The European Proceedings of
Social & Behavioural Sciences
EpSBS

Future Academy

ISSN: 2357-1330

https://dx.doi.org/10.15405/epsbs.2018.07.87

ECCE 2018
VII International Conference Early Childhood Care and Education

OPPORTUNITIES FOR DEVELOPMENT OF EXECUTIVE FUNCTIONS IN PLAY ACTIVITIES: A THEORETICAL OVERVIEW

Alexander Veraksa (a), Marina Vasilyeva (a,b), Daria Bukhalenkova (a)*
*Corresponding author

(a) Lomonosov Moscow State University, Moscow, Russia, d.bukhalenkova@inbox.ru, +7-916-321-13-72
(b) Boston College, Boston, USA

Abstract

This review is devoted to opportunities for development of executive functions in play in preschool age. The aim was to analyse the research into the relationship between executive functions and play activities in preschool children over the past 15 years. A number of correlation studies have shown some connection to exist between the play development level and self-regulation in preschool children. In addition, numerous studies prove there is connection between the use of imagination in a play situation and executive functions development. The second part of the review is describing the studies that attempt to develop executive functions by involving children in play. The findings suggest that play activity does not only require a certain level of executive functions development but it also serves as a mechanism for their development. We believe it to be important for an imaginary, symbolic situation, emotionally charged by the presence of an imaginary character to allow the child to reach a new level of EF development, which is otherwise unattainable to him in a real situation. Thus, the results of our review indicate a positive relationship between executive functions and play in preschool children. Furthermore, this relationship is traceable not only at the level of correlation research, but it is also very conspicuous in the formative researches.

Keywords: Preschool age, play, executive functions, imagination, symbolic situation.

https://dx.doi.org/10.15405/epsbs.2018.07.87
Corresponding Author: Daria Bukhalenkova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

1. Introduction

Play is a symbolic space that is built by the child and serves to cognize the complex world around him. Acting as a leading activity, according to A.N. Leontiev (1996), the play form of cognition provides the child with advantages in comparison, for example, with the symbolic one.

Psychological science has accumulated a huge amount of data that shows the play activity potential for development of thinking (for example, Kuczaj, 1981; Fisher, 1991), imagination (eg Fisher, 1991), memory (eg. Istomina, 1978) and other mental functions (Russ, Robins, & Christiano, 1999). These and many other studies emphasize the importance of the play space as a special space in which, according to L.S. Vygotsky (2004), the child acts with an object as being simultaneously a real one and an imaginary one.

2. Problem Statement

Executive functions are considered as higher processes that allow controlling behavior, making it more adaptive and goal-oriented. Among the most important cognitive processes as part of executive functions, there is working memory, restraining control and cognitive flexibility (Almazova, Bukhalenkova, & Veraksa, 2016; Miyake, 2000).

One of the main components of play is the child's acceptance of various roles. Assuming a role, a preschooler, on the one hand, follows the rules and regulations that the role has to meet, and on the other hand, at any time, the child can exit from the role, i.e., change the play situation into a real one. Play activity involves all EF components: cognitive flexibility (switching from one role to another, from play activity to real activity), restraining control (use of play substitution, that is, restraining the attitude to a play situation as a real one and an action according to the game rules), working memory (which presupposes maintaining the play rules, etc.). In addition, In play a child interacts his peers, as a result of which children begin to take into account another child’s wishes and actions, to control their behaviour and carry out joint plans. In this regard, play is traditionally regarded to be important for the development of the child’s voluntariness (Elkonin, 2013).

3. Research Questions

In this regard, this review is devoted to opportunities for development of executive functions in play in preschool age.

4. Purpose of the Study

The purpose of the review was to analyze the research into the relationship between executive functions and play activities in preschool children.

5. Research Methods

In this study, we analyzed the articles devoted to the study of executive functions and play of preschool children with their peers over the past 15 years.

https://dx.doi.org/10.15405/epsbs.2018.07.87
Corresponding Author: Daria Bukhalenkova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

6. Findings

6.1. Correlation studies of interrelationship between executive functions and play in the preschool age

A number of correlation studies have shown some connection to exist between the play development level and self-regulation in preschool children (Slot, Mulder, Verhagen, & Leseman, 2017; Zyga, 2016; Elias & Berk, 2002). The results of several studies show there is a consistent relationship between the level of children's interaction in play and executive functions (Fantuzzo, Sekino, Cohen, 2004; Ivrend, 2016; Mikami, 2010). The study by R. Kelly and colleagues (2011), however, did not reveal any relationship between children's performance of EF diagnosis methodologies and observation of free play.

Thus, the available research shows that play has a complex structure and includes different aspects related to the indicators of the EF development in preschool children. In addition, numerous studies prove there is connection between the use of imagination in a play situation and EF development (Mischel, Shoda, & Rodriguez, 1989; Vieillevoye & Nader-Grosbois, 2008).

