


Teachers' perceptions on the design and use of an outdoor learning environment for sensory and motor stimulation

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This qualitative study makes recommendations to help teachers understand how an outdoor learning environment could be designed and used to enrich perceptual development through sensory and motor stimulation for the Grade R learner. This was done by establishing design principles that create better teaching and learning environments from the perspective of Grade R educators in the South African context. Three purposively selected case studies (preschools) enabled the collection of data using collection methods such as photos, video clips, interviews and observations. Content analysis was conducted and four themes emerged: contradictory perspectives on outdoor learning environments, outdoor play is valuable, creating the ideal outdoor learning environment and increased deficiency of sensory and motor development among Grade R learners. Findings of the study aid educators and other professionals to create a valuable outdoor learning environment for sensory and motor stimulation of Grade R learners.

Introduction

The capability to gain, understand and react in an appropriate manner to sensory and motor experiences is known as perceptual development. Perceptual development of the Grade R learner is enhanced by sensory and motor stimulation and has an impact on learning readiness for Grade 1 (Erasmus et al. 2011:46; Rushton, Juola-Rushton & Larkin 2010). Sensory and motor stimulation do not only take place in the classroom, but much of it takes place outside, on the playground, if the environment is favourable. It is important to know how perceptual development takes place on the playground in order to identify favourable environments and to modify existing learning environments optimally (Rushton et al. 2010:354).

How perceptual development takes place through sensory and motor stimulation is not always clear to educators and other professionals in related fields. Cognitive psychologist Jerome Bruner (2010:44) said that it was difficult to understand how perceptual processes are 'affected by other concurrent mental functions and how these functions, in their turn, are affected by the operation of perceptual processes'. The aim of this research project, though, was not to investigate the intricacies of how movement and sensory stimulation lead to perceptual development, but rather to formulate recommendations that would help educators understand how an outdoor learning environment could be structured to enrich perceptual development.

A literature study was conducted to establish existing principles of a sensory and motor-stimulating playground. An understanding needed to be gained of the principles of design and use according to which Grade R playgrounds could be developed to offer sensory and motor stimulation to enhance perceptual development. The literature informed us on the framing of the interview questions as the research intended to qualitatively explore how teachers perceive the design and implementation of an outdoor learning environment to optimally stimulate the sensory and motor development of Grade R learners in South Africa by investigating playgrounds planned and facilitated by Grade R teachers and employed for perceptual development. The primary research question was as follows: How can the outdoor learning environment be designed and used to enhance sensory and motor stimulation of the Grade R learner? This research focused on the educator's perspective of such outdoor learning environments, as it is the educator who spends much time facilitating learning in such an environment.

Background to the study

As early childhood specialists, we had first-hand experience of the need for outdoor playgrounds to enhance learning. This research arose from aspects such as play environments that were not

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sufficiently stimulating (Erasmus et al. 2011), the limited knowledge of how sensory and motor stimulation relates to perceptual development and the limited practical skills to apply available information. We regard an outdoor play environment as one that could complement and extend the learning that takes place in the classroom. We investigated what is meant by an outdoor learning environment and how it is designed and used by facilitators of learning and learners to stimulate the child through directed activities and free or facilitated sensory and motor play.

The South African climate is ideal for more outdoor activities. Facilitators of learning can make use of this opportunity by structuring an outdoor learning environment that is conducive to perceptual development (Rushton et al. 2010:354). Despite the favourable weather, however, our experience has been that there are increased restrictions on children's free roaming outdoors because of concerns parents have about the safety of their children. Moreover, the families in our catchment area are increasingly moving into smaller, 'more secure' home spaces such as flats, and movement on the school playground is of the utmost importance to compensate for these restrictions.

Literature review

There is much interest in the field of outdoor learning environments, outdoor playgrounds and the role of play in physical and cognitive development, among others (Bullard 2010:330; Fikus & Luchs 2013:207; Ghafouri 2014:69; Greenman 2007:283; Tovey 2007:32; Wellhousen 2002:23, 30; White 2008:2, 3; Wilson 2008:47). A review of the relevant literature revealed an increase in articles, research studies, reports and conferences in the past 20 years and beyond, highlighting the importance of preprimary stimulation for perceptual development and school readiness (Erasmus et al. 2011:46; Perry 2010:iii; White 2008:2, 3). The importance of outdoor learning experiences for perceptual development is very prominent in research across disciplines such as education (Erasmus et al. 2011:46) and educational psychology (Merzenich 2001:68; Postner 2001:387; Thelen 2001:161), occupational therapy (Berkley 2009:208) and landscape architecture (Pigott 2012:1, 2; Woolley & Lowe 2012). Collecting information across these varied disciplines placed the research in a holistic framework from which to view the study.

