



**Population Health Sciences  
Institute**

**Biostatistics Research  
Group**

**Evaluation of ‘Building Underdeveloped  
Sensorimotor Systems’ (BUSS<sup>®</sup>) for  
children who have experienced disruption  
to their early development**

# **Final report**

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## Plain English Summary

### What is BUSS®?

BUSS® stands for *Building Underdeveloped Sensorimotor Systems*. It is a short programme that helps children who experienced difficult experiences early in life. BUSS® works by teaching parents and carers simple, playful activities that use movement, touch and nurturing interaction. These games help the child feel safe in their body, build trust in their caregiver, and strengthen the foundations needed for learning, behaviour and relationships. Although families and professionals have spoken positively about BUSS®, there had not yet been a study to measure whether it works.

### Who took part in this study?

This evaluation looked at information already collected by the BUSS® team over four years (2021–2025) comparing outcomes measured before and after BUSS®. We looked at data from **468 male and female** children and young people aged **2 to 19**, most of whom were **adopted** or in **special guardianship**. Just under half had a **known or suspected neurodivergent condition** such as ADHD, autism or FASD.

### What did we find?

**Nearly 90% of families completed** the programme, which is very high for interventions of this kind. Children and young people who completed BUSS® showed **clear improvements in behaviour, emotions, relationships, daily functioning, and specific goals** like core strength, emotional regulation, or feeling safe with movement. Children of all ages, both boys and girls, showed similar improvements, although the size of the improvement differed and some, but not all, had statistically significant changes for every group.

### What does this mean for families and services?

The findings suggest that BUSS® is **helpful** for many children with early trauma; **low cost** compared with many other therapies; **practical and doable** for families; **suitable for children with complex needs**. BUSS® appears to give children a stronger foundation in their bodies and relationships which could help them for life.

### What are the limitations of this study?

This type of study could be measuring improvements that happen by chance, or naturally as part of a child's development. We used statistical tests to show that improvements were **'statistically significant'**, meaning they were unlikely to be due to chance.



## Glossary

Abbreviation	Meaning
ASGSF	Adoption and Special Guardianship Support Fund
BAC	Brief Assessment Checklists
BUSS®	Building Underdeveloped Sensorimotor Systems
CAO	Child Arrangement Order
CYP	Children and Young People
DDP	Dyadic Developmental Psychotherapy
GBO	Goal-Based Outcomes
LA	Local Authority
PTSD	Post Traumatic Stress Disorder
RAA	Regional Adoption Agency
SDQ	Strengths and Difficulties Questionnaires
SGO	Special Guardianship Order
SMART	Sensory Motor Arousal Regulation Treatment
SPD	Sensory Processing Disorder
TAYC-R	Thinking About Your Child – Revised



## Executive Summary

### Background to the Research

The BUSS® (*Building Underdeveloped Sensorimotor Systems*) model is an innovative intervention designed for children who have experienced early developmental disruption, including trauma, neglect, prenatal substance exposure, prematurity, and prolonged hospitalisation. BUSS® was developed by an Occupational Therapist with extensive experience in CAMHS. BUSS® is designed to be delivered by practitioners with expertise in developmental trauma. The intervention supports parents and caregivers to use structured, playful touch, rhythm, and movement activities within nurturing relationships to develop the three foundation sensorimotor systems, where development is affected by disruption. The *tactile system* supports the understanding of our environment and information coming from outside our body; the *vestibular system* gives the body a foundation of core strength and gravitational security (a feeling of wellbeing when we're moving) that supports the development of more complex movement; the *proprioceptive system* is concerned with modulation and coordination of movement, so that we're able to do familiar tasks without much conscious attention. Working within the parent - child relationship supports the development of this relationship.

Previous BUSS® evaluations have demonstrated agreement among adoptive, special guardian, and foster families that the model is highly acceptable, and is regarded by professionals as being feasible and deliverable, with a high degree of 'fidelity' to training; in other words, professionals can be trained to use BUSS® in a way that is faithful to the original. This evaluation, commissioned by BUSS® and conducted by Newcastle University, represents the first large-scale analysis of routinely collected quantitative outcome data. The aim was to assess whether BUSS® improves bodily regulation and related developmental, emotional and relational outcomes for children and young people (CYP) aged 2–19.



