

# Effects of Iron Deficiency on Social-Emotional Behavior of Internationally Adopted Children

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## Background

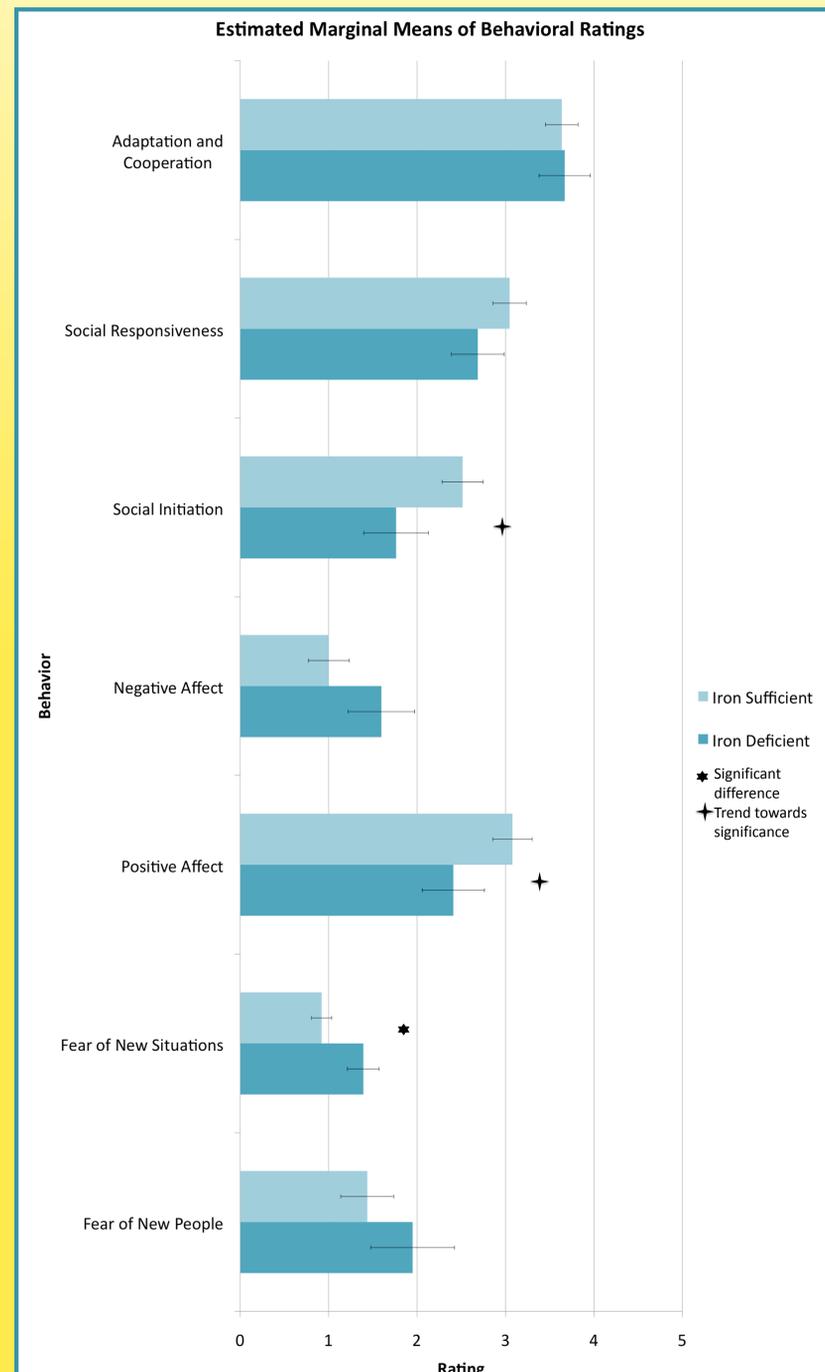
- Iron Deficiency Anemia affects 20-25% of infants around the world, and even more are experiencing iron deficiency without anemia (Corapci et al, 2009).
- Iron Deficiency has been reported in internationally adopted children, including those from Eastern Europe, China and Guatemala (Fuglestad et al, 2008).
- Infants with iron deficiencies are known to test lower on various measures of development as well as show differences in affect (Corapci et al, 2009).
- Infants social-emotional behavior has been shown to be adversely affected by iron deficiency with or without anemia (Lozoff et al, 2008).
- The aim of this study is to assess the differences between post-institutionalized children with iron deficiency and those without on measures of social-emotional behavior.