Although there is extensive literature about outdoor playgrounds for young children, the bulk of this literature focuses on the child's motor skills. Considerably less information was found about developing learning opportunities for the development of all the senses, not only the five senses that are commonly known, on the playground. Little research relating to Grade R learners has been conducted in this field in Pretoria, South Africa. We position the research in this noticeable silence and structure the review to give an educator's understanding of the topic.

Sensory and motor stimulation

To ensure proper functioning of the senses, these must be stimulated from birth. Mental growth is aided by a child's

active exploration of his environment. Years of research have proven that children who receive adequate stimulation achieve higher IQ scores than those who lack proper or receive improper stimulation. The child must have rich and varied experiences through their senses, but these must provide developmentally appropriate stimuli in order not to overstimulate the child, which will have a negative effect on development. Stimulating the senses can have a positive effect on learning as well as emotional and social growth in a child. Sensory stimulation in learning means having activities that challenge or make use of the senses. These senses – touch, taste, smell, hearing and sight – must be included in one's learning (Schmidt 2003). Stimulation of the vestibular, proprioceptive and tactile sensory systems promotes development of core posture, bilateral coordination of the body and eyes, praxis (ability to perform planned movement patterns) and achieves optimal arousal states for learning (Stoneham 1996:11). It seems therefore that sensory stimulation helps to develop controlled movement, but that sensory stimulation is also achieved through movement.

Movement is a vital ingredient of the young learner's existence (Grobler et al. 2004:104). It is the door to their learning (Fredericks, Kokot & Krog 2006:29). In this way they come to know things through hands-on experience. Physical and academic capabilities are acquired simultaneously through movement:

Physical skills such as crawling, walking, and running, climbing and hopping are only mastered by repetition. This also applies to kicking and throwing a ball, rolling a tyre and building with blocks. (Grobler et al. 2004:104)

Moving about in their environment helps the young learner to learn about that environment:

For example, mastering a skill such as jumping leads the child to the discovery of concepts such as high and low. Playing with a ball provides the child with important opportunities for learning about speed, direction and space. Climbing, again, is important for balance and co-ordination. Such play teaches the concepts of above, below, beneath, behind and beside as well as other information essential for becoming a well-balanced human being. (Grobler et al. 2004:104)

'Motor proficiency' denotes explicit skills that the young child uses when moving around. These are gauged by assessing 'running speed and agility, balance, bilateral co-ordination, strength, upper limb co-ordination, reaction speed, visual-motor control, upper limb speed and agility' (Sherrill in Pienaar & Kemp 2014:169). It is very important to monitor these skills in young learners, as inadequate motor ability can hinder many facets of their education (Pienaar, Cairney et al. and Pienaar et al. in Pienaar & Kemp 2014:167).

Outdoor learning environment checklist for sensory and motor stimulation

Young children are dependent on us as adults to make sure that the settings that they find themselves in are environments in which they can become familiar with themselves, other kids and natural surroundings because, essentially, they cannot make

assessments about these settings themselves. This creates an opportunity for landscape architects and educationalists to collectively fashion experiential settings for education that inspire children to discover and investigate, construct and mingle, and dash and play. The aim is to advance holistic development and to generate a need for learners to be outside among natural surroundings (Pigott 2012:112). If we can achieve a diverse outdoor setting that brings together accessible green areas, natural characteristics and assembled play apparatus, we succeed in giving young learners a chance to grow their intellect and their physical abilities and cultivate 'a healthy lifestyle, rather than a sedentary, indoor one with all of the associated health risks' (Pigott 2012:115).

In order to accomplish the proposed research, general and research literature on all these related aspects were investigated through an empirical, reflective practice (Slabbert, De Kock & Hattingh 2009:35). The present research adds to the limited research already conducted by undertaking a qualitative investigation of South African teachers' perceptions and implementation of these principles. The literature informed us on the framing of the interview questions and what to look for during the observations. We refer to Figure 1 as a checklist compiled from the literature. The research verified how the findings corresponded to and correlated with the checklist and that this research could therefore contribute to the existing literature.

Methodology

A 'design' refers to the plan or blueprint of how the research will proceed (Bogdan & Biklen 2003:49; Maree & Van der Westhuizen 2010:70; Mouton 2001:55). We needed to set out beforehand how we were going to conduct the research and which research methods to apply, thus ensuring that the visits to the sites would cover all the aspects that might be of value to the study and avoiding the need for repeat visits to collect missing data when themes emerged from the data analysis.

Preprimary school playgrounds and their teachers were the main focus in this study and therefore the identified unit of analysis. Three sites were purposefully selected because 'in qualitative data collection, purposeful sampling is used so that individuals are selected because they have experienced the central phenomenon' (Maree & Van der Westhuizen 2010:295). The criteria for selection of schools were based on the specific design of their outdoor learning environments and the age of the children attending the school within the Pretoria area.

