

RELATIONSHIP OF FAMILY FUNCTIONING TO EMOTIONAL PROSODY



FOLLOWING PEDIATRIC TRAUMATIC BRAIN INJURY



Adam T. Schmidt, Ph.D., Kimberley D. Orsten, M.Sc., Gerri R. Hanten, Ph.D.,
Xiaoqi Li, M.S., & Harvey S. Levin, Ph.D.

Children sustaining a traumatic brain injury (TBI) often exhibit significant and persistent social difficulties (e.g., impairments in social problem solving, theory of mind, and pragmatic communication)¹⁻³.

Undergirding all the above processes is the concept of social cognition (i.e., the ability to monitor and understand social exchanges and use this information to guide subsequent behavior)⁴. Moreover, the ability to recognize emotional cues is seen as a crucial aspect of social cognition⁵.

Researchers are recognizing that brain structures and cognitive functions involved in social cognition (i.e., emotion recognition) are often perturbed after TBI^{2,3,6}. In concert with injury related factors, research indicates that family functioning (e.g., social stressors and resources, financial strain, and parental coping) exerts a significant impact on behavioral/psychosocial recovery following pediatric TBI⁷⁻¹⁰.

The current study investigated the relationship between variables of family functioning (as indexed by a measure of caregiver social/financial stressors and resources) and the child's performance in emotional prosody – a task used to examine emotion recognition, an important component of social cognition.

Life Stressors and Social Resources Inventory-Adult Form (LISRES-A)

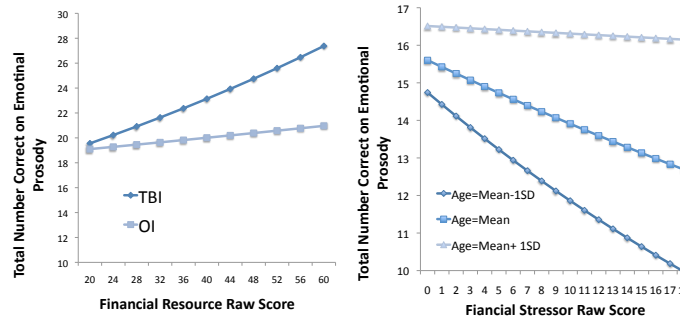
- The LISRES-A¹¹ is a parent self-report measure of family resources and stressors. This was administered to the participating parent at each time point. Family stressors include five Stressors scales (Health, Work, Spouse, Extended Family, and Friends), and Family Resources include four Resource scales (Work, Spouse, Extended Family, and Friends). Internal consistency is moderate to high for all LISRES-A scales as is stability (except for work) over a one-year interval.

Emotional Prosody Task^{12,13}

- During this task, children listened to a digital recording of the same four semantically neutral sentences, presented in random order, spoken with eight different emotional prosodic contours: happy, sad, angry, neutral, afraid, surprised, disgusted, and sleepy. The child indicated which emotion was expressed by pointing to the name of the emotion printed beneath a cartoon picture of a face displaying that emotion. Performance was evaluated in terms of the number of sentences correctly identified.

RESULTS

Findings indicated that financial stress was negatively related to performance on the emotional prosody task for both groups but only for younger children, and there was a significant interaction between family financial resources, group, and child performance on the emotional prosody task, so that children with TBI exhibited significantly better performance at higher levels of family resources. Again, this result was stronger in younger versus older children.



	OI	TBI	χ^2	p
Gender				
Males	47 (70.15%)	49 (65.33%)	0.37	0.5404
Females	20 (29.85%)	26 (34.67%)		
Race*				
White	21 (31.34%)	32 (42.67%)	7.56	0.0228
Black	23 (34.33%)	11 (14.67%)		
Other	23 (34.33%)	32 (42.67%)		
Mother's education			t	p
Mean	13.53	12.45	2.21	0.0285
S.D.	2.68	2.99		
Range	7 to 20	5 to 18		

*Groups are significantly different when p<0.05.

Participants were examined at 3 timepoints: baseline (within one month after injury), 3 months and 1 year post injury.

Statistical Analysis

The demographic data were compared using t-tests for continuous variables and a Chi-Square test for categorical variables. A generalized linear mixed model utilizing the Glimmix procedure in SAS was applied to the emotional prosody data. The quadratic function of the effect of time was initially entered but was not significant, so only the intercept and slope were included. Age-at-injury, mother's education (estimated SES), gender, ethnicity and injury group were examined for effects on the intercepts and slopes of the recovery; however, gender and ethnicity were not significant and were dropped from the final model.

Results summary for the relation of LISRES-A to performance on the Emotional Prosody

Factors of LIRES-A	Predictors	Estimate	t	P
Financial Stressor	Group (OI vs. TBI)	0.0584	1.46	0.1453
	Mother's education	0.0178	2.45	0.0154
	Age	0.0210	2.91	0.0041
	Financial stressor	-0.0115	-2.77	0.0063
	Financial stressor * Age	0.0038	2.67	0.0084
	Interval	0.0897	2.76	0.0065
Financial Resource	Group (OI vs. TBI)	0.0979	2.53	0.0123
	Mother's education	0.0115	1.62	0.1068
	Age	0.0201	2.89	0.0045
	Financial resource	0.0084	5.04	<.0001
	Financial resource * Group	-0.0061	-2.73	0.0072
	Interval	0.0842	2.57	0.0110

Note: Interval is time since injury interval

DISCUSSION

This finding makes intuitive sense and agrees with previous research indicating that younger children are more susceptible to parental stress and perturbations in the family system when compared to older children and adolescents¹⁴.

Although we found some differences in performance on the emotional prosody task with regard to family functioning, only one significant group difference was observed (that is, the positive relationship between family resources and emotional prosody performance for the TBI group).

This finding remained significant even after controlling for estimated SES, and is consistent with previous research demonstrating that income and financial considerations are significant predictors of caregiver burden following brain injury.

Further, it underscores the importance of adequate financial resources in facilitating positive outcome after brain injury¹⁵.

The major group difference observed in the present investigation allows us to speculate about the potential for reciprocal interactions between financial resources, family stress/caregiver burden, and recovery from TBI. That is, one could imagine a scenario whereby lower family resources have a direct impact on recovery by restricting access to rehabilitation services and/or appropriate environmental/educational modifications, but also have an indirect impact on recovery by exacerbating caregiver burden and increasing overall levels of family stress.

When considering these findings, several caveats should be noted:

- The results are only concerned with performance on a single task of emotional recognition
- Only one subscale revealed any group differences – suggesting that emotional recognition is more influenced by injury related variables rather than family factors.
- Caregiver distress and resources were used as a proxy measure of overall family functioning.
- The estimate of financial resources was based off of a single scale on the LISRES-A.

1. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
2. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
3. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
4. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
5. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
6. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
7. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
8. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
9. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
10. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
11. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
12. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
13. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
14. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.
15. Schmidt, A. T., Orsten, K. D., Hanten, G. R., Li, X., & Levin, H. S. (2015). Social cognition after traumatic brain injury: A review of the literature. *Journal of Head Trauma Rehabilitation, 30*, 101-110.