Starting with Vygotsky, establishing the boundaries between reality and an imaginative situation, has served as a basis for genuine play activities. I.E. Sigel (1970) used the term "psychological distancing", which meant behavior or an event that cognitively separated a child from his immediate environment which in turn led to the development of representation. In this tradition, play activity development was closely associated with the formation of double coding.

In our studies, we showed that the use of the symbolic space in solving cognitive problems serves as a proximal development zone for children who find it difficult to learn symbolic means (Veraksa, Horovaya, & Kisel, 2014). At the same time, movement in the proximal development zone, according to Lillard (1993), is virtually independent without an adult's active participation in it.

When placed in a classic experimental situation of deferred reward children were asked to sit for a long time in front of an attractive and edible stimulus (little marshmallow) in order to subsequently receive more marshmallows from an adult. The kids who were able to imagine marshmallows as some abstract objects in an imaginative situation, e.g. clouds, proved to be the most successful ones (Mischel & Walter, 1989).

The results of the study by J. Perucci and colleagues (2014) showed that children's thoughts related to the make-belief world are significantly associated with the development of cognitive flexibility and inhibitory control. However, play actions, for instance, those involving an imaginary toy or actions in the process of pretend play, were negatively related to these EF indicators. In interpreting the findings, the authors emphasize the importance of the cognitive aspects of fantasy for development of self-regulation rather than its behavioral manifestations.

S. Carlson and colleagues (2014) showed there is a stable positive relationship between executive functions and the performance of imaginary actions by children at the age of four. The results confirmed the conclusions of previous studies that had been obtained on a more detailed sample (Vieillevoye, Nader- & Grosbois, 2008). In the authors' opinion, this circumstance illustrates the need to attain a certain level of developed executive functions in order to carry out imaginary actions and subsequently to embrace play activities. Undoubtedly, this does require certain EF development in order to perform play actions. However, play development contributes a powerful motivational factor to the development of regulation.

https://dx.doi.org/10.15405/epsbs.2018.07.87
Corresponding Author: Daria Bukhalenkova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

The study by R.Kelly and S. Hammond (2011) revealed a significant association between inhibitory control and structured pretend play on a relatively small sample of 20 children aged 4-6 years. The higher play development was in terms of using substitute objects; imagining missing objects; attributing imaginary properties to objects; the child's role acceptance, the higher the development level of this EF indicator was. The small sample of children, unfortunately, does not allow us to make any firm conclusions about the relationship revealed, but it indicates the research area, which undoubtedly presents great interest.

6.2. Use of play activities to impact executive functions development

Before describing the studies that attempt to develop executive functions by involving children in play, let us dwell on a study that used an imaginary situation to enhance the development of the EF potential in children. A recent study which was conducted by R. White and S. Carlson (White & Carlson, 2016) confirmed the effectiveness of this approach as it examined the impact of performing EF assignments depending on the role that the child takes on itself (White, Carlson, 2016). The tasks were presented in three options: first, a traditional one, second, a situation where the child represented another child performing the task ("Where does John think this card belongs to?") and third, a situation where the child performed an assignment on behalf of a fictional character ("Now you're Batman!" Where will Batman put this card? "). The results of the research showed that the fulfillment of assignments from the third person significantly increased the accuracy of the tasks performed. At the same time, children's performance of tasks in a situation with a fictional character was more successful in comparison with that when it concerned another child. The authors interpret the results as showing the importance of children's psychological distancing and its connection with the level of self-regulation development.

Returning to the study of S.Carlson and colleagues (2014), the findings suggest that play activity does not only require a certain level of EF development but it also serves as a mechanism for their development. We believe it to be important for an imaginary, symbolic situation, emotionally charged by the presence of an imaginary character to allow the child to reach a new level of EF development, which is otherwise unattainable to him in a real situation.

The study by R.Thibodeau and colleagues (2016) involved 110 children aged 3-5 years. In what was a pretest the study examined the development of three major indirect components of executive functions in children. Accordingly, the children were divided into three groups: Group 1 was engaged in pretend play, Group 2 was engaged in non-imaginative play and Group 3 was a control one where the daily routine and activities did not change. Pretend play involved an unfolding of fantastic plots suggested by an adult, e.g., a moonwalk, and developed by children. In Group 2 children were offered ball games, coloring pages, songs and other activities that deliberately excluded executive functions. The experiment lasted for five weeks, during which time children were subdivided into mini groups of 5-6 people and were engaged for 15 minutes a day. At the end of the experiment, a post-test was conducted to measure EF development. The results showed that the children who had participated in pretend play had significantly increased the level of their working memory and cognitive flexibility in comparison with those from the other groups. The authors argue that "the act of switching between reality and imagination ... is what leads to advances in EF development in a way similar to cognitive achievements observed when languages were switched in a bilingual environment" (Thibodeau, Gilpin, Brown, & Meyer, 2016 , p. 135).