We complied with the ethical requirements of the research by giving letters of voluntary informed consent and assent to the principal, the Grade R teacher and the parents of all the learners that would be affected by our observation on the playground and also letters to the children themselves. Consent was necessary as we conducted three interviews with the Grade R teachers from these three different nursery schools. Other data collection methods were the observation

of the sites (including the field notes and site inventories), photos and video clips. The site photos and video footage were helpful for off-site investigation.

While it is important to have a clear action plan, this plan must not be allowed to become too rigid and should allow for changes according to altering circumstances (Burton & Bartlett 2009:40). The research design was flexible and was moulded and modified as the research process proceeded (Bogdan & Biklen 2003:50), with design decisions being made throughout the study (Bogdan & Biklen 2003:50). 'It is not possible to prespecify in detail the design for a naturalistic enquiry; the design of a naturalistic enquiry unfolds as the study progresses' (Norris & Walker 2005:133). This study made use of the case study methodology.

The data analysis process included drawing up a detailed site map of each outdoor learning environment using the sketch that we had made on site, in combination with photos of each setting and a video tour of the playground. A site inventory was drawn up and field notes made to give further insight into the data obtained from the interviews and to give context to the emergent themes. The inventory was compiled over two days to ensure that no pertinent information was overlooked on the first day.

The photos and video clips were reviewed in conjunction with other data sources. The fact that the sites were purposefully selected caused specific aspects to be considered and looked for when taking photos and video clips. These aspects were based on information from the literature about the theory and criteria of good practice for the design and use of an outdoor learning environment. The photos and video clips were taken with the purpose of providing visual evidence of what was observed in the outdoor learning environments and to aid with further off-site investigation of the data. This evidence was investigated to validate the findings of the other data sources such as the semi-structured interviews where the photos substantiated, for example, the opinions of the teachers by capturing a visual component to the research. The photos and video clips were also used to look for aspects that were not evident in the other interview data sources.

The process of thematic analysis (Maree & Van der Westhuizen 2010:298) brought structure to the information by producing themes and sub-themes from the data. As we worked with the data, a colour coding process was followed to code information. The information was then prioritised and sifted to the point where themes emerged from the data. Once these themes were extracted, the data were re-analysed across all the data sets of semi-structured interviews, photos, video clips, site maps, site inventories, the whole child development checklist, the table of features for sensory and motor stimulation of each preschool in the study as well as the observation field notes again for further emergent themes. The inclusion and exclusion criteria (Middeljans 2014:73) served to guide in a scientific way the decisions about what data to include and what data to exclude as not pertinent to the themes and sub-themes and to guide the sifting process.

	Whole-child development	The design and use of the outdoor learning environment provides for these aspects on a scale of 0–5 0 being least and 5 being most					
		0	1	2	3	4	5
Aim (Goal) The goals of an outdoor play environment are to stimulate:	Physical activity						
	Self-knowledge and self-confidence						
	Learning how to assess risk and take challenges						
	Creativity						
	Aesthetic well-being						
	Curiosity						
	Learning through a variety of play						
	Social interactions with other children						
	Interactions with and attraction to nature						
	Wide variety of prolonged outdoor activity levels and activity types						
	Rich and varied sensorial experiences teaching body, spatial, temporal and directional awareness						
	Opportunities to influence the evolution of space and understand how their actions can change their surroundings						
Purpose (Objective) To meet these goals, designers and educators should create play environments that provide:	Rich, complex and dynamic space – experimental landscapes for learning						
	Appropriate child to space density						
	Child's scale features and spaces						
	Real equipment and tools proportionate to the size of the child (age-appropriate)						
	An integrated layout promoting easy flow between activities and multiple behaviour settings						
	A variety of textures of both natural and man-made materials and surfaces						
	Natural and man - made loose parts						
	Sun and shade						
	Moveable features to encourage flexibility and elements to manipulate						
	A variety of settings and sub-behaviour settings and setting within settings and diversity of places and habitats						
	Big settings for physical activity						
	Enclosed spaces for imaginary activity						
	Spaces for loud and active behaviour – children must be able to run freely						
	Spaces for quiet and restful behaviour						
	Sensorial swings						
	Living things						
	An environment that is sensitive to climate						
	Risk and challenge with facilitator to support and guide the child in how to assess risk for themselves						
	Child-initiated, teacher-supported play activities						
	A facilitator of learning and pedagogy						
	Opportunity to freely choose activity directed towards a goal or self-initiated inquiries, activities or play						
	Interaction with trees, bushes and hedgerows and a variety of non-toxic vegetation, including fruit-bearing bushes and beautiful gardens						
	Interaction with water, earth, sand and transport of water from one area to another						
	Novelty and diversity						
	Wind blowing and music chimes						
	Trees that filter light, provide climbing opportunities and that change during seasons and provide loose parts (leaves, bark, etc.)						
	Grass and rocks						
	An inviting environment that is not over-stimulating						
	Art outside Sensopathic play areas						
	Opportunities to water plants; search for, gather, distinguish plants with different scents etc.; pick fruit and containers with children's own plants – a garden that is dear to them						
	Use of bicycles, tricycles, go-carts and wheeled toys						
	Climbing opportunities						
Wash-up area after messy activities before returning indoors							
Materials for children to manipulate with their hands and fingers							

