**Arranging the Room to Engage the Child**

**Aspects of the Environment Can Impact Performance**

This section will include summaries of the literature from the field of education on the importance of room set up for learning and also will include information about the sensory affordances of objects / activities and how they can enhance performance.

**2017**

**Dearden, J., Emerson, A., Lewis, T., & Papp, R. (2017). Transforming engagement: a case study of building intrinsic motivation in a child with autism. *British Journal of Special Education*, *44*(1), 8-25.**

This longitudinal case study of a 10‐year‐old girl with autism and severe communication impairment measures the impact of the MORE (Means, Opportunities, Reasons and Expectations) approach to enhancing engagement and communication. Through detailed observation of video data over a period of 28 months, engagement behaviours including interaction with adults and following adult directions increased, while resistant behaviours such as kicking, hitting and pushing adults away decreased. Fluctuation between different ‘states’ demonstrated that the frequency and duration of engagement was influenced by the MORE approach and an emphasis on developing intrinsic motivation. In order to enable further efficacy research, core features of the intervention and the changes in engagement over time are described.

**Brussoni, M., Ishikawa, T., Brunelle, S., & Herrington, S. (2017). Landscapes for play: Effects of an intervention to promote nature-based risky play in early childhood centres. *Journal of Environmental Psychology*, *54*, 139-150.**

The outdoor space at childcare centres can be many preschoolers' primary experience of outdoor play. Trends prioritizing risk reduction have diminished access to nature and risky play. We examined the effects of an intervention to increase opportunities for nature and risky play in the outdoor play environments of two childcare centres using a repeated measures mixed methods design. We used the Seven Cs play space design criteria, adding natural materials to enhance affordances for play. We measured changes in play, social behaviour, psychological wellbeing, and physical activity in 45 children aged 2 to 5. Findings indicated significant decreases in depressed affect, antisocial behaviour and moderate to vigorous physical activity, and increases in play with natural materials, independent play, and prosocial behaviours. Early Childhood Educators observed improved socialization, problem-solving, focus, self-regulation, creativity and self-confidence, and reduced stress, boredom and injury. Outdoor play spaces are important for promoting children's wellbeing and development.

**Hanley, M., Khairat, M., Taylor, K., Wilson, R., Cole-Fletcher, R., & Riby, D. M. (2017). Classroom displays—Attraction or distraction? Evidence of impact on attention and learning from children with and without autism. *Developmental Psychology,* *53*(7), 1265-1275. doi:10.1037/dev0000271**

Paying attention is a critical first step toward learning. For children in primary school classrooms there can be many things to attend to other than the focus of a lesson, such as visual displays on classroom walls. The aim of this study was to use eye-tracking techniques to explore the impact of visual displays on attention and learning for children. Critically, we explored these issues for children developing typically and for children with autism spectrum disorder (ASD). Both groups of children watched videos of a teacher delivering classroom activities—2 of “story-time” and 2 mini lessons. Half of the videos each child saw contained high levels of classroom visual displays in the background (high visual display [HVD]) and half had none (no visual display [NVD]). Children completed worksheets after the mini lessons to measure learning. During viewing of all videos children’s eye movements were recorded. The presence of visual displays had a significant impact on attention for all children, but to a greater extent for children with ASD. Visual displays also had an impact on learning from the mini lessons, whereby children had poorer learning scores in the HVD compared with the NVD lesson. Individual differences in age, verbal, nonverbal, and attention abilities were important predictors of learning, but time spent attending the visual displays in HVD was the most important predictor. This novel and timely investigation has implications for the use of classroom visual displays for all children, but particularly for children with ASD.

**2016**

**Morris, C. (2017). Making sense of education: sensory ethnography and visual impairment. *Ethnography and Education*, *12*(1), 1-16.**

Education involves the engagement of the full range of the senses in the accomplishment of tasks and the learning of knowledge and skills. However both in pedagogical practices and in the process of educational research, there has been a tendency to privilege the visual. To explore these issues, detailed sensory ethnographic fieldwork was conducted in further education colleges, investigating the experiences of visually impaired students who use their non-visual senses and embodied actions to achieve their learning. The study found that the full sensory schemas of the students were not always appreciated or accessed by tutors, resulting in lost learning opportunities. Whilst particularly relevant for visually impaired students, these findings have implications for pedagogy for all students. Further the study highlighted the significance of sensory ethnography as a tool to explore the processes of teaching and learning.

**AL‐Ayash, A., Kane, R. T., Smith, D., & Green‐Armytage, P. (2016). The influence of color on student emotion, heart rate, and performance in learning environments. *Color Research & Application*, *41*(2), 196-205.**

In this study, six colors (vivid red, vivid blue, vivid yellow, pale red, pale blue, and pale yellow†) were manipulated in a simulated study environment to determine their effects on university students' learning performance, emotions, and heart rate. It was hypothesized that learning, physiological and emotional states would be affected by different colors in private study spaces. A total of 24 undergraduate and postgraduate students participated in this study. The dependent variables were reading task performance, emotional responses, and changes in heart rate. The results showed that, although participants assessed the situation as relaxed, calm, and pleasant in the pale color conditions, reading scores were significantly higher in the vivid color conditions. Heart rates were significantly affected by hue; they increased in the red and yellow conditions. In addition, the results suggested that, regardless of the degree of whiteness, the hue had a significant impact on participants' emotions; blue increased relaxation and calmness feelings of participants compared to the other colors. Implications of these findings and suggestions for further research are discussed

**Rooney, T. (2017). Planning for Flexible and Innovative School Spaces: Safety and Risk. *Risk, Protection, Provision and Policy*, 405-421.**

The chapter presents an analysis of the challenges that arise when children’s movements and activities in school grounds become limited or overcontrolled as a result of the requirements set out in safety and security policies. The discussion focuses on policies at both national and local levels that aim to respond to a particular risk (or perceived risk) of potential harm to people or property in schools. This includes an examination of safety in the playground and the tensions teachers often face between duty of care obligations and the pedagogical imperative to provide challenging and creative activities. The implications of security policy in schools, as implemented via mechanisms such as secured fences and surveillance technologies, are also examined to better understand how these might impact on both student and teacher experience with school spaces.

