'effort'. However, the findings from different measurement methods are not always in agreement, with correlation often weak, and large variation between participants' data having been found. This work represents a first initiative to investigate individual differences with participants' data.

Methods

Our findings originate from secondary data analysis of data obtained from n = 31 participants (50% male, age 51-80) using repeated measures and multiple measurement methods(1). Hearing thresholds ranged from 8 to 79 dB HL (M=41.7, SD=17.7). The task was to listen to 50 sets of 6 digits presented sequentially in noise. After a three seconds' retention period, participants were shown one digit on the screen and had to indicate if this was one of the six digits. Physiological responses (PR) in EEG, GSR and pupil diameter were simultaneously recorded. Self-reported effort were measured by NASA Task Load Index. The same experiment was repeated after one week for within and between individual analysis.

Results

For each PR, the average response over the 50 trials (average trial response, ATR; approximately 18 seconds in duration) and the time trend over the 50 trials (time course response, TCR; approximately 30 minutes duration) were analysed. For both ATR and TCR, permutation tests demonstrated that the correlation between repeated measurements of the same PR is significantly higher than the correlation between repeated measurements of the same PR taken from other participants. Large differences in PRs between individuals were observed. K-Means cluster analysis of ATR and TCR in all PRs were carried out to group participants according to response morphology. Groups were not significantly different in self-reported effort, suggesting response morphologies were not determined by subjective effort.

Conclusions

Overall, results indicate the presence of large individual difference in physiological responses to listening effort. Average group responses poorly represent what is observed in individuals, as different individual responses can be in opposite directions. This should not be overlooked when designing experiments and analysing PRs during effortful listening.

1. S. Alhanbali, P. Dawes, R. E. Millman, K. J. Munro, Ear Hear 40, 1084-1097 (2019).

doi:10.1016/j.ijpsycho.2023.05.211

Heart rate and heart rate variability: Unaffected by caffeine consumption

S. Leimroth[a], F. Villarey[a], N. Pawlenko[a], F. DeBlasio[a], R. Barry[a]
[a]*Brain & Behaviour Research Institute, University of Wollongong, Wollongong, Australia*

Introduction

Caffeine (1,3,7-trimethylxanthine), the world's most consumed stimulant, is shown to consistently affect arousal. Unsurprisingly, caffeine is often controlled for in cardiac psychophysiological experiments. While it is reasonable to consider caffeine's stimulant effect on cardiac measures, a review of the literature suggests evidence is ambiguous. In prior research by this lab (Barry et al., 2005, 2008), in an eyes-closed (EC) condition at 30 mins post ingestion, caffeine was associated with increased skin conductance level (SCL), increased respiratory rate, a global reduction in alpha power, but no significant cardiovascular effects. Here we extend this research by including both EC and eyes-open (EO) conditions at 30 and 60 minutes post ingestion, and assessing both heart rate (HR) and heart rate variability (HRV).

Method

We analysed mean HR and low frequency (LF) and high frequency (HF) HRV from 19 young adults (12 F; age M = 20.7, SD = 3.2 years). Participants ingested 250 mg of caffeine or placebo in a randomized double-blind placebo-controlled repeated-measures crossover study. Participants abstained from caffeine for 4 hours before each of two sessions, approximately 1 week apart. ECG was recorded during 2 min alternating EO and EC epochs that commenced 4 mins after ingestion. Using Kubios HRV software we analysed mean HR, and HRV (LF and HF), during two EO epochs bracketing an EC epoch, approximately 30 mins and 60 mins following ingestion. We conducted a univariate MANOVA for each variable (Mean HR, LF and HF HRV).

Results

Our results confirm the HR findings of the prior EC study, using a different quantification approach, including the EO condition, and including measures of HRV. There was no impact of caffeine cf. placebo across conditions (EO/EC), no effect of resting condition (EC vs. EO), and no caffeine x condition interaction, at either 30 min or 60 min.

Conclusions

Our findings show that caffeine has no effect on HR or HRV during rest. While caffeine reliably increases arousal, with increased SCL and reduced alpha activity, changes in cardiac measures are not significant, indicating fractionation of the physiological measures. Considering the context of our experiment (participants at rest) these findings suggest cardiovascular measures are not sensitive to arousal alone. The few studies in the literature that do show caffeine effects on HR may be due to methodological confounds including dosage, timing, prior caffeine use and habituation, as well as individual variation in response to caffeine as an adenosinergic antagonist and phosphodiesterase inhibitor.

doi:10.1016/j.ijpsycho.2023.05.212

Atypical processing of vowels in the left auditory cortex predicts speech-in-noise perception in children with ASD

K. Fadeev[a], D. Goiaeva[a], T. Obukhova[a], T. Ovsyannikova[a], A. Prokofyev[a], T. Stroganova[a], E. Orekhova[a]
[a]*Moscow State University for Psychology and Education, Moscow, Russian Federation*

Background. Difficulty in processing speech in a noisy background are common in children with autism spectrum disorders (ASD) and can be associated with impaired processing of the basic properties of speech sounds, especially vowels, which play a crucial role in speech recognition. Formant structure and periodicity are key vowel characteristics that are automatically detected early in sound processing stream. It is unknown whether such automatic processing is altered in people with ASD. Here we used magnetoencephalography (MEG) to investigate whether vowel processing in the auditory cortex in children with ASD is altered and whether this putative deficit is related to their perception of speech in stationary noise or their ability to benefit from gaps in amplitude-modulated noise.

Method. The ability to recognise words in stationary and amplitude-modulated noise was examined in 42 children with ASD and 38 typically developing children aged 7-12 years. In some of these children, we recorded MEG while they were passively listening to synthetic vowels of 800 ms duration. Vowels were interspersed with spectrally complex sounds that matched the temporal characteristics of the synthetic vowels and were characterized either by F0 periodicity ('periodic non-vowels'), or formant structure ('non-periodic vowels'), or neither of these qualities