Introduction to Neuroscience and its Influence on Studying Human Development

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Neuroscience, the study of the nervous system, has traditionally been seen as a branch of Biology. Due to major advances in electrophysiology or computational neuroscience during the past decades, tremendous advances have been made on how humans' brain and nervous system works, how it is structured, and how it can be influenced. Thereby, neuroscience moved more towards an interdisciplinary field of research, collaborating, for instance, with Psychology. This intersection facilitated the study of development of the nervous system across the life span and the identification of underlying mechanisms on a cellular basis. Investigation into the structural and functional aspects of the brain aids the explanation of psychological functioning and delivers new and exciting insights into the developmental processes at a micro-level. The current scientific and public awareness about the progress and benefits of research on the brain and the nervous system under a developmental perspective may particularly ground in the fact that insights from developmental neuroscience are informative not only for basic but also applied research (e.g., with regard to planning interventions against adolescent risk taking behaviors, or creating optimal educational settings).

As a reflection of this interesting new branch of research, the special section of this issue of the ISSBD Bulletin contains a series of stimulating papers with a focus on neuroscience and development from different research sites, dealing with the neuromodulation of behavioural, cognitive, and motivational development (Li) and focusing explicitly on willpower (Posner and Rothbart) or the development of episodic memory (Shing & Lindenberger). Additionally, two reports from labs where research on human development is studied under a neuro-scientific paradigm introduce their recent studies and new findings. In this way, modes on how to conduct studies in the area of neuroscience and development are introduced to the readers in depth. Hewig and colleagues in their lab report focus on the investigation of adolescent risk taking behavior while the second lab report deals with a study analyzing the development of the biliterate brain (Singh). Both the feature articles and lab reports of this special section represent excellent examples of research with the potential to investigate developmental mechanisms at the micro-level of brain networks, structure, and function of neural processes.

This issue of the ISSBD Bulletin also contains a country focus. This time, we chose to present Canadian developmental research to the readers because of the Biennial Meetings of the society taking place in Edmonton, Canada, this summer. The report by Dhariwal and Connolly focuses explicitly on adolescent romantic relationships and contributions made by Canadian researchers in this field. We are sure that the readers will enjoy this paper and most likely, they will be able to follow up on this topic during the conference in Edmonton 2012. Finally, this Bulletin gives information from the society with Wolfgang Schneider sharing his presidential notes and our Early Career Representative, Jaap Denissen, along with the editor of the IJBD, Marcel van Aken giving related updates. In addition, in a report on the ISSBD Asia Workshop held in India last year, Verma and Sharma give an excellent example on intersections between research findings and their translation into action plans to improve the situation among children at-risk in Asia.

We hope that the members of the society enjoy this issue of the bulletin. We are grateful to all the authors for their contributions towards the special section. Again, we would like to encourage the readers to actively approach us with their suggestions and ideas concerning the bulletin – we are very much looking forward to hearing about new ideas and suggestions for upcoming special sections.

Neuromodulation of Behavioral, Cognitive, and Motivational Development Across the Lifespan

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Behavioral, cognitive, and motivational development entail co-constructive dynamics between the environmental and social influences from the developmental context, on the one hand, and the individual's neurobiological inheritance, on the other hand. Key brain networks underlying cognition, emotion, and motivation are innervated by major transmitter systems (e.g., the catecholamines and acetylcholine). Thus, the maturation and senescence of neurotransmitter systems have direct implications for lifespan development. This brief review highlights recent research on the roles of neuromodulation in different domains of behavioral, cognitive, and motivational development.

Development across the lifespan entails cumulative reciprocal interactions between the individual's neurobiological faculty (genetic predispositions and brain mechanisms) and the social as well as environmental contexts (Baltes, Reuter-Lorentz, & Rösler, 2006; Li, 2003; Gottlieb, 1998). I thus propose that behavioral and cognitive development be conceptualized as the development of adaptive neurocognitive representations, which are "embodied" in motor, sensory, and perceptual processes and "situated" in situational contexts that often involve social interactions (Clark, 1999; 2001; Robbins & Aydede, 2008). The embodied and situated neurocognitive representations are modulated by various neurotransmitter systems (see Figure 1 for a schematic diagram).