In this discussion, the significance of implementing school safety and security policy within an educational context is explored. A number of strategies and areas for future research emerge on how school spaces may be made sufficiently safe for children and at the same time provide them with opportunities to take risks, to build authentic encounters with the world around them, and to foster skills for lifelong learning in a changing and uncertain world.

**Fay, D., Wilkinson, T., Wagoner, M., Brooks, D., Quinn, L., & Turnell, A. (2016). Effect of group setting on gross motor performance in children 3–5 years old with motor delays. *Physical & occupational therapy in pediatrics*, 1-13.**

*Aims*: The purpose of this study was to evaluate differences in gross motor performance of children 3–5 years of age with motor delays when assessed individually compared to assessment in a group setting among peers with typical development (TD). *Methods*: Twenty children with motor delays and 42 children with TD were recruited from a preschool program. A within-subject repeated measures design was used; each child with delay was tested both in an individual setting and in a group setting with two to four peers with TD. Testing sessions were completed 4–8 days apart. Ten different motor skills from the Peabody Developmental Motor Scales-2 were administered. Performance of each item was videotaped and scored by a blinded researcher. *Results*: Overall gross motor performance was significantly different (*p* < .05) between the two settings, with 14 of 20 children demonstrating better performance in the group setting. In particular, children performed better on locomotion items (*p* < .05). *Conclusions*: The higher scores for locomotion in the group setting may be due to the influence of competition, motivation, or modeling. Assessing a child in a group setting is recommended as part of the evaluation process.

**Piller, A., & Pfeiffer, B. (2016). The Sensory Environment and Participation of Preschool Children With Autism Spectrum Disorder. *OTJR: Occupation, Participation and Health*, *36*(3), 103-111.**

Sensory processing is recognized as impacting participation for preschool children with autism spectrum disorder (ASD). Little research exists to examine the impact of the sensory environment on the participation patterns of children with ASD, specifically from a contextual standpoint. The researchers in this study examined the viewpoint of teachers and occupational therapists on the sensory-related environmental barriers to participation within the preschool context. Qualitative descriptive methodology was used for data collection and analysis. Thirteen preschool teachers and occupational therapists were interviewed. Sensory aspects of the environment both inhibited and enhanced participation. Physical and temporal components of the environment are identified as being the most influential. Modifications of the environment are identified as increasing participation. It is important to consider the sensory aspects of the environment, in addition to the sensory processing patterns of the person in assessment and intervention planning within the preschool environment.

**Mulder, H., Oudgenoeg-Paz, O., Hellendoorn, A., & Jongmans, M. J. (2016). How Children Learn to Discover Their Environment: An Embodied Dynamic Systems Perspective on the Development of Spatial Cognition. *Neuropsychology of Space: Spatial Functions of the Human Brain*, 309.**

<https://books.google.com/books?hl=en&lr=&id=mmKdBgAAQBAJ&oi=fnd&pg=PA309&dq=environment+impact+on+performance+AND+children&ots=4JP6eM40Tb&sig=1EnpBH3rErCsFDdwzlPTUtkZp3k#v=onepage&q=environment%20impact%20on%20performance%20AND%20children&f=false>

**2015**

**Waldman‐Levi, A., & Erez, A. B. H. (2015). Will Environmental Interventions Affect the Level of Mastery Motivation among Children with Disabilities? A Preliminary Study. *Occupational therapy international*, *22*(1), 19-27.**

Children with developmental disabilities tend to demonstrate lower levels of mastery motivation in comparison with typically developing children. The goal of this study was to investigate the effect of physical and social environmental interventions on the mastery motivation of children with disabilities. Participants included 19 children (from two classes) with disabilities between the ages of 2–4 years from an educational rehabilitation centre. The Individualized Assessment of Mastery Motivation was used to assess the level of mastery motivation; the Early Childhood Environment Rating Scale – Revised and the Teacher–Child Interaction Observation were used to assess the physical and social environments. A counterbalance study design was used such that the children from the two classes received two phases of intervention, social and physical environmental interventions. The study's results point to the advantage of the social intervention, over the physical one, in improving the child's mastery motivation. However, the results lend support for the efficacy of using both aspects of environmental changes to the overall persistent score. The study findings, although preliminary, demonstrate the efficacy of providing both social and physical environmental interventions to improve mastery motivation.

**Burgess, N. (2015). Inspiring Places: Exploring Outdoor Learning Spaces with Young Children.**

The purpose of this project is to explore young schoolchildren’s involvement in selecting and creating outdoor learning spaces. The question leading this investigation is, “how can Canadian educators involve young children’s voice in the development of inspiring outdoor learning spaces?”. The review of the literature examines emergent curriculum and outdoor play, finding that these approaches to educating young children are complimentary. Multiple factors impacting children’s engagement in outdoor learning will be examined, indicating that duration, frequency, proximity, availability of engaging materials, and an invested adult all play a part. As the studies discussed in this project will demonstrate, there is a gap in the Canadian literature involving young children in research. A future study using a mixed methods approach, combining the Mosaic approach and case study analysis, is proposed, involving young children in designing outdoor learning spaces on school grounds in Canada.