FIGURE 1: Checklist for the design and use of an outdoor learning environment for sensory and motor development as part of the whole child development.

	Whole-child development	The design and use of the outdoor learning environment provides for these aspects on a scale of 0–5 0 being least and 5 being most					
		0	1	2	3	4	5
Create these surroundings (Recommended settings) The following behaviour setting types can be used to meet the design objectives:	Open green space, grass						
	Different pathways of which some allow for the use of wheeled toys						
	Dramatic play settings						
	Water play areas						
	Sand play area or digging pit						
	Earth play area or digging pit						
	Play structure areas						
	Animal or wildlife areas						
	Sensory garden						
	Vegetable, herb and fruit gardens						
	Edge habitat						
	Gathering spaces						
	Space for activities such as art						
	Climbable trees or structures						
	Swing areas – both seated and by the arms						
	Varied topography such as mounds of grassed earth, slopes and hills with climbers, different gradients and stairs						
	Woodwork area						
	Resting areas with seating						
Outdoor basin and wash-up area							

FIGURE 1 (Continues...): Checklist for the design and use of an outdoor learning environment for sensory and motor development as part of the whole child development.

Findings and discussion

From the results of the data analysis, the strategies used and the process of thematic analysis (Creswell et al. 2010:298) brought structure to the data by producing themes and sub-themes from the data. Four main themes emerged, with several sub-themes under each. Within each we include the discussion by referring to literature. The data sources were verified with the checklist compiled from the literature provided in Figure 1. This table was a guide for the observations and to inform and interpret the interview questions and their reflections.

Theme 1 included the contradictory perspectives of what an outdoor learning environment is. Theme 2 included the value of outdoor play. Theme 3 covered the creation of the ideal outdoor learning environment. Theme 4 included the increased deficiency of sensory and motor development among Grade R learners.

What sensory and motor development is and how it takes place

The teachers from all three sites agreed that sensory development is very important and must take place in the young child. Schmidt (2003) states that this sensory development takes place when the senses are growing. The teachers affirmed this in the study by explaining that if opportunities are provided for children to experience information about the world around them through their senses, then sensory development will result. Schmidt (2003) and Stoneham (1996) in the literature review verify the importance of sensory stimulation for learning. The teachers emphasised that these sensory experiences must be such that the senses are not over- or understimulated, which has an

adverse effect on the sensory development that needs to take place. 'Sensory development would be the development of the child's senses, so that they're not over- or understimulated':

'You have to be aware of the problems with the sensory areas, at the same time the general stimulation and encouragement and helping them to understand to use them, so that they can grow and develop and be able to understand the world around them better.' (Participant 3, Female, Grade R Teacher)

The table for features of outdoor playground settings for sensory and motor stimulation revealed this children experienced sensory and motor stimulation across most of the playground on all three sites, but it is the richness of this experience that is determined by the affordances provided.

The literature revealed that there are more senses than the five senses of touch, smell, sight, hearing and taste that are commonly known (Munsinger in De Witt & Booyesen 1995:71) and therefore also more areas of sensory development. These are the chromatic, thermic, baric, stereognostic, kinaesthetic and the vestibular senses (Van Staden & Faber 2004:43). Teachers in this study varied in their knowledge of the additional senses. A better knowledge of the additional senses could help them better facilitate development in those sensory areas.