One of the most striking features of brains is that neurons contain and release a very large number of neurotransmitters, which play important roles in regulating signal transmission between neurons (see Vizi & Lajtha, 2008, for overviews). Several transmitter systems, such as the catecholamines (dopamine, serotonin, and norepinephrine) and acetylcholine, broadly innervate various neural circuitries throughout the brain to modulate key aspects of cognition, such as attention and memory as well as reward-mediated motivational influences on behavior control (see Noudoost & Moore, 2011; Shohamy & Adcock, 2010; Cools, Roberts, & Robbins, 2008; Volkow, Wang, & Baler, 2011 for recent reviews). Depending on situational or task demands as well as the integrity of brain functions, neurotransmitters modulate task-relevant brain circuitries, so that individuals can adapt their behavior, action, and goals. Therefore, the maturation and senescence of neurotransmitter systems have direct implications for behavioral, cognitive, and motivational development across the lifespan.

The maturation and senescence of neuromodulation

Currently, there is a consensus that the integrities of the dopamine, serotonin, and acetylcholine systems decline during the course of usual aging. For instance, cross-sectional estimates showed that in various extrastriatal and striatal regions the pre- and postsynaptic markers of the dopamine system decline about 10% per decade starting around the begin of the third decade of life (e.g., Kaasinen et al., 2000; Inoue et al., 2001; see also Bäckman, Nyberg, Lindenberger, Li, & Farde, 2006 for review). Similarly, cross-sectional estimates of aging-related declines in the availability of serotonin receptors in various brain regions also range from 3% to 10% per decade (e.g., Pirker et al., 2000; Yamamoto et al., 2002; see also Eppinger, Hämmerer, & Li, 2011, for review). As for the cholinergic system, which is known to implicate neurodegenerative processes associated with dementa (see Court et al., 2001 for review), results from a recent receptor imaging study also showed that, on average, there is about 5% per decade decline of the nicotinic acetylcholine receptor in eight brain regions, including the frontal cortex and striatum (Mitsis et al., 2009). Empirical evidence and computational studies have related aging-related declines in dopamine modulation to age-related deficits in processing speed, processing fluctuations, episodic memory, working memory, and cognitive control (e.g., see Bäckman et al., 2006 for an empirical review; see Li, Lindenberger, & Sikström, 2001 for a theoretical integration).

As for the maturation of neuromodulatory systems during child and adolescent development, the evidence is much scarcer due to practical limitations of applying invasive methods, such as PET receptor imaging, in these age groups. Therefore, comparisons of dopamine functions across the human lifespan have, so far, come from post-mortem studies (Haycock et al., 2003; Tunbridge et al., 2007). For instance, postnatally dopamine level in the striatum increases 2- to 3-fold through adolescence and then decreases during aging (Haycock et al., 2003). The activity of the Catechol-*o*-Methyltransferase (COMT), an enzyme that regulates extracellular dopamine levels in the prefrontal cortex, increases about 2-fold from neonate to adulthood, and declines slightly afterwards (Tunbridge et al., 2007). Evidence from animal studies also suggests that the

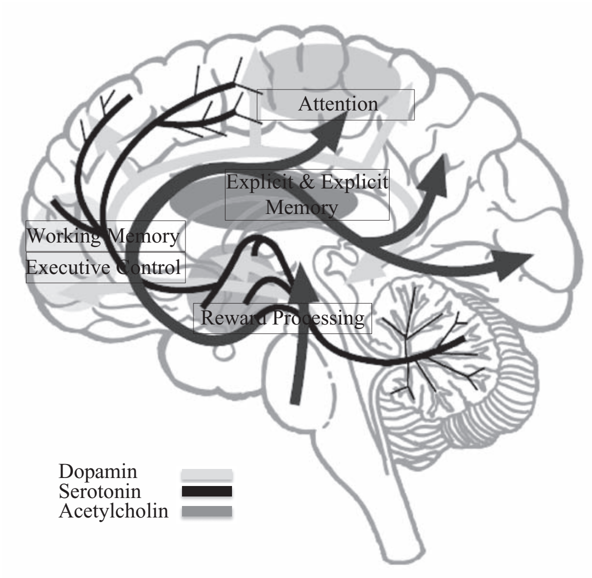

Figure 1. Schematic diagram of major transmitter pathways and subserved functions (adapted from: http://www.mpib-berlin.mpg.de/en/research/lifespan-psychology/projects/neuromodulation-of-lifespan-cognition).