**Webster, C. A., Russ, L., Vazou, S., Goh, T. L., & Erwin, H. (2015). Integrating movement in academic classrooms: understanding, applying and advancing the knowledge base. *Obesity Reviews*, *16*(8), 691-701.**

In the context of comprehensive and coordinated approaches to school health, academic classrooms have gained attention as a promising setting for increasing physical activity and reducing sedentary time among children. The aims of this paper are to review the rationale and knowledge base related to movement integration in academic classrooms, consider the practical applications of current knowledge to interventions and teacher education, and suggest directions for future research. Specifically, this paper (i) situates movement integration amid policy and research related to children's health and the school as a health-promoting environment; (ii) highlights the benefits of movement integration; (iii) summarizes movement integration programs and interventions; (iv) examines factors associated with classroom teachers’ movement integration; (v) offers strategies for translating research to practice and (vi) forwards recommendations for future inquiry related to the effectiveness and sustainability of efforts to integrate movement into classroom routines. This paper provides a comprehensive resource for developing state-of-the-art initiatives to maximize children's movement in academic classrooms as a key strategy for important goals in both education and public health.

* **Black, I. E., Menzel, N. N., & Bungum, T. J. (2015). The Relationship Among Playground Areas and Physical Activity Levels in Children. *Journal of Pediatric Health Care*, *29*(2), 156-168.**

**Introduction**

Almost 20% of American children aged 6 to 11 years are obese. A decrease in physical activity has been associated with an increase in obesity. The school environment is one place where many children can be reached. This cross-sectional study determined which types of playground areas attract children and promote moderate to vigorous physical activity (MVPA) or sedentarism.

**Method**

Children on two urban elementary school playgrounds (one of which offered a jogging program called Jog and Walk Stars [JAWS]) were observed before school with use of the System for Observing Play and Leisure Activity in Youth and System for Observing Play and Recreation in Communities observational tools. Descriptive statistics, paired-samples *t* tests, and independent-samples *t* tests were used to analyze the data.

**Results**

The highest populated areas for schools K and B on non-JAWS days were the general blacktop areas; however, approximately 50% of the children in these areas were sedentary. At school B on days when the JAWS program was offered, the highest populated area was the JAWS track, and 99% of those children participated in MVPA. There was a significant difference in counts for average total sedentary children per square foot between school K (*M* = 216.70) and school B on JAWS days: *M* = 80.38, *t* (22.02) = 2.24, *p* < .5, two-tailed.

**Discussion**

A playground environment assessment to identify areas that promote MVPA, such as offering a JAWS program, may be one avenue to address the need for increasing MVPA levels in children in general, in addition to physical education class, and help them obtain the recommended 60 minutes of daily MVPA.

**Bagot, K. L., Allen, F. C. L., & Toukhsati, S. (2015). Perceived restorativeness of children's school playground environments: Nature, playground features and play period experiences. *Journal of environmental psychology*, *41*, 1-9.**

With little research examining children's restorative environments, the design of environments supportive of children's functioning is limited. The aim of this study was to examine the predictors of perceived restorativeness of children's school playgrounds, using Attention Restoration Theory. Children (*N* = 550, 46% boys, *M*age = 9.73 years, *SD* = 1.21) from 14 schools reported playground perceived restorativeness and play period experiences (affect, physical activity, social activity, perceived affordances). Playground characteristics of nature, size, play areas, play equipment and ratio of total grounds were assessed. After controlling for gender, age and playground size, vegetation volume was the only significant naturalness measure predicting perceived restorativeness. Play period experiences explained more variance than physical characteristics. With only moderate levels of perceived restorativeness revealed, the potential for school grounds to enhance children's functioning remains. Factors contributing to children's restorative environments may differ from adults, requiring children's inclusion in the research and design of their environments.

**Howe, F. E., & Stagg, S. D. (2016). How Sensory Experiences Affect Adolescents with an Autistic Spectrum Condition within the Classroom. *Journal of Autism and Developmental Disorders*, 1-13.**

Sensory processing difficulties are consistently reported amongst individuals with an autistic spectrum condition (ASC); these have a significant impact on daily functioning. Evidence in this area comes from observer reports and first-hand accounts; both have limitations. The current study used the Adolescent/Adult Sensory Profile (AASP; Brown and Dunn in The Adolescent/Adult Sensory Profile: self questionnaire. Pearson, 2002a), and a qualitative questionnaire to investigate sensory issues in school children with ASC. The AASP found that the participants’ mean scores were outside normal parameters. Participants reported difficulties in at least one sensory domain, with hearing affecting them the most. Content analysis revealed sensory sensitivity to affect the participant’s learning and that sensory experiences were largely negative. Results suggest that schools need to create sensory profiles for each individual with ASC.

**2014**

**Asiyai, R. (2014). Students' Perception of the Condition of Their Classroom Physical Learning Environment and Its Impact on Their Learning and Motivation** [***College Student Journal***](http://www.ingentaconnect.com/content/prin/csj;jsessionid=nfx9li189twe.alice)***, 48,* 714-723.**

This study examined the perception of secondary school students on the condition of their classroom physical learning environment and its impact on their learning and motivation. Four research questions were asked and answered using descriptive statistics while three hypotheses were formulated and tested using t-test statistics at 0.05 level of significance. Findings emerging from data analysis revealed that private school students differed significantly in their perception on the condition of their classroom physical learning environment than public school students. There was no significant difference between the perception of male and female students on the condition of their classroom physical learning environment. A significant difference existed between the perception of urban and rural school students on the condition of their classroom physical learning environment. The finding further revealed that the condition of classroom physical learning environment had great impact on students' learning and motivation including the motivation to actively participate in academic activities; it can influence their personal behavior and their school attendance. The study concluded by recommending that government and other education stakeholders should give priority attention to creating positive learning environment in schools for students' successful learning and academic development.

