



# Iron Deficiency in Infancy and Its Impact on Motor and Mental Development

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## Purpose

Iron plays a large role in nerve myelination, dopamine neurotransmission, and neuronal metabolism. The purpose of this literary review was to investigate the connection between iron deficiency and motor and cognitive development. Iron-deficiency is the most prevalent nutrient deficiency world-wide, and infants are at a greater risk due to their rapid growth. Due to the higher risk, this review focuses on iron deficiency in infancy.





<https://www.womansday.com/relationships/family-friends/g25451501/baby-girl-names/>

## Methods

Multiple library databases were used to access peer reviewed articles researching iron deficiency in infancy and its relation to delayed cognitive and motor development as well as hepcidin's (a hormone produced by the liver) role in iron absorption.

## Data

### Cognitive Effects

| Auditory Brainstem Responses   | Visually Evoked Potentials   | Psychiatric Disorders   | School Performance   |
|--|--|---|--|
| Significantly slower in previously iron-deficient infants (Congdon, et al., 2012)  | Indicated slower visual response times in previously iron-deficient infants at 4 years of age (Congdon, et al., 2012)  | Iron deficiency anemia patients had a higher chance of having psychiatric disorders such as unipolar depressive disorder, bipolar disorder, anxiety disorder, ASD, ADHD, tic disorder, delayed development, and mental retardation (Chen, et al., 2015) | There is a strong correlation between iron deficiency in childhood and likelihood of mild or moderate mental retardation requiring placement in special education (Hurtado et al., 1999) |
| Central conduction time was longer in iron-deficient infants, indicating slower nerve conduction velocity (Roncagliolo, et al., 1998). | <br><a href="https://unsplash.com/s/photos/cute-baby">https://unsplash.com/s/photos/cute-baby</a> | Males had a higher chance of having unipolar depression, anxiety, ASD, ADHD, delayed development, and mental retardation, while females had a higher chance of having bipolar disorder and tic disorder (Chen, et al., 2015)                            | <br><a href="https://www.fl.edu/heart/red-blood-cells">https://www.fl.edu/heart/red-blood-cells</a> |

### Psychomotor Effects

| Reach Development   | Grasp Development   |
|---|---|
| Infants with iron deficiency anemia had a hand path that was almost twice as long than the straight-line distance between the wrist location at the beginning and the end of the reach movement (Shafir, et al., 2009). | Iron deficient anemia infants had a long duration from movement onset to maximum aperture, or maximum distance between the tip of the thumb and the tip of the forefinger (Shafir, et al., 2009). |

### Hepcidin

Hepcidin levels increased with acute, daily iron supplementation, eventually decreasing the amount of iron absorbed from the supplement (Moretti, et al., 2015).

Hepcidin levels were found to be higher in those who did not respond to iron treatment, indicating an inverse relationship between hepcidin levels and amount of iron absorbed (Goodnough, et al., 2012).

## Discussion

The research found that iron deficiency in infancy can lead to many different mental and physical developmental delays. Iron deficiency significantly altered auditory brainstem responses and visually evoked potentials, indicating slower nerve conduction. Iron deficiency also lead to significant increase of psychiatric disorders and a significant decrease in school performance. Finally, infants with iron deficiency or who were previously iron deficient had significant delays in reach and grasp development. All 5 studies found that these issues in development did not improve once iron stores were returned to normal ranges, indicating that iron deficiency leads to long-lasting negative effects on brain development. It was found that hepcidin negatively impacted iron absorption. When a higher level of hepcidin is present, iron absorption is impaired. In a clinical setting, this information emphasizes the importance of making sure that an infant has proper iron stores from the beginning of life so that they can properly grow and develop, both mentally and physically. However, it is difficult to restore iron levels in infants once they have an iron depletion, so it is most important to ensure that the mother has enough iron throughout the pregnancy to guarantee that the infant has enough iron.

## References

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