

Desk cycles study

Crescent Academy

Problem: What challenges do your school(s) have that need to be addressed?

UK classrooms are becoming increasingly sedentary. From a health point of view this is a very worrying trend, particularly in Stoke-on-Trent where health indices are well below the national average. There is also a proven link between exercise and fitness levels with attainment and again the attainment of children in Stoke-on-Trent is below the national average (Public Health Report, Child Profile 2016). Some children find it difficult to remain sedentary in a classroom for any length of time. They lose focus and concentration and take longer to complete tasks. They also have an inclination to disturb other children as they can unintentionally make annoying noises by tapping or constantly moving in their chair. These children are not naughty children, they just do not cope well with long periods of inactivity.

Innovation: How will the innovation help improve the problem you have identified and benefit teachers and learners?

A desk cycle is a small, portable pedal unit which fits under a desk allowing a person to pedal whilst doing work. The desk cycles chosen are the same make as the ones used in the American Study. They are only 24cm high and can be used under a low desk. The units work on a magnetic resistance so are quiet and shouldn't distract other children. Each cycle has a display which will be covered up so that the children don't become competitive or fixated on the cycle. However teaching staff will be able to record the distance each child has pedalled at the end of every morning session.

The 10 children who score highest on the hyperactivity subscale of the Strengths and Difficulties Questionnaire (SDQ) will form the trial group in the class using the desk cycles and the 10 children who score highest on the SDQ in the parallel class or Year 5 class will form the control group. The target group will be children who typically fidget, have lapses in concentration, and

who display behaviour that in general is a low level distraction to other children and staff. Each child in the trial will have access to a desk cycle during the morning when lessons are typically maths and literacy. The children will be able to decide for themselves how they use the cycles. Other children in the class will be able to use the cycles in the afternoon if they choose to do so.

Existing evidence: What evidence is there that this innovation will improve outcomes?

Research evidence supports the view that an increase in physical activity has a positive effect on cognitive development and consequently attainment. Some of the newest of these discoveries are the immediate effects of exercise on the mind. Studies have shown that people, after freshly completing a session of exercise, are better able to concentrate and ignore distractions (Scudder et. al, 2013). Exercise has also been shown to have been shown to improve student memory, significantly improving verbal memory learning in both short- and long-term memory (Etnier et al 2014).

In America kinaesthetic learning in the classroom (not to be confused with Kinaesthetic learning style) is being evaluated. This approach is a subset of active learning, as children in this case are being physically active and moving round in the classroom as they learn; in a small number of schools they are using desk cycles. An elementary school in America trialled the use of desk cycles (2015) and reports state that the outcome was positive. The children's test scores improved as they were more focused and reported that using the desk cycles helped them concentrate and helped reduce stress levels. In addition data from a Read and Ride study being run in over 30 schools in Arkansas show a link between the use of a cycle desk with a growth in literacy scores and reading comprehension proficiency. It should be acknowledged though that there appears to be a lack of a control group in the American studies.

Pilot

I conducted a small scale study using desk cycles with a Year 6 class in January 2017, with a control group in the parallel Year 6 class. I found the results to be similar to the American pilot; children were more focused and an improvement in maths scores was noted.

Research question or hypothesis: What effect will the intervention, implemented for how long, with which pupils, have on what outcomes?

Research question 1: Does access to desk cycles in a primary school classroom setting for 15 weeks reduce the hyperactivity levels of Y5/Y6 pupils with high levels of hyperactivity?

Research question 2: Does access to desk cycles in a primary school classroom setting for 15 weeks improve the attainment in maths of Y5/Y6 pupils with high levels of hyperactivity?

Research question 3: Does the use of desk cycles in a primary school classroom setting for 15 weeks have a positive impact on the fitness levels of Y5/Y6 pupils?

Method: Include sample, design, measures, intervention, process evaluation, and analysis

Sample

Ten Year 5 or Year 6 children per school (50 in total) will be in the trial with a further 50 Year 5 or Year 6 children in a control group (one of the schools in the trial who have a two-form entry will have a trial group in Year 5 and in Year 6). Children will be chosen by the class teacher based on observation of behaviour (using the SDQ hyperactivity scale). The 10 children with the highest scores in the hyperactivity scale of the SDQ in the class will form the target group and 10 children with the highest observed level of hyperactivity in the parallel class will form the control group. Consent for involvement in the trial must be approved by the parent and head teacher. In terms of demographics, the 2015 Index of Multiple Deprivation ranks Stoke-on-Trent the 13th most deprived Local Authority out of 326, so high social deprivation is common to all four schools in the trial.