# **Bach, P. Nicholson, T., & Hudson, M. (2014). The affordance-matching hypothesis: how objects guide action understanding and prediction. Front Hum Neurosci, 8, 254. doi:** [**10.3389/fnhum.2014.00254**](http://dx.doi.org/10.3389/fnhum.2014.00254)

Action understanding lies at the heart of social interaction. Prior research has often conceptualized this capacity in terms of a motoric matching of observed actions to an action in one’s motor repertoire, but has ignored the role of object information. In this manuscript, we set out an alternative conception of intention understanding, which places the role of objects as central to our observation and comprehension of the actions of others. We outline the current understanding of the interconnectedness of action and object knowledge, demonstrating how both rely heavily on the other. We then propose a novel framework, the affordance-matching hypothesis, which incorporates these findings into a simple model of action understanding, in which object knowledge—what an object is for and how it is used—can inform and constrain both action interpretation and prediction. We will review recent empirical evidence that supports such an object-based view of action understanding and we relate the affordance matching hypothesis to recent proposals that have re-conceptualized the role of mirror neurons in action understanding.

**2011**

**Seied Majid Mofidi Shemirani1, Gholam Hossein Memarian2, Shahnaz Pour Naseri3, Vahid Vaziri4 (2011). A Survey on Day Lighting Design Strategies in Schools Journal of American Science, 2011;7(5). http://www.americanscience.org editor@751**

**Abstract:** Throughout history, daylight has been a primary source of lighting in buildings, supplemented originally with burned fuels and more recently with electrical energy. Before daylight was supplemented or replaced with electric light in the late 19th-century, consideration of good daylight strategies was essential. As we entered the mid- 20th-century, electric light supplanted daylight in buildings in many cases. Fortunately, during the last quarter of the 20th-century and early years of this century, architects and designers have recognized the importance and value of introducing natural light into buildings. Daylight can provide a welcome and dynamic contribution to the human experience in buildings and, as demonstrated in recent studies on schools and retail sales environments, can impact human performance. Most people appreciate daylight and also enjoy the outside view that windows provide. Good daylighting design can result in energy savings and can shift peak electrical demand during afternoon hours when

daylight availability levels and utility rates are high. Le Corbusier so clearly identified the importance of light in architecture when he expressed the point that, “Architecture is the masterly, correct and magnificent play of volumes brought together in light ...” emphasizing that “...the history of architecture is the history of the struggle for light. This article summarizes the use of daylight in primary schools with focus on goals, climate and weather, sky, conditions, design criteria, and strategies for day lighting design.

 **2010**

**Winterbottom, M.** **& Wilkins, A.**(2010). **Lighting and discomfort in the classroom** [Journal of Environmental Psychology](http://www.sciencedirect.com/science/journal/02724944)

References and further reading may be available for this article. To view references and further reading you must [purchase](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6WJ8-4V47CJH-1&_user=10&_coverDate=03%2F31%2F2009&_rdoc=1&_fmt=full&_orig=search&_origin=search&_cdi=6872&_sort=d&_docanchor=&view=c&_searchStrId=1587617482&_rerunOrigin=scholar.google&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=9527c43e7a2dfc678f63f48e93ec2681&searchtype=a) this article.

Aspects of classroom lighting and décor that can promote discomfort and impair task performance through glare, and imperceptible 100 Hz flicker from fluorescent lighting, were examined in a sample of UK schools. In 90 classrooms, across eleven secondary schools and six local education authorities variables measured included flicker, illuminance at desks, and luminance of whiteboards. Results showed that 80% of classrooms are lit with 100 Hz fluorescent lighting that can cause headaches and impair visual performance. Mean illuminance (from excessive day- and artificial lighting) was in excess of recommended design illuminance in 88% of classrooms, and in 84% exceeded levels beyond which visual comfort decreases. Lighting could not be adequately controlled due to classroom design and infrastructure. Ceiling-mounted data-projectors directed at whiteboards mounted vertically on the wall resulted in specular reflection from the whiteboard, visible as a glare spot with luminance high enough to cause discomfort and disability glare. The intensity of the glare spot varied between different brands of whiteboard. Ambient lighting, needed for close work at pupils' desks, reduced image contrast. Venetian blinds in 23% of classrooms had spatial characteristics appropriate for inducing pattern glare. There was significant variation between schools and local authorities. These findings may provide insights into small-scale reports linking pupils' attainment, behaviour and learning to classroom lighting, and may also help explain some of the benefits of coloured overlays for pupils' reading.

**2009**

**Hatice Zeynep Inan (2009). The Third Dimension in Preschools: Preschool Environments and Classroom Design European Journal of Educational Studies 1(1) 55** <http://www.ozelacademy.com/EJES_vn1_Inan.pdf>

The physical environment plays an important role in the lives of preschoolers with special needs. It can add a significant dimension to children’s experience and development when the physical environment is carefully and knowingly arranged. The physical environment and the curriculum together enhance and support the child's ability to do something himself, take care of himself, initiate and complete activities, take control of his own actions and responsibilities, communicate and interact with others easily, and have better perceptual and motor skills. In this paper, more than a physical space, the physical environment is discussed in terms of different aspects, namely, relation of the physical environment to the curriculum philosophy, general schedule of activities, modifications, safety-security issues, different areas, placement of those areas, furniture/materials, lighting, textures/colors, and outdoor area.

**Hatice Zeynep Inan, (2009). Understanding Features of Amiable Environments That Can Nourish Emergent Literacy Skills of Preschoolers Aus tralian Journal of Bas ic and Applied Sciences , 3(3): 2510-2518** <http://www.insipub.com/ajbas/2009/2510-2518.pdf>

Educators and researchers are cognizant of the importance of environment and relationships and their impacts on children’s gaining literacy skills . The Reggio Emilia approach values all layers of environment that surrounds preschoolers. The current study focuses on many dimensio n s of “classroom environment.” It examines how classroom environment appears and facilities literacy education in a Reggio Emilia-inspired preschool. The qualitative research study involved a Reggio Emilia inspired -laboratory preschool at a Midwestern research university in the United States of America. The results indicated that a preschool classroom environment has many dimensions that preschool teachers should know about. Moreove r, the study showed that the Reggio Emilia-inspired preschool offered a rich, amiable environment that satisfied preschoolers ’ interests , triggered their inquiries and supported their development and learning in relation to literacy.

