

Investigate the effects of a physical activity programme on children's health and motor skills development.

Abstract

Physical development is crucial during the early years of children and is widely promoted for health benefits during childhood and preventing diseases into adulthood. This study will explore research into the health benefits and effectiveness of physical education with a focus on children's health and development of motor skills. Thus, determining if a physical activity programme aimed at preschool children aged three to five years will improve their fundamental motor skills and health. Twelve children will be sampled from selected nurseries across South Wales. One group will take part in the physical activity programme, the other a control group. Baseline assessments will be gathered before starting the programme. During the programme children will wear an accelerometer to produce data on their physical activity and observations will be made by practitioners, researchers and qualified PE instructors. Group interviews will be conducted after the programme to discover the children's opinions. A follow-up test will be conducted six months after the programme to determine the long-term effects of the study programme on children's activity levels and motor development. Ethical conditions will be considered to protect the children from harm and ensure they give informed consent to take part.

Literature review

Children aged three to four should spend at least 180 minutes of the day in a variety of types of exercise at any intensity, of which 60 minutes is moderate to vigorous (World Health Organisation, 2002; National Health Service, 2022). This supports the question that children should engage in physical activity during their day. Physical activity guidelines based on FITT (Frequency, Intensity, Time, Type) can be classed as Physical education, active travel, play and sports which develop movement skills, muscular fitness, and bone strength (UK Chief Medical Officer, 2019). Research by National Centre for Sport and Exercise Medicine (2015) states that only 9% children aged two to four years complete three hours of daily exercise and 84% take part in less than one hour. Evidence from previous research shows that 4.4% of children

have delayed fundamental motor skills and a further 8.8% are at risk of delay (Che *et al.*, 2023). Furthermore, data from European countries from Ahrens *et al.* (2014) showed an increase in physical activity as the children grew older but still lacked the recommended amount of activity. However, Aubert *et al.* (2020) found that only four out of twenty countries had reported data so more would need to be collected to further examine.

Payne, Townsend, and Foster (2013) suggested that more effects were needed to minimise the amount of time children are sedentary as this can have harmful effects to the body (Carson *et al.*, 2016). This has been a growing concern over the past decade with more children staying indoors on iPads and parents less likely to let them out to play. Reports from The Health and Social Care Information Centre (2015) reported over 9% of children in Reception were obese in 2013. With that in mind, cardiovascular disease is one of the most common causes of death and this can be contributed by obesity and a sedentary lifestyle. Studies from Pinckard, Baskin and Stanford (2019) show that a combination of diet and exercise induces weight loss and improves cardiovascular health.

Additionally, free play is important for movement, but it can be argued that it is not enough to achieve motor learning levels. Some motor skills need to be learnt through appropriate feedback and instruction (McNamara *et al.*, 2015). This is reflected in guidelines for under-fives to have a combination of structured activity and free play. Two-year-olds are more physically active than at any other time of life and interest in large motor activities increases with improved motor abilities. Research by Fumagalli *et al.* (2022) showed that children participating in structured activities made significant improvement in physical development. The practice of motor skills continues to be an important part of play, which can be achieved through both free play and structured play developing skills such as spatial awareness, balance, and co-ordination. Nuffield Foundation, 2022 and Bahr *et al.* 2023) found that during Covid children's motor skills were seriously affected by spending less time outdoors and more time sedentary. This raises the point of how important exercise is for children's development alongside the concern of current lifestyles and not moving as much as guidelines state (Department of Health and Social Care, 2019).

Moreover, there is an abundance of research about Primary Physical education programmes in schools, but no reference is made to organised activity in the Early Years. Department for Education (2013) state that in Key stage one children should develop fundamental movement skills, participate in team games and perform movement patterns in dance. Accordingly, the Early Years Foundation Stage Framework (2023) states that lots of opportunities are given to children to develop their physical development, movement and exercise but no formal activity is implemented.

