

Primary School and Life Project: The Contribution of Outdoor Education and Gamification

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Abstract

Primary school and Life Project: the contribution of outdoor education and gamification. This study investigates the impact of combining outdoor education and gamification on primary school pupils' learning of mathematics and well-being. The research, conducted in a school in Naples with a sample of 150 pupils (10 diagnosed with ADHD), adopted a mixed qualitative-quantitative experimental design, dividing the pupils into a control group and an experimental group. The quantitative results, measured using the Strengths and Difficulties Questionnaire (SDQ), showed significant improvements in the experimental group in terms of attention, self-regulation and prosocial behaviour, with particularly significant effects in students with ADHD. The qualitative data, collected through interviews and observations, confirmed that active participation, contact with the external environment and playful dynamics made learning more motivating and inclusive. In line with the theoretical framework of Self-Determination Theory and the Quality-of-Life model (Schalock & Verdugo, 2002), the study shows how outdoor education and gamification can promote well-being, self-determination and social inclusion, three dimensions that also represent the pillars of the Life Project outlined by Legislative Decree 62/2024. This evidence reinforces the need to rethink everyday teaching practices in an innovative, inclusive way that is geared towards the overall growth of each student.

Keywords: *Outdoor education; Gamification; Primary school; Inclusion; ADHD; SDQ; Mixed research*

Introduction

In recent years, growing interest in innovative teaching methods has prompted researchers and teachers to re-evaluate educational spaces and strategies, with the aim of making learning more motivating and inclusive, and better suited to pupils' developmental needs. Outdoor education and gamification are two such approaches, born out of different traditions and contexts, which now find common ground in primary schools. Outdoor education is based on the idea that direct contact with the natural or urban environment fosters more authentic and engaging cognitive, emotional, and social processes than traditional classroom teaching alone. It involves more than just moving lessons outside; it requires a rethinking of the entire educational process, which is structured around concrete experiences, practical activities and situated learning. The

environment thus becomes a 'classroom without walls', in which pupils can experiment using their senses and bodies, develop their observation and problem-solving skills, and consolidate their motor and relational skills. At the same time, intrinsic motivation is emphasised. Outdoor learning has been associated with improvements in attention, stress reduction, and collaborative behaviour (Kaplan & Kaplan, 1995; Berman et al., 2008). Furthermore, educational experiences in natural settings have been shown to have a positive effect on students with attention difficulties, increasing their participation and reducing dysfunctional behaviours (Szczytko et al., 2018).

Gamification, on the other hand, involves applying game dynamics, mechanics and logic to non-playful contexts, such as education. It is not limited to digital or board games, but involves introducing motivating elements such as goals, progressive challenges, scoring systems, symbolic rewards, badges and levels. Borrowed from the world of video games, these tools stimulate student engagement and a sense of self-efficacy, transforming activities that are perceived as tedious or abstract into dynamic and engaging experiences. Gamification also promotes cooperation and positive competition, and reinforces both extrinsic and, progressively, intrinsic motivation, fuelling curiosity and enjoyment in learning (Alabdulkareem, 2020). Gamification-based strategies have been shown to be effective in enhancing executive functions and attention span in pupils with ADHD. Similarly, serious games have been shown to reduce impulsivity and improve social skills and attention. Therefore, the combination of these two approaches appears particularly promising: outdoor learning offers a context rich in sensory and relational stimuli, while gamification introduces a motivational structure that channels students' energies and supports attention and perseverance. This synergy is particularly relevant in primary school, where the experiential and playful dimension is a fundamental lever for the development of transversal skills, motivation and inclusion. For pupils with ADHD in particular, the opportunity to learn through motor and dynamic activities combined with play is an effective strategy for reducing inattention and impulsivity while promoting participation and integration into the class group.