**Ya-huei Wang (2009). Open Space Learning Circle and Active Learning in English Communication Class *European Journal of Social Sciences, 11*, 3** <http://www.eurojournals.com/ejss_11_3_13.pdf>

The study intended to propose an open space learning circle (OSLC) classroom management to modify the traditional classroom structures and instructions in order to motivate students’ interest in class participation. The open space learning circle was derived from Owen’s open space technology. Through learning circle, talking sticks,

empowerment, dialogism, and the law of mobility, students could have their voices heard in class discussion, hence transforming passive class learning environment to active one. The purpose of this study was to investigate whether students under the open space learning

circle can experience greater satisfaction in English communication class than those under traditional classroom arrangement. Student satisfaction questionnaire and interviews were conducted to elicit students’ learning reflection toward the class. The results showed that

those students under the open space learning circle attained greater satisfaction in class than those under traditional class in terms of instructional objective, instruction material/method, teacher’s qualities, class climate/environment, assessment, and overall satisfaction.

**Sandseter, E. (2009).** [Affordances for risky play in preschool: The importance of features in the play environment.](http://web.ebscohost.com.ezproxy.lib.uconn.edu/ehost/viewarticle?data=dGJyMPPp44rp2%2fdV0%2bnjisfk5Ie46bZRtqy0Tbek63nn5Kx95uXxjL6nrVGtqK5Jrpa1UrGruEiyls5lpOrweezp33vy3%2b2G59q7Ra%2bmsVCyqbRQtKqkhN%2fk5VXj5KR84LPui%2ffepIzf3btZzJzfhruorki3o65Ntq20Ra6mtz7k5fCF3%2bq7fvPi6ozj7vIA&hid=2) **Early Childhood Education Journal, 36(5), 439-446.**

The purpose of this article is to qualitatively explore the affordances for risky play in two different preschool outdoor environments, an ordinary preschool playground and a nature playground, based on Gibson (The ecological approach to visual perception, 1979) theory of affordances and Heft’s and Kytteä’s (Heft in Children’s Environ Qual 5(3) 29–37, 1988; Kyttä in J Environ Psychol 22:109–123, 2002, Kyttä in J Environ Psychol 24:179–198, 2004) extended work on this theory. Observations of risky play in two Norwegian preschools, one ordinary preschool (where play took place on an ordinary playground) and one nature and outdoor preschool (where play took place in a nature area) were conducted. In addition, the children were interviewed about their actualized affordances of risky play, their mobility license, and the constraints on risky play. The results show that both play environments afford an extensive amount of risky play among the children, and that the degree of mobility license tolerated by the staff is an important factor for the children to actualize these affordances. Differences in the qualities and features in the two play environments were found to have an impact on the degree of riskiness in the play situations. As such, the nature playground afforded a higher degree of risk in children’s risky play.

[**Kirkorian HL**](http://www.ncbi.nlm.nih.gov/pubmed?term=%22Kirkorian%20HL%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstract)**,** [**Pempek TA**](http://www.ncbi.nlm.nih.gov/pubmed?term=%22Pempek%20TA%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstract)**,** [**Murphy LA**](http://www.ncbi.nlm.nih.gov/pubmed?term=%22Murphy%20LA%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstract)**,** [**Schmidt ME**](http://www.ncbi.nlm.nih.gov/pubmed?term=%22Schmidt%20ME%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstract)**, &** [**Anderson DR**](http://www.ncbi.nlm.nih.gov/pubmed?term=%22Anderson%20DR%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstract)**. (2009).** [**The impact of background television on parent-child interaction.**](http://www.ncbi.nlm.nih.gov/pubmed/19765004)**Child Dev.** **80(5), 1350-9.**

This study investigated the hypothesis that background television affects interactions between parents and very young children. Fifty-one 12-, 24-, and 36-month-old children, each accompanied by 1 parent, were observed for 1 hr of free play in a laboratory space resembling a family room. For half of the hour, an adult-directed television program played in the background on a monaural television set. During the other half hour, the television was not on. Both the quantity and quality of parent-child interaction decreased in the presence of background television. These findings suggest one way in which early, chronic exposure to television may have a negative impact on development.

[Raymond, J](http://www.ncbi.nlm.nih.gov/pubmed?term=%22Raymond%20J%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstract)**.(2009).** [Interactions of attention, emotion and motivation.](http://www.ncbi.nlm.nih.gov/pubmed/19733764)Prog Brain Res. ***176,* 293-308.**

Although successful visually guided action begins with sensory processes and ends with motor control, the intervening processes related to the appropriate selection of information for processing are especially critical because of the brain's limited capacity to handle information. Three important mechanisms--attention, emotion and motivation--contribute to the prioritization and selection of information. In this chapter, the interplay between these systems is discussed with emphasis placed on interactions between attention (or immediate task relevance of stimuli) and emotion (or affective evaluation of stimuli), and between attention and motivation (or the predicted value of stimuli). Although numerous studies have shown that emotional stimuli modulate mechanisms of selective attention in humans, little work has been directed at exploring whether such interactions can be reciprocal, that is, whether attention can influence emotional response. Recent work on this question (showing that distracting information is typically devalued upon later encounters) is reviewed in the first half of the chapter. In the second half, some recent experiments exploring how prior value-prediction learning (i.e., learning to associate potential outcomes, good or bad, with specific stimuli) plays a role in visual selection and conscious perception. The results indicate that some aspects of motivation act on selection independently of traditionally defined attention and other aspects interact with it.