Furthermore, Duncombe (2019) suggests that physical literacy needs to be implemented from birth promoting it through participation in physical activity gaining motivation, confidence and physical competence. Spending time being physically active will influence the development of motor skills and once mastered, children are more likely to join in with activities and increase their fitness levels (Woodfield, 2004). Looking at the Foundation Phase in Wales with the play-based curriculum, children get lots of opportunity to be physically active, not spending time at a desk (Gardener *et al.*, 2019). However, do the children see themselves as just 'playing' rather than being physically active? Howard and McInnes (2013) stated that play is play and activity is not play.

In conclusion, research into the health benefits of being physically active show it is an important time in young children to develop their fundamental movement skills and muscle growth during a time that could lead to becoming obese and at a higher risk of later developing cardiovascular disease. Practitioners in Early Year settings play an important role in developing children's physical literacy.

Methodological Considerations

Sampling

Samples are important in studies to ensure validity and reliability (Aitken and Burmeister, 2012) allowing researchers to select a sampling method to conduct small scale research and can generalise findings from a vast population eliminating error and bias and enhancing representativeness (Berndt, 2020).

There are many sampling techniques to choose from when conducting research. Random sampling is where participants are selected at random meaning all will have an equal chance to take part. This is known as probability sampling based on an unbiased representation of the population (Bell, 2018). This is easy to implement as researchers only need minimal knowledge of the population, free from bias and the data is easy to analyse. Limitations of this sample are that the cost is high as a sampling frame is required and errors can be made with large sampling (Acharya *et al.*, 2013).

Furthermore, convenience sampling is a type of non-probability sampling selected by the researcher based on participant's availability at the time of the research and who fit the criteria of the study (Stratton, 2021). By using this method, data is easily collected with fast results for the researcher, but these results can be seen as biased as it is not representative of the population as it cannot be controlled or measured (Cohen, Manion, Morrison, 2017).

Similarly, purposive sampling is where participants are selected based on characteristics related to the study. The benefits of this sampling are that it is targeted to the research that is relevant to the study and the responses will be high quality as it is a smaller population (Wall-Emerson, 2015). However, this is not as effective using a larger scale and some parts of the population may be eliminated by error. This can also be biased because it is generalised to the sample not the entire population (Andrade, 2020).

This study will use purposive sampling as it requires children to be healthy, injury free and without disabilities. From this selected sample, random sampling will be used to select twelve children in each setting to ensure validity and remove bias. The lottery method will be used assigning a number to the population, selecting at random. Limitations will be mitigated by using a small sample size (Oakes, 2017).

This study will consist of a sample of children based in Primary and Nursery schools across South Wales. The chosen sample uses children aged three to five attending preschool full-time. Twelve children will be selected from each school representing both genders and of good physical health, excluding children with disabilities,

medical conditions and injuries. The children will be selected by purposive sampling as the study requires the children to be in good health. Children will then be randomly assigned to either an intervention group or a control group. A small sample sized group will be beneficial given the young age of the children which can also present challenging behaviour. However, larger sample sizes may provide more reliable data, so this study will collect data from multiple schools in the area.

Methods

This study will look at children participating in a structured physical activity programme conducted for forty-five minutes, three times a week for twelve weeks. Activities will include fundamental motor skills activities including ball skills, balance and control and large physical movement. These will be age-appropriate and can be completed indoors or outdoors. The study will be a quasi-experiment where one group will take part in the intervention programme, the other group will be the control group where they will continue their preschool curriculum without physical activity interventions. All activities and assessment will be facilitated by trained PE instructors and supervised by the settings educators to ensure safety to the participants.

Qualitative research is how information or data can be interpreted and the vast range of this gives the researcher validity (Roberts-Holmes, 2011) and often focuses on 'how' and 'why' questions. Sample sizes are usually small scale and relies on participants to share their voices, experiences and interpretations to gain data, understanding the meanings and patterns of behaviour (Cohen, Manion and Morrison, 2017).