efficacies of both the subcortical and cortical dopamine systems (e.g., the density of different receptor types) increase continuously and steadily during the postnatal period and childhood. Furthermore, the current consensus suggests that whereas the subcortical dopamine system reaches its peak already in adolescence, the development of the cortical system is slower and reaches its peak level only in early adulthood (see Figure 2 for a schematic diagram, Li, in press; e.g., Tarazi & Baldessarini, 2000; see Herlenius & Lagercrantz, 2004 for review). The more protracted maturation of the cortical dopamine system may constrain the development of attention and other frontal executive functions during childhood and adolescence (e.g., Diamond, 1996, Diamond, Briand, Fossella, & Gehlbach, 2004; Liotti, Pliszka, Perez, Kothmann, & Woldorff, 2005). Moreover, the discrepancy in the maturational trajectories of the subcortical and cortical dopamine systems in adolescence (see Andersen, 2003; Crews, He, & Hodge, 2007 for reviews) may make this life period particularly malleable by positive (e.g., social rewards) or negative contextual influences (e.g., extreme stress or addiction).

Research Highlights

Juxtaposing the functional roles of various neurotransmitter systems and their lifespan changes, it becomes apparent that development across the lifespan is, in part, regulated by the maturation and senescence of neuromodulatory functions. Here I selectively highlight recent research that sheds new light on neuromodulation of behavioral, cognitive, and motivational development (for more details see *Developmental Psychology*, Vol. 48, No. 3, *Special Section* on neuromodulation and development). Together they cover themes that range from the roles of neuromodulation in the development of temperament, cognitive control, emotional regulation, and working memory plasticity during childhood, to behavioral inhibition and incentive motivation in

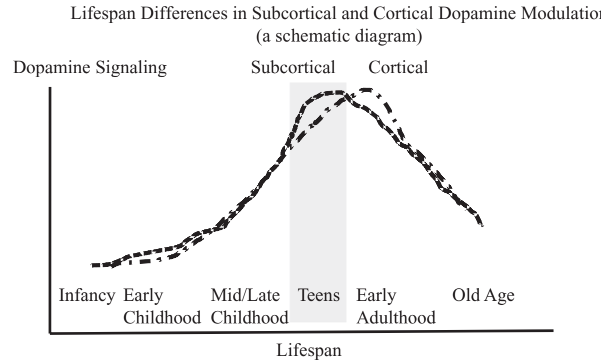

Figure 2. Schematic diagrams of the trajectories of the subcortical and cortical dopamine systems across the lifespan (adapted from Li, in press, Developmental Psychology).

adolescence and goal-directed behavior across the lifespan, as well as working memory deficit in old age.

Behavioral inhibition is an aspect of temperament that is characterized in infancy and early childhood by a clear tendency to withdraw from novel or unfamiliar stimuli or situations. Helfinstein, Fox, and Pine (2011) recently related developmental and individual differences in behavioral inhibition to the maturation of the dopamine innervated mesolimbic networks (including the striatum and amygdala). Linking the divergent developmental trajectories of the orienting and executive attention, respectively, to the maturations of the cholinergically modulated parietal network and the dopaminergically modulated frontal-striatal network, Posner and colleagues (Posner, Rothbart, Sheese, & Voelker, 2011) propose that the development of cognitive and emotional self-regulation needs to be understood in terms of developmental shifts in these two cortical control networks and their neuromodulators.

Focusing on children's working memory plasticity, Söderqvist and colleagues (Söderqvist et al., 2011) investigated interactive effects between individual differences in genetic variations relevant for dopamine functions and memory intervention. Their preliminary result shows that variations in the dopamine transporter (DAT) gene (*SLC6A3*) are associated with individual differences in working memory plasticity in pre-school children. Concerning the other end of the lifespan, older adults' spatial working memory and executive functioning were associated with individual differences in genetic predispositions of the *COMT* gene, which affects dopamine signaling in the prefrontal cortex (Nagel et al., 2008, Störmer, Passow, Biesenack, & Li, 2011). As for any genetic association studies, these preliminary results, however, need to be verified in future studies in independent samples before the associations can be considered as established.

