

## Title

Literature review of the potential links between attachment and numeracy development and later attainment in maths skills

\*This is part of a collaborative project from the Forth Valley and West Lothian Regional Improvement Collaborative for which our combined research question is: "What are the combined findings from the four studies on key psychological issues affecting numeracy development?"

## What did we ask? (Research Questions)

### Collaborative Research Question:

- What are the key psychological factors affecting numeracy development?

### Clackmannanshire Research Questions:

- Is there evidence of a correlation between attachment style/status and numeracy outcomes?
- Is there research to indicate that lack of key developmental concepts of object permanence or constancy is influenced by attachment and has an impact on later numeracy development?

## What is the evidence base? (link to your definition of the poverty gap) 300 words

Early maths skills show a strong predictive power over later attainment (Duncan, 2007); both later maths *and* literacy success (Moomaw, 2017). Differences in mathematics skills have been shown to contribute more to the variance in work productivity, income, and employment among individuals than reading ability and intelligence (Fuchs et al., 2009).

Low social-emotional status (SES) has been linked to increased insecure parent-child attachment (Van IJzendoorn & Bakermans-Kranenberg, 1996; NICHD, 1997), and disorganised attachment is almost twice as prevalent in low than middle SES children (Lyons-Ruth et al 1990). In addition, attachment status has been shown to impact attainment (Bergin & Bergin, 2009). This suggests that SES may be influencing attainment through increased levels of insecure styles of attachment.

North Lanarkshire Council identified a gap in mental arithmetic skills between pupils living in the most and least deprived areas. (North Lanarkshire Council, 2017).

In Clackmannanshire 30% of pupils live in SIMD 1&2. For this current research we use the following to define the poverty gap in our context:

- Number pupils living in SIMD deciles 1 & 2.
- Number pupils known to be deprived of opportunities and resources.
- Number pupils identified as "at risk" of lower than expected attainment by schools.

Review of the developmental and attachment literature suggests a correlation between the development of object/person permanence and secure attachment (e.g. Bomber, 2007). Other literature indicates that pupils with ambivalent attachment have difficulty with numeracy skills (Geddes, 2006). Conservation of quantity appears to develop before 'number sense', and is linked to the development of object permanence (OP; Meltzoff & Moore (1999, 2009). The full literature review explored these areas of potential links between OP/attachment style and numeracy skills development in more detail and identify future research questions which might provide and new insights into supporting numeracy outcomes.

*(Words, 298)*

### What did we do? 200 words

In order to answer the research questions outlined literature review was conducted, using the search terms:

Attachment; Attachment style **and** numeracy; attachment theory **and** mathematics; symbolic representation; attachment and numeracy development/outcomes/school outcomes/school success/Socio-Economic Status; numeracy development; object permanence; constancy; Risk taking; exploratory behaviours; problem solving). It is recognised that numeracy skills and mathematics are not the same, however a review of both was considered important to explore possible links between attachment and attainment in the broadest sense.

Analysis of the findings of the literature review provided some answers to answer the research questions while suggesting future avenues for a research project within the local context. Findings were shared with partners in the RIC and cross cutting themes emerged. *(Words 119)*

### What have we found? 200 words

The literature reviewed indicated that the research about attachment and numeracy skills development/ maths attainment often use similar language and appear to be exploring similar concepts, however there is not yet a body of work which fully "joins the dots". Further research would be required to establish if there is a correlation between emotional and numerical constancy (and if they are related to Piaget's concept of conservation) (Piaget, 1952), and potential link between strengthening object/person permanence and improved numeracy skills development (and therefore potentially later maths attainment).

The literature indicated that insecure attachment status was shown to predict:

- school dropout (Marcus, 2001);
- behavioural development (Finzi, 2001);
- verbal ability, maths ability, reading comprehension, overall academic achievement and levels of curiosity (Bergin & Bergin, 2009);
- academic competency (Jacobsen 1997);
- adjustment to school transition (Granot, 2001)

- early maths skills development (Dobbs et al., 2006).

Individual cognitive skills and concepts influenced by attachment include:

- problem solving (Matas, 1978; Frankel, 1990);
- risk taking/ exploratory behaviours (Coltman, 2007; Main, 1983);
- object permanence (Bomber, 2007);
- sustaining attention to tasks (Main, 1983).

Correlation between attachment status/ style and later academic achievement was shown:

- Attachment and numeracy at .33 effect size (Dobbs et al., 2006)
- Insecure/other attachment and poorer maths skills (0.35; McCormick et al., 2012)
- Ambivalent attachment and poorer maths skills (0.14; McCormick et al., 2012)

Since young children develop early maths skills through informal exploration of their surroundings (Dobbs et al., 2006) the “lower exploratory competence in avoidant and ambivalently attached toddlers” (Moss & St-Laurent, 2001) presents risks for numeracy development.

Suggested interventions were outlined in the full literature review.

(wds 266).