The Grade R teachers were in agreement that motor development is equally important for the young child. They explained that this development takes place when children's bodies are developing and maturing, enabling them to acquire more skills in every area – balance, ball skills, hand-eye coordination, midline crossing, etc. They also mentioned that this development includes gross and fine motor skills as well as core muscle strength:

'And we've now introduced core activities to work specifically for sitting.' (Participant 2, Female, Grade R Teacher)

'Are all their gross motor, their fine motor areas in place?' (Participant 3, Female, Grade R Teacher)

Sensory and motor development therefore takes place when children are experiencing stimulation of the senses and motor responses. All three teachers are of the opinion that sensory and motor development can take place during structured or unstructured experiences provided for the child and that both are important components of this development. Unstructured experiences usually occur during free play, while structured movement experiences will include an activity such as a set obstacle course or a specific movement programme on the playground. Unstructured experiences give the child an opportunity to learn new things on their own and also from their peers:

'So you're not telling them how to use it or what to do ... so they gain experience through trying new things and exploring.' (Participant 1, Female, Grade R Teacher)

'Then it's also not learning from a teacher, it's from a peer.' (Participant 2, Female, Grade R Teacher)

The sensory and motor development milestones of the Grade R learner

Teachers were hesitant to elaborate on sensory developmental milestones. One teacher did not know what to answer when asked what important sensory developmental milestones are for Grade R learners:

'I don't know how to answer that.' (Participant 1, Female, Grade R Teacher)

Only one teacher expressed that she had specific developmental milestones she expected her Grade R learners to reach:

'Each teacher has particular levels and milestones that you want your child to reach.' (Participant 3, Female, Grade R Teacher)

The other two teachers did not elaborate on the milestones, but claimed that they would be able to see the lack of sensory development when they exposed the learners to sensory activities, where it would be apparent if a child was over- or undersensitive and consequently a sensory seeker or a sensory avoider.

'That's why it is important to have all those activities and exposure (to sensory experiences) cause then you as the teacher can see (if sensory development takes place).' (Participant 1, Female, Grade R Teacher)

'We generally see the lack of sensory development.' (Participant 2, Female, Grade R Teacher)

In a previous study we conducted about sensory development (Smit 2011), most of the teachers who were interviewed were of the opinion that if a rich array of sensory experiences were available to the young child, the child would engage in this sensory stimulation naturally. If the child does not engage naturally, the teacher can see that there is a deeper problem that needs intervention strategies. It seems that the teachers

in this study echoed the same opinion about the assessment of sensory development.

All three teachers were more confident when explaining what motor development milestones the Grade R learners needed to achieve. Teacher 3 explained that the teachers at their school had averages of motor development milestones they knew they were expected to see, for example whether the learner can sit on a chair, sit on the carpet with their legs crossed and hands on their knees, etc. This teacher specifically monitored muscle tone as well:

'We know that muscle ... tone is one of the big problems that have been for a long time.' (Participant 3, Female, Grade R Teacher)

Teachers 1 and 2 mentioned that they made use of assessments that cover gross and fine motor skills and typically included aspects such as hopping on one leg, skipping, jumping jacks, rolling, skipping with ropes, coordination and crawling. Van Staden and Faber (2004:3) note that the necessary physical progress for a young learner during their Grade R year is to cultivate a resilient and fit physique, achieve motor and perceptual abilities according to their age and grasp and regulate their body and be physically self-sufficient.

The constituents of the outdoor learning environment of the Grade R child

Nature seems to be a primary constituent of a sensory and motor-stimulating outdoor environment, according to the data and the existing literature. The data revealed that teachers felt that children learned through nature and being outdoors and that nature should be incorporated into the outdoor learning environment anywhere possible:

'There are benefits of being in nature ... the outside provides you with a lot that you can teach and learn with.' (Participant 2, Female, Grade R Teacher)

The literature indicates that 'deeper engagement in exploring and discovering the natural environment around them' (Ghafouri 2014:69) affords greater sensory and motor stimulation, strengthens perceptual development and ultimately enhances cognitive development.

The literature reveals that there should be a move away from the conventional playgrounds because these types of play areas provide the minimum play affordances and the greatest ambling and stationary behaviour among the children, with the result that they do not engage in play (Prince et al. 2013:184). This discourages exploration and self-directed activity, resulting in a decrease of sensory and motor development. Teacher 2 and Teacher 3 noted that if topography does not provide the affordances needed for sensory and motor stimulation, then it could be beneficial to have structures that promote these; therefore, a natural outdoor learning environment could also incorporate man-made structures to enhance opportunities for stimulation:

'If you've got a big tree ... that is wonderful. If you don't ... then we use jungle gyms instead.' (Participant 3, Female, Grade R Teacher)

'Look, I think if all you have available to you is the steel and the traditional stuff, then I don't think it's going to harm the child, I think you are lucky to have it.' (Participant 2, Female, Grade R Teacher)

From the site inventory of School 1, it was observed that the site did not have slopes or uneven surfaces and we noted that the jungle gym slides, drums and planted tyres helped with stimulation in this regard.

