

摘要

无聊在大学生群体中普遍存在,已经成为学业中感受最强烈的情绪之一,而且无聊对学业成就具有负面影响。在外语学习的背景下,为数不多的无聊现象的研究大多停留在行为观测层面,发现无聊是由环境的无意义和个体缺乏动机导致的,但目前还没有考察状态型无聊和特质型无聊对外语词汇学习效果的影响是类似还是不同的。状态型无聊和特质型无聊在概念等方面存在明显差异,并且对两者的关系的研究结果还未达成一致观点,这两类无聊的神经机制是关联还是分离的还不清楚,而且无聊影响外语词汇学习效果的神经机制也还没有进行探索。

结合行为实验和功能性磁共振成像(fMRI)技术可以很好地探索状态型无聊和特质型无聊对外语词汇学习效果的影响及其神经基础。功能性磁共振成像方法和心理学实验手段可以将语言现象与大脑之间的关联较为客观地展示出来,并揭示外语学习的神经基础,从而为基于思辨的语言学理论提供数据支撑和验证。因此,本研究旨在探索特质型无聊和状态型无聊对外语词汇学习效果的影响,同时探索这两类无聊是否存在可辨别的神经机制,进一步探究状态型无聊和特质型无聊与外语词汇学习效果的关系是否与各自的脑机制存在关联。在学业情绪理论框架下,采用量表结合“学习-测试/再认”范式的任务,对非语言专业的大学生进行测试,以遗忘率作为外语词汇学习效果的指标,借助fMRI技术,探索无聊影响外语词汇学习效果的神经基础。本文共包括三个研究:

研究一使用无聊倾向量表(BPS)和多维状态无聊量表(MSBS)结合“学习-测试”任务来探索状态型无聊和特质型无聊对大学生外语词汇学习效果是否存在影响,结果发现状态型无聊和特质型无聊对外语词汇学习效果的影响不同;特质型无聊对外语词汇学习效果的影响不显著,而状态型无聊对外语词汇学习效果具有显著负面影响,可能的原因是无聊状态下,注意缺乏导致学习效果欠佳。

研究二使用fMRI技术探索状态型无聊和特质型无聊的脑机制,考察基于体素形态(VBM)分析的灰质体积(GVM)、静息态的局部一致性(ReHo)和低频振幅(ALFF)指标的特点,研究发现状态型无聊和特质型无聊的脑结构和静息态功能态的特点相对独立;结构上,状态型无聊与负责注意控制网络的双侧额上回显著相关,而特质型无聊与涉及体感系统的双侧后脑岛显著相关。功能上,状态型无聊显著相关的脑区主要涉及默认网络的左侧角回以及左侧中央前回等脑区,而特质型无聊主要涉及运动系统的右侧中央前回脑区。这一研究结果表明状态型无聊和特质型无聊可能分别主导无聊的认知和情感维度。

研究三在研究一和研究二的基础上,探索状态型无聊影响外语词汇学习效果的神经基础,检验状态型无聊相关联的左侧额上回的灰质体积及其全脑的功能连

接(FC)在状态型无聊影响外语词汇学习效果的关系中的中介效应,分析发现在脑结构和脑功能上,左侧额上回在状态型无聊影响外语词汇学习效果的关系中都起了部分中介作用,表明左侧额上回的注意控制的表征能力可能在状态型无聊与外语词汇学习效果的关系中具有重要影响,无聊状态下左侧额上回抑制更多的认知资源进行工作记忆等认知加工过程。显然,左侧额上回在状态型无聊影响外语词汇学习效果中起了重要的注意控制作用。

本研究从大脑的静息态与结构像视角揭示状态型无聊和特质型无聊的脑机制及状态型无聊影响外语词汇学习的神经基础,一方面为外语人才的培养提供了理论依据和基于脑神经的评估方法。另一方面,为应对和调控特质型无聊和状态型无聊及其影响提供了数据参考。总之,本研究对理解无聊影响外语词汇学习的本质原因、开发无聊情绪研究的广度和深度都具有重要的理论和实践意义。

