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What anthropometric, psychological, and lifestyle factors influence endogenous pain modulation?

Student: Pratham Gurung[a] | **Supervisor(s):** Dr Samuel A Smith[b], Professor Alexis R Mauger[c]

Abstract:

Background: The endogenous pain modulatory system in humans inhibits the sensation of pain throughout the body. Conditioned Pain Modulation (CPM) is an experimental technique used to measure the capabilities of this system in an individual. It is unknown which factors are most predictive of an individual's ability to modulate pain endogenously, and which type of factors are most significant. Thus, this research aimed to discover the relationship between anthropometric, psychological and lifestyle factors and CPM in healthy adults.

Methods: Twenty-six adults (12 males, 14 females) attended two lab visits; their age, height, weight, BMI, and fat mass percentage presented as mean ± SD were 23 ± 3 years, 172 ± 8 cm, 68± 11 kg, 23.15 ± 3.98, and 24% ± 10.5% respectively. To measure CPM, participants first underwent test stimulus (on index finger of right hand) by pressing an algometer and reaching 0.5 out of 10 on the Cook Pain Intensity Scale. This was followed by the conditioning stimulus (above antecubital fossa of left arm) where a pressure cuff was inflated gradually to 7 out of 10 on the scale. Following this, the test stimulus was tested again. The outcome variable was the degree of change in pressure pain threshold before and after the conditioning stimulus. Psychological variables measured include positive and negative affect, pain expectation and confidence, and pain quality.
Subjective and objective measures of physical activity were taken. Stepwise regression analysis was performed to identify which variables can form a regression model which can predict participants' CPM. Significance testing was used to identify the variables that are significant independent predictors of CPM.

Results: The regression model included five variables which predicted 62.1% of the variance in CPM ($R^2 = 0.621$, Adjusted $R^2 = 0.526$, $\Delta R^2 = 0.087$) with a $p < .001$. These variables were negative affect at the present moment, pain expectation, objective walking data (hr/day), subjective vigorous physical activity (day/week) and walking data (day/week). The first three variables were negatively correlated with CPM, while the latter were positively correlated. Negative affect and pain expectation combined explained the most variance (31.6%) before the lifestyle factors. Significance testing revealed only the first three variables were significant independent predictors of CPM ($p < .05$), whereas the subjective physical activity measures were not ($p > .05$).

Conclusions: This study provides evidence for the importance of psychological and lifestyle factors in the efficacy of the endogenous pain modulatory system, highlighting psychological factors as more significant. Objective walking data is negatively correlated with CPM, while self-reported vigorous physical activity and walking help contribute to the accurate prediction of CPM but are not directly correlated with the efficacy of endogenous pain modulation significantly. The discovery of these five variables as key in predetermining CPM, and the endogenous analgesic system by extension, sets up key targets for promoting emotional well-being and physical activity as effective pain management strategies. The findings should lead future research to identify what interventions can improve these five variables the most effectively and improve endogenous pain inhibition.

Keywords: Pain | Endogenous Pain Modulatory System | Conditioned Pain Modulation | Emotion | Pain Expectation | Physical Activity

[a] 4th Year Medical Student, Kent and Medway Medical School, Canterbury, Kent, United Kingdom.

[b/c] School of Sports and Exercise Sciences, University of Kent, Canterbury, Kent, United Kingdom.

Main contact email: p.gurung362@kmms.ac.uk