1. Aim of the research

This study aims to evaluate the impact of an outdoor teaching programme incorporating gamification elements on the social behaviour and attention levels of primary school pupils, particularly those with ADHD. The first objective is to verify whether learning in natural environments, integrated with recreational and physical activities, can improve concentration and behavioural regulation, as suggested by Attention Restoration Theory (Kaplan & Kaplan, 1995; Berman et al., 2008). It is expected that exposure to natural stimuli and participation in practical activities will reduce levels of inattention and hyperactivity, promoting more balanced and effective learning. At the same time, introducing gamification elements, such as progressive goals, reward systems, and cooperative dynamics, aims to stimulate student engagement, motivation, and perseverance (Deterding et al., 2011; Hamari et al., 2014). We aim to investigate whether the playful aspect, regulated by game mechanics, can positively impact intrinsic motivation, self-efficacy and peer collaboration — central dimensions of well-being at school (Ryan & Deci, 2000). A further objective concerns school inclusion: particular attention will be paid to pupils with ADHD, for whom traditional approaches may be less effective. Recent studies have shown that structured motor activities and gamified interventions can improve executive functions, reduce impulsivity, and encourage participation (Alabdulkareem, 2020).

The research therefore aims to explore whether combining outdoor education and gamification could be an effective, inclusive strategy for supporting these students in their mathematics learning journey, while also improving relational dynamics and class cohesion.

1.2 Sample selection

The study was conducted in a primary school in Naples, involving a total sample of 150 pupils aged between 7 and 10. Among these, 10 pupils had a clinical diagnosis of ADHD (Attention Deficit/Hyperactivity Disorder), distributed equally between the two experimental groups in order to ensure the comparability of the results and to specifically assess the impact of the educational intervention on this population.

The sample was divided into two subgroups:

- Control group: composed of 75 students (including 5 with ADHD), who followed traditional classroom teaching activities according to the standard curriculum.
- Experimental group: composed of 75 students (including 5 with ADHD), who participated in innovative teaching based on a combination of outdoor education and gamification, applied to the teaching of mathematics.

The following inclusion criteria were defined for participation in the study, based on international guidelines for educational and clinical research:

1. Diagnostic certification of ADHD issued by a child neuropsychiatry service for students with a diagnosis, a fundamental requirement for accurately distinguishing the clinical subgroup and ensuring the external validity of the results. The diagnosis of ADHD, according to the DSM-5, is based on criteria of persistent inattention, impulsivity and hyperactivity (American Psychiatric Association, 2013). This methodological choice is based on evidence that children with ADHD need alternative and highly structured educational settings (Barkley, 2015).
2. Informed consent signed by parents or legal guardians, an essential requirement for the ethical protection of minors and in accordance with the Declaration of Helsinki and European data protection regulations (World Medical Association, 2013). This criterion ensured the transparency of the project and actively involved families, who were considered an integral part of the educational process.
3. Ages between 7 and 10, corresponding to the primary school period when basic cognitive skills, executive functions and social skills are consolidated (Piaget, 1972; Vygotsky, 1978). This developmental stage is particularly sensitive to experiential and cooperative learning, making the intervention consistent with the developmental needs of the pupils.
4. Absence of school repetition, a choice motivated by the need to avoid the overlap of variables linked to previous educational paths or experiences of school failure, which could have influenced motivation levels and research outcomes (Traversetti, 2018).
5. Attendance at least 50% of the scheduled meetings, considered the minimum threshold for attributing any behavioural and emotional changes to the educational intervention. Regular participation is in fact a key element in ensuring the internal validity of the study and in assessing more accurately the relationship between exposure to treatment and results obtained (Shadish, Cook & Campbell, 2002).

The rigorous application of these criteria enabled the selection of a representative and methodologically sound sample, thereby reducing potential bias and strengthening the reliability of the collected data. The balanced distribution between the control and experimental groups, and the presence of clinical and socio-relational heterogeneous subgroups, enabled an in-depth comparative analysis of the impact of outdoor teaching and gamification on students with ADHD.

1.3 Tools

A mixed qualitative-quantitative approach was adopted for the study to integrate numerical and narrative data, providing a more comprehensive understanding of the effects of the educational intervention. This methodological choice is based on the understanding that mixed methods

enable information to be triangulated and strengthen the validity of interpretations (Creswell & Plano Clark, 2011).

The Strengths and Difficulties Questionnaire (SDQ) in its version for school-aged children was used to collect quantitative data. Developed by Goodman (1997), the tool allows psychosocial functioning to be investigated across five scales: emotional symptoms, conduct problems, hyperactivity/inattention, problems with peers, and prosocial behaviour. The SDQ has been widely validated internationally (Muris et al., 2003; Goodman et al., 2000) and is recognised as an effective tool for assessing children's behavioural difficulties and strengths in both clinical and educational settings. It was chosen to monitor socio-emotional and behavioural variables systematically and comparably between the two groups.

