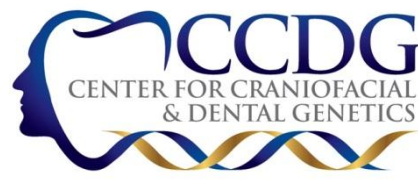
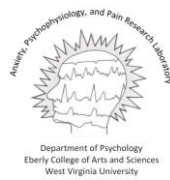


Relation Between Dental Fear and Fear of Pain: How Heritable?

Cameron L. Randall^{1, 7}, John R. Shaffer^{2, 7}, Xiaojing Wang^{3, 7}, Daniel W. McNeil^{1, 4, 7},
Richard J. Crout^{5, 7}, Robert J. Weyant^{6, 7}, and Mary L. Marazita^{3, 7}



¹Department of Psychology, Eberly College of Arts and Sciences, West Virginia University

²Department of Human Genetics, Graduate School of Public Health, University of Pittsburgh

³Center for Craniofacial and Dental Genetics, Department of Oral Biology, School of Dental Medicine, University of Pittsburgh

⁴Department of Dental Practice and Rural Health, School of Dentistry, West Virginia University

⁵Department of Periodontics, School of Dentistry, West Virginia University

⁶Department of Dental Public Health, School of Dental Medicine, University of Pittsburgh

⁷Center for Oral Health Research in Appalachia (COHRA)

Overview and Significance

- Minimal dental care-related fear research has incorporated genetic variables (e.g., Binkely et al., 2009; Ray et al., 2010; Vassend, Roysamb, & Nielsen, 2011)
- Genetic factors may be important for understanding mechanisms involved in dental care-related fear
- Complete understanding of etiological mechanisms is critical for treatment development

Introduction

- Greater levels of dental care-related fear → avoidance of treatment (Doerr et al., 1998; Moore et al., 1996)
- Avoidance associated with poorer oral and systemic health (Schuller et al., 2003; Williams et al., 2008)
- Between 10% and 20% of adults report a high level of fear associated with dental visits (Smith & Heaton, 2003)

Introduction (continued)

- Fear of pain is a critical component of dental care-related fear (McNeil & Berryman, 1989)
- Interplay of fear of pain and pain sensitivity is important for understanding dental-care related fear (Kent, 1985; McNeil et al., 2011)

Introduction (continued)

- Dental care-related fear has been hypothesized to be at least partly heritable (e.g., Thomson et al., 2009; Vassend et al., 2011)
- **Inheritance may be, at least in part, a result of the inheritance of pain sensitivity and, relatedly, an inclination toward fear of pain**

Objectives

1. Determine the heritability of dental care-related fear
2. Determine the heritability of fear of pain
3. Determine the shared heritability of dental care-related fear and fear of pain

Participants

- Members of families taking part in the Center for Oral Health Research in Appalachia (COHRA) study on determinants of oral diseases in families
 - N = 1370 (632 female)
 - Ages 11 – 81 years ($M = 29.1$, $SD = 12.2$)
 - Appalachia population (McNeil, Crout, Marazita, 2012)

Method

- Measures
 - **Dental Fear Survey** – 20-item, self-report measure of anxious reactions to dental situations (Kleinknecht et al., 1973)
 - **Fear of Pain Questionnaire-Short Form** – 9-item, self-report measure of pain-related fear (McNeil & Rainwater, 1998)
- DNA Collection
 - **Blood and saliva sampling** (Oragene*DNA Self-Collection Kit; DNA Genotek Inc., Ottawa, Ontario, Canada)

Method

- Participants completed study questionnaires as part of a larger, comprehensive protocol (Polk et al., 2008)
- Heritability and genetic correlation estimated from families using likelihood-based methods under the variance components framework

Results - Relative Pairs

- 1370 Individuals
- 480 Parent-Offspring Pairs
- 146 Sibling Pairs
- 10 Grandparent-Grandchild Pairs
- 31 Avuncular Pairs
- 41 Half-Sibling Pairs
- 1 Half-Avuncular Pair
- 16 First Cousin Pairs



Relative pairs used
in heritability
analysis

Results - Heritability

Heritability Estimates for Measured Phenotypes

Phenotype	h^2r	R^2	p -value
DFS – Total Score	.30	.03	1×10^{-4}
DFS – Avoidance Subscale	.22	.02	4×10^{-3}
DFS – Specific Stimuli Subscale	.36	.02	3×10^{-6}
DFS – Physiological Arousal Subscale	.14	.04	3×10^{-2}
FPQ – Total Score	.35	.05	4×10^{-6}
FPQ – Minor Pain Subscale	.16	.02	2×10^{-2}
FPQ – Severe Pain Subscale	.30	.05	3×10^{-5}
FPQ – Medical Pain Subscale	.35	.04	3×10^{-6}

Note: Heritability estimates are adjusted for sex and age. Standard Error = .08 for all heritability estimates. Sex effect is significant at $p = 1 \times 10^{-12}$.