As for the topic on motivational development, Luciana and colleagues (Luciana, Wahlstrom, Porter, & Collins, 2012) suggest that adolescents' heightened behavioral responses to incentives may be associated with the differential developmental trajectories of the subcortical and cortical dopamine system; the development of the subcortical dopamine system is earlier and peaks in adolescence, whereas the cortical system only reaches maturation in adulthood. Based on evidence gathered from lifespan samples, Hämmerer and Eppinger (2012) suggest that although children and older adults behaviorally seem to share similar difficulties in reward-based learning and outcome monitoring, the relative contributions of the cortical and subcortical dopamine systems to the expressed behavioral deficits may be different between these age groups.

Lifespan changes in neuromodulation may affect genotype-phenotype relations

Progresses in molecular genetics have opened new avenues for investigating neuromodulation of behavioral and cognitive development (e.g., Diamond et al., 2004; Lindenberger et al., 2008; Spangler, Johann, Ronai, & Zimmermann, 2009). Of particular interest in this context is the finding that changes in brain resources at the anatomical or neurochemical levels during maturation or senescence may modulate genotype-phenotype relations in different life periods, as brain mechanisms are the "intermediate phenotypes" (Meyer-Lindenberg & Weinberger, 2006) between genetic expressions in the central nervous system and behavioral phenotypes. Genes related to the neurotransmitter dopamine (DA) is a good example. Evidence from clinical (Mattay et al., 2003) and animal (Vijayraghavan, Wang, Birnbaum, Williams, & Arnsten, 2007) studies as well as neurocomputational simulations (Li & Sikström, 2002) suggests that the relation between DA signaling and cognitive performance follows an inverted-U function (see Cools & D'Esposito, 2011, for review). The nonlinear function relating DA modulation to cognitive performance predicts that genetic effects on cognition would be more apparent when DA signaling recedes from an optimal level, such as in childhood or old age or in conductions when the natural dopamine level is perturbed by excessive stress or stimulants that affect neuromodulation (Li, Lindenberger, & Bäckman, 2010; Lindenberger et al., 2008). Findings from a study on aging lend preliminary support to this resource-modulation hypothesis. Older adults' spatial working memory and executive functioning were associated with individual differences in genetic predispositions of the COMT gene, which affects dopamine signaling in the prefrontal cortex, whereas no such relation was observed in younger adults (Nagel et al., 2008; Störmer et al., 2011). Given that genetic effects in small samples are highly susceptible to chance, the resource-modulation hypothesis clearly needs to be further tested with respect to other genotype effects and functions in larger samples. Nonetheless, in the search for associations between behavioral phenotypes and genotypes, the potential influences of lifespan changes in the intermediate brain phenotypes (e.g., neuromodulation) on such relations in different life periods need to be considered.

Beyond the themes covered in this special section, other processes channeling interactions between the individual and the developmental context, such as social attachment (e.g., Spangler et al., 2009), as well as other factors in the developmental context, such as environmental or social stress (e.g., Armbruster et al., 2011; Plessow, Fischer, Kirschbaum, & Goschke, 2011) and addictive substances (see Kalivas & Volkow, 2005, for review), also operate on or through neurotransmitter systems. How may these contextual influences interact with the maturation and senescence of neurotransmitter systems in affecting the development of emotion, motivation, and cognition across the lifespan are "outstanding" questions for future research.

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Willpower and Brain Networks*

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*This paper is a commentary on several recent books and articles in the popular media on willpower from the perspective of our study of self regulation, which has been supported in part by NIH grant HD060563 to Georgia State University

Recently there has been much discussion of willpower, with two recent books and a number of commentators addressing the topic (Baumeister & Tierney, 2011; Gazzaniga, 2011). In a New York Times exchange between Walton and Dweck (2011) and Baumeister and Vohs (2011) the role of attitudes versus biology in willpower is discussed. In this debate, the issue is framed in terms of whether willpower involves innate biological mechanisms and thus cannot be changed or whether it involves a learned understanding that can easily be altered by instruction. This discussion of biology and attitude seems to be another instance of a nature vs. nurture distinction which has been settled in much of developmental psychology, but still seems to underlie many arguments about development.

In discussing "willpower," Walton and Dweck (2011) oppose a biological theory based on depletion of glucose with their own research indicating the importance of attitudes toward the efficiency of will in influencing persistence on a difficult task. It is important to know whether attitudes can reduce fatigue and improve performance, even if there are limits to how long they can keep decline away, as Baumeister and Vohs (2011) point out in their response to the Walton and Dweck piece. However, it is unfortunate to have the issue posed as a simple dichotomy, because there is now a real opportunity to understand the brain mechanisms that lie behind our often limited ability to bend our behavior to our will.

