Introduction

Despite the well-documented benefits of physical activity for enhancing cognition, emotional, and physical health, a persistent challenge is how to motivate people to engage in physical activity in their daily lives. Clinical trials have attempted to identify optimal messages that could be delivered in health interventions with mixed success. The neurobiological mechanisms underlying effective communication of these messages remains largely unspecified. The small number of studies that have used neural responses to predict behavior change have largely described brain-behavior relationships that are agnostic to message characteristics, making it difficult to identify why some messages are most effective in driving brain responses that relate to later behavior. The goal of this project is to use a neuromarketing approach to identify neural predictors of health behavior change and ultimately produce more effective health interventions.

Methods

Healthy adult participants (ages 30–80) completed a behavioral assessment, baseline activity tracking, an fMRI scan, and then participated in an 80 day mobile health intervention where they received framed messages focused on benefits of physical activity and risks of being sedentary while wearing a FitBit.

While undergoing fMRI, during each trial participants read one of 80 statements (that they would later receive as a text message) and made a motivation rating on a scale of 1–10.

Goals

- Evaluate whether message framing (valence, social) affects motivation ratings and physical activity in daily life
- Identify brain regions that track motivation ratings (are more active when participants rate messages as more motivating)

Results

Motivation ratings and physical activity

Positive messages were rated as more motivating than negative messages (left) but message framing did not affect daily activity (below).

Self-reported motivation ratings explained less than 2% of the variance in daily physical activity.

Parametric effect of subjective motivation ratings across participants

- No significant clusters at p<.001
- Highly exploratory 40 voxel extent at p < .01 (right) revealed some evidence for a correlation between motivation rating and BOLD signal (warmer colors = positive correlation).

Individual participants

Some participants showed greater activation in the MPFC, PCC for messages rated as more motivating. However, many participants did not show this pattern or showed opposite effects in the MPFC.

Conclusions

The results revealed that overall there was a weak association between self-reported motivation ratings and neural activity across participants. Although some participants had higher activity in the MPFC and PCC when rating a message as being very motivating, it was not clear why we didn’t observe this effect across participants. After additional data quality checks, future analyses will examine whether functional neural responses to health messages explain significant additional variance, beyond self-reported motivation ratings which explained very little variance in daily physical activity. The broader aim of these studies is to better understand how the brain responds to health communication and motivates behavior change, in order to produce more successful health interventions.

Supported by NIH/NIA grant P30-AG034424, Duke Bass Connections, and the Charles Lafitte Foundation.