https://dx.doi.org/10.15405/epsbs.2018.07.87
Corresponding Author: Daria Bukhalenkova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

Note that the factor of time spent on developing play activities, is important in planning an intervention. So, in the study of L.Qu and colleagues (2015) preschoolers were taught dramatic play during four meetings. However, this had no effect on EF development. The extensive experience of using educational programs for preschoolers by focusing on play activity and EF development, does show positive changes in the development of self-regulation, the structure of programs, however, does not allow us to single out the contribution of the play factor as being more important than the rests (Shaheen, 2014).

7. Conclusion

The results of our experimental studies review indicate a positive relationship between executive functions and play in preschool children. At the same time, this relationship is traceable not only at the level of correlation research, but it is also very conspicuous in the formative studies.

These studies are not without limitations. First, they tend to deal with relatively small samples of children belonging to different age groups within the age bracket of 3-6 years, which makes it difficult to compare the norms obtained and trace the patterns for 2-3 years.

Secondly, the research under review confines, in most cases, the study of play activities to analyzing one of its aspects (play substitution, role acceptance, an imaginary situation). In addition, the methods used in the research help to establish the presence or absence of the fulfillment of a pretend action, role acceptance, etc. in an experimentally given situation.

However, in terms of the play theory within the framework of cultural and historical psychology and the theory of activity the implementation of such procedures in a laboratory does not allow us to talk about the true unfolding of a full play activity that presupposes appropriate motivation, peer interaction, etc. (Smirnova, Veraksa, Bukhalenkova, & Ryabkova, 2018). Neither do observations of play activities in the group, as described in the studies affect all of its essential components; instead, they are reduced to the presence or absence of play interaction. Obviously, description of each specific child's play activity requires to single out a number of parameters and, most importantly, to observe that child play for a long time.

Speaking about the formative research it is necessary to note the complexity of the organization of EF development during a play activity. It is important that, on the one hand, play should not be used only as a context for a child's emotional involvement, and on the other hand, the chosen symbolic situation should meet the child's interests. As our studies have shown, selecting a symbol that would have a developmental effect on the formation, for example, of the motor skill, presents a rather complex specific task (Veraksa, Gorovaya, Leonov, Pashenko, & Fedorov 2012).

Obviously, the relatively small number of studies considered in this review, speaks of both problems and prospects for this area of research. The popularity of Vygotsky's approach to education in preschool childhood (Veraksa & Sheridan, 2018) allows us to expect new papers to be published aiming to reveal the developing potential of play activities.

Acknowledgments

The study was supported by the Grant RFBR №18-013-01057

https://dx.doi.org/10.15405/epsbs.2018.07.87
Corresponding Author: Daria Bukhalenkova
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

References

Almazova, O. V., Bukhalenkova, D. A., & Veraksa, A. N. (2016). The voluntariness in the preschool age: a comparative analysis of various approaches and diagnostic tools. *National Psychological Journal*, *4*, 14-22.

Carlson, S., White, R., & Davis-Ungera, A. (2014). Evidence for a relation between executive function and pretense representation in preschool children. *Cognitive Development, 29*, 1—24. doi:10.1016/j.cogdev.2013.09.001;

Elias, C., & Berk, L. (2002). Self-regulation in young children: Is there a role for sociodramatic play? *Early Childhood Research Quarterly, 17*, 216–238.

El'konin, D. B. (2013). Psychology of play: The Book on request (Psikhologiya igry. – Kniga po Trebovaniyu). – M.: Книга по Требованию, 2013

Fantuzzo, J., Sekino, Y., & Cohen H. (2004). An examination of the contributions of interactive peer play to salient classroom competencies for urban Head Start children. *Psychology in the Schools, 41*, 323-336. doi:10.1002/pits.l0162

Fisher, E. (1991). The Impact of Play on Development: A Meta-Analysis. *Play and Culture*, 5, 159 –181.

Istomina Z. M. (1978). *Development of memory (Razvitiye pamyati)*. Moscow.

Ivrend, A. (2016). Choice-driven peer play, self-regulation and number sense. *European Early Childhood Education Research Journal, 24*(6), 895-906

Kelly, R., & Hammond S. (2011). The relationship between symbolic play and executive function in young children. *Australasian Journal of Early Childhood*, *36* (2), 21-27.

Kelly, R., Hammond S., Dissanayake, C, & Ihsen E. (2011). The relationship between symbolic play and executive function in young children. Australasian. *Journal of Early Childhood, 36*, 21-28.