Gazzaniga (2011) argues that brain mechanisms support our control of mental events even if our beliefs in the extent of their influence and their freedom from constraint are illusory. However, Gazzaniga does not provide any detailed studies of these mechanisms from a neuroscience viewpoint. Below we briefly outline some of the approaches used in applying neuroscience methods to understanding the mechanisms of will, showing that these biological mechanisms develop and are influenced by the social environment including specific training, even though there clearly are limits to their plasticity.

Imaging Approaches

A model situation for studying the strength of will is to look at how we select a weak alternative in the presence of a stronger one. How do we choose a salad when given the opportunity to eat an attractive heavier meal? Conflict tasks such as the Stroop Effect have been used to study the brain systems involved in resolution of conflict (Botvinick, Braver, Barch, Carter, & Cohen, 2001). This same Stroop method is used by Baumeister to assay fatigue of will (Baumeister & Tierney, 2011). Exercises of will, such as avoiding the prepotent color name when saying the color of the ink, activate a set of brain areas, including the anterior cingulate, anterior insula, and underlying basal ganglia that are often called the executive attention network (Posner & Rothbart, 2007).

This Stroop conflict effect is only present for a skilled reader, so in work with young children we used a conflict between a central target and surrounding flanker stimuli which is a part of the Attention Network Test (ANT, Fan, McCandliss, Sommer, Raz, & Posner, 2002). Fan, McCandliss, Fossella, Flombaum, & Posner (2005) showed in an fMRI study with adults that three different conflict-related tasks, including the Stroop and the ANT activated a common site within the dorsal part of the anterior cingulate. This portion of the cingulate is closely connected to frontal and parietal cortical areas. When the conflict involved emotional stimuli, a more ventral part of the cingulate that is closely connected to the amygdala and other limbic emotion areas, becomes active (Bush, Luu, & Posner, 2000). Thus control of both emotional and cognitive conflict involves a brain network including portions of the anterior cingulate. Our studies of children between 4 and 10 years of age have used a child version of the ANT to examine the ability to resolve conflict (Rueda et al., 2004). This test introduces conflict by requiring children to respond in the direction of a central fish target. Flankers around the target may point in the same (congruent) or opposite (incongruent) direction.

Using the ANT with young children (Rueda et al., 2004) it was found that the length of time needed to resolve the conflict between the target and flankers was correlated with measures of effortful control in the Children's Behavior Questionnaire (Rothbart, Ahadi, Hershey & Fisher, 2001; Rothbart & Rueda, 2005). Effortful control scales measure individual differences in the child's ability to exercise self-regulation as reported by parents. Thus, a test of the efficiency of the executive attention network involving the anterior cingulate gyrus and other frontal brain areas is related to parents' report of their children's everyday self-regulation (Rothbart, 2011).

The network approach goes back at least to Hebb (1949), but it has gained impetus from imaging research. This approach provides a very natural way to combine the two major streams of psychological research. Experimental psychology has largely concerned generalized human behavior and mind, while the study of individuality has been concerned with measuring differences in human abilities. Common networks underlie our general behavior, but individual differences are represented by the efficiency with which these networks operate. Efficiency may reflect both tuning of neurons in activated brain areas and changes in connectivity. The ANT provides measures of differences in the efficiency of attention networks common to all and allows consideration of both general behavior and individual differences at once.

Evolutionary Approaches

A possible difference between humans and other primates in their control of cognition and emotion may lie in the close connectivity that the cingulate has to other parts of the brain. Comparative anatomical studies point to important differences in the evolution of cingulate connectivity between non-human primates and humans. Comparative anatomical studies show the great expansion of white matter, which has increased more in recent evolution than has the neocortex itself (Zilles, 2005). At the cellular level, one type of projection cell called the Von Economo neuron is found only in the anterior cingulate and a related area of the anterior insula (Allman, Watson, Tetreault, & Hakeem, 2005). It is thought that this neuron is important in communication between the cingulate and other brain areas. This neuron is not present at all in macaques and expands greatly in frequency between great apes and humans. The two brain areas in which Von Economo neurons are found (cingulate and anterior insula) are also shown to be in close communication even during the resting state (Dosenbach, et al., 2007). Moreover, there is some evidence that the frequency of the neurons increases in human development between infancy and later childhood (Allman et al., 2005). The ability of children to resolve conflict as measured by the ANT improves up to age 7 (Rueda et al., 2004), during the time of strong changes in connectivity, and increases in von Economo cells (Allman et al., 2005). In our view the von Economo neuron and the rapid and efficient connectivity it provides, could be a major reason why self-regulation in adult humans is stronger than in other organisms.

