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Time Varying Predictor Model of Socialization Behavior in Children Diagnosed with Pediatric Brain Tumors

Alyssa Ailion, Tricia Z. King, Ph.D., Chris Henrich, Ph.D., Robin Morris, Ph.D., and Nicolas Krawiecki, M.D.

Introduction

- Medical advances have improved the survival rate of children with brain tumors, allowing research on long term outcomes (Palmer, 2008).
- Research suggests that children diagnosed with pediatric brain tumors may be at risk for social impairments (Carey et al., 2001; Poggi et al., 2005), which could affect performance in a normal classroom setting.
- Prior research suggests that social functioning is often negatively affected by brain insults, and childhood receptive vocabulary may be related to socialization behavior for children with traumatic brain injuries (Greenham et al., 2010).
- **The purpose of this study was to investigate the longitudinal relationship between changes in receptive vocabulary and socialization behavior in children diagnosed with brain tumors.**

Hypothesis

1)There will be a positive correlation between the slope of receptive vocabulary and socialization behavior.

2) Presence of radiation therapy will be related to poorer receptive vocabulary and socialization.

Method

- Analyses included standard scores from the Peabody Picture Vocabulary Test Revised (Dunn and Dunn, 1981) and the Vineland Socialization Scale (Sparrow et al., 1984).
- The data collection schedule included assessments at diagnosis, six months later, and each year afterwards.

Participants

- The sample consisted of 154 children who participated in a longitudinal research study, and participants had 1-7 assessments resulting in 544 cases for analysis.
- There were 75 female and 79 male participants.
- SES was on average 3.12 (*SD=1.23*) where higher scores mean lower SES (Hollingshead, 1957).
- 98 participants were treated with radiation therapy, 72 had a hydrocephalous diagnosis, and 47 had a prescription for seizure medication.
- The average age at diagnosis was 7.46 (*SD*=4.2) and ranged from -.05 to 16.51 years old.
- The average age at the first time point was 8.58 (*SD*=4.14) and ranged from 5 to 18.25 years old.

Acknowledgements

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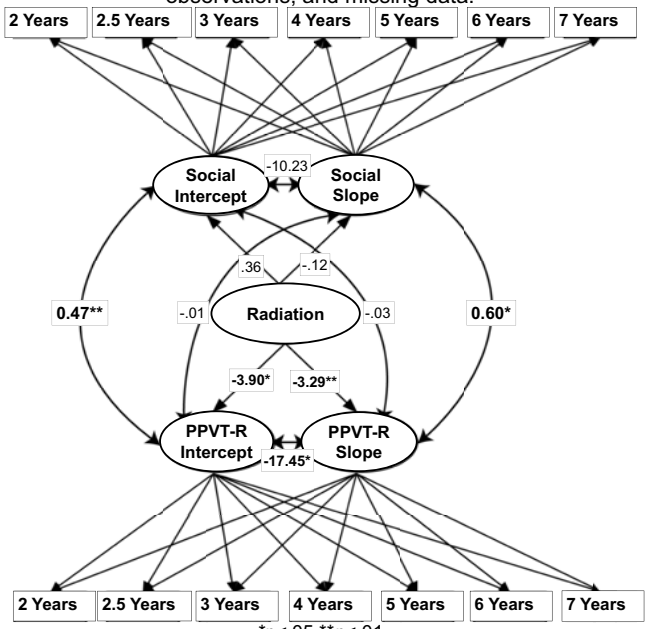
Analyses

Latent growth curve modeling was selected to analyze the data because it allows for variability in individual slopes, dependent observations, and missing data.



*p<.05 **p<.01

The average time from diagnosis for each assessment was used as the sequential variable for linear factor loading. Factor loading forces a linear increase on the model, and in this model the values used were 2-7 years post diagnosis. The linear time factor loading was centered at 2 years post diagnosis, thus estimates were based on the first time point.

Results

- The time varying predictor model was a significant improvement in model fit over the unconditional growth model χ^2 diff (19) = 3685.72, p<.001.
- The addition of predictor variables accounted for significant variance in the slope and intercept of socialization scores (R^2: 41% of the variance in slope, and 38% of variance in the intercept.
- Socialization and PPVT-R scores were significantly positively correlated (intercept γ=.47, p<.001 & slope γ=.60, p=.02 see Figure 2), which meant that as PPVT-R scores increased so did standard scores of socialization behavior.
- Radiation was a contributing factor to the decline in PPVT-R scores (γ=-3.29,p<.001; see Figure 3), and radiation was not a statistically significant predictor of the slope in socialization (γ=-0.12, p=.93; see Figure 4).
- The model explained large portion of variance however there was still residual variance left to be explained at each time point.

Graphs

Figure 2. Correlation between PPVT-R and Socialization Slopes (n=154)

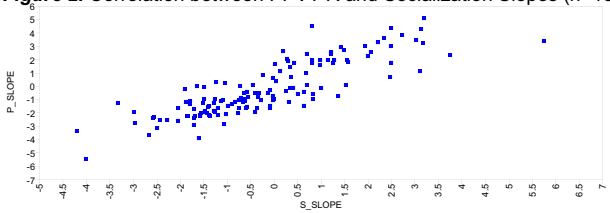


Figure 3. PPVT-R based on presence of radiation at each time point

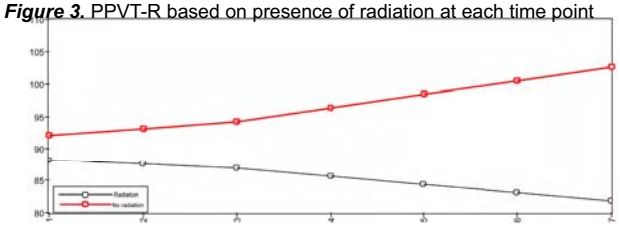
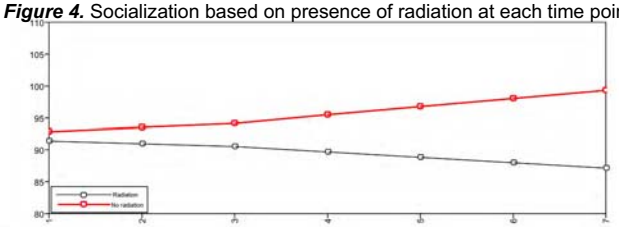


Figure 4. Socialization based on presence of radiation at each time point



Discussion & Future Directions

- These results provide evidence that change in vocabulary ability parallels changes in socialization behaviors.
- The longitudinal design of these results suggests that receptive vocabulary is consistently related to socialization behaviors across several assessments over 7 years in a heterogeneous group of children diagnosed with brain tumors.
- Future research should look at the correlation between receptive vocabulary and social behaviors in adult survivors of childhood brain tumors to see if this relationship persists into adulthood.
- Research should explore the relationship between receptive vocabulary and social skills, particularly with regards to applications in early interventions programs.
- Future research should also examine if the white matter damage associated with radiation therapy is related to poor social outcomes (Palmer et al., 2010).
- The sample size in this study was small for latent growth curve analysis, future research should try to replicate the findings with either larger samples or alternative statistical analyses.

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