Quantitative research is data which can be collected and measured using statistical methods to analyse findings in a numerical way (Bolshaw and Josephidou, 2018).

Numerical data can be collected through surveys, experiments and observations.

Sample sizes are usually larger to allow for comparison across populations.

Quantitative researchers often start out with a hypothesis that can be proved true or false with findings. Quantitative methods can be a direct measurement, an observation or a survey as long as the distribution is large (Davies, no date). To

minimise bias in a study, the researcher must assume a neutral and objective stance and use standards of reliability and validity.

Mixed methods combines both qualitative and quantitative research which allows for a more complete understanding as one will build on or support the other (Solvason and Walker, 2014) and be able to view data from different perspectives. Therefore, by combining these approaches researchers can gather the strengths and take into account the weaknesses of both. Using mix methods can allow researchers to answer 'what' questions from quantitative and 'why' from qualitative provide understanding of the research problem. Researchers are then able to decide how much of both methods are needed according to the type of question being researched (Efrat and Ravid, 2018).

Another approach of mixed methods is known as the Mosaic Approach which includes the child's voice. This combines more traditional methods of observation and interviewing where children are seen as participants taking on the role of showing the researcher their world from their perspective (Clark, 2005). Another important aspect of this study is listening to children who are active participants in the study (Robert-Holmes, 2018). Historically, children have not taken part in studies as it was thought their views were not beneficial to research. However, with the introduction of the United Nation Convention on the Rights of a Child [hereafter UNCRC], (1989) it recognises the need to work with children, not for and perceive the children as a group, rather than interpreting their voice through family who have spoken for them previously. Article 12 states that children have the right to make decisions that affect them (Unicef, no date).

This study will use a mixed method approach of collecting data as it allows both qualitative and quantitative approaches. To gain quantitative data, the participants will take part in a base line assessment where their physical fitness will be assessed. Children will also wear an accelerometer to measure physical activity whilst taking part in the activities (Cadenas-Sanchez *et al.*, 2017). For the qualitative data, a group discussion will take place using semi-structured questions to assess their opinions on taking part in the study. Mosaic method was considered but not needed as physical activity requires a quantitative method for data collection.

Triangulation

In research methodology, triangulation involves using different types of qualitative and quantitative data to enhance the validity and credibility of the findings (Noble and Heale, 2019). For example, if data from qualitative and quantitative results show the same outcomes, then there is agreement (Robert-Holmes, 2018). This gains a more comprehensive understanding of the research and is beneficial to reduce limitations or bias and give credibility by comparison and contrast (Denzin, 2006). This study will triangulate the data to enhance the validity of the results. This can be achieved by using multiple methods and data which will lead to the same conclusion and mitigate any biases through the methods, data or researcher thus making the findings reliable.

Methods for data collection

Interviews with participants can generate knowledge through conversation instead of gathering numerical data (Brinkmann and Kvale, 2014). These interviews can allow participants to discuss their interpretations of the world and their views making it a flexible tool for data collection (Cohen, Manion and Morrison, 2017). There are limitations to interviews with children as can be a strange situation with a stranger making children unlikely to share their thoughts. There could be a limited understanding of what is being asked of them and equally a limited vocabulary to express themselves (Colwell, Hart and Johnson, 2014).

In this study to compensate for this, a group discussion will take place. This will be less intimidating for the children, and they will more likely feel comfortable communicating with peers. The questions asked during the discussion will be semi-structured and will range in difficulty as it is important to consider children's capabilities. This will ensure children feel included and appreciated (National Society for the Prevention of Cruelty to Children [hereafter NSPCC], 2024). Moreover, it will keep focus and maintain control of the research. Previous approaches of this method are limited as it was found that children under seven do not have the social skills and language abilities for group participation (Evans, Stolzenburg and Wylie, 2021).