Developmental Approaches

Although most studies of conflict resolution require voluntary responses, we have examined the presence of aspects of self-regulation in infancy. One aspect of self-regulation is the recognition of error. Infants as young as 7 months look longer when an obvious error has occurred (Wynn, 1992). To study the mechanism involved in detecting error, Berger, Tzur, & Posner (2006) studied the same error recognition test as Wynn had used, but also recorded brain activity using a high-density scalp electrode array. It was found that detecting an error activated the same mid-frontal electrodes in both infants and adults. In adults, this set of electrodes has been found to result from activity in the anterior cingulate (Dehaene, Posner, & Tucker,1994).

However, there are also considerable differences in the self-regulation of the 7-month-old and the adult. The 7-month-old does not correct new behavior based on error detection; this ability seems to emerge at about 30 months of age (Jones, Rothbart, & Posner, 2003). What has happened over this period to achieve a higher degree of regulation? During the early years there is a great change in the connectivity of the executive attention network supporting a higher level of self-regulation (Fair et al., 2009). Indeed for the infant, most regulation occurs externally and involves a network of brain areas used in orienting to external sensory stimuli. Only over several years does the executive network become dominant in self-regulation (Posner, Rothbart, Sheese, & Voelker, in press; Rothbart, Sheese, Rueda, & Posner, 2011).

Genetic Approaches

While the brain network that underlies willpower is common to all of us, like all neural networks, there are individual differences in its efficiency. Some people have stronger activations and connectivity than others and are thus better able to exercise the various functions of self-regulation. We have used the Attention Network Test (ANT) to study differences among individuals in their performance in the alerting, orienting and executive networks that represent significant parts of the human attention system (Petersen & Posner, in press; Posner, 2012). The Attention Network Test uses separate subtractions to obtain the individual performance in each network. The three networks involve separate anatomies as measured by fMRI (Fan et al., 2005) and separate white matter pathways (Niogi & McCandliss, 2009), and have generally low inter-correlations (Fan et al., 2002, 2009).

How do these individual differences arise? In part they are due to genetic variations. While all humans have similar genes, variation between persons occurs, giving rise to differences in efficiency. In our work with adults we were able to take advantage of the finding that each of the attention networks involves different dominant neuromodulators. The alerting network primarily involves norepinephrine; the orienting network is modulated by the cholinergic system; and for executive function the primary modulator is dopamine (Fan, et al, 2003). This allows the prediction that genetic variation in each of these neural modulators will influence the relevant network (see Green et al., 2008 for a summary). We found, for example, that variants of dopaminergic genes influenced the conflict score in the ANT and also that groups with the faster resolution of conflict showed greater activation of the anterior cingulate when performing the ANT (Fan et al., 1995).

We have followed these adult studies by examining how genetic variation works during development. One example of this is the influence of variations in the dopamine 4 receptor gene on behavior in young children. It has been found that the presence of one version of the gene (the 7 repeat allele) can lead to differences in impulsivity and other risk-taking dimensions of children (Sheese, Voelker, Rothbart, & Posner, 2007). Parental training improves self-regulation for children with the 7 repeat allele but not for those without this genetic variation (Bakermans-Kranenberg, van IJzendoorn, Pijlman, Mesman, & Juffer, 2008).

However, environmental influences and learning can also lead to differences in efficiency, and experience and genetics are not entirely separate influences. Gene expression can be altered by the environment in which the genes operate. Genetic differences can even influence the degree to which specific experience is effective in leading to learning (Belsky & Pluess, 2009). Our genes thus influence the degree to which our behavior is altered by experience. This form of gene activation by environment interaction is a far cry from the concept of the immutability of genes that might underlie the idea that our "weaknesses are unchangeable." This seems to reflect Walton and Dweck's concern about biological control. There is some evidence that the greater susceptibility to environmental influence among those with the 7 repeat allele continues into adulthood (Larsen et al., 2010).

