Institution: Coventry University		
Unit of Assessment: 24		
Title of case study: Improving the Health of Young People through Fundamental Movement Skills (FMS)		
Period when the underpinning research was undertaken: September 2012- July 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	**Role(s) (e.g. job title):**	**Period(s) employed by submitting HEI:**
Professor Michael Duncan	Professor in Sport and Exercise Science	2009-Present
Dr Emma Eyre	Research Associate	2014 – Present
Period when the claimed impact occurred: August 2013 – December 2020		
Is this case study continued from a case study submitted in 2014? Y/N No		

1. Summary of the impact (indicative maximum 100 words)

An increase in physical activity by just 25% could prevent over 1.3million deaths per year around the world. In England only 17.5% of children in England meet the Chief Medical Officers' guidelines for physical activity for health. Research by Duncan and Eyre has considered how children's health and physical literacy can be enhanced through the development of Fundamental Movement Skills (FMS). Their work provided teachers, coaches and community sport-providers with new knowledge, which has changed practices at international, national and local levels. The embedding of these improvements in guidance has helped thousands of children reach a positive trajectory for health.

2. Underpinning research (indicative maximum 500 words)

Fundamental Movement Skills (FMS) are considered the building blocks for all forms of physical activity, comprising: locomotor, object control and stability skills. Poor FMS in childhood can impede a child's development and lead to poor health in adulthood. Research led by Professor Mike Duncan and Dr Emma Eyre at Coventry University has helped create a pathway for children to engage in physical activity for life through development of their FMS.

In 2012 and to 2015, Coventry City Council approached Duncan to find a new method to assess whether children in local schools were acquiring movement skills for Physical Education (PE) at the 'optimum' chronological milestone. Prior to 2012, data assessing the PE skills of UK children was scarce. Duncan assessed movement skills, relating to eight FMS (including run, hop and jump), in children from years 2–6 (ages 6-11). The children's movements were analysed using biomechanics software. Results highlighted that a child's specific year group (age) influenced seven out of the eight skills, and that factors such as weight status and gender showed significant correlation with levels of mastery over different skills (R1). The research demonstrated how analysis of FMS attainment could be used to inform targeted interventions amongst primary school children.

From 2016 to 2017, the British Academy funded Duncan (G1) to develop the scientific understanding of the relationship between FMS, physical activity, weight status and related health indices in children (R2). Duncan used a storytelling activity, through a randomised control trial in 74 children aged 3-4 years of age, to examine connections between these factors. Duncan's research was the first investigation to evidence that combining FMS development with

storytelling could enhance both language and movement capacity in early years children to a greater extent than movement or storytelling-only interventions alone.

Concurrently, Duncan undertook research with the United Kingdom Strength and Conditioning Association. This assessed the safety and effectiveness of using resistance training interventions within primary school children on FMS, physical self-efficacy and health-related fitness. The research demonstrated the importance of developing FMS during childhood, judged against the key health-related metrics of physical activity and weight status (R3).

From 2017 to 2020, Duncan and Eyre carried out research funded by the Badminton World Federation (BWF) to examine the efficacy of a badminton-specific movement intervention for primary school children, the Shuttle Time Programme (STP), compared to traditional physical education (G2, G3). Using a cluster randomised design with 124 children, Duncan and Eyre evaluated FMS attainment levels before, during and after participation. The research showed that FMS development could be anchored to a specific sport rather than a generic programme of activities, as is more common. It demonstrated that the STP was not effective in all children, as had been assumed by BWF, and raised important questions about the efficacy of 'one-size-fits-all' interventions (R4).

Duncan's work on FMS and the development of physical literacy amongst young people is ongoing, and he was recently invited to be lead author of an Expert Statement on FMS for children's health on behalf of the British Association of Sport and Exercise Sciences.