## Hypothesis

- Internationally adopted children with iron deficiency will be affected adversely on behavioral measures.
- Internationally adopted children with iron deficiency will have lower ratings of positive affect, social initiation and responsiveness and adaptation/cooperation and higher ratings of negative affect and fear
- The behavioral coding developed and used will be effective in testing different types of fear and in different contexts than previously used, such as the LABTAB.

## Methods

- Sample included 17 children adopted internationally; 4 from Eastern Europe, 9 from Ethiopia and 4 from China
- Age range was 9.66-19.22 months (mean age 13.6524 months and standard deviation of 2.953) at the time of the assessment
- Children were tested within a month of their adoption
- 5 of the children were found to be iron deficient while 12 were iron sufficient
- Procedures:
  - Iron deficiency was determined by a blood test. Children were considered deficient in iron if they had 2 abnormal results; TS < 12%, SF<12 µg/L, MCV<74fl or Hgb<11.0g/dL
  - Children and their parents were invited to a laboratory assessment consisting of a 5 minute free play session, a LABTAB portion and a 5 minute social play. Free play involved the child playing alone with toys, LABTAB consisted of the child being exposed to various toys such as a moving car and bubbles, and social play consisted of the child and parent playing together.
  - Coding: Sessions were taped and coded by two different coders and tested for reliability. Coding looked at social communication, in addition to various emotional and behavioral ratings.
  - Overall behaviors for the entire session were coded. Behaviors coded included measures of fear of new people and new situations, positive and negative affect, interest/engagement, quantity and quality of exploration, hyperactivity/impulsivity, social initiation and responsiveness and adaptation to change/cooperation.
  - Each behavior was coded on a scale of 0-5. Zero representing no evidence of the behavior and 5 representing high evidence of the behavior.



## Results

- Fear of new situations was found to be significantly higher in iron deficient children ( $F(2,13)=4.75, p=.047$ )
- Positive affect was found to trend towards lower ratings in iron deficient children ( $F(2,13)=2.484, p=.137$ )
- Social Initiation was found to trend towards lower ratings in iron deficient children ( $F(2,13)=2.89, p=.111$ )
- We found no differences between iron sufficient and iron deficient children in the other behaviors that were tested
- We conducted ANOVA tests controlling for the age at the time of research
- We did not find a significant difference in the age of participants at the time of research

## Conclusions

- Results show that the children with iron deficiency were affected adversely on behavioral measures, which is consistent with past research on non-adopted children as well as with our hypothesis (Lozoff et al, 2008).
- The results support our hypothesis that internationally adopted children with iron deficiency had higher significantly higher ratings of fear of new situations.
- We did not see any other significant differences, possibly due to the small sample size of the study, yet we did see trends towards lower ratings of positive affect and social initiation.
- Limitation: The sample size of children assessed was only 17. While we did see significant results and trends as predicted the small nature of the sample does not give us quite enough statistical power to make strong conclusions.
- Further research with a larger sample size is expected to show more significant results that follow the trends established from this study.
- Behavioral Coding: The similar results in relation to past research signifies that the behavioral coding developed and used in this project is effective.
- The Coding used and the LABTAB assessment were both found to be sensitive to iron deficiencies.
- The coding developed may be used for future studies of a similar nature.

## References

- Corapci, F., Calatroni, A., Kaciroti, K., Jimenez, E., & Lozoff, B. (2009). Longitudinal Evaluation of Externalizing and Internalizing Behavior Problems Following Iron Deficiency in Infancy. *Journal of Pediatric Psychology*, 1-10
- Lozoff, B., Clark, K., Jing, Y., Armony-Sivan, R., Angelilli, M., & Jacobson, S.. (2008). Dose-Response Relationships between Iron Deficiency with or without Anemia and Infant Social-Emotional Behavior. *The Journal of Pediatrics*, 152, 696-702.
- Anita J. Fuglestad, Ashton E. Lehmann, Maria G. Kroupina, Anna Petryk, Bradley S. Miller, Sandra L. Iverson, Dana E. Johnson, Michael K. Georgieff, Iron Deficiency in International Adoptees from Eastern Europe, *The Journal of Pediatrics*, Volume 153, Issue 2, August 2008, Pages 272-277.

Participants	Female	Male	Origin	Mean Age of Session
Iron Deficient N=12	3	2	Eastern Europe (3), Ethiopia (1) and China (1)	14.97 Months (sd=3.51)
Iron Sufficient N=5	7	5	Eastern Europe (1), Ethiopia (8) and china (3)	13.10 Months (sd=2.66)