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## Introduction

- Exposure to adversity early in life can undermine developmental well-being by accelerating aging<sup>1</sup>
- Molar eruption is assessed routinely and unambiguously, and may therefore serve as an easily accessible biomarker to identify individuals at risk for accelerated development<sup>2</sup>
- The COVID-19 pandemic has been an unprecedented life stressor for many families, but it remains unknown whether it has impacted the pace of children's development
- Accelerated maturation may correlate with reduced brain plasticity<sup>3</sup>, and thus have consequences for learning and cognition

## Methods

### Aims

- (1) Explore the influence of the COVID-19 pandemic on the timing of dental development among young children
- (2) Investigate associations between accelerated molar development and cognition

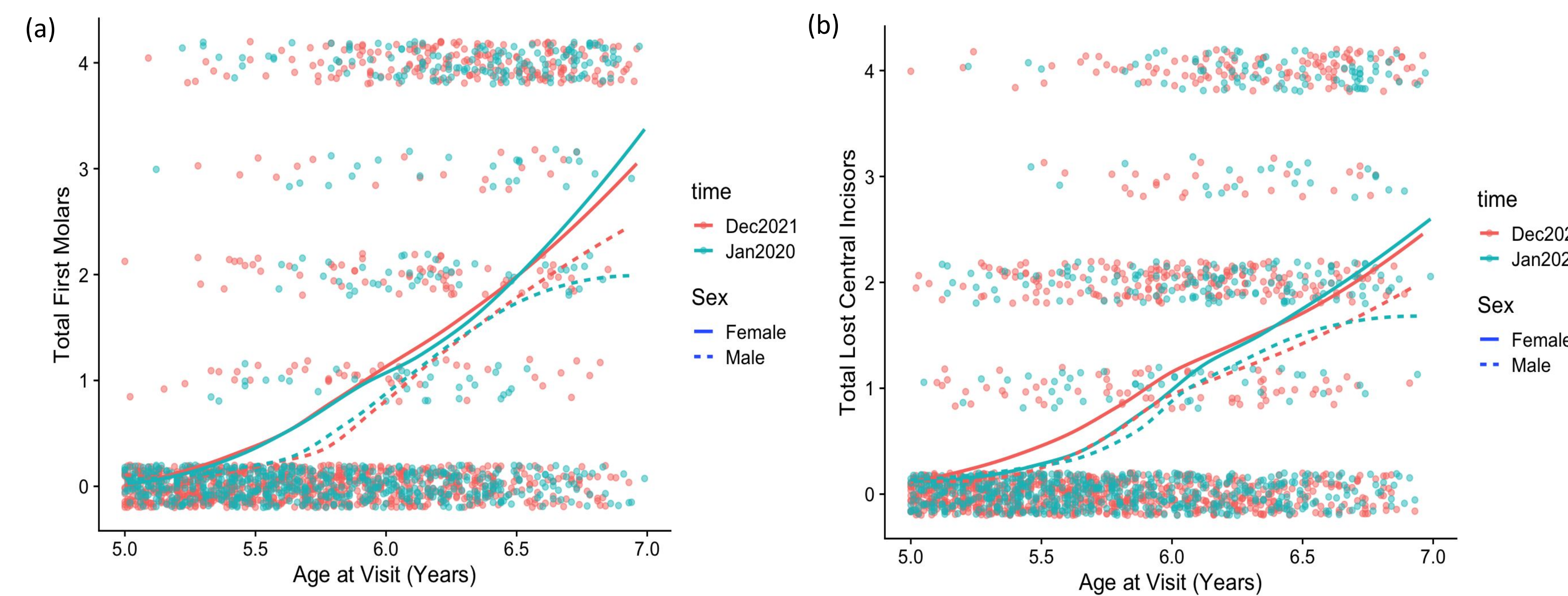
### Study 1.

- Determined tooth state from deidentified dental records from Penn Dental
  - The state of each tooth was determined: 0 = permanent, 1 = primary, 2 = permanent missing, 3 = primary missing
- Cross-sectional group comparison to determine whether the pandemic has significantly altered the developmental trajectory of teeth in children ages 5-7
  - Used linear regression models, controlling for age and gender
  - January 2020 vs. December 2021