Another aspect in the data as well as the literature is the need for novelty, variety and challenge in the outdoor learning environment for sensory and motor stimulation. The three teachers felt that Grade R learners in particular need many new experiences outdoors. Teacher 1 felt that there must be opportunities for the children to explore and discover on their own in the outdoor learning environment. The function of the outdoor learning environment is:

'to provide opportunities for the children to explore and discover on their own.' (Participant 1, Female, Grade R Teacher)

Loose materials and apparatus are varied on a weekly basis to enhance opportunities for new experiences in addition to the other elements comprising the outdoor learning environment. The teachers' views in this study echo Pigott (2012:102–104), who stated that a diverse selection of natural and man-made loose parts will add educational value to the outdoor learning environment.

From the site map, site inventory, field notes and video clips, we observed that open spaces contributed to children's desire to engage in running and vigorous activity, as the size of the open space of the playground was proportionate to the vigour applied in running that took place in each setting. Feez (2011:48) notes that children must be able to run freely and spontaneously. We notes therefore that outdoor learning environments should not be too crowded by either equipment or too many children at any time to promote motor development.

The employment of the outdoor learning environment by educators for sensory and motor development of the Grade R learner

Firstly, the teachers in the study understood their playgrounds to be an outdoor learning environment, with Teacher 3 adding that an outdoor learning environment is a planned and structured environment in contrast to free and unstructured play. Therefore, her understanding was that their playground would be an outdoor learning environment when she plans a specific lesson that takes place outside. According to Pigott (2012:111), an increased understanding of what outdoor learning environments are will enable teachers and designers to use the spaces more successfully.

Teacher 3 used the outdoor learning environment for additional specific purposes when children with difficulties need to use the outdoor learning environment to prepare them for learning in the classroom and also to help them cope with learning during class time by taking a break and

spending a few minutes in the outdoor learning environment. Chakravarthi in Ernst (2013:4) notes that the views educators hold of the outdoor learning environment may reduce the prospects the educator provides for children outdoors. What we noted in this research was that the knowledge and experience that the teacher had also played a great role in the richness of experiences provided for the children outdoors.

The teachers in the study were in agreement that children need challenges for their development and that they must be encouraged to take age-appropriate risks in the outdoor learning environment. We observed however that Teachers 1 and 2 were reluctant to let children take risks. At School 1 the low branches were cut to avoid children picking leaves and berries, which contributed much to their sensory and motor development. At School 2 children were not allowed to play wrestling games outside. We noted that risky play was not really encouraged at School 3 either even though the teacher was in favour of this concept. Sandseter, Little and Wyver (2012:176) report that Norwegian educators contended that risky and challenging play was central for the progress of motor ability and motor skills, attaining new proficiencies, growing courage and self-confidence and learning about hazards through personal encounters. From the observation it seemed that the wooden climbing structures provided challenging play to some extent when there were no trees or uneven, rocky surfaces. We observed that the teachers therefore employed these wooden structures when natural features of varied topography were not available to children on the playground.

Teachers 1, 2 and 3 used the outdoor learning environment for the growth and development of all the motor skills of the children. We observed that they provided different items, such as balls, hoops, sandpit toys, etc., for skill development each day. All the teachers made use of sensory tables in the interviews, although we only observed the use of these tables at two of the schools.

Opportunities for outdoor play can also be planned by the teacher and can depend on the theme of the week. The teachers in the study used the outdoor learning environment in many aspects to complement the learning that takes place inside the classroom. We saw for example that Teacher 1 used farm animals in the sandpit for free play to complement the farm theme of the week. Many teachers working in early childhood settings want to make the outdoor playground an extension of the indoor classroom (Wellhausen 2002:23).

Teachers were aware of the difference between structured and unstructured play and employed both in the outdoor learning environment. We found that teachers made use of structured as well as unstructured activities for sensory and motor development outdoors; for example, at School 2 we observed that the teacher used some of the free play time to practise throwing self-made rockets to measure whose rocket went the furthest. Afterwards they played freely with the rockets and other equipment on the playground. The teachers understand that sensory and motor development result from

free play and feel that sensory and motor stimulation during unstructured free play contributes to learning and also specifically to self-directed learning. The children gain experience through exploring and trying new things on their own. In a study by Gehris, Gooze and Whitaker (2014:8), the educators maintained that 'natural features – such as areas that attract butterflies, trees for climbing and mounds of sand for digging' – involve the senses of the learners and afford occasions for 'hands-on learning'. Teachers do not interfere during free play, because this type of play affords its own kind of development. This was validated by our observations, as we noted that teachers were not directing any activities the children were involved in.

Teachers 2 and 3 mentioned certain challenges to the use of the outdoors as a learning environment such as weather, overstimulation in the outdoor environment and lack of time. They also offered solutions to most of these challenges, with careful planning and being versatile being the most important.

