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Short notice

Stručni članak

DEVELOPMENTAL NEUROSCIENCE IN THE FUNCTION OF SENSORY AND PERCEPTUAL DEVELOPMENT OF CHILDREN

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Professional paper

Abstract: This paper seeks to explore the role of developmental neuroscience in the context of sensory and perceptual development of young children. Nurseries are places that provide conditions for such a development through nurturing as a part of educational process. Sensory and perceptual development makes a basis to which different sensory impressions, woven into social experience and mental reworking, are added so that they make perception. Nursery workers are of great importance in a child's life and they have to be seen as people who are capable of recognizing children's feelings, of "getting to them", guiding them and providing them with contents that will lead to the fulfillment of all of their potentials.

Key words: infants and toddlers, nurseries, developmental neuroscience, sensory and perceptual development, educator.

INTRODUCTION

Upbringing and nurturing infants and toddlers is a formative process that implies creating a stimulating environment where children acquire experiences of their own and explore themselves and the world around them by participating in it in accordance with their needs and abilities (*Pravilnik o Opštim osnovama predškolskog programa*, 2006; Lazić, 2013). A nursery is a place where a child lives, spends time, grows up and learns life skills, starting as early as the age of six months (Colić, 1997; Miljak, 2009; *Zakon o predškolskom vaspitanju i obrazovanju*, 2010). It is a place where a nursery worker directly participates and explores the educational process in terms of conditions in which it is realized. A nursery worker offers but does not impose, listens but does not insist, always encouraging each child's uniqueness and authenticity. He/she approaches children with respect to their

RAZVOJNA NEURONAUKA U FUNKCIJI SENZORNOG I PERCEPTIVNOG RAZVOJA DECE

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Apstrakt: Predmet rada je uviđanje doprinosa razvojne neuronauke u kontekstu senzornog i perceptivnog razvoja dece ranog uzrasta. U jaslicama se to ostvaruje kroz proces nege koja je sastavni deo vaspitanja. Senzorni i perceptivni razvoj čine bazu na koju se nadovezuju čulne impresije protkane kroz socijalno iskustvo i mentalnu preradu i kao takve tvore doživljaj. Zbog značaja koji ima u životu deteta, vaspitača u dečjim jaslicama je potrebno razumeti kao nekoga ko je sposoban da prepozna dečja osećanja, da 'uđe' u njih, da ih usmerava i da ponudi sadržaje kojima će podstaći ostvarivanje detetovog punog potencijala.

Ključne reči: dete ranog uzrasta, dečje jaslice, razvojna neuronauka, senzorni i perceptivni razvoj, vaspitač.

Uvod

Vaspitanje i nega dece do 3 godine je formativni proces koji se vrši kroz stvaranje podsticajne sredine u kojoj dete stiče iskustva po sopstvenom programu, u kojoj otkriva sebe i svoju okolinu i u kojoj je aktivno u skladu sa svojim potrebama i mogućnostima (*Pravilnik o Opštim osnovama predškolskog programa*, 2006; Lazić, 2013). Dečje jaslice su mesto u kojem dete već od 6. meseca života živi, boravi, razvija se i uči životne veštine (Colić, 1997; Miljak, 2009; *Zakon o predškolskom vaspitanju i obrazovanju*, 2010), mesto u kojem je vaspitač direktni učesnik obrazovne prakse, istraživač vaspitno-obrazovnog procesa u uslovima u kojima ga realizuje. On nudi, a ne nameće, osluškuje a ne insistira, podržava različitost i autentičnost deteta. Deci prilazi u skladu sa onim što ih odlikuje, sa ciljem pronalaženja i podsticanja potencijala i njihove kvalitativne nadogradnje u vidu mnogostranih razvojnih aspekata koji će ići u pravcu ostvari-

personal characteristics, aiming to reveal and encourage their potentials which will be further enhanced in various developmental aspects, leading to positive outcomes both in terms of a child's subjectivity and the educational process (Klemenović, 2009; Siegel & Payne Bryson, 2015). A nursery worker is aware of the fact that human brain is a social organ that undergoes quantitative and qualitative changes with experience (Siegel & Payne Bryson, 2015), which is the reason why the lower part of the brain and its right side responsible for emotions are more developed in infants, while understanding of reality comes later, depending on social context. Therefore, a nursery worker helps children to achieve integration of emotions and comprehension, thus carrying out a process-model curriculum which, with its flexibility and ability to adapt to new situations and different activities, becomes a goal in itself, with its own inner value (Klemenović, 2009), encouraging an adult person to develop and further enhance its quality.