3. References to the research (indicative maximum of six references)

R1. Bryant, E. S., Duncan, M. J., Birch, S. L. (2014). Fundamental movement skills and weight status in British primary school children. European Journal of Sport Science, 14, 730-736. https://doi.org/10.1080/17461391.2013.870232

R2. Duncan, M. J., Cunningham, A., Eyre, E. (2017). A Combined movement and storytelling intervention enhances motor competence and language ability in pre-schoolers to a greater extent than movement or storytelling alone. European Physical Education Review, 25, 221-235. https://doi.org/10.1177/1356336X17715772

R3. Duncan, M.J., Oxford, S., Eyre, E. (2018). The effects of 10 weeks Integrated Neuromuscular Training on fundamental movement skills and physical self-efficacy in 6-7 year old children. Journal of Strength and Conditioning Research. 32, 3348-3356. https://doi.org/10.1519/JSC.0000000000001859

R4. Duncan, M.J., Noon, M., Lawson, C., Hurst, J., Eyre, E.L.J. (2020). The Effectiveness of a Primary School Based Badminton Intervention on Children's Fundamental Movement Skills. Sports, 8, 11. https://doi.org/10.3390/sports8020011

G1. Duncan, M. (PI) (2016-2017). 'Using Movement and Story-telling to Enhance Motor and Cognitive Development in Preschoolers'. British Academy: Leverhulme Small Research Grant. Total grant amount: £6,293.

G2. Duncan, M (PI), Eyre, E. (2017-18). 'Evaluation of the Shuttletime Programme'. Badminton World Federation Sports Science Research Grant. Total grant amount: $6,300 (£4746.42).

G3. Duncan, M (PI), Eyre, E. (2017-18). 'The Effectiveness of a Primary School Based Badminton Intervention on Children's Fundamental Movement Skills'. Badminton World Federation Sports Science Research Grant. Total grant amount: $9,000 (£7,055).

4. Details of the impact (indicative maximum 750 words)

Research by Duncan and Eyre has helped provide children with the 'tools' to be physically active for life: improving knowledge, guiding practice, and informing policy for teachers, sports organisations and private companies.

Guidance for BWF Outreach

Launched in 2012, 'Shuttle Time' (ST) is the flagship young person's programme of the Badminton World Federation (BWF) that supports its implementation in 138 countries, with over 50,000 coaches trained. In 2017 BWF approached Duncan and Eyre to measure the effectiveness of the programme with FMS. They found that ST best enhanced FMS in children below seven, but was far less effective in those aged 10 or above. As a result, FMS development was embedded for the first time within a governing body of sport's work. BWF used the research to change the way ST was implemented, and to support 'the further growth of the programme globally' (S1).

BWF disseminated new guidance based on CU findings to all coaches worldwide, resulting in improved coaching knowledge and practice (S1, 2). Implementation guidelines now specify that ST is most effective in Key Stage 1 (equivalent); BWF revised ST for KS2 as a result, refocussing the programme on Fundamental Sport Skills (rather than FMS). The Development Director of Badminton Pan America stated that this has 'changed thinking 'on how they 'use Shuttle Time to enhance children's experiences of badminton and… help enhance children's movement skill development' (S2).

Enhancing FMS for Schools, Early Years and Community Sports Providers

Following engagement with CU researchers, since 2016 Coventry City Council have used analysis of children's FMS to inform development of targeted interventions relating to physical literacy: schools now include child-specific resistance exercise training in statutory PE at Key Stage 1 (S3). Duncan's work has also provided an effective framework for assessments of primary PE, which are mandatory but often poorly conceptualised: schools across Warwickshire – catering for some 82,000 children - now include FMS assessment in their standard monitoring and observation strategies for curriculum PE (S3). Warwickshire Education's Integrated Disability Service also used this research to change motor-skill and movement interventions to better enhance education opportunities for children with special educational needs, integrating speech therapy with FMS to improve language development (S4).

From 2015 to 2020, Duncan worked closely with one of the largest grassroots football clubs in Birmingham County FA, reaching some 1,500 junior footballers over five years. Over 30 community grassroots coaches were trained in the best ways to enhance movement and motor skills for children, and the chairman reports the 'positive influence' it has delivered to help develop foundation skills (S5), proven to benefit lifelong physical activity and health.