However, groups of children freely expressing themselves reduces the power imbalance which in turn will reduce the halo effect (De Sordi and Meireles, 2019).

Halo Effect

The halo effect is a cognitive bias that can affect the way participants interpret people of significance. This can distort data as judgements may be made during the study which can affect the way the participant views the researcher. Studies have shown that aesthetic and physical appearances can be linked to intellect (Espoito *et al.*, 2021) Trustworthiness is also found to be fundamental to social perception where participants can assess another person's good intentions.

Hawthorne Effect

This can be described as participants behaviour changing or improving because they are aware of being studied or evaluated and can change in line with these expectations (Adair, 1984). This can cause limitations for studies when gathering data. To combat this, trust needs to be gained between researcher and participants. They will in turn feel relaxed and unthreatened (Oswald, Sherratt and Smith, 2014).

Ethical Considerations

Ethics is defined, according to Resnik (2015) as a “norm for conduct that distinguish between acceptable and unacceptable behaviour”. In terms of research there are several meanings of ethics. This is found to be knowledgeable and truthful when researching, collaborate with others and give credit where due, to be held accountable to the public and morally to take in to account the health and safety of others, including integrity and objectivity. Rogelberg (2004) suggests that ethics should be considered before conducting a study by evaluating competence, knowledge and planning of study and being familiar with the ethical guidelines that govern the laws and legislation.

Consent

According to Roberts-Holmes (2011) informed consent refers to participants agreeing to take part in research voluntarily based upon disclosure of all information relating to the study gaining trust over time as it proceeds.

Additionally, Parsons (2018) states that assent is for participants who are under legal age of consent. Parents/guardians would typically provide consent on their children's behalf known as an agreement. Children can still choose to participate, and this can be observed by their body language as well as through discussion. Early Education (2011) states in the code of ethics that researchers should be aware of issues in children's participation such as fatigue and their interest therefore practitioners in settings can use their judgment to inform researchers of the needs of the child. With that in mind, Alderson (2008) suggests involving children in telling them about the research using a child-friendly leaflet to inform them making it easier to explain.

Openness and disclosure

At the beginning of this study, a PG2/E1 form was submitted to the University of Wales Trinity Saint David [hereafter UWTSD] to ensure the research complied with ethical guidelines before gaining consent from the participants. In addition to this, a risk assessment is needed, particularly when working with children who are at risk of having an injury during the study.

Informed consent was gained from the settings used, the parents and the child. A letter was sent to the setting gaining consent from the manager and practitioners. The setting then agreed to pass on information about the study and a meeting was organised to meet and discuss with parents about both theirs and their child's ethical rights and to sign consent forms. As mentioned above a child friendly leaflet will be discussed with the child to verbally gain consent. This gives the child a voice as defined in UNCRC (1989), in articles twelve and thirteen giving the child a right to express feelings and views and having freedom to express thoughts and opinions (UNICEF, no date). This established children's rights and changed the way children were viewed by researchers making it clear that children should be viewed as participants and not treated as subjects (Palaiologou, 2012).

Right to withdraw

Researchers need to recognise the right to withdraw from the research at any time and should be informed of their right to do so and how to go about it. This is important when working with children to ensure they can withdraw without

consequences (Harcourt, Perry and Waller, 2011). Care must be taken not to coerce a participant if they can be encouraged to take part. However, children may just lose interest and are not withdrawing from the experiment entirely. To counteract this happening, researchers can ensure that full disclosure is given at the beginning of the study to ensure participants are fully informed and to continue to maintain good practice throughout the study in order to keep withdrawal levels low (Holm, 2011).

Confidentiality and anonymity

Confidentiality will be addressed by naming who is responsible for the security of confidential data collected during the study. Participants will be informed of how data will be stored, for how long and who has access to it during the length of the study (Cartmel, Macfarlane and Nolan, 2013).

Images of children and other data are collected with informed consent and are stored and utilised according to legislative policy requirements in the Code of Ethics (Early Education, 2011). Participants will be aware of this information and how they can access it.