关键词: 特质型无聊; 状态型无聊; 外语词汇学习; 功能性磁共振成像 (fMRI); 神经基础

Effects of boredom on novel lexicon learning and its neural basis

Abstract

Boredom is common among university students. It has become one of the most intense emotions in study, which has a negative impact on academic performance. In the context of foreign language learning (FLL), the few studies on boredom by behavioral observation have found that boredom is caused by environmental meaninglessness and individual lack of motivation. However, no research has explored whether state boredom and trait boredom have similar or different effects on novel lexicon learning. There are obvious differences between state boredom and trait boredom in terms of concept, and there is no consensus on the results of the relationship between the two. And it is not clear whether the neural mechanism of the two types of boredom is related or separated, and the neural basis of boredom affecting novel lexicon learning has not been explored.

The effects of state boredom and trait boredom on novel lexicon learning and their neural basis can be explored by combining behavioral experiments with functional magnetic resonance imaging (fMRI). The study using fMRI and psychological experiments can objectively demonstrate the relationship between language phenomena and the brain, and explain the neural basis, which provides data support and verification for speculative linguistic theories. Therefore, this study aims to investigate the effects of boredom on novel lexicon learning and its neural basis, and to explore whether there is a discernible neural mechanism between state boredom and trait boredom. In the framework of the control-value theory (CVT), non-language major university students were tested by questionnaires and “learning - test/recognition” task. And forgetting rate was regarded as the indicator of novel lexicon learning. Combining behavioral results with fMRI data was to explore the neural basis of boredom affecting on novel lexicon learning. This paper includes three studies:

Study I used Boredom Proneness Scale (BPS), the Multidimensional State Boredom Scale (MSBS) and learning tasks to explore whether state boredom and trait boredom had a significant impact on novel lexicon learning. The results showed that state boredom and trait boredom had different effects on novel lexicon learning. Only state boredom had significantly negative effects on novel lexicon learning, while not

trait boredom, indicating that inattention in the state of boredom led to poor learning effect.

Study II used fMRI to explore the neural mechanism characterizing state boredom and trait boredom, both grey matter volume (GMV) using voxel-based morphometry (VBM) in the level of structure (sMRI) and ReHo, ALFF in the level of function (rs-fMRI) included. The results showed that the brain features of state boredom and trait boredom in terms of structure and function were relatively independent. Structurally, trait boredom was associated with bilateral posterior insula involved in somatosensory systems, while state boredom was related to bilateral superior frontal gyrus characterizing attentional control patterns. Functionally, trait boredom mainly involved the right precentral gyrus of motor system. The brain regions associated with state boredom mainly involved the left angular gyrus of the default network and the left precentral gyrus. These results suggested that state boredom and trait boredom dominated cognitive and emotional dimensions of boredom respectively.

Furtherly, in Study III, according to the results of Study I and Study II, GMV of the left superior frontal gyrus and the functional connection (FC) between the left superior frontal gyrus and the left precentral gyrus was considered to be a mediator respectively. Mediating effect test showed that the left superior frontal gyrus partially mediated the effects of state boredom on novel lexicon learning in both of structure and function. This suggested that the function of attentional control related to the left superior frontal gyrus may play an important mediating role in the effect of state boredom on novel lexicon learning. The function of this brain region inhibited more cognitive resources for working memory and other cognitive processing in the state of boredom. Obviously, the left superior frontal gyrus played an important executive control role in this process.

From the perspective of sMRI and rs-fMRI, this study reveals the neural mechanisms of state and trait boredom and the neural basis of state boredom affecting novel lexicon learning. On the one hand, it provides a theoretical basis for the cultivation of foreign language talents and an evaluation method based on brain nerves. On the other hand, it offers data reference for coping with and regulating state and trait boredom and their influence. In conclusion, this study has important theoretical and practical significance for understanding the essential reasons of boredom affecting novel lexicon learning and exploring the breadth and depth of boredom.

Key words: Trait boredom; State boredom; Novel lexicon learning; fMRI; Neural basis