* An interesting link about designing educational environments more generally <http://www.futurelab.org.uk/resources/documents/handbooks/outdoor_learning_spaces2.pdf>
* A Book of interest By **Alison Clark** Transforming Children's Spaces Children's and adults' participation in designing learning environments

**Prior to 2009**

[van Hof P](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22van%20Hof%20P%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DiscoveryPanel.Pubmed_RVAbstractPlus)**,** [van der Kamp J](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22van%20der%20Kamp%20J%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DiscoveryPanel.Pubmed_RVAbstractPlus)**, &** [Savelsbergh GJ](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Savelsbergh%20GJ%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DiscoveryPanel.Pubmed_RVAbstractPlus)**. (2008). The relation between infants' perception of catchableness and the control of catching.** Developmental Psychol***ogy, 44*, 182-94.**

The authors studied how infants come to perceive and act adaptively by presenting 35 three- to nine-month-olds with balls that approached at various speeds according to a staircase procedure. They determined whether infants attempted to reach for the ball and whether they were successful (i.e., contacted the ball). In addition, the time and distance of the ball at the onset of the catching movements were measured for the successful interceptions. The authors found that not only catching skill but also the perceptual judgments of the catchableness improved with age; infants started to take their catching ability into account when judging whether a ball was catchable. Moreover, the authors observed that infants who made imprecise perceptual judgments were more likely to use a distance control strategy, whereas infants who made accurate perceptual judgments were more likely to use the more adaptive time strategy to control the catching movements. They conclude that the present study supports the proposal that, even in prelocomotor infants, the development of perception is intricately linked to or constrained by development in the visual control of action. Copyright (c) 2008 APA.

[Woolner, P.,](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Woolner+Pamela%22)[Hall, E.,](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Hall+Elaine%22)[Higgins, S.,](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Higgins+Steve%22)[McCaughey, C.,](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22McCaughey+Caroline%22) **& Wall, K. (2007). A Sound Foundation? What We Know about the Impact of Environments on Learning and the Implications for Building Schools for the Future. *Oxford Review of Education, 33,* 47-70.**

This paper reports on a literature review conducted in the UK for the Design Council and CfBT (Higgins et al., 2005) which looked at the evidence of the impact of environments on learning in schools. We have reviewed the available evidence regarding different facets of the physical environment and provided an analysis based on different areas of effect, including the extent to which different facets interact (positively and negatively) with one another. Our conclusions suggest that, although the research often indicates the parameters of an effective environment, there is an overall lack of empirical evidence about the impact of individual elements of the physical environment which might inform school design at a practical level to support student achievement. However, at a secondary level of analysis, there are indications that environmental change can be part of a catalytic process of school development and improvement. The implications of these findings for Building Schools for the Future will be discussed.

[Klatte M](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Klatte%20M%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstract)**,** [Meis M](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Meis%20M%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstract)**,** [Sukowski H](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Sukowski%20H%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstract)**, &** [Schick A](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Schick%20A%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstract)**. (2007). Effects of irrelevant speech and traffic noise on speech perception and cognitive performance in elementary school children.** Noise Health. ***9,* 64-74.**

The effects of background noise of moderate intensity on short-term storage and processing of verbal information were analyzed in 6 to 8 year old children. In line with adult studies on "irrelevant sound effect" (ISE), serial recall of visually presented digits was severely disrupted by background speech that the children did not understand. Train noises of equal Intensity however, had no effect. Similar results were demonstrated with tasks requiring storage and processing of heard information. Memory for nonwords, execution of oral instructions and categorizing speech sounds were significantly disrupted by irrelevant speech. The affected functions play a fundamental role in the acquisition of spoken and written language. Implications concerning current models of the ISE and the acoustic conditions in schools and kindergardens are discussed.

**Evans, G.W.­ (2006). Child development and the physical environment.** Annual Review of Psychology,*57*,423-451.

Characteristics of the physical environment that influence child development are discussed. Topics include behavioral toxicology, noise, crowding, housing and neighborhood quality, natural settings, schools, and day care settings. Socioemotional, cognitive, motivation, and psychophysiological outcomes in children and youths are reviewed. Necessary methodological and conceptual advances are introduced as well.

**Pavese, Antonella; Buxbaum, & Laurel J. (2007). Action matters: The role of action plans and object affordances in selection for action.** [Visual Cognition](http://www.ingentaconnect.com/content/psych/pvis;jsessionid=35nxwprct08fh.alexandra)***, 9,* 559-590.**

In a series of three experiments requiring selection of real objects for action, we investigated whether characteristics of the planned action and/or the ''affordances'' of target and distractor objects affected interference caused by distractors. In all ofthe experiments, the target object was selectedon the basis of colour and was presented alone or with a distractor object. We examined the effect of type of response (button press, grasping, or pointing), object affordances (compatibility with the acting hand, affordances for grasping or pointing), and target/distractor positions (left or right) on distractor interference (reaction time differences between trials with and without distractors). Different patterns of distractor interference were associated with different motor responses. In the button-press conditions of each experiment, distractor interference was largely determined by perceptual salience (e.g., proximity to initial visual fixation). In contrast, in tasks requiring action upon the objects in the array, distractors with handles caused greater interference than those without handles, irrespective of whether the intended action was pointing or grasping. Additionally, handled distractors were relatively more salient when their affordances for grasping were strong (handle direction compatible with the acting hand) than when affordances were weak. These data suggest that attentional highlighting of specific target and distractor features is a function of intended actions.

