU. Limited data from experimental lab studies are available about the negative consequences of ECGP on players' cognitive characteristics. In this study, we compared three groups of participants (current ECGP participants, previous ECGP participants, and control participants) on a Multiple Object Tracking (MOT) task. The previous ECGP participants performed significantly better than the control participants, which suggested a facilitation effect of computer games on visuospatial abilities. Moreover, the current ECGP participants performed significantly worse than the previous ECGP participants. This more important finding indicates that ECGP may be related to cognitive deficits.

In the third study, we studied EIUsers' functions of emotion, inhibition, decision-making and executive control. We used self-reported satisfaction scale, Zung depression scale and more detailed questionnaires of SCL90 and WHOQOL-BRIEF to study emotional states of EIUsers. We have reported in the first study that EIUsers showed better ability to inhibit prepotent responses. In the present study, we studied EIUsers' abilities of resistance to distractor interference and proactive interference by CFQ and WBSI questionnaires, respectively. We have showed in the first study that EIUsers have deficits in decision-making function, which are characterized by a strategy learning lag rather than an inability to learn from task contingencies. To study EIUsers' decision-making functions, in the current study, we used more decision-making experimental paradigms including Kirby and Richards delay discounting task which can measure if participants prefer immediate reward to future larger reward, and Cambridge Gambling Task which can measure participants' risk-seeking behavior. We also studied EIUsers' function of executive control with Wisconsin Card Sorting Test (WCST). Results of the third study are being analyzed now. We will report these results in future.

Our study of is a good start point to research EIUsers' cognitive functions with experimental methods. Results of our studies may help diagnosing and treating

EIUsers. Based on our study, more researches should be taken on EIUsers' neural activities and different factors (e.g. age, gender, education and culture) influencing on EIUsers' behaviors.

Some of the work described in this dissertation was appreciated by other researchers. One of the reviewers of CNS Spectrum commented on the paper of study I "Overall, the paper was well written and deals with a new area of research. As the field of Internet addiction (excessive Internet use) continues to grow, this paper adds to the fundamental understanding of the disorder. The design is helpful in understanding factors that are predictive of incidence and remission. The authors apply a number of assessment measures and gather a relatively good sample size to support their findings which provides an initial view of similarities and dissimilarities in decision making function between excessive Internet uses and other addictive behaviors." (more comments please see attached files after the first page of the article of study I)

The result of Study I was accepted by CNS Spectrum (Impact Factor 2007: 2.222); Study II has already published on Cyberpsychology & Behavior (2008, 11: 545-548, Impact Factor 2007: 1.368). Study III is now in the stage of research paper writing.

Keywords: Excessive Internet Use, Excessive computer game playing, decision-making, inhibition, executive control, emotion

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