Risks to Participant

Ethics for the participant has a focus on their protection, ensuring their rights and interests and protecting confidentiality. Participants will be aware of the study by way of an information sheet explaining the purpose, process and their rights before committing to the study. This will be written in easy-to-understand language. Each study will have a risk assessment to identify any potential risks to participants' health and safety. This can include physical and psychological harm (Ethical Research Involving Children [hereafter ERIC], no date).

For this study parents will need to give consent for their children to take part and researchers and school practitioners will be present looking for signs that children are unwilling to take part. They will be aware of their duty of care towards the participants and can withdraw from the study at any time (NSPCC, 2024). By signposting the right support researcher can ensure that children feel respected and can participate safely.

Participants personal information and data will be stored using a password protected file to ensure confidentiality. There may be circumstances where confidentiality may need to be broken. This would be documented in the consent forms to state this. Any personal comments made would be kept confidential unless the researcher considered they were at risk or in danger. Researchers must follow a duty of care to disclose information to relevant authorities (British Educational Research Association [hereafter BERA], 2024).

Risks to the researcher

Ethics for the researcher can focus on their reputation. Risks to the researcher can happen at any time throughout the study. If there is a conflict of interest and it is not declared, the researcher is compromised and can risk damage to their professional reputation and a loss of trust with the public (Hedgecoe, 2015). Researchers need to ensure they do not lie or distort the truth when conducting a study. To ensure this does not happen, everything needs to be recorded as proof and if possible countersigned to reduce bias.

There is a risk of physical harm to the researcher as participants history may not be known. Conducting studies that relate to personal experiences could lead to conversations that evoke painful memories (Butler, Copnell and Hall, 2017). Challenging behaviours may arise as a result of this and there is a need for the participant to protect themselves. In this situation, data or information could be gathered by telephone or email where the researcher can adopt a pseudonym.

Risks to the University

Researchers are responsible for maintaining the ethical standards of the University so as not to implicate the University's reputation. Any piece of work or research needs to comply with the rules as stated in the (*Research Ethics and Integrity Code of Practice 2022*). These are important to uphold, for example, conducting research ethically and legally, based on best practice and to handle allegations of misconduct as they arise.

Research misconduct can jeopardise the reputation of the University (UWTSD, 2024). Producing results that have been fabricated or research that has been

plagiarised can have an effect causing loss of funding, retraction of papers and diminished credibility towards the University.

In this study ethical considerations will need to be undertaken as the participants are children taking part in physical exercise so are a higher risk to both the researcher, University and participants themselves. This will ensure children will not be disadvantaged during the study and are safeguarded from harm (Cartmel, Macfarlane and Nolan, 2013). Researchers and PE Instructors will be required to complete an Enhanced Disclosure and Barring Service check to be able to conduct their research through the University. This is a legal requirement when working with children and can protect the University's reputation.

Data Protection

General Data Protection Regulation [hereafter GDPR] (2018) is a European Union law that governs the way in which organisations can use, process and store data (Data Protection Commission, 2019). There are seven principles for organisations to be aware of when collecting personal data. These include storage limitation, lawfulness and transparency and accountability. Limitation is important as data should be collected for a specific reason, not to be further processed for another use. Lawfulness means that any data collected must have a legal basis and transparency is important for rights ensuring that information about data is easily accessible and clear to the public. These are not new principles, having been built upon previous regulations.

Data Protection Act (2018) is the implementation of the (GDPR, 2018) for the UK and controls how personal information is used by businesses, organisations or the government (Welsh Government, no date). Information stored can be kept up to date, handled appropriately and securely and kept for no longer than necessary. Included in the Act are stronger protection for data such as ethnicity, religious beliefs and biometrics. There are strict rules regarding use of personal data and under this act people have the right to find out what information is stored including access to personal data, how it is being used and deleted if necessary.

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