With regard to the qualitative component, exploratory methodologies were adopted to give voice to the subjective experiences of the pupils and the observations of the teachers. In particular:

1. Semi-structured interviews with pupils, with the aim of investigating their personal perception of the educational activities, their experience of participation and their experience of inclusion in the peer group. Semi-structured interviews proved particularly suitable in the school setting as they allow for a common thread to be maintained, while at the same time capturing the spontaneity and perspective of the child (Kvale, 1996).
2. Systematic observations during educational activities, aimed at assessing the quality of participation, collaborative behaviour and interactive dynamics among peers. Direct observation, widely used in educational research (Angrosino, 2007), was supplemented with assessment forms to ensure greater reliability of the data collected.
3. Teachers were also asked to describe any changes in student behaviour that they had observed, paying particular attention to collaborative attitudes and active participation. This type of assessment, which involves teachers directly as privileged observers, was considered crucial for capturing changes in relationships and motivation (Hammersley & Atkinson, 2007).
4. The qualitative data were analysed using thematic analysis (Braun & Clarke, 2006), which identified recurring patterns and organised the information into meaningful thematic categories. NVivo software, widely regarded as a benchmark tool for computer-assisted qualitative analysis (Bazeley & Jackson, 2013), was employed to facilitate the coding and management of textual material.
5. Integrating quantitative and qualitative data enabled triangulation of evidence (Denzin, 1978), thereby strengthening the reliability of the results and offering a more nuanced understanding of the observed educational processes. This approach enabled not only the evaluation of the intervention's measurable effects on students, but also an understanding of the subjective experiences and relational dynamics that accompanied the process.

1.4 Activities

The educational intervention took place over a period of three months, with two weekly meetings, each lasting 90 minutes. The aim was to integrate the development of mathematical skills with motor and relational activities, using a differentiated approach between the control group and the experimental group.

The pupils in the control group followed a mathematics teaching programme carried out exclusively in the classroom, in line with conventional primary school teaching practices. This programme was developed according to a traditional model, characterised by a predominantly transmissive approach, in which the teacher played a central role in presenting the content and managing the timing and methods of learning (Frabboni & Pinto Minerva, 2013).

Teaching activities were organised into three key stages.

1. Lecture: the teacher introduced the mathematical content of the curriculum (calculations, arithmetic problems, concepts of plane and solid geometry, units of measurement). Knowledge was transmitted through oral explanations, use of the blackboard and, in some cases, the use of simple teaching aids such as rulers, set squares and paper geometric figures. This type of approach corresponds to the traditional school model, in which the central role of the teacher and the sequential nature of the content are the main characteristics (Crahay, 2000).

2. Individual exercises: at the end of the explanation, students were given exercises to complete in their notebooks or on worksheets, with a progressive level of difficulty. The exercises involved, for example, solving operations, calculating equivalences, applying simple geometric formulas and solving arithmetic problems. This method reflects an approach geared towards the mechanical consolidation of skills through repetition and individual exercise, typical of traditional teaching (Mariani, 2016). The focus was mainly on the student's autonomy and the correctness of the procedure, rather than on cooperative or creative dynamics.

3. Collective correction and verification: the final phase involved reviewing the exercises, which were discussed collectively in the classroom under the guidance of the teacher. The teacher corrected the pupils' work on the blackboard, highlighting errors and suggesting alternative strategies. Structured assessment tests were also administered at regular intervals to monitor learning levels and certify progress in accordance with ministerial objectives (MIUR, 2012).

4.

The teaching environment was therefore stable and based on routines, with regular rhythms and a work organisation that favoured interaction between teachers and learners. There were limited opportunities for collaborative learning or experimentation with playful dynamics or experiential activities. While this approach ensures sequential learning and systematic control of objectives, it can reduce students' intrinsic motivation and disadvantage those who require more dynamic, cooperative methods (Bruner, 1996; Cornoldi, 2017). In contrast, the experimental group participated in an innovative programme integrating mathematics activities with outdoor motor experiences and gamification strategies. These activities were designed to stimulate experiential learning, cooperation, and motivation in accordance with the principles of outdoor education (Dewey, 1938; Waite, 2011) and recent studies on gamification in an educational context (Deterding et al., 2011; Hamari et al., 2014). The main activities included:

1. Mathematical trails: the outdoor space was divided into stages, each with a mathematical task to be solved in order to continue. This method is reminiscent of "situated learning" (Lave & Wenger, 1991), in which knowledge is constructed through action in a meaningful context.

