Factors affecting gross motor development

Aisling Murray
Gross motor development

• Infant’s ability to use their arms and legs, and to control their body to sit up, keep their balance and ultimately walk

• Developing these skills in infancy is important for the growing child’s ability to move around and explore their environment, and become more independent
Child factors and gross motor development

• Birth weight and length (e.g. Cheung et al, 2001)
  – Indicating growth in the womb

• Physical growth post-natal (e.g. Cheung et al, 2001)
  – Possibly indicating nutrition

• Disability or inherited conditions
  – Physical disability
  – Time spent in bed sick/feeling unwell
  – Other physical problems, e.g. poor eyesight (O'Connor et al, 2009)
• Maternal education (e.g. Najman et al, 1992)
• Socioeconomic status (e.g. Nicholson et al, 2010)
• Physical environment (e.g. Berger et al, 2007)
• Parenting practices
  – Individual preferences for floor play, car seats, sleeping position
  – Cultural expectations regarding playful boisterous infants or quiet, well-protected children
    • Contrasts observed in motor skills of young children between Brazil vs Britain (Victoria et al, 1990) and USA vs Hong Kong (Chow et al, 2001)
  – Emerging evidence that infants who are put to sleep on their back reach gross motor milestones later (e.g. Davis et al, 1998)
Gross motor milestones

Infants would be expected to reach the following milestones between 8 and 11 months of age

- Sit up straight on their own for several minutes without using their hands for support
- Be able to stand while someone holds their hand for balance

• **And while holding on to furniture**
  - Stay standing without having to lean their chest against furniture for support
  - Bend down to pick up a toy
  - Lower themselves to the floor with control
  - Walk along while holding on to furniture with just one hand

• These milestones come from the Ages and Stages Questionnaire (ASQ)

• Milestones were reported by parents
Percentage reaching key milestones by 9 months

- Sit up straight on their own for several minutes without using their hands for support 92%
- Be able to stand while someone holds their hand for balance 85%
- And while holding on to furniture
  - Stay standing without having to lean their chest against furniture for support 55%
  - Bend down to pick up a toy 33%
  - Lower themselves to the floor with control 31%
  - Walk along while holding on to furniture with just one hand 18%
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<thead>
<tr>
<th>Differences between infants</th>
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Overall gross motor development

- For each of the six milestones, children were given
  - 10 points if (according to parents) they were able to do the activity
  - 5 points if they were able to do the activity sometimes
  - 0 points if they were not able to do the activity
  - This resulted in a score of between 0 and 60

- The mean score (excluding very premature babies) was 33.1
Potential factors included in regression model

- Child characteristics
  - Child’s gender
  - Low birthweight
  - Twin or triplet
  - Chronic physical or mental health condition, illness or disability
  - Temperament (‘calm and quiet’ or ‘active and vigorous’)

- Family characteristics
  - Mother born in or outside Ireland
  - Family type
  - Household social class
  - Household income quintile
  - Maternal education

- Parenting practices/beliefs
  - Maternal smoking during pregnancy
  - Ever breastfed
  - Child placed on back to sleep
  - Belief that a child as young as 1-year-old would know the difference between right and wrong

- Environment
  - Season of birth
  - Type of accommodation (house or apartment)
Summary of final model

• The final model accounted for 18% of the variance in infant gross motor scores

• Child characteristics
  – Lower gross motor scores were associated with:
    • Being a twin or triplet
    • Born at low birthweight
    • Having a chronic health condition
  – Infants who were described as being ‘above average’ in terms of being active and vigorous in general had higher gross motor scores
  – Boys had somewhat higher scores than girls

• Family characteristics
  – Higher scores were associated with
    • Mother born outside Ireland
    • Families with only one child
    • Mothers with the highest education
    • Lowest income families
  – No effect of household social class
Summary of final model

- The final model accounted for 18% of the variance in infant gross motor scores

- Parenting practices/beliefs
  - Lower scores were associated with
    - Maternal smoking all through pregnancy
    - Infant placed on back to sleep
  - Higher scores were associated with
    - Being ever breastfed
    - Agreeing that a child as young as 1-year-old would know the difference between right and wrong

- Environment
  - Infants who were living in apartments had higher scores than those living in houses
  - Infants born in Winter/Early Spring (and aged 6-8 months during the summer months) had higher scores than those born Late Spring/Summer (and aged 6-8 months during the winter months)
Selected factors

- Low birthweight
- Twin/triplet
- Put to sleep on back
- Irish-born mother
- Ever breastfed
- Active temperament
- Lives in a house

Overall mean gross motor score

- Yes
- No

- Low birthweight: 25.0/33.5
- Twin/triplet: 23.0/33.4
- Put to sleep on back: 31.1/39.4
- Irish-born mother: 30.9/39.4
- Ever breastfed: 29.6/35.8
- Active temperament: 26.1/35.8
- Lives in a house: 32.5/40.8
## Selected regression statistics

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<td>-5.58</td>
<td>.89</td>
<td>-.06***</td>
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<td>Twin/triplet</td>
<td>-7.00</td>
<td>1.14</td>
<td>-.06***</td>
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<tr>
<td>Put to sleep on back</td>
<td>-5.57</td>
<td>.41</td>
<td>-.14***</td>
</tr>
<tr>
<td>Irish-born mother</td>
<td>-4.45</td>
<td>.43</td>
<td>-.12***</td>
</tr>
<tr>
<td>Ever breastfed</td>
<td>3.27</td>
<td>.38</td>
<td>.10***</td>
</tr>
<tr>
<td>Active temperament</td>
<td>9.00</td>
<td>.37</td>
<td>.24***</td>
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<td>Lives in a house</td>
<td>-3.86</td>
<td>.71</td>
<td>-.06***</td>
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Discussion points

• In common with other types of outcome, infants who are born at low birthweight, or are part of a multiple birth, are at risk of developing gross motor skills more slowly than expected.
• However, environmental factors also play an important role – particularly those related to parenting practices:
  – Sleeping position
  – Breastfeeding
  – Possible cultural influence
• Indicative of the complexity of child development
Policy implications

- No change to safe sleep policy
- Expect that slower pace due to sleeping position will be ‘caught up’ by age 3
- May need to highlight the second part of the “back to sleep, front to play” message
Policy implications

• Further evidence of benefit of promoting breastfeeding even for a short time
• Possibility of more information on providing safe floor-play environments for infants
• May need to adjust expectations for timing of motor milestones to reflect contemporary parenting practices
Acknowledgments

• Participating families and children
• Parents of “Emily”

• References