## What do we plan to do next? 100 words

Further research within Clackmannanshire Council’s context indicated from the current findings:

- Use questions arising from literature review to interrogate existing local data sets (from the Readiness for Learning pilot study) which measured attachment status and attainment
- Review existing assessment tools/devise checklist to identify appropriate interventions for pupils whose attachment style impacts on numeracy
- Explore the potential impact of attachment, OP and constancy on the development of foundation skills for numeracy
- Collaborate with Clackmannanshire Council’s SAC programme to pilot and evaluate potential new assessments/interventions/develop local staff training around the impact of relationships and attachment styles on numeracy skills development and later maths attainment. (Words104)

## References

- Bell, S. M. The development of the concept of object as related to infant-mother attachment. *Child Development*, 41(2), 291-311.
- Bergin, C. & Bergin, D. (2009). Attachment in the Classroom, *Educational Psychology Review*, 21(2), 141-170.
- Bomber, L. M. (2007). *Inside I’m Hurting: Practical strategies for supporting children with attachment difficulties in schools*. London: Worth Publishing.
- Coltman, P. (2006). Talk of a Number: Self-Regulated Use of Mathematical Metalanguage by Children in the Foundation Stage. *Early Years: An International Journal of Research and Development*,

- 26(1), 31-48.
- Dobbs, J., Doctoroff, G. L., Fisher, P. H. & Arnold, D. H. (2006). The Association between Preschool Children's Socio-Emotional Functioning and Their Mathematical Skills. *Journal of Applied Developmental Psychology, 27*(2), 97-108.
- Finzi, R., Ram, A., Har-Even, D., Shnit, D. & Weizman, A. (2001). Attachment Styles and Aggression in Physically Abused and Neglected Children. *Journal of Youth and Adolescence, 30*(6), 769-86.
- Frankel, K. A. and Bates, J. E. (1990). 'Mother-Toddler Problem Solving: Antecedents in Attachment, Home Behavior, and Temperament'. *Child Development, 61*(3), pp. 810-819.
- Fuchs, L. S., Powell, S. R., Seethaler, P. M., Cirino, P. T., Fletcher, J. M., Fuchs, D., Hamlett, C. L. and Zumeta, R. O. (2009). Remediating Number Combination and Word Problem Deficits among Students with Mathematics Difficulties: A Randomized Control Trial. *Journal of Educational Psychology, 101*(3), 561-576.
- Granot, D. & Mayseless, O. (2001). Attachment security and adjustment to school in middle childhood. *International Journal of Behavioral Development, 25*(6), 530-541
- Geddes, H. (2006). *Attachment in the Classroom: The links between children's early experience, emotinal well-being and performance in school*. London: Worth Publishing.
- van IJzendoorn, M. H., & Bakermans-Kranenburg, M. J. (1996). Attachment representations in mothers, fathers, adolescents, and clinical groups: A meta-analytic search for normative data. *Journal of Consulting and Clinical Psychology, 64*(1), 8-21.  
<http://dx.doi.org/10.1037/0022-006X.64.1.8>
- Jacobsen, T. & Hofmann, V. (1997). Children's Attachment Representations: Longitudinal Relations to School Behavior and Academic Competency in Middle Childhood and Adolescence. *Developmental Psychology, 33*(4), 703-710.
- Lyons-Ruth, K., Connell, D.B., Grunebaum, H.U. & Botein, S. (1990). Infants at Social Risk: Maternal Depression and Family Support Services as Mediators of Infant Development and Security of Attachment. *Child Development, 61*(1), 85-98.
- Main, M. (1983). Exploration, play, and cognitive functioning related to infant-mother attachment. *Infant Behaviour and Development, 6*(2-3), 167-174.
- Marcus, R. F., & Sanders-Reio, J. (2001). The Influence of Attachment on School Completion. *School Psychology Quarterly, 16*(4), 27-444.
- Matas, L. and et al. (1978). Continuity of Adaptation in the Second Year: The Relationship between Quality of Attachment and Later Competence. *Child Development, 49*(3), 547-56.
- McCormick, M. P., O'Connor, E. E., & Barnes, S. P. (2016). Mother-child attachment styles and math and reading skills in middle childhood: The mediating role of children's exploration and engagement. *Early Childhood Research Quarterly, 36*, 295-306.
- Meltzoff, A. N., & Moore, M. K. (2009). Numerical identity and the development of object permanence. In S. P. Johnson (Ed.), *Neoconstructivism: The new science of cognitive development* (pp. 61-83). New York: Oxford University Press.
- Moore, M. K., & Meltzoff, A. N. (1999). New findings on object permanence: A developmental difference between two types of occlusion. *Br J Dev Psychol, 17*(4), 623-644. doi: 10.1348/026151099165410.
- Moomaw, S. (2017). Not All Preschool Math Games Are Created Equal. *YC Young Children, 72*(3), 14-21.
- Moss, E. & St-Laurent, D. (2001). Attachment at School Age and Academic Performance. *Developmental Psychology, 37*(6), 863-74.
- NICHD Early Child Care Research Network. (1997). The effects of infant child care on infant-mother attachment security: results of the NICHD study of early child care. *Child Dev. 68*, 860-879.

doi: 10.1111/j.1467-8624.1997.tb01967.x

North Lanarkshire Council (2017). *Achieving excellence and equity through enhancing teacher knowledge in arithmetical development, numeracy pedagogy and quality interactions: A coaching and mentoring approach*. Retrieved from <https://education.gov.scot/improvement/documents/sac72-n-lanarkshire-numeracy.pdf>

Piaget, J. (1952) *The child's conception of number*. London : Routledge.

Winnicott, D. W. (1958). *Collected papers : through paediatrics to psycho-analysis*. London: Tavistock Publications.

van IJzendoorn, M. H., & Bakermans-Kranenburg, M. J. (1996). Attachment representations in mothers, fathers, adolescents, and clinical groups: A meta-analytic search for normative data. *Journal of Consulting and Clinical Psychology*, 64(1), 8-21..

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### Number of words

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