2. Numerical relays: team games that combined physical activity and rapid calculation. The alternation between movement and cognitive tasks meets the attentional needs of children, particularly those with ADHD, for whom short, structured physical activities promote self-regulation (Jensen, 2005; Zentall, 2006).

3. Mathematical treasure hunt: cooperative problem-solving activities in which solving mathematical puzzles allowed participants to advance towards the final goal. The element of play and challenge promotes engagement, as demonstrated by self-determination theory (Ryan & Deci, 2000).

4. Construction of geometric figures with natural materials: using ropes, sticks and stones, students reproduced geometric shapes and calculated areas and perimeters. This activity is part of the "hands-on" approach and experiential teaching, which stimulates conceptual understanding through manipulation (Kolb, 1984).

5. Points and badge system: teams received points and symbolic rewards not only for correct results, but also for collaboration and creativity. The introduction of gamification dynamics increases motivation and a sense of self-efficacy (Domínguez et al., 2013).

2. Data Analysis

2.1 Quantitative data analysis

Analysis of the quantitative data collected via the Strengths and Difficulties Questionnaire (SDQ) revealed significant differences between the control and experimental groups at the conclusion of the educational intervention.

Pupils in the experimental group showed an overall improvement of 23% in hyperactivity/inattention scores, compared to a marginal 5% increase in the control group. Regarding conduct problems, the experimental group showed an 18% reduction, compared to a more modest 7% improvement in the control group.

Regarding emotional difficulties, the change was smaller but still significant: pupils in the experimental group reported an average reduction of 12% in difficulty scores, whereas pupils in the control group showed a decrease of only 4%.

Regarding positive dimensions, prosociality scores increased by an average of 20% in the experimental group, compared to an increase of 6% in the control group. Similarly, peer problems decreased by 15% in the experimental group and by 5% in the control group.

Overall, the quantitative data suggest that the combination of outdoor education and gamification had a significantly greater impact on attention, behavioural regulation and relational skills than traditional classroom methods. These results appear to be in line with what has been highlighted in the literature regarding the benefits of structured motor and play activities on the development of executive functions and socio-emotional skills (Berman et al., 2008; Zentall, 2006; Domínguez et al., 2013).

Analysis of the SDQ scores for the 10 pupils with ADHD alone revealed even more marked differences than in the total sample.

In the experimental group (n=5), the scores on the hyperactivity/inattention scale showed an average improvement of 28%, while in the control group (n=5) the reduction was limited to 6%. This confirms that the combination of motor activities and gamification contributed significantly to channelling energy and sustaining concentration.

With regard to conduct problems, pupils with ADHD in the experimental group reported a 22% decrease, compared with only a 5% decrease in the control group. Problems with peers also showed a significant improvement in the experimental group (20% reduction), compared to a modest improvement of 4% in the control group.

In terms of positive dimensions, prosociality increased by 25% among children with ADHD who participated in the gamified outdoor programme, while the control group recorded a much smaller increase (7%). Finally, emotional difficulties showed a 15% decrease in the experimental group and only 3% in the control group.

Overall, the data on students with ADHD show that the innovative programme had a substantially greater impact than the traditional approach, with significant benefits in terms of attention, behavioural self-regulation and social integration. These results are consistent with the literature that emphasises the effectiveness of dynamic, experiential and motivating educational contexts in supporting self-regulation and social skills in children with ADHD (Zentall, 2006; Barkley, 2015; Rapport et al., 2009).

2.2 Qualitative data analysis

Analysis of the semi-structured interviews and systematic observations revealed significant differences in the opinions and experiences of pupils in both the control and experimental groups.

Pupils in the control group described teaching activities as clear and orderly, emphasising the sense of security provided by the traditional structure and constant teacher presence. However, many also reported monotony and a sense of being involved mainly because it was compulsory rather than for the pleasure of learning. Some pupils said that they found mathematics “difficult” or “repetitive”, consistent with studies reporting that transmissive methods can limit intrinsic motivation (Bruner, 1996; Cornoldi, 2017).