**Montesano, L.   Lopes, M.   Bernardino, A.   Santos-Victor, J.   (2007). Learning Object Affordances: From Sensory--Motor Coordination to Imitation: *Robotics, IEEE Transactions*, 24, 15-26.** <http://www.robotcub.org/misc/review3/07_Montesano_Lopes_Bernardino_Santos-Victor.pdf>

Affordances encode relationships between actions, objects and effects. They play an important role on basic cognitive capabilities such as prediction and planning. We address the problem of learning affordances through the interaction of a robot with the environment, a key step to understand the world properties and develop social skills. We present a general model for learning object affordances using Bayesian networks integrated within a general developmental architecture for social robots. Since learning is based on a probabilistic model, the approach is able to deal with uncertainty, redundancy and irrelevant information. We demonstrate successful learning in the real world by having an humanoid robot interacting with objects. We demonstrate the benefits of the acquired knowledge in imitation games.

**Taylor Martina, Daniel L. Schwartzb (2005). Physically Distributed Learning: Adapting and Reinterpreting Physical Environments in the Development of Fraction Concepts Cognitive Science 29, 587–625.**

Five studies examined howinteracting with the physical environment can support the development of fraction concepts. Nine- and 10-year-old children worked on fraction problems they could not complete

mentally. Experiments 1 and 2 showed that manipulating physical pieces facilitated children’s ability to develop an interpretation of fractions. Experiment 3 demonstrated that when children understood a content

area well, they used their interpretations to repurpose many environments to support problem solving, whereas when they needed to learn, they were prone to the structure of the environment. Experiments

4 and 5 examined transfer after children had learned by manipulating physical pieces. Children who learned by adapting relatively unstructured environments transferred to new materials better than

children who learned with “well-structured” environments that did not require equivalent adaptation. Together, the findings reveal that during physically distributed learning, the opportunity to adapt an environment permits the development of new interpretations that can advance learning.

**De Barros, K.M.F.T., Fragosos, A.G.C., de Oliveira, A.L.B., Filho, J.E.C., & de Castro, R.M. (2003). Do environmental influences alter motor abilities acquisition? Arq Neuropsiquiatr, 61, (2-A), 170-175.\***

The authors of this study examine environmental variables that may impact motor development. They specifically highlight the importance of sensorimotor integration in motor learning through feedback and feed forward. To examine motor learning, 100 healthy preschool age children participated in a variety of motor tasks and questionnaires were completed regarding numerous environmental variables. In addition, the effects of SES were examined as well. The motor tasks included static balance, dynamic balance, fine motor coordination activities, drawing, copying, throwing to a target, and serial finger to thumb touching. Environmental issues included variables such as attendance in public day care or private school, the place where the child spent most play time (for example in the crib, carriage, held by adult, independently on floor), types of toys available to the child, and length of time being breastfed. The researchers found that there were differences in fine motor development between children in public vs. private schooling with the children in public daycare demonstrating fine motor delays. In addition, children who were less able to move freely through their environment, such as those who were held more or placed in infant seats also had slower motor development. Lower SES and having improper toys for developmental age were also related to poorer motor development.

**Grezes, J. & Decety  J. (2002). Does visual perception of object afford action? Evidence from a neuroimaging study. *Neuropsychologia, 40*, 212-222.**

Positron emission tomography (PET) was used to explore the neural correlates of a potential involvement of motor representation during the perception of visually presented objects with different tasks. The main result of this study was that the perception of objects, irrespective of the task (judgement of the vertical orientation, motor imagery, and silent generation of the noun or of the corresponding action verb), versus perception of non-objects, was associated with rCBF increases in a common set of cortical regions. The occipito–temporal junction, the inferior parietal lobule, the SMA-proper, the pars triangularis in the inferior frontal gyrus, the dorsal and ventral precentral gyrus were engaged in the left hemisphere. The ipsilateral cerebellum was also involved. These activations are congruent with the idea of an involvement of motor representation already during the perception of object and thus provide neurophysiological evidence that the perception of objects automatically affords actions that can be made toward them. Besides this common set of cortical areas, each task engaged specific regions. © 2001 Elsevier Science Ltd. All rights reserved.

[Vetter, P](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Vetter%20P%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DiscoveryPanel.Pubmed_RVAbstractPlus)**. &** [Wolpert, D.M](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Wolpert%20DM%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DiscoveryPanel.Pubmed_RVAbstractPlus)**. (2000). Context estimation for sensorimotor control.** Journal of Neurophysiology, ***84*, 1026-34.**

Human motor behavior is remarkably accurate and appropriate even though the properties of our own bodies as well as the objects we interact with vary over time. To adjust appropriately, the motor system has to estimate the context, that is the properties of objects in the world and the prevailing environmental conditions. Here we show that to determine the current context the CNS uses information from both prior knowledge of how the context might evolve over time and from the comparison of predicted and actual sensory feedback. We show that these two sources of information may be modeled within the CNS and combined to derive an accurate estimate of the context which adjusts motor command selection. This provides a novel probabilistic framework for sensorimotor control.

**Bertenthal , B.I. (1996). Origins and early development of perception, action, and representation** Annual Review of Psychology*. 47*, 431-459 .

Research relevant to the origins and early development of two functionally dissociable perceptual systems is summarized. One system is concerned with the perceptual control and guidance of actions, the other with the perception and recognition of objects and events. Perceptually controlled actions function in real time and are modularly organized. Infants perceive where they are and what they are doing. By contrast, research on object recognition suggests that even young infants represent some of the defining features and physical constraints that specify the identity and continuity of objects. Different factors contribute to developmental changes within the two systems; it is difficult to generalize from one response system to another; and neither perception, action, nor representation qualifies as ontogenetically privileged. All three processes develop from birth as a function of intrinsic processing constraints and experience.