The subject of this paper is the contribution of neuroscience in the context of sensory and perceptual development of infants and toddlers, and its aim is to define sensory and perceptual development as a framework for achieving a child's general benefit and to point out certain activities that can enable a qualitative advancement in a child's growth.

Sensory and perceptual development in infancy and early childhood

The first three years in a child's life represent a period of intense development when a child – a helpless being completely dependant on the care and attention of an adult person – gradually becomes capable of expressing his/her needs in a clear and unambiguous way, understanding basic causal links and participating actively in the social context (Vigotski, 1977; Pijaže & Inhelder, 1988; Čuturić, 1993). During this period, a child grows more, learns more, moves more, and fights more than at any other time. Babies use their natural drive to be mobile, they fall over and get up again, learn about their surroundings through obstacles, develop proprioception and achieve sensory integration (*The Secret Life of Babies*, 2014; Pekçetin et al., 2016). What they achieve through these experiences is the ability to use resources more successfully, and to understand themselves and the world around them more effectively.

Receiving sensory impressions from our environment, interpreting and organizing them make a complex psychological function that melts feelings and experiences and is known as perception (Vojvodić, 2016). Since education is a pre-planned, organized and purposeful activity whose aim is developing every single child's potentials, perception in nurseries is more than mere noticing. It is a deliberate activ-

vanja pozitivnih ishoda dečjeg subjektiviteta i vaspitno-obrazovnog procesa (Klemenović, 2009; Siegel & Payne Bryson, 2015). Svestan je činjenice da je mozak socijalni organ koji ostvaruje kvantitativne i kvalitativne promene zahvaljujući iskustvima (Siegel & Payne Bryson, 2015), zbog čega deca ranog uzrasta imaju razvijeniji donji deo mozga i njegovu desnu polovinu koje odlikuju osećanja, dok razumevanje stvarnosti dolazi kasnije i zavisno je od socijalnog konteksta. Zbog toga pomaže deci da dosegnu integraciju osećanja i razumevanja. Na ovaj način ostvaruje proces-model kurikulum koji svojom fleksibilnošću i mogućnostima prilagođavanja novonastalim uslovima i promenjenim aktivnostima postaje sam sebi cilj sa svojstvenom unutrašnjom vrednošću (Klemenović, 2009), ohrabrujući odraslu osobu da ga kvalitativno nadograđuje i unapređuje.

Predmet rada je uviđanje doprinosa razvojne neuro nauke u kontekstu senzornog i perceptivnog razvoja dece ranog uzrasta. Cilj rada je definisanje senzornog i perceptivnog razvoja kao okosnice dosezanja opšte dobrobiti deteta i ukazivanje na aktivnosti kojima se omogućava njihov kvalitativni iskorak. Primenjeno je teorijsko istraživanje i analiza sadržaja kao pripadajući istraživački postupak.

Senzorni i perceptivni razvoj dece jaslenog uzrasta

Prve tri godine života su period intenzivnog razvoja deteta koje od nemoćnog bića, u potpunosti zavisnog od brige i pažnje odrasle osobe, postaje sposobno da iskaže svoje potrebe na jasan i nedvosmislen način, da razume osnovne uzročno-posledične veze i da aktivno učestvuje u socijalnom kontekstu (Vigotski, 1977; Pijaže & Inhelder, 1988; Čuturić, 1993). U to vreme raste više, uči više, kreće se više i bori više nego što će to ikada činiti, koristi prirodnu potrebu za pokretom, pada i ustaje, upoznaje stvarnost kroz prepreke, razvija propriocepciju i ostvaruje senzornu integraciju (*The Secret Life of Babies*, 2014; Pekçetin et al., 2016). Posledice koje kroz ta iskustva nosi, pomažu detetu u uspešnijem korišćenju resursa, potpunijem razumevanju sebe i stvarnosti.