In contrast, pupils in the experimental group described experiences characterized by enthusiasm and active participation. Outdoor activities were described as 'fun' and 'engaging', and it was emphasised in several cases that movement and play made mathematics 'easier to understand' or 'more interesting'. The pupils reported a strong sense of collaboration and belonging to the group, confirming that cooperative and playful dynamics foster not only learning, but also interpersonal relationships (Dewey, 1938; Ryan & Deci, 2000; Waite, 2011). Particular attention was paid to students with ADHD. In the control group, those diagnosed with ADHD reported difficulty maintaining attention during frontal explanations and a sense of frustration related to repeated errors in individual exercises. Some also reported feeling 'tired' or 'bored' during longer lessons, which confirms the hypothesis that static settings do not adequately meet their attentional needs (Barkley, 2015; Zentall, 2006). In the experimental group, however, pupils with ADHD reported a significantly more positive experience. They said that movement helped them 'stay focused', that the game's dynamics made them feel 'more capable', and that team activities reduced their sense of isolation. Additionally, some emphasised that 'winning together' was more rewarding than working alone, suggesting increased intrinsic motivation and perceived self-efficacy (Rapport et al., 2009; Hamari et al., 2014).

Teachers' opinions also confirmed this dichotomy. Those in the control group observed good content acquisition, but reported inconsistent levels of attention, particularly among pupils with ADHD, as well as passive participation. They highlighted that managing discipline was sometimes challenging, with motivation remaining mainly linked to test results. Teachers in the experimental group, however, reported a marked increase in motivation, peer collaboration, and self-regulation skills among pupils, particularly those with ADHD. According to these teachers, the latter group demonstrated significant progress in managing impulsivity and interacting with their peers, suggesting that the outdoor, gamified approach fosters a more inclusive and participatory classroom environment (Hammersley & Atkinson, 2007; Jensen, 2005).

In summary, the qualitative data revealed that, while the traditional approach offered reassurance and stability to some students, it had limitations in terms of engagement and motivation. In contrast, the innovative approach produced a more dynamic, inclusive and meaningful learning experience, which was particularly beneficial for students with ADHD.

3. Discussion

The results of this study highlight the significant impact that the combination of outdoor education and gamification can have on key aspects of quality of life, such as well-being, self-determination and social inclusion (Schalock & Verdugo, 2002). Quantitative analysis revealed clear improvements in attention levels, self-regulation, and prosocial behaviour among pupils in the experimental group, particularly among those with ADHD. Qualitative analysis confirmed that active participation, movement and cooperative dynamics made learning more motivating, reducing feelings of frustration and promoting a sense of self-efficacy. In terms of well-being, the intervention fostered a more positive school climate, reducing inattention and conflict while increasing prosociality. These results are consistent with studies demonstrating the role of the natural environment in promoting attentional recovery and

psychological well-being (Kaplan & Kaplan, 1995; Berman, Jonides & Kaplan, 2008). The playful nature of gamification also enhanced the enjoyment of learning, transforming complex tasks, such as mathematics, into engaging and accessible experiences. In line with studies by Deterding et al. (2011), gamification was found to stimulate intrinsic motivation and persistence, thereby contributing to school well-being and student satisfaction. Notably, well-being manifested not only at an individual level but also at a collective level, fostering greater cohesion among peers and strengthening the sense of school community, as highlighted by Rickinson et al. (2004) in their meta-analysis of outdoor education.

In terms of self-determination, outdoor and gamified activities enabled pupils to experience decision-making autonomy, cooperation, and the progressive development of self-efficacy. This aligns with Self-Determination Theory (Ryan & Deci, 2000; Deci & Ryan, 2017), which states that satisfying the needs for autonomy, competence, and relatedness is fundamental to intrinsic motivation and personal growth. Pupils with ADHD, who are often at risk of failure and exclusion, particularly benefited from contexts in which they could act, make choices and receive immediate feedback. This strengthened their confidence and resilience. These results corroborate the findings of Skinner, Kindermann and Furrer (2009) regarding the role of active participation in enhancing students' sense of control and self-efficacy.