**Lewis, Michael. (1992). Individual differences in response to stress.** Pediatrics, 90 **(3), 487-490.**

This article focused on observing newborns and infants in response to an induced stressor (a heel-stick procedure that is performed on all newborns to screen for hereditary and metabolic disorders) one to two days postpartum. Threshold (“…the amount of stimulation necessary to produce either a negative or positive response”), dampening (“…a child’s ability to stop responding to a particular stimulus once threshold as been reached”), and reactivation (“…a child’s ability to become aroused again once arousal and dampening have occurred”) are defined and discussed. These three features of the nervous system are related to the behavioral features of temperament. To identify stable measures of reactivity, each newborn’s heel was lanced in a routine manner while an examiner observed and recorded the newborn’s reactions to the initial heel stick and to the subsequent perturbations intervals, which were rated on a 4-point intensity scale. The infants were then again reexamined at 2-months of age in relation to their response to stress (the pain of their first series of inoculations) to determine if the environment influenced an infants reactivity to a negative stimulus (pain). It was found that there was a significant relation between the threshold response and the average overall reaction to the perturbation. The results of this study suggests that infants who are highly reactive remain so regardless of environmental influences, however, low—to-moderate reactive infants, are highly affected by their environments. For low reactive infants, a responsive environment would result in low-to moderate reactivity, whereas a less responsive environment would result in high reactivity. The ability of infants to suppress the response to pain was negatively related to illness, which means that the more the infant was unable to suppress his or her response, the more the incidence of illness. The threshold response could not predict how long it would take the newborns to quiet.

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**McEvoy, M.A., Fox, J.J. & Rosenberg, M.S. (1991).** **Organizing Preschool Environments Suggestions for Enhancing the Development/Learning of Preschool Children with Handicaps Topics in Early Childhood Special Education,11(2), 18-28**

Appropriate skill development is one of the basic functionsof preschool programs. In many instances, behavior problemsin classrooms can be managed by appropriately organizing caregivingenvironments. For example, researchers have demonstrated thatorganized environments may promote increases in appropriatesocial interaction and decreases in disruptive behavior. Thepurpose of this article is to suggest ways that preschool environmentscan be organized to avoid behavior problems, and the implicationsof these arrangements for moving children from preschool toelementary school settings are discussed. In addition, the relationshipbetween environmental arrangement and direct contingency managementinterventions is discussed.

**Gibson,E.J. & Walker, A.S. (1984). Development of Knowledge of Visual-Tactual Affordances of Substance.** Child Development**,*55,* 453-460.**

Infants of 12 months were familiarized in the dark with an object of either a hard or an elastic (spongy) substance. Following 60 sec of manipulation, a visual preference test was given with simultaneous presentation of 2 films of identical objects, 1 moving in a pattern characteristic of a rigid object and 1 moving in a pattern characteristic of an elastic object. Infants handled the 2 substances differently in an appropriate manner and looked preferentially with more and longer first looks to the type of substance familiarized. A replication of this experiment with familiarization in the light yielded comparable results. A third experiment with 1-month-old infants allowed them to mouth objects of either a hard or a soft substance for haptic familiarization and then tested looking preferences with real objects moving rigidly or deforming. These infants looked longer at the object moving in a manner characteristic of the novel substance. The results, together, suggest that quite young infants detect intermodal invariants specifying some substances and perceive the affordance of the substance.

**Weinstein, C.S. (1979).** **The Physical Environment of the School: A Review of the Research.** Review of Educational Research**,*49*, 577-610.**

This paper reviews research on the impact of classroom environments on student behavior, attitudes, and achievement. The first section examines studies of six environmental variables: seating position, classroom design, density, privacy, noise, and the presence or absence of windows. In the second part of the paper, research conducted from an "ecological" perspective is considered. A third section focuses on the effects of open space school designs. Finally, some future directions for research are discussed, and the advantages and limitations of various research designs are summarized.

[Weinstein, C. S.](http://eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Weinstein+Carol+S.%22) **(1977). Modifying Student Behavior in an Open Classroom through Changes in the Physical Design. *American Educational Research Journal, 14,* 3, 249-62.**

Spatial distribution of activity in a second-third grade open classroom was observed before and after a change in the physical design, to test the hypothesis that minor changes in the physical setting would produce predictable, desirable changes in student behavior. In most cases the desired behavior changes were produced.

[Gingold, William](http://www.eric.ed.gov:80/ERICWebPortal/Home.portal?_nfpb=true&_pageLabel=ERICSearchResult&_urlType=action&newSearch=true&ERICExtSearch_SearchType_0=au&ERICExtSearch_SearchValue_0=%22Gingold+William%22) **(1971) The Effects of Physical Environment on Children's Behavior in the Classroom. ERIC ED120942**

No significant difference of student-concrete physical environment interaction occurred with a change in physical environment. A test was made on five null hypotheses related to the change of physical environment and (1) student-concrete physical environment interaction; (2) environmental preference by students; (3) student attending behavior; (4) student movement within the classroom; and (5) student-concrete physical environment interaction relationship to temperature, humidity, atmospheric pressure, sound level, and illumination level. All data recording and collecting procedures were made through classroom visitations and observations in classes that involved academic subjects. Subjects for the study consisted of 230 elementary and junior high age students located in three separate school facilities in Wisconsin. Forty of these subjects were educable mentally retarded children. All students had been in an "old" structure for at least a month before moving to a "new" structure. Other factors remained constant: classroom unit composition, curricula, teachers, and general time schedule.

* A Pedagogy of Connection: The Place of Play <http://www.cecde.ie/english/pdf/Vision%20into%20Practice/Brennan.pdf>
* Optimal Learning Spaces <http://www.oecd.org/dataoecd/38/47/43834191.pdf>
* Elegant Interior and Exterior Play Spaces for Young Children <http://www.cecde.ie/english/pdf/Vision%20into%20Practice/Kalinowski.pdf>