In terms of EAL (national 20.5%):

- Moorpark Junior School 19.1%
- Crescent Academy 7.8%
- STAR Academy 8%
- Sandford Hill Primary 9.2%

In terms of Free School Meals (national 24.7%):

- Moorpark Junior School 47.9%
- Crescent Academy 58%

- STAR Academy 39.3%
- Sandford Hill Primary 22.2%

Assignment to condition

Two of the schools have a one-form entry so either the Year 5 or the Year 6 class will be the trial class. I will pair the two schools together and toss a coin to determine which school will have the trial group in Year 6 and the control group in Year 5. The two schools with a two-form entry will also be paired and a coin tossed to determine who will run a trial group in Year 5 and in Year 6. For the school with only one trial group a coin will be tossed to determine whether this is a Year 5 or a Year 6 class. The children chosen for the trial groups and the control groups will be the 10 children who score highest on the SDQ in each class and a standard deviation spread sheet will be used to ensure a similar population is used in each school.

Innovation

A desk cycle will be placed under the desk of each child in the trial for a period of 15 weeks. The display on the cycle will be switched on but covered up to avoid competition and distraction for the children. The children can decide how they would like to use the cycles (continuous cycling or when they choose to pedal) and they will have access to the cycle throughout the morning. The class teacher will be asked to record the distance pedalled by each child at the end of every morning on a data collection form – a spreadsheet provided for the school to capture all baseline assessment and desk cycle usage. To avoid any jealousy or possible stigma attached to using a cycle the other children in the class will be able to use the desk cycles in the afternoon if they choose to do so. If other children use the cycles then the class teacher or TA will have to either switch off the display in the afternoon or reset the display first thing in the morning so that the distance recorded for the trial group is accurate.

Outcome measures

Data collection 1 in January and data collection 2 after SATS. Data collection 3 in July when SATs are published.

- Completion of SDQ by the class teacher (The emotional scale and the hyperactivity scale). Data collection 1 & 2.
- Predicted SATs scores for maths assessed by class teacher (children also sit past test papers) and actual SATs scores for maths. Data collection 1 & 3.
- Time taken to complete the daily mile. Data collection 1 & 2.
- Waist circumference divided by height measurement. Data collection 1 & 2.

The Strengths and Difficulties Questionnaire (SDQ) is a brief behavioural screening questionnaire for use with 3–16 year olds. It exists in several versions to meet the needs of researchers, clinicians and educationalists. The Strengths and Difficulties Questionnaire (SDQ) includes five scales and two are being used for the purpose of this study (the emotional scale and the hyperactivity scale), as this is a general population sample. Each scale contains five questions eg. a child is observed in relation to the question are they restless, overactive, cannot stay still for long? The teacher will conclude either 'not true', 'somewhat true' or 'certainly true'. In this example score 0 for not true, 1 for somewhat true, and 2 for certainly true. The scores for all five questions are added up and compared on the hyperactivity scale (max of 10).

Process analysis

Pilot lead to observe the use of the desk cycles by the children on a monthly basis starting on 29th January (week 2, week 6, week 10 and week 14). This will act as a check that only the children in the trial are using the desk cycles in the morning and it can also be observed how and when the children are using the cycles. Random sample questioning of children and staff will also take place during the pilot eg. attitude towards the use of the desk cycle as in do they like using the desk cycle, when during the lesson do they use the desk cycle and does it help them in any way. The same questions will be used in each school and children not using the desk cycles will also be asked their opinion eg. do they find the desk cycles distracting? Do they use the desk cycles in the afternoon? etc. The answers will be captured on a mobile phone (voice only) and then transcribed to ensure accurate recording of what was said. At the end of the data collection an interview of a focus group of children and a class teacher will be filmed to get an accurate record of their response to the desk cycle pilot (after week 15).

Analyses

Compare the data collected in January with the data collection in May and July and also compare results between the trial groups and the control group.