In terms of social inclusion, cooperative dynamics encouraged active participation and a sense of belonging to the class group, reducing the risks of isolation and stigmatisation. In this way, the programme addressed one of the pillars of the Life Project, as set out in Legislative Decree 62/2024, which is to enable every student, whether with disabilities or not, to envisage and develop meaningful personal trajectories within inclusive settings. The inclusion observed was not limited to a formal presence, but translated into authentic participation characterised by spontaneous interactions and mutual recognition — essential elements for a real quality of school life (Florian & Black-Hawkins, 2011; Booth & Ainscow, 2011). These results are also consistent with studies by Humphrey (2013) which emphasise the importance of inclusive educational practices in promoting socio-emotional well-being and active participation.

Another emerging aspect concerns the transformative value of these teaching practices for the teachers themselves. They observed changes in the classroom atmosphere and in their professional roles, shifting from transmitters of knowledge to facilitators of learning and growth processes. This finding raises questions about the need for continuous training and support for teachers, in order to meet the challenge of truly inclusive teaching. This requires not only disciplinary skills, but also relational, reflective, and planning skills (Alexander, 2008; Damiano, 2006). In this regard, integrating outdoor education and gamification can provide teachers with an opportunity for professional development, encouraging them to reconsider their role in light of a participatory, relationship-centred pedagogy.

In summary, the study shows that outdoor education and gamification are innovative teaching strategies and pedagogical tools that can put the concept of the Life Project into practice as a dynamic and multidimensional process. They combine disciplinary learning and personal growth, while promoting well-being, self-determination and inclusion: three dimensions that, when intertwined, contribute to outlining a real prospect of Quality of Life for all students. This evidence reinforces the need to move beyond viewing school as solely a place of instruction and embrace an integrated perspective in which the educational experience becomes an opportunity for building identity, developing citizenship skills, and fostering future orientation (OECD, 2019; WHO, 2020).

Conclusions

The study highlighted that combining outdoor education with gamification constitutes an innovative and effective teaching strategy in primary schools that can positively influence attention, self-regulation, and prosocial behaviour. This approach was found to have a particularly significant impact on pupils with ADHD, who benefited from a dynamic, motivating and inclusive environment in which they could develop their personal resources and reduce feelings of frustration and exclusion (Szczytko, Carrier & Stevenson, 2018; Holmes, 2011).

The quantitative and qualitative results confirm that the combination of outdoor physical activity and playful dynamics supports processes that are fundamental to overall growth: well-being, self-determination and social inclusion. Schalock and Verdugo (2002) identify these three dimensions as pillars of quality of life, and they are now fully recognised in the Life Project outlined by Legislative Decree 62/2024.

In terms of well-being, the intervention fostered a more peaceful and cohesive classroom environment, increasing motivation and enjoyment of learning. These results are consistent with studies demonstrating the role of the natural environment in promoting attention and psychological well-being (Kaplan & Kaplan, 1995; Berman, Jonides & Kaplan, 2008). In terms of self-determination, outdoor and gamified experiences enabled pupils to make choices, work together and gradually develop self-confidence, in line with the principles of Self-Determination Theory (Ryan & Deci, 2000; Deci & Ryan, 2017). In terms of inclusion, the cooperative dimension made each pupil an active part of a shared journey, moving beyond mere integration to achieve authentic forms of participation (Florian & Black-Hawkins, 2011; Johnson & Johnson, 2009).

In addition to its effects on students, the study emphasised the importance of supporting teachers in their ongoing professional development. This would enable them to redefine their role as facilitators of growth and identity-building processes, rather than mere transmitters of knowledge. From this perspective, adopting outdoor and gamified practices can provide an innovative methodology and an opportunity for professional development and pedagogical reflection (Hattie, 2009; Beames, Higgins & Nicol, 2012).

While recognising the limitations associated with the short implementation period and specific context, the collected data offer concrete ideas for designing educational programmes that combine cognitive, socio-emotional, and inclusive objectives. Looking ahead, longitudinal studies in different school contexts could consolidate this evidence and strengthen the case for systematically integrating outdoor education and gamification into everyday practice (Rickinson et al., 2004; Dichev & Dicheva, 2017).

In conclusion, the experience described shows that school can become not only a place of education, but also a space that generates quality of life, where every pupil – with or without disabilities – has the opportunity to build their own life project, in the name of well-being, self-determination and inclusion (Schalock & Verdugo, 2002; WHO, 2020).

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