Changing one's belief in the immutability of will can definitely overcome some of the fatigue which one might have in performing a repetitive task, as is shown by the research discussed by Walton and Dweck (2011). However, the limits of executive attention in being able to resolve conflict cannot be fully overcome by a belief that we can do so. We should not teach drivers that they can overcome the limits of attention by assuming they can carry on interesting conversations on their cell phones in heavy traffic, even though many seem to believe they can.

Specific Training

There is evidence that the mechanisms underlying will can be altered by specific training. This should not be too surprising because all neural networks are subject to change through experience.

Many forms of everyday life activity and of specific training exercises may work to improve self-regulation, but we distinguish two very general forms of training (Tang & Posner, 2009). One form uses specific practice that activates the brain's executive attention network. Such practice may be part of classroom activities (Diamond, Barnett, Thomas, & Munro, 2007; Stevens, Lauinger, & Neville, 2009) or individual computer training (Klingberg, 2011; Rueda, Rothbart, McCandliss, Saccamanno, & Posner, 2005; Rueda, Checa, & Combita, in press), and may involve attention or working memory tasks. Usually the tasks increase in difficulty over time, pushing the person to continually improve performance.

A second form of improving self-regulation is by learning to adopt a different brain state (Tang et al., 2007). Randomized controlled studies of meditation training with young adults have shown that five days of practice can produce improvement in executive attention, reduced stress and a more positive mood (Tang et al., 2007). One way this may be achieved is by changing the connectivity between brain areas related to self-regulation (Tang et al., 2010).

Future Studies

Not all is known about the detailed biology of the neural networks that regulate our behavior. However, readers of the Walton and Dweck (2011), and the Baumeister and Vohs (2011) piece, and also the Baumeister and Tierney (2011) book may come to the conclusion that will must either be an immutable aspect of biology or a simple matter of attitude: Either biology or environment, nature or nurture. The truth is more complex and more hopeful. The mechanisms of will arise in the operation of neural networks but these networks are shaped by both genes and the social environment. Despite or even because of their genetic basis, these networks are subject to modification, probably at any age. If we keep that in mind perhaps we can learn enough to help ourselves and our children to a better life.

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The Development of Episodic Memory across the Lifespan: Integrating Behavioral and Neural Evidence

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Episodic memory (EM) refers to the conscious remembering of events and situations relating the past, present, and future (e.g., Tulving, 2002). Researchers in the fields of cognitive child development and cognitive aging have been working on understanding how EM develops and changes within confined age periods. However, remarkably little effort has been invested into comparing the mechanisms that underlie memory changes in childhood and old age. As we show in this article, a lifespan perspective on EM helps to delineate the differences, commonalities, and dependencies among mechanisms that regulate memory functions and development (cf. Craik & Bialystok, 2006).

Lifespan Differences in Memory Plasticity

EM performance increases during childhood and adolescence and declines during old age (e.g., Li et al., 2004). It is important to note that this inverse-U shaped relation between memory performance and age tells us little about its robustness against variations in developmental context. Hence, similar to neuroscientists, lifespan researchers seek to complement descriptive knowledge about average age trends with a systematic exploration of the malleability of these age trends through intervention. In comparison to single-shot comparative research, this focus on plasticity permits a purified assessment of age-based changes in the psychological function under investigation (Lindenberger & Baltes, 1995).

Brehmer, Li, Mueller, Oertzen, and Lindenberger (2007) directly compared memory plasticity from middle childhood to early old age. The authors used a multiphase training design consisting of baseline assessment, strategy instruction, and strategy practice to compare the plasticity of EM performance in younger children aged 9–10, older children aged 11–12, younger adults aged 20–25, and older adults aged 65–78. The participants learned and practiced the Method of Loci, an imagery-based mnemonic technique, to encode and retrieve words by location cues. Children performed at similar levels as older adults at baseline and after receiving instruction in the strategy (see Panel A of Figure 1). However, children profited considerably more than older adults from subsequent practice, leading to a magnification of age differences between children and older adults over the course of the experiment.