## Methods Used in the Evaluation

The evaluation analysed anonymised routine clinical data collected between April 2021 and March 2025 from 468 children enrolled in BUSS<sup>®</sup>. Ethical approval was granted in 2024. Four validated outcome measures are collected by BUSS<sup>®</sup>. These are specified by Department for Education for the Adoption and special guardianship support fund (ASGSF). They were analysed as pre- and post-intervention matched pairs:

1. **Goal-Based Outcomes (GBO)**
2. **Strengths and Difficulties Questionnaires (SDQ)** for ages 2–4, 4–17 and self-complete 11–17
3. **Brief Assessment Checklists** (BAC-C for 4–11; BAC-A for 12–17)
4. **Thinking About Your Child – Revised (TAYC-R)**

TAYC-R and BAC-C/BAC-A were only introduced in September 2023, after SDQ and GBO, so the following results have different counts in matched data for each of the outcomes. Descriptive statistics and regression modelling were used to assess differences before and after intervention across age, gender and goal categories. Families completed 11 sessions, mostly online, with high completion and data return rates.

## Key Findings

### Cohort Characteristics

- 468 children aged 2–19; majority aged 4–11
- 62% male
- 89% living with adoptive parents
- High levels of neurodivergence (22% diagnosed; 27% suspected)
- 49% had a known exposure to drugs and/or alcohol in utero

### Completion

- **86%** completed the BUSS<sup>®</sup> programme
- Most common reason for non/incompletion was caregiver capacity (10%), and only 5 children (1%) did not consent



## Outcome Improvements

### 1. Strengths and Difficulties Questionnaire (SDQ)

- *Ages 2-4 (parent/carer-rated)*: Significant reductions in total difficulties, internalising behaviours, hyperactivity/inattention, and peer problems and significant increases in kind and helpful behaviours.
- *Ages 4-17 (parent/carer-rated)*: Highly significant reductions across all domains (emotional distress, conduct, hyperactivity, peer problems) and increased prosocial behaviours.
- *Ages 11-17 (self-complete)*: Too few cases to detect broad effects, but significant improvements in emotional distress and impact on daily life.

### 2. Brief Assessment Checklists (BAC-C and BAC-A)

- Significant reductions in total difficulties for both children (4-11) and adolescents (12-17).

### 3. Thinking About Your Child – Revised (TAYC-R)

- Significant improvements in parent skills/understanding, parent-child relationships, and child's responsiveness to care.

### 4. Goal-Based Outcomes (GBO)

- Very strong improvements across **all** domains
- Largest gains in building gravitational security (vestibular system)
- Benefits consistent across ages and genders.

## Overall conclusion from findings

Among children who complete BUSS<sup>®</sup>, **statistically significant improvements** were observed in emotional regulation, sensorimotor functioning, behaviour, parent-child relationships, and goal attainment.

## Barriers and Challenges to the Evaluation

- **Lack of a control group**: Limits ability to attribute outcomes solely to BUSS<sup>®</sup> or rule out natural developmental progression.
- **Potential unknown differences between completers and non-completers**: Those who completed BUSS<sup>®</sup> had similar demographic characteristics to those





## Recommendations and Conclusions

- **For Statutory Adoption Bodies (Adoption England, National Adoption Service (Wales), Scottish Government, Adoption Authority of Ireland)**
  - Recognise BUSS® as a low-cost, high-value intervention with measurable benefits across emotional, behavioural, and relational domains.
  - Support continued national access and consider strategic investment in scaling training and materials.
- **For Regional Adoption Agencies (RAAs) and Local Authorities (LAs):**
  - Prioritise BUSS® as part of multi-disciplinary support pathways, particularly for children who struggle to access talking therapies.
  - Ensure practitioners are trained and supervised to maintain model fidelity.
- **For Families:**
  - BUSS® provides a structured, relationship-based approach that many families found acceptable, feasible and beneficial.
  - Parents may wish to access their own supportive therapies alongside BUSS® to enhance capacity and resilience.
- **For Future Research:**
  - Further controlled studies to strengthen evidence around causality and long-term benefits.
  - Research examining subgroups (e.g., neurodivergence, age brackets) using higher-quality diagnostic data.
  - Exploration of long-term outcomes such as educational attainment, mental health trajectories, and placement stability.

## Conclusion

The evaluation provides the first quantitative evidence that BUSS® may be an effective, accessible and acceptable intervention for children who have experienced significant early adversity. It supports sensorimotor development, enhances emotional and behavioural outcomes, and strengthens parent-child relationships. BUSS® appears to be a promising, cost-effective component of therapeutic provision for adoptive, foster and special guardianship families.