Promoting Storytelling to Enhance Movement and Language

Research combining FMS development with storytelling activities (R2) informed a novel intervention designed to be practically useable by pre-school teachers, with activities based on the popular children's book 'The Gruffalo'. This work was utilised as a template within teachers' 'INSET' training across Warwickshire, leading to the incorporation of child-specific resistance training and/or combined movement with storytelling in classrooms (S3). Schools attest to the 'sustained impact on the physical education outcomes' of pupils, improving 'motor-development related outcomes' and the way it has helped 'provide continuous professional development' for teachers, improving provision (S3).

The research was also utilised by HE institutions Dublin City University (DCU), Mary Immaculate College (MIC), Limerick, and Instituto Universitário da Maia (ISMAI), Portugal to inform teacher education programmes at undergraduate and postgraduate level (S6). A Senior Lecturer from MIC notes that 'many student teachers have adopted this practice during the school placement

experiences'. At ISMAI and MIC the research was also used to inform wider community-based programmes: for example, the findings of R2 were 'central to changes' in ISMAI's 'PETIZ' community gymnastics programme, which 'enhanced' the experiences of participants, helping babies and toddlers 'to move more effectively' (S6).

Informing UK Government Policy

In 2015 the UK Government gave Sport England a new remit to support children aged 5-14 years. SE commissioned Duncan and Eyre (R1, R2) to undertake a review (completed in March 2017) to inform the body's response to this, and provide knowledge on childhood development. This led SE to integrate FMS into their approach. As a result from 2017 new questions related to physical literacy were included within the annual 'Active Lives' survey, a cross-government decision-making tool collecting data from 96% of English school children in years 1-11 (S7). Guided by Duncan and Eyre, SE now measures the data received against key performance indicators relating to positive attitudes towards sport, physical literacy, and being active, informing the way SE assesses children's physical development for the Government (S7, S8 S9).

Informing Commercial Development

In 2017 Jupiter Play, a UK-based SME producing play equipment for children in public spaces, used Duncan's work to adjust their strategy and 'explicitly embed the development of FMS in the design of spaces for local communities across the UK' (S10). Jupiter used the research to demonstrate FMS benefits of their product range to customers in an online campaign during the first COVID-19 UK lockdown period (March - June 2020). It 'informed the advice, design and products supplied by Jupiter Play' at residential sites Houlton, Rugby and Alconbury Weald, Huntingdonshire, marking the beginning of Duncan's collaboration with largescale development company Urban&Civic plc (S10).

5. Sources to corroborate the impact (indicative maximum of 10 references)

S1. Collated Testimonial and Web Page. World Badminton Federation.

S2. Testimonial. Development Director, Badminton Pan Am Confederation.

S3. Collated Testimonials. Coventry and Warwickshire Schools and Pre-Schools.

S4. Testimonial. Integrated Disability Service 0-5 Team, Warwickshire Integrated Disability Service.

S5. Testimonial. Chairman, Ambleside Junior Football Club.

S6. Collated Testimonials. Sports Sciences Academics, Dublin City University, Mary Immaculate College, Limerick, ISMAI Portugal.

S7. Testimonial. Strategic Lead on Customer Insight, Sport England.

S8. Sport England: 'Active Lives Children and Young People Surveys'. (Assessments using 'Positive Attitudes' and 'Physical Literacy' are used within metrics from the initial 2017-18 report.)

S9. 'Sporting Future', Second Annual Report – Measurement Dashboard (June 2018). HM Government. (KPIs 5 and 8 relate to corresponding 'Active Lives' Survey Data on 'Physical Literacy' and 'Positive Attitudes' to sport.)

S10. Collated Testimonials. Sales and Marketing Manager, Jupiter Play and Leisure Co; Regional Director, Communications, Communities and Partnerships, Urban&Civic plc.