Primanje utisaka iz okruženja putem čula, njihova prerada i organizacija čini složenu psihičku funkciju poznatu pod imenom opažanje, kojom se sjedinjuju osećaji i iskustvo (Vojvodić, 2016). S obzirom na to da je vaspitanje planirana, organizovana, svrhovita delatnost koja se sprovodi sa ciljem razvoja potencijala svakog deteta, opažanje u jaslicama je više od pukog primećivanja. Ono je namerna aktivnost koja se sprovodi radi potpunijih čulnih percepcija, njihovog prepoznavanja u

ity that results in improved sensory perceptions, their recognition in repeated situations and adequate transferring of the acquired knowledge to new contexts. Perception is a function that babies learn, and nurseries provide an environment that offers a number of experiences that will enhance their sensory and perceptual development (*Pravilnik o Opštim osnovama predškolskog programa*, 2006).

Sight

Immediately after the birth, a newborn's eyes are looking for a human face and within twenty minutes the baby is able to imitate facial expressions of adults. A newborn baby can see most clearly at the distance of 20 cm, which is the distance of a mother's eyes from the baby during feeding (*The Secret Life of Babies*, 2014). Consequently, adults instinctively lean towards a baby to position themselves at this distance, and their facial expressions become slower and exaggerated.

Hearing

Although a newborn's ears are entirely covered with liquid, they work quite well after the birth, so that babies can hear all the sounds around them (*The Secret Life of Babies*, 2014). They get used to loud sounds during the prenatal period when they listen to their mother's heartbeats which is the sound with dB level ranging from 80-110 decibels. This corresponds to the sound made by a vacuum cleaner, a car on a flat road or a symphonic orchestra (Delić, 2014). Even number of hearing organs, which make the real sound through refraction, reduces echo. Adults, who seem to be (un)aware of this fact, instinctively pronounce simple repetitive sounds.

Touch

This powerful sense is used to express love and concern for others, it enables us to explore the world around us, make connections, build up confidence and form an image of the significant Other (Stefanović-Stanojević, 2005). It is an instance of evolutionary adaptation, a form of an instinctive behaviour developed in the childhood, whose function is to protect a child from danger, and is reflected in children's keeping close to their custodian (Stojić, Divljan & Avramov, 2010; *The Secret Life of Babies*, 2014). Unfortunately, not all children are blessed with supporting adults, so that their touch, which should be a touch of love, to some children mean everything but that (Lazić, Muškinja, Majkić, 2016). Consequently, there are significant differences in brain size, to the advantage of children who grow up in a supportive environment. Children who have negative experiences build

ponovljenim slučajevima i otiskivanja na nove slučajeve koji pogoduju primeni prethodno saznatog. Opažanje je funkcija koja se uči, zbog čega su jaslice okruženje koje može pružiti značajan broj iskustava u senzornom i perceptivnom razvoju (*Pravilnik o Opštim osnovama predškolskog programa*, 2006).

Čulo vida

Odmah po rođenju, bebine oči traže ljudsko lice i već u prvih 20 minuta u stanju je da oponaša mimiku koju ima odrasli iz njegovog vidnog polja. Novorođenče najbolje vidi na udaljenosti od 20 cm, što odgovara udaljenosti majčinih očiju od bebe dok je doji / hrani (*The Secret Life of Babies*, 2014). Ova fokusiranost bebe na ljudsko lice za posledicu je dala intuitivno približavanje odraslih upravo na ovu udaljenost i usporenu i prenatuženju mimiku.

Čulo sluha

Iako su u potpunosti prekrivene tečnošću, bebine uši po rođenju veoma dobro rade, te čuju sve zvuke oko sebe (*The Secret Life of Babies*, 2014). Naviknute su na glasne zvuke jer je u prenatalnom periodu beba slušala otkucaje majčinog srca koji se nalaze u rasponu od 80 do 110 decibela, što odgovara zvucima nekih usisivača, automobila na ravnom putu i simfonijskog orkestra (Delić, 2014). Parano broj organa čula sluha koji prelamanjem daje pravi zvuk, za rezultat daje manji eho. Odrasli koji se staraju o detetu su toga (ne)svesni, te intuitivno izgovaraju jednostavne glasove koje ponavljaju.