- Were there any significant reductions to the HA or E scales (standalone scales from the SDQ) for the children in the trial compared with the control group?
- Did children in the trial group make significantly more progress in their math SATs than the control group?
- Did the trial group's level of fitness improve (reduction in daily mile time) when compared to the control group?
- Was there a significant change in waist height ratio measurement in the trial group compared to the control group?

All of the baseline data will be compared with the final data collection and effect size will be used to see if there is a meaningful change as a result of using the desk cycles (shown by a positive

score). Effect size is where the mean of the control group is subtracted from the mean of the intervention and then divided by the standard deviation of the sample.

Evaluation of the children and teacher's responses to the benefits of using desk cycles in a classroom setting. This will be achieved by using thematic analysis; a method for identifying, analysing and reporting patterns within data. Thematic analysis is a widely used method of analysis in qualitative research.

**Conclusion: What will happen if your innovation improves outcomes, or not?
What are the limitations of your evaluation?**

Limitations

In terms of the number of factors involved it will always be difficult to attribute the use of the desk cycles exclusively to any improvement in SATs scores or SDQ scales. However to try and increase internal validity a meeting of all staff engaged in the study will explain the experimental method being used and the need for consistency. As the study involves four schools all data collection will be taken during the same weeks using the same tests and methodology. Questioning and observations will be conducted in the same weeks and the same questions used with each group. All teachers' involved will use the same data collection documentation provided by the pilot lead. That said, some internal factors cannot be controlled, for example the varying levels of motivation of the children towards learning or a change in class teacher which may impact on the study. In terms of external validity the selection process for the trial and control group will be consistent and can be reliably replicated. The demographics of the four schools are very similar as their postcodes are in areas of high social deprivation. It may be necessary to conduct further research before generalising results to other populations. The use of the desk cycles by the children will take place over a five-month period to ensure the results are not distorted by the novelty impact of using the desk cycles.

Implications

If positive extend the pilot to involve a larger number of schools. If results were negative then the desk cycles would be removed from the classroom but could be used during wet play or C4L after school clubs to help improve fitness levels of children.

References

1. Research that highlights the problems of being sedentary

Start Active Stay Active; A report on physical activity for health from the four home countries' Chief Medical Officers (2011)

Sedentary Behaviour and Obesity Expert Working Group (2010) *Sedentary Behaviour and Obesity: Review of the Current Scientific Evidence*. London: Department of Health.

Designed to Move: A Physical Activity Action Agenda

Riddoch, C.J., Andersen, L.B., Wedderkopp, N., Harro, M.,Klassonheggebø, L., Sardinha, L. B., Cooper, A. R., and Ekelund, U.(2004).

Physical Activity Levels and Patterns of 9- and 15-yr-old European Children. *Medicine and Science in Sports and Exercise*, Vol. 36, No. 1, pp. 86-92.

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Public Health Profiles for Stoke-on-Trent <https://fingertips.phe.org.uk/profile/health-profiles>

2. Research that highlights the link between exercise and cognitive performance

The Kinetic Classroom, By Richard Ogoe, CEI Intern (Centre for Educational Improvement USA)

(Scudder et. al, 2013). (Piepmeier et. al, 2014) (Schwartz et. al, 2014).

Read and Ride Program <http://www.readandride.org/> Data has been published on the website linking use of a bike desk with improved attainment in reading (copy of data attached).

Designed to Move – A physical activity action agenda (copyright 2012, 2013 by Nike, Inc. All rights reserved).

'*The link between Pupil Health and Wellbeing and Attainment*' A briefing for head teachers, governors and staff in education settings. Public Health England November 2014

Booth J, Leary S, Joinson C, Ness A, Tomporowski P, Boyle J & Reilly J (2014). Associations between objectively measured physical activity and academic attainment in adolescents from a UK cohort. *British Journal of Sports Medicine*, 48, 265-270.

'*Spark: The Revolutionary New Science of Exercise and the Brain*' by [John J. Ratey](#), [Eric Hagerman](#) ISBN 1849161577 (2010)

Also see John Ratey Ted talk: 'Run, Jump, Learn! How Exercise can Transform our Schools.

3. Research to support use of waist measurement to height ratio rather than BMI

Leeds Beckett University. "Waist-to-height ratio more accurate than BMI in identifying obesity, new study shows." ScienceDaily. ScienceDaily, 6 June 2017. <www.sciencedaily.com/releases/2017/06/170606090942.htm>.

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