Kuczaj, S. A. (1981). Factors influencing children's hypothetical reference. *Journai of Child Language*, 8, 131-137.

Leont'yev, A. N. (1996). Psikhologicheskiye osnovy doshkol'noy igry (Psychological bases of preschool play). *Psikhologicheskaya nauka i obrazovaniye. (Psychological science and education)*, 3.

Lillard, A., Lemer, M., Hopkins, E., Dore, R., Smith, E., & Palmquist, C. (2013). The Impact of Pretend Play on Children's Development: A Review of the Evidence. *Psychological Bulletin, 139*(1), 1-34.

Lillard, A .S. (1993). Pretend Play Skills and the Child's Theory of Mind. *Child Development*, 64, 348—371.

Mikami, A. Y. (2010). The importance of friendship for youth with attention-deficit/hyperactivity disorder. *Clinical Child and Family Psychology Review*, 13, 181-198.

Mischel, W., Shoda, Y., & Rodriguez, M. L. (1989). Delay of gratification in children. *Science*, 244(4907), 933-938.

Pierucci, J., Brien, C., McInnis, M., Gilpin, A., & Barber, A. (2014). Fantasy orientation constructs and related executive function development in preschool: Developmental benefits to executive functions by being a fantasy-oriented child. *International Journal of Behavioral Development, 38*(1), 62–69.

Qu, L., Shen, P., Chee, Y. Y., & Chen, L. (2015). Teachers' Theory-of-mind Coaching and Children's Executive Function Predict the Training Effect of Sociodramatic Play on Children's Theory of Mind. *Social Development, 24*(4), 716-733

Russ, S., Robins, D., & Christiano B. (1999). Pretend Play: Longitudinal Prediction of Creativity and Affect in Fantasy in Children. *Creativity Research Journal*, 12, 129–139.

Shaheen, S. (2014). How child's play impacts executive function – related behaviors. *Applied Neuropsychology: Child*, 3, 182-187.

Sharon, T., & Woolley, J. D. (2004). Do monsters dream? Young children's understanding of the fantasy/reality distinction. *British Journal of Developmental Psychology*, 22, 293–310.

Sigel, I. E. (1970). *The distancing hypothesis: A causal hypothesis for the acquisition of representational thought*. In: Jones, MR., editor. Miami Symposium on the Prediction of Behavior, 1968: Effects of Early Experience. Coral Gables, FL: University of Miami Press, 99-118.

Slot, P., Mulder, H., Verhagen, J., & Leseman, P. (2017). Preschoolers' cognitive and emotional self-regulation in pretend play: Relations with executive functions and quality of play. *Infant Child Development*, e2038. doi: 10.1002/icd.2038.

Smirnova, E. O., Veraksa, A. N., Bukhalenkova, D. A., & Ryabkova, I. A. (2018). Relationship between Play Activity and Cognitive Development in Preschool Children. *Cultural-historical psychology, 14*(1), 4—14. (In Russ., abstr. in Engl.). doi: 10.17759/chp.2018140101

Thibodeau, R., Gilpin, A., Brown, M., & Meyer, B. (2016). The effects of fantastical pretend-play on the development of executive functions: An intervention study. *Journal of Experimental Child Psychology*, 145, 120–138

Veraksa, A. N., Gorovaya, A. E., Leonov, S. V., Pashenko, A. K., & Fedorov, V. V. (2012). The Possibility of Using Sign and Symbolic Tools in the Development of Motor Skills by Beginning Soccer Players. *Psychology in Russia: State of the Art*, 5, 473-497

Veraksa, N., & Sheridan, S. (ed.) (2018) Vygotsky's Theory in Early Childhood Education and Research. Russian and Western values. London: Routledge.national Maritime Organization (2010). International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978/1995/2010.

Veraksa, A. N., Gorovaya, A. E., & Kisel, A. V. (2014) Possibilities of the use of symbolic and sign means in the teaching of preschool children (based on the example of the development of the rainbow phenomenon). (Vozmozhnosti ispol'zovaniya znakovykh i simvolicheskikh sredstv v obuchenii doshkol'nikov (na primere osvoyeniya fenomena radugi). *Psychological and pedagogical studies*, *6*(2), 19–34.

Vieillevoye, S., & Nader-Grosbois, N. (2008). Self-regulation during pretend play in children with intellectual disability and in normally developing children. *Research in Developmental Disabilities*, 29, 256–272.

White, R., & Carlson, S. (2016). What would Batman do? Self-distancing improves executive function in young children. *Developmental Science*, 19, 419-426.

Zyga, O. (2016). *The Act of Pretending: Play, Executive Function, and Theory of Mind in Early Childhood*. [Electronic Master's Thesis or Dissertation]. .http://rave.ohiolink.edu/etdc/view?acc_num=case1467391080