The impact of sensory and motor stimulation on the Grade R learner's development and ability to learn

The teachers in this study agreed that sensory and motor development has a significant influence on the child's ability to learn. They mentioned many learning difficulties resulting from a lack of sensory and motor development, which they experienced as having become more prevalent during the last few years:

'And you very often have children, especially these ones these days, the new big problem is the sensory areas, the sensory development where they're overstimulated or one in particular is lacking and it has a great impact on their ability to do things.'
(Participant 3, Female, Grade R Teacher)

Teacher 2 and 3 stated that if sensory development has not taken place appropriately, the child will fall behind and even be lost in the classroom. Sensory avoiders and sensory seekers therefore experience difficulties in the classroom situation. If all the areas of sensory development are not in place, the child's learning is going to be severely compromised, as these deficiencies will result in learning difficulties. Refshauge et al. (2013:1) support the view that a lack of sensory development may result in learning difficulties.

All the teachers stated that motor development also has to take place, because that is how our human bodies work. If our motor skills do not develop like they should, it is going to compromise how we go through school and work. If muscles are not developed, then tiredness will result and then learners cannot focus, they cannot listen to what the teacher is saying and in the end they will close down and no learning will take place. They noted that motor development is important for aspects such as writing skills and to help children to concentrate longer while sitting still and focusing on what is being taught. They also noted that problems resulting from a lack of motor development include aspects such as lack of

concentration and compromised learning because children are too tired to focus.

'If they've got low muscle tone ... it's gonna influence the period of time that they can sit at the table, the concentration on the carpet.'
(Participant 1, Female, Grade R Teacher)

'Your learning is going to be compromised a great deal.'
(Participant 3, Female, Grade R Teacher)

Ayers in Refshauge et al. (2013:1) says that it is imperative that children therefore engage in physically challenging experiences in their environment as soon as possible.

All three teachers believed that sensory, motor, perceptual and cognitive development all form part of the learning of the child and that they cannot be separated. Practical examples mentioned of these links were aspects such as low muscle tone, which influences the child's ability to concentrate. Another example was the inability to take part in activities because of sensory deficiencies, which impacts negatively on learning and other development. These aspects lay the foundation of the learners' academic performance for the rest of their lives, and if these do not develop accordingly, learning difficulties will result:

'If our motor skills don't develop according to the lines that we feel they should, then it is going to compromise how we go through school and to work. It can carry on in affecting you there in choosing the job you would like to do.'
(Participant 3, Female, Grade R Teacher, p. 8)

This confirms Elliot's view (in Ernst 2013:5) that developmental philosophies propose that young children learn through active physical and sensory interaction with their environment.

How the outdoor learning environment can be designed and used to enhance sensory and motor stimulation of the Grade R learner

All the teachers felt that it was important for children to be in nature as much as possible, because they learn through nature and being outdoors. Ernst (2013:5) stated that 'nature experiences have been associated with superior cognitive functioning'. The teachers in this study, on the other hand, felt that in their experience the ideal outdoor learning environment for sensory and motor stimulation should contain a combination of natural and traditional elements:

'They are both important (natural and traditional playgrounds). If you can have all of it, that's the best scenario ... if you can't, try and have ... as much as you can. They need to be physically moving, they need to be using every part of their body. ... If you've got a big tree ... that is wonderful. If you don't ... then we use jungle gyms instead.'
(Participant 3, Female, Grade R Teacher)

Teachers in the study noted that the outdoor learning environment should be enriched because this gives children more opportunities to learn on their own through play and enriched learning experiences. Grade R children in particular need many new experiences; they should experience new

things all the time. Therefore, change, variety and challenges are needed in the outdoor learning environment for the learners to gain experience by trying new things and exploring. Everything that is incorporated into the outdoor learning environment must be such that it can be built on. Teachers can therefore add and build on what they already have available on the playground. Teachers felt that from the teacher's perspective, the environment must be a learning environment, but the child should experience the environment as fun and inviting. The outdoor learning environment must also complement classroom teaching and match the theme that the teachers are covering:

'So, you've got to think about what you are teaching, what your teaching the particular class is and what can supplement and help outside, as well as just being fun, but you are using it a way that is complementing your classroom teaching as well.' (Participant 3, Female, Grade R Teacher)

The teachers pointed out that much planning and out-of-the-box thinking was needed when designing an outdoor learning environment.

'You really have to think out of the box, otherwise it can get very, very expensive.' (Participant 2, Female, Grade R Teacher)

They pointed out that educators needed to work with what was available to them in terms of resources. Good planning could reduce the cost of transforming the playground into an outdoor learning environment. Neither a lack of funds nor the lack of a garden or equipment should be viewed as a factor limiting the transformation of the outdoor learning environment for sensory and motor stimulation. The potential for transformation does, however, depend on the teacher, and we noted from our observations that the teachers demonstrated various levels of effective use of the outdoor learning environments for sensory and motor stimulation.

