

**A study of the interaction between musical tonality and colour saturation on mood improvement: constructing a framework for multi-channel mood experience**

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**Purpose:** This study explores the effects of the interaction between musical tonality and colour saturation on mood improvement through an empirical approach to construct a framework for multi-channel emotional experience.

**Methods:** The study used a 2 (musical tonality: major, minor) x 3 (colour saturation: high, medium, low) between-subjects experimental design, recruited healthy participants from different backgrounds (N=xx), and analysed the mechanism of synergistic action of the audiovisual channels in conjunction with physiological indices (heart rate, galvanic activity of the skin) and reports of subjective mood.

**Results:** The results showed that there were significant main and interaction effects of music tonality and colour saturation on the level and potency of emotional arousal: the combination of major key music and high saturation colours significantly enhanced positive emotional arousal ( $p < .05$ ), medium saturation colours showed transitional features of emotional regulation in both tonalities, while the combination of minor key music and low saturation colours reinforced the experience of negative emotions; physiological data further showed that individuals' perceptual sensitivity to high saturation colours was enhanced in high arousal states, and the adaptation of medium saturation colours was more pronounced in low arousal states.

**Conclusion:** The study verified the information integration mechanism of auditory and visual in the cross-sensory theory, revealed the pathways through which musical tonality influences colour perception through emotional mediation, and provided theoretical and practical basis for music therapy, colour psychology and multi-channel emotion regulation strategies. Future research could expand the dimension of multisensory integration and deepen the exploration of neural mechanisms to enhance ecological validity and applicability.