### Study 2.

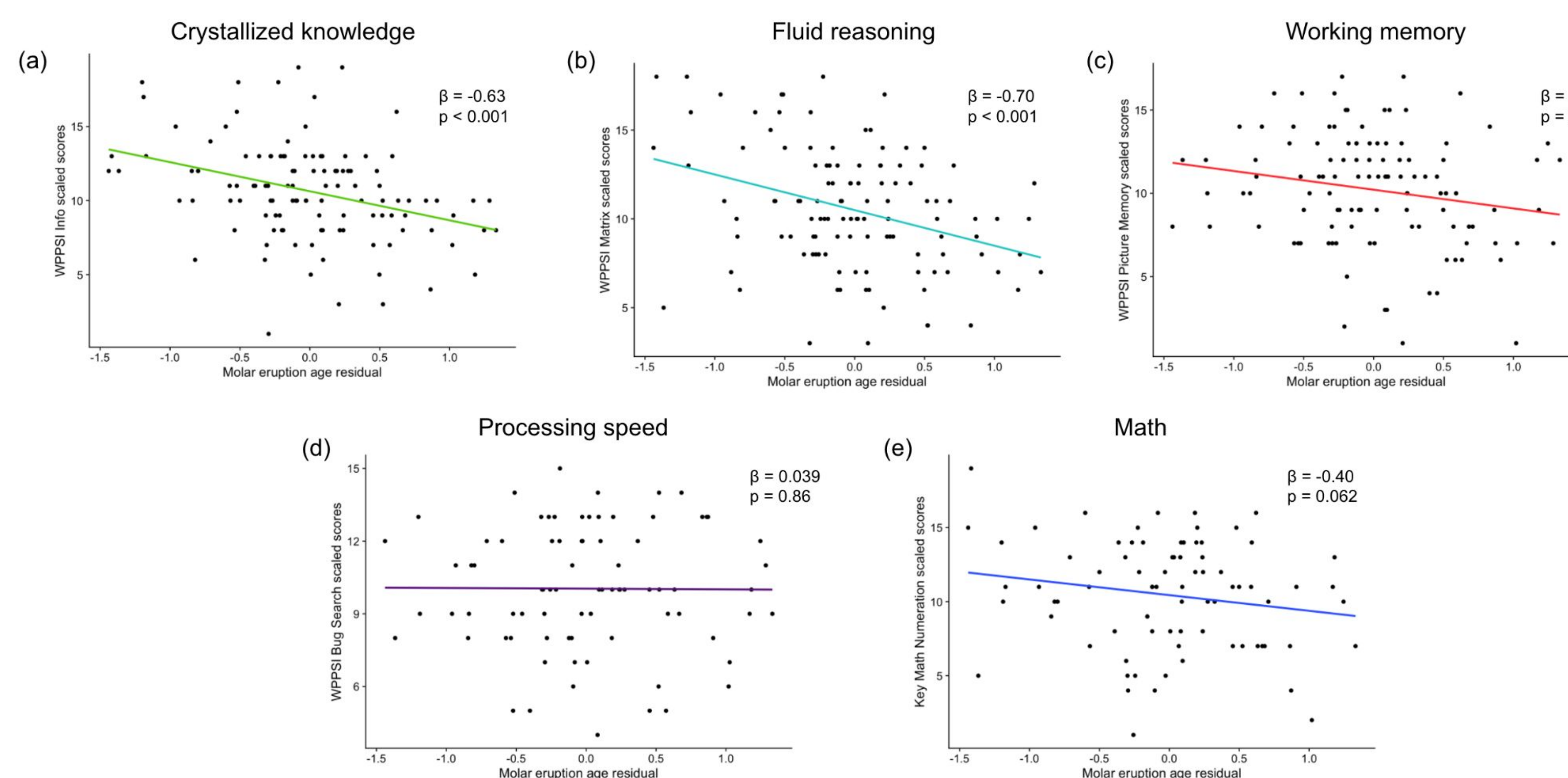
- Molar eruption status was rated from T2-weighted MRI scans of children ages 4-7
  - Eruption status of each first permanent molar was rated on a scale from 1 (unerupted) to 4 (fully erupted)
- Questionnaires about were administered to parents about gender, race/ethnicity, household income
- Children completed standardized cognitive tests:
  - Crystallized knowledge: WPPSI Information
  - Fluid Reasoning: WPPSI Matrix Reasoning
  - Working Memory: WPPSI Picture Memory
  - Processing Speed: WPPSI Bug Search
  - Math: Key Math Numeration
- Tested association between molar eruption and cognition
  - Used linear regression models, controlling for age, gender, and household income

## The COVID-19 Pandemic has not significantly altered molar eruption



Difference in (a) molar eruption and (b) central incisor loss, between the pre- and post-pandemic samples; separated by gender

## Accelerated development may have cognitive consequences



Association between age-residualized molar eruption and cognitive tests, (a) WPPSI Information, (b) WPPSI Matrix Reasoning, (c) WPPSI Picture Memory, (d) WPPSI Bug Search, (e) Key Math Numeration. Positive residuals indicate accelerated molar development

## Results

### Study 1.

- Observed the expected effects of age and gender on molar eruption and central incisor loss within both child samples
- No significant pandemic effects on molar eruption.
- Central incisor loss may be a leading indicator of accelerated dental development. Trend for young girls to show early central incisor loss during the pandemic.

### Study 2.

- Molar eruption was negatively associated with three cognitive skills: crystallized knowledge, fluid reasoning, and working memory
- Significance of molar eruption status was reduced when accounting for income, but still was significant for fluid reasoning

## Limitations

- We may not have captured the lasting effects of the pandemic on the speed of maturation by the end of 2021.
- Dental development may be less malleable to transient stressors.
- We could not test for changes in cognitive performance over time; longitudinal research is necessary.
- These findings are not deterministic; if a child shows earlier dental development, it does not mean that there will definitely be cognitive consequences.

## Conclusions

- Molar eruption status can be characterized early in life to identify children at risk for accelerated aging and therefore poorer cognitive abilities.
- A key direction for future research is to determine whether early psychosocial intervention programs can alter patterns of accelerated biological aging among stress-exposed children.

## Acknowledgements

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