Čulo dodira

Ovim moćnim čulom se iskazuju ljubav i pažnja, omogućava upoznavanje sveta, ostvarivanje vezanosti, sticanje osnovnog poverenja i formiranje predstave o značajnom drugom (Stefanović-Stanojević, 2005). U pitanju je evolucionarna adaptacija, oblik instinktivnog ponašanja koje se razvija tokom detinjstva, sa funkcijom zaštite deteta od opasnosti preko blizine staratelja (Stojić, Divljan & Avramov, 2010; *The Secret Life of Babies*, 2014). Nažalost, život nije svoj deci podario podržavajuće odrasle, pa njihov dodir, koji bi trebalo da je dodir ljubavi, nekoj deci je sve samo ne to (Lazić, Muškinja, Majkić, 2016). Zbog toga se ostvaruju značajne posledice i na veličinu mozga, u korist deteta koje odrasta u podržavajućem okruženju. Dete, usled iskustava kojima je izloženo, gradi odnos nepoverenja, što doprinosi još većem stepenu njegove nesigurnosti, teskobe i anksioznosti.

a relationship of distrust, which further increases their feelings of insecurity, anguish and anxiety.

Taste and smell

Breastfeeding provides everything a baby needs during the first six months of life (Kiš Miljković, 2015), and after that solid food, which fosters intensive growth and development of infants, is introduced. The introduction of solids starts with sweet food that provides energy and tastes familiar to babies. Babies have a clear aversion towards vegetables and intuitively reject green food, which might be connected to the inherited fear of poisonous plants and/or thorns (*The Secret Life of Babies*, 2014). Smell is closely connected to taste, and in working with young children the greatest attention is devoted to different tastes and smells of food. Apart from that, smells are also connected to hygiene and spending time in the open air (*Pravilnik o Opštim osnovama predškolskog programa*, 2006).

Gross motor skills

Gross motor skills are the basis of psychomotor development (Čuturić, 1993). Once they have stood up and tried to walk, babies will never give up. Movement is a natural need of the human body, and its urge to be mobile is inexorable. The process of moving changes the perception of reality and through this important activity children learn about their environment, their own place in it and they begin to understand causal links.

Communication

In the first two years of life babies communicate and show their feelings by cooing, waving hands in joy or clearly expressing distress and anger. The development of speech organs is stimulated by smiling and laughing. Smiling is inherited, and all babies smile even if they have never seen a smile or heard anyone laughing before (*The Secret Life of Babies*, 2014). Babies utter sounds that are common to all languages, and they possess exceptional potentials for learning more than one language (*When Children Speak More Than One Language*, 2014).

DISCUSSION

Every time an educator talks or pays attention to a child, he/she exposes the child to sensory experiences and makes the child's brain grow. In interaction with adults, children interpret their own experiences thus stimulating different parts of the brain, which enables creating new ideas, insights and creative thinking. These connections become stronger every time they make an eye contact,

Čulo ukusa i mirisa

Ishrana majčinim mlekom u prvih šest meseci života obezbeđuje bebi sve što joj je potrebno (Kiš Miljković, 2015), nakon čega se uvodi čvrsta hrana. Njome se potpomaže intenzivan rast i razvoj odojčeta. Započinje se sa slatkom hranom koja ima dovoljno energije, a ukusom podseća na poznato. Bebe iskazuju jasan otpor prema konzumiranju povrća i intuitivno ne vole da jedu zelenu hranu, što se objašnjava nasleđenom distancom od biljaka zbog otrova i/ili trnja (*The Secret Life of Babies*, 2014). Čulo mirisa je u tesnoj vezi sa čulom ukusa, pa se u radu sa decom ranog uzrasta najveća pažnja obraća na različite ukuse i mirise hrane. Odvojeno, mirisi se vezuju za higijenu i boravak na vazduhu (*Pravilnik o Opštim osnovama predškolskog programa*, 2006).

Krupna motorika

Krupna motorika je okosnica psihomotornog razvoja (Čuturić, 1993). Kada se jednom popne u stojeći položaj i pokuša da hoda, dete ne odustaje, jer je pokret prirodna potreba ljudskog tela, a želja da postane pokretno je nezaustavljiva. Kroz proces hodanja percepcija stvarnosti postaje drugačija, a dete kroz ovu značajnu aktivnost uči o okruženju, svom mestu u njemu i počinje da razume uzročno-posledične veze.

Komunikacija

Prve dve godine života dete komunicira, pa su jezici poput gukanja, radosnog mahanja rukama, jasnog iskazivanja uznemirenosti i besa, pokazatelji njegovih stanja i osećanja. Razvoj govornog aparata neguje se osmehom i smehom. Osmeh je nasledna radnja i čine je sve bebe, čak i slepe, iako nikada nisu videle osmeh niti smeh (*The Secret Life of Babies*, 2014). Bebe izgovaraju glasove koji odlikuju sve jezike sveta, a iskazuju izuzetne potencijale za učenje više od jednog jezika (*When Children Speak More Than One Language*, 2014).