All three teachers mentioned all the elements they considered necessary in the playground to transform it into a learning environment. These elements should include many opportunities for free play, as free play results in development and learning in sensory and motor areas:

'On the playground I think free play is important.' (Participant 1, Female, Grade R Teacher)

An aspect not mentioned by the teachers and absent from the case studies investigated, with the exception of wild birds, was the inclusion of animals in the outdoor learning environment. In the literature, Williams-Siefredson (2012:49) suggests that animals should be included in the outdoor learning environment – ranging from large to small animals, depending on the available space.

From the literature and observations, it is evident that it is not sufficient for there to be a rich array of opportunities in children's surroundings; the children must have access to engage in these prospects (Spencer & Blades 2006:142). Therefore, an outdoor learning environment cannot simply include a vegetable garden, for example, but should include

a vegetable garden where the children are involved in planting, tending and harvesting the vegetables. Children must be allowed to enter the green areas of the playground, to climb the trees, to pick the flowers and in short to learn from these natural elements by their own experiences. It is important, according to Feez (2011:48) and Ghafouri (2014:58), that children have the opportunities to be involved in self-initiated enquiries, activities or play. It is also important to take note that an outdoor learning environment should include a teacher to assist and guide the children to evaluate risk for themselves (Hall et al. 2010:45; Roopnarine & Johnson 2013:337) and to facilitate the learning process on different levels (Slabbert et al. 2009:118).

Recommendations for further research

The Grade R class needs to be observed for the full day for an entire week to really gain a true perspective of the facilitation of learning that takes place outdoors. The short observation during free play for a small part of the day is not a complete reflection of the day's activities, and the researchers relied on the statements of the Grade R teachers to give an account of the rest of the day. This is regarded as a limitation of the study.

A further study should focus specifically on how to make a playground a natural environment when the playground is not really situated in nature. We have only addressed it to a limited extent in this study. This is based on the comment that one of the teachers in the interviews made:

'Yes. I think you can learn from nature. Obviously it is very difficult. We're not really in nature here.' (Participant 2, Female, Grade R Teacher)

One of the key aspects in this study was exploring the significance that the natural environment plays in the development of the young child (Fikus & Luchs 2013:208–209). Further research should move a step beyond this, focusing on nature-orientated playgrounds in particular (Fikus & Luchs 2013:208–209). The combination of indoor and outdoor learning also needs to be taken into account in more detail and for the full duration of the school day.

Further research is needed to study how the duration of outdoor free play among preschool outdoor play environments impacts on activities. This could lead to interesting findings that would positively impact on whole-child development. More research is also needed to study how adult involvement affects children's behaviour, learning and development during outdoor free play (Pigott 2012:115). Also the study only focuses on sensory and motor development and did not include socio-emotional development through spontaneous exploration; therefore, it did not cover holistic learning to the full extent. Holistic learning is presented in some of the checklists, although it was not the primary focus of the study.

Herrington et al. (n.d) point out that a 'study should be used in concert with existing codes, safety regulations,

and design guidelines'. We did not include fire in any of the recommendations, as it is illegal to have an open fire at school in South Africa, although it is used in countries such as Denmark as part of their outdoor education. It is also important to remember that it is necessary to use methods in the design process that take into consideration the location of the particular playground (Jansson in Refshauge et al. 2013:2) and not to assume that one playground design could fit all locations.

Conclusion

The contribution of this study is that it adds to the limited research conducted on the design and use of the outdoor learning environment to enhance perceptual development for Grade R learners in South Africa. Motor stimulation was investigated in combination with sensory stimulation, as it was found that these two aspects are mostly researched in isolation. Therefore, the study contributed to a more integrated context for learning in the outdoor learning environment, which has not been addressed sufficiently in the research literature. The purpose of this study was to make useful recommendations that will help teachers understand how an outdoor learning environment could be structured to enhance perceptual development. An added contribution of this study might be the data-gathering tools employed in the study. This study resulted in a map containing schematic detail of each site, an inventory documenting site details and the relevance for sensory and motor stimulation, a rubric for recording the site features of an outdoor learning environment for sensory and motor stimulation and a checklist for the design and use of an outdoor learning environment for sensory and motor development as part of whole-child development. The research was specifically conducted from the perspective of an educator in the South African context. The research suggests a framework that can be used as an assessment tool as well as for further research in South Africa and abroad. Therefore, we propose that a valuable outdoor learning environment for perceptual development be designed as well as facilitated according to the proposed guidelines in this study for the appropriate sensory and motor stimulation to take place.

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Competing interests

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Authors' contributions

A.N. executed the research and collected the data. I.J. and C.H. were the research supervisors A.N. did the concept article and I.J. and C.H. helped with the academic writing of the article.

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