Results – Genetic Correlations

Genetic Correlations for Selected Phenotypes

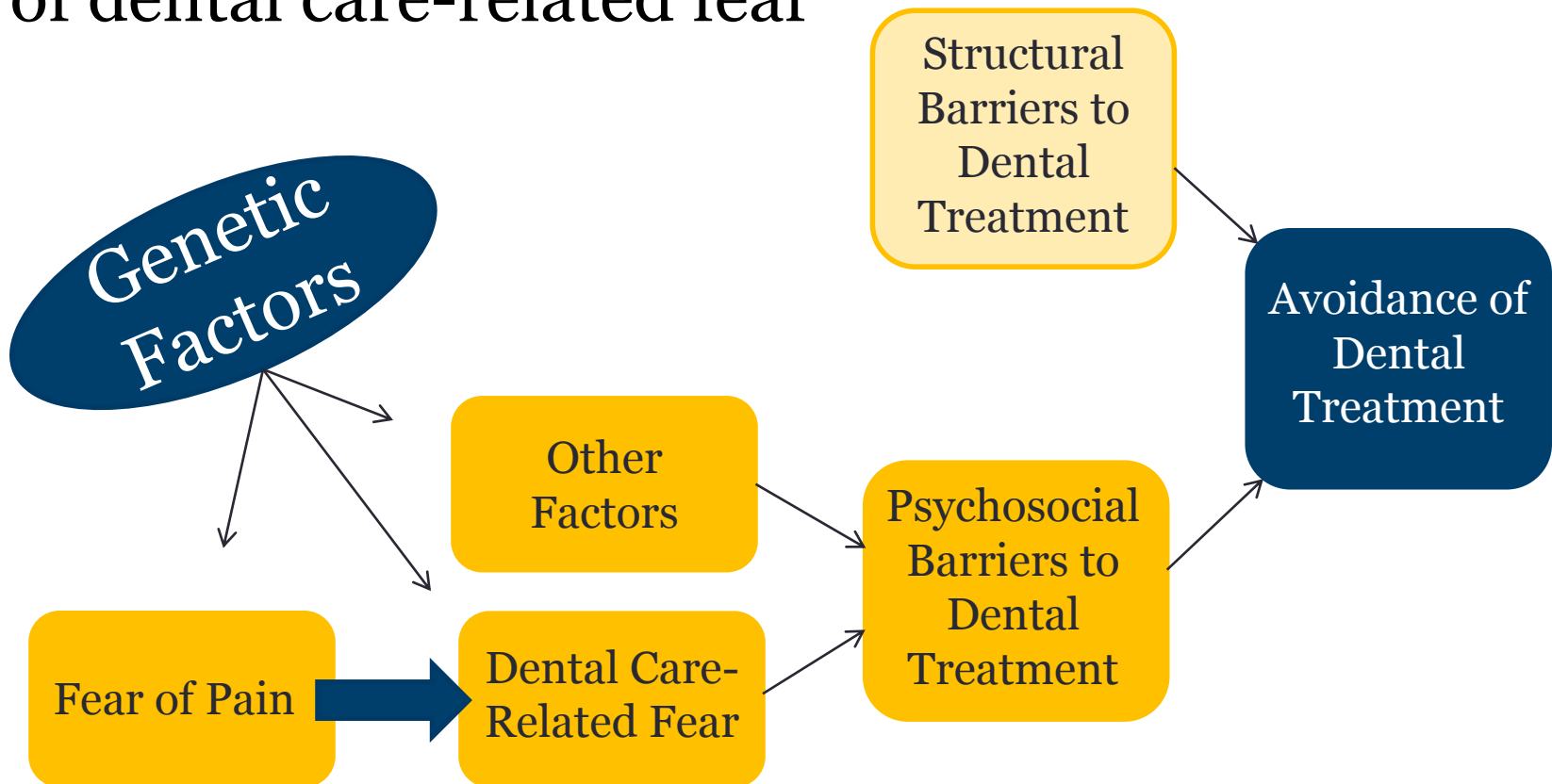
	rhoG	p-value H₀: rhoG = 0
DFS – Total Score & FPQ – Total Score	.68	1 x 10 ⁻²
DFS – Total Score & FPQ – Minor Pain Subscale	.19	6 x 10 ⁻¹
DFS – Total Score & FPQ – Major Pain Subscale	.72	7 x 10 ⁻³
DFS – Total Score & FPQ – Medical Pain Subscale	.76	4 x 10 ⁻³

Conclusions

- In line with existing literature, dental care-related fear is associated, but not completely overlapping, with fear of pain, $r = 0.50$, $p < 0.01$ (phenotypic correlation)
- Both dental care-related fear and fear of pain are moderately heritable, 30% and 35%, respectively
- Notably, there is a substantial genetic correlation between dental care-related fear and fear of pain
 - 44.9% of the genes accounting for one phenotype also account for the other phenotype

Discussion

- The findings bolster existing literature that suggests that fear of pain is a critical component of dental care-related fear



Limitations

- Phenotypes are based solely on self-report data
- One inclusion criterion was that all members of a household participate, so many (but not all) relatives lived together
- Comparison of heritability of subscale score “phenotype” and total score “phenotype” should be done with caution, as one is part of the other
- Did not account for environmental factors given data available and modeling strategy
- Though heritability is evident, it is unclear what role genes play in development/maintenance of dental care-related fear, and which genes

Acknowledgements

- **Participating families and community partners**
- **Anxiety, Psychophysiology, and Pain Research Laboratory** (Director: D. McNeil)
- **Center for Oral Health Research in Appalachia (COHRA)**, supported by grant R01 DE014899 from the National Institutes of Health/National Institute of Dental and Craniofacial Research (PI: Marazita)
- **Behavioral and Biomedical Sciences Predoctoral Traineeship**, Research and Graduate Education, Robert C. Byrd Health Sciences Center, West Virginia University (funded by NIH/NIGMS grant T32 GM081741)

Thank you for your attention.