DISKUSIJA

Svaki put kada vaspitač priča sa detetom, bavi se njime, izlaže ga čulnim iskustvima i čini da mu mozak raste. U interakciji sa odraslima dete povezuje svoja iskustva, samim tim i različite delove mozga koji omogućavaju stvaranje novih ideja, uvida i kreativnog mišljenja. Te veze se osnažuju svaki put kada se ostvari kontakt očima, svaka nova reč koja se razmeni sa detetom, svaki put kada se u socijalnom kontekstu dete nasmeje (Shlain et al., 2012). Život se upoznaje življenjem i iskustvenim učenjem, a senzorni i perceptivni stimuli pogoduju razvoju čulnog opažanja i razumevanju sebe i drugih.

hear a new word or smile in a social context (Shlain et al., 2012). Life is comprehended through living and learning from experience, and sensory and perceptual stimuli invigorate the development of sensory perception and children's understanding of both themselves and others.

A child's brain keeps record of every experience. The lack of selection of (un)important information and their huge influx activates the lower part of the brain responsible for feelings so that a child becomes overflowed with emotions, which is the cause of tantrums (Siegel, Payne-Bryson, 2015). In that case, the educator should make a connection with the child and help him/her calm down (comfort the child in a soothing voice, hug him or hold him tight – depending on the situation) and move him/her away – physically and symbolically – from the dominant feeling of unpleasantness. After that, the upper part of the brain, responsible for thinking, should be engaged by focusing the child's attention by questions, insights and negotiations.

CONCLUSION

Fulfilling children's true potentials in nurseries should be viewed holistically. It means that educators must be aware that a child lives in the given moment, as well as of the influence of every single experience on a child's overall development. All the experiences that children are exposed to from the age of six months in this form of educational work affect their perception of the world. Sensory and perceptual development makes a basis to which sensory impressions are added. These impressions are woven into social experience and its mental reworking thus creating a perception. It means that a stimulating environment "invites" young children to participate in it actively and provides them with an opportunity to play out what they have experienced, to establish behaviour patterns, to comprehend previous and anticipate future experiences. Besides, such an environment enhances the development of neural networks and builds up an adequate attitude towards the challenges of growing up.

Dečji mozak beleži svako proživljeno iskustvo. Izo- stanak selekcije u mozgu za prijem (ne)bitnih informacija i njihov visoki priliv, aktivira donji deo mozga kojim dete oseća, pa bude preplavljeno osećanjima, što uzrokuje tantrume (Siegel, Payne-Bryson, 2015). Vaspitač bi tada trebalo da se poveže sa detetom i pomogne mu da se smiri (u zavisnosti od situacije - tešenjem i umirujućim glasom; grljenjem; čvrstim stiskom i grljenjem), te ga fizički i simbolično odmakne od dominantnog osećaja neprijatnosti. Onda nastupa angažovanje gornjeg dela mozga, zaduženog za razmišljanje, tako što se dete zainteresuje pitanjima, uvidima i pregovorima koje čini odrasla osoba.

ZAKLJUČAK

Ostvarivanje detetovih punih potencijala u jaslicama je neophodno shvatiti holistički. To znači da je vaspitač svestan uticaja svakog pojedinačnog iskustva na celokupni razvoj deteta, kao i činjenice da dete ranog uzrasta živi u trenutku. Zbog toga sva iskustva kojima se izlažu deca od 6. meseca života u ovom obliku vaspitno-obrazovnog rada, utiču na njihovo razumevanje sveta. Senzorni i perceptivni razvoj čine bazu na koju se nadovezuju čulne impresije koje su protkane kroz socijalno iskustvo i mentalnu preradu i kao takve tvore doživljaj. To znači da se deci ranog uzrasta kroz stimulatívno okruženje koje ih 'poziva' na aktivno učešće, omogućava proigravanje proživljenog iskustva, utvrđivanje obrazaca ponašanja, razumevanje prethodnih i predviđanje budućih iskustava. Pored toga, ovo okruženje deci omogućava i osnaživanje uspostavljenih neuronskih veza i pravilno postavljanje prema izazovima odrastanja.

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