



Dental Fear and *MC1R* Genotype: Fear of Pain as Mediator

Center for Oral Health Research in Appalachia (COHRA)

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Background

- Dental fear is a prevalent and important problem
 - 45 million adults in USA with moderate fear; 10-20% report severe levels (Dionne et al., 1998; Smith & Heaton, 2003)
 - Fear is associated with avoidance of treatment and other poor oral health behaviors (e.g., Armfield et al., 2007; Meng et al., 2007)
 - Fear and avoidance are associated with:
 - oral health status (e.g., Armfield et al., 2009; Randall, McNeil et al., 2013; Schuller et al., 2003)
 - lower quality of life and self-esteem (Crofts-Barnes et al., 2010; Locker, 2003)
 - diabetes, cardiovascular disease, neurocognitive problems, poor pregnancy outcomes (e.g., Offenbacher et al., 1996; Williams et al., 2008)
- Fear of pain is a critical component of dental fear (McNeil & Berryman, 1989)
- Detailed conceptualizations of both dental fear and fear of pain have been established, but most have failed to explicitly include the role of genetics
- Recent work suggests that there are genetic contributions in the etiology of dental fear
 - Dental fear is moderately heritable (Randall, Shaffer et al., 2013; Ray et al., 2010; Vassend et al., 2011)
 - Melanocortin-1 Receptor (*MC1R*) gene variants are associated with dental care-related fear (Binkley et al., 2009)
- The aims of this study were to:
 - confirm the previously reported association between *MC1R* variant status and dental fear
 - examine how *MC1R* variant status is related to fear of pain
 - determine whether fear of pain mediates the relation between *MC1R* variant status and dental fear

Results

- Consistent with existing literature, 31.2% of the sample had *MC1R* variants
- As has been demonstrated before, *MC1R* variant status predicted dental fear, controlling for age and sex ($\beta = .07$, $p = .05$)
- MC1R* variant status also predicted fear of pain, controlling for age and sex ($\beta = .07$, $p = .02$)
- Fear of pain predicted dental fear, controlling for age and sex ($\beta = .50$, $p < .001$)
- Fear of pain mediated the relation between *MC1R* variant status and dental fear ($\beta = .51$, $p < .001$, $R^2 = .25$)

Table 1. Final Regression Model: Predicting DFS Score

Predictor Variable	Unstandardized regression coefficient (B)	Standard Error	Standardized Regression Coefficient (β)	Significance Value (p)
Age	.065	.02	.01	.72
Sex	1.63	1.2	.04	.17
<i>MC1R</i> Variant Status	1.10	1.2	.03	.36
FPQ-9 Score	1.19	.07	.51	< .001

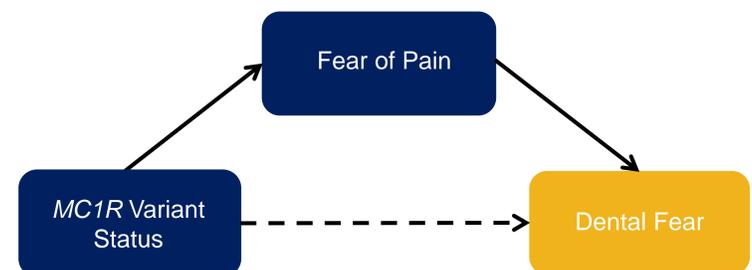


Figure 1. Fear of Pain Mediates Relation between *MC1R* Variant Status and Dental Fear

Method

Utilized existing COHRA data from a large, family-based cross-sectional study on determinants of oral diseases at the community-, family-, and individual levels (Marazita et al., 2005; Polk et al., 2008; Randall, McNeil, Crout et al., 2013)

Participants

- 732 households (containing at least one biological parent-child pair) enrolled; For data analyzed, sample included age 21 and older (N = 920, 64% female)
- Mean age = 35.2 years (SD = 8.7, range = 21-74)

Self-Report Assessment Instruments

- Demographic questionnaire (see Polk et al., 2008)
- Fear of Pain Questionnaire-9 – FPQ-9 (McNeil et al., 2015)
- Dental Fear Survey – DFS (Kleinknecht et al., 1973)

DNA Collection, Genotyping, and Risk Score Calculation

- DNA collected for all participants from blood, saliva, or cheek swab samples; Genotyped on Illumina platform
- Labeled the following *MC1R* SNPs as “variant”: rs1805006, rs11547464, rs1805007, rs1110400, rs1805008, rs1805009 (as in Binkley et al., 2009)
- Genetic data combined across variants to calculate risk score (positive variant status – one or more *MC1R* variants; negative variant status – zero *MC1R* variants)

Data subjected to mediational (simple & multiple regression) analyses, utilizing Baron & Kenny (1986) approach

Conclusions

- Fear of pain mediates the relation between *MC1R* genotype and dental fear
- Thus, genetic factors, and particularly the *MC1R* gene, play an important part in the etiology of dental fear
- Future experimental work will determine the mechanism by which the *MC1R* gene is associated with fear of pain and dental fear, with particular attention paid to its role in dental pain sensitivity
- These results enhance our conceptualization of dental fear and, with additional work, may offer potential targets for intervention in the treatment of dental care-related fear and anxiety to improve dental treatment-seeking behavior

Contact & Support

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