Presumably, the instruction gains observed by Brehmer et al. (2007) indicated individuals' ability to use a new mnemonic strategy to actively organize learning materials, hence reflecting differences in baseline plasticity. Practice gains, on the other hand, reflected individuals' latent potential for optimizing the formation and retrieval of new associations, hence reflecting differences in developmental plasticity. The results of Brehmer et al. (2007) indicate that children in middle childhood and older adults differ little in baseline performance and baseline plasticity, but that children possess greater developmental plasticity in EM performance than older adults.[1]

In a follow-up study with the same sample, Brehmer et al. (2008) examined the long-term maintenance of the mnemonic strategy 11 months after the completion of the original training study (see Panel B of Figure 1). They tested maintenance performance in two sessions, the first without and the second with mnemonic reinstruction. Children in both age groups spontaneously showed performance improvements beyond the level they had attained 11 months earlier, and did not gain any further from reinstruction. In contrast, older adults showed decreased performance, and improved reliably from the first to the second retest session. These results suggest that developmental plasticity in middle childhood reflects a powerful alliance between learning and maturation that permitted enhancement of skilled EM performance without the need for reinstruction. The overall pattern of findings suggests that the efficiency of cognitive interventions decreases from childhood to old age, pointing to possible practical implications (cf. Knudsen, Heckman, Cameron, & Shonkoff, 2006).

In sum, under suitable conditions for improvement, the performance patterns of children and older adults diverge (Figure 1), suggesting that the mechanisms that limit performance in old age are at least partially different from those that limit performance in childhood. Together with our colleagues, we have proposed a two-component model of EM development that attempts to provide an initial framework for capturing behavioral and neural differences in EM development in childhood and adulthood (Shing, Werkle-Bergner, Li, & Lindenberger, 2008; Shing et al., 2010; Werkle-Bergner, Mueller, Li, & Lindenberger, 2006). Below, we provide a summary of this framework.

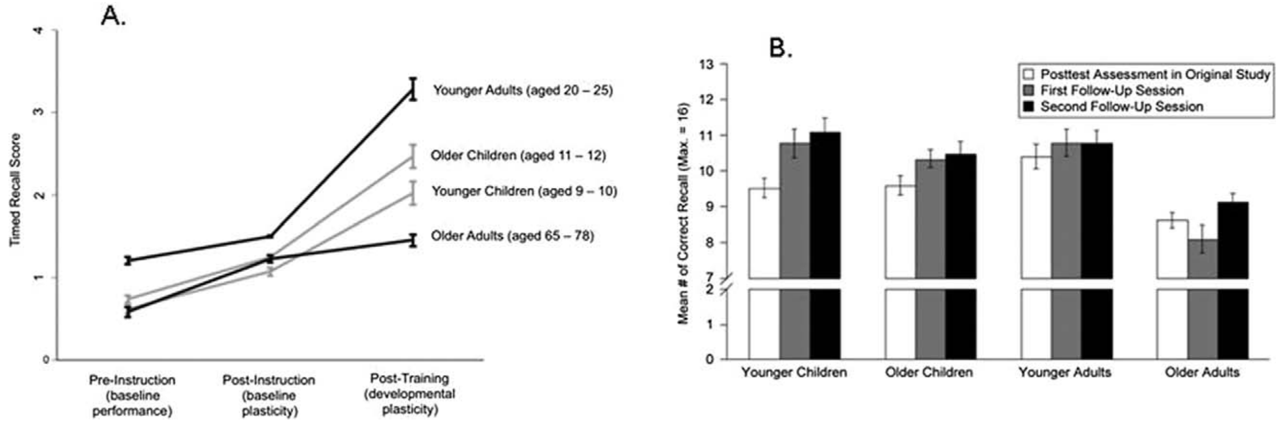

Figure 1. (Panel A) The plasticity of episodic memory is greater in children than in older adults. Memory performance refers to correctly recalled items over encoding time. Post-instruction scores for younger adults cannot be interpreted because of ceiling effects; all other data points can be interpreted. Error bars represent standard errors. Adapted from Brehmer et al. (2007). (Panel B) Average number of correctly recalled words as a function of session and age group. Recall performance is plotted separately for each age group. The white bars represent performance (number of correctly recalled words) in the posttest session of the original study (Brehmer et al., 2007), the gray bars represent performance in the first follow-up session (i.e., without mnemonic reinstruction), and the black bars represent the performance in the second follow-up session (i.e., after reinstruction in the mnemonic technique). Error bars indicate standard errors of the mean. Children (now aged 10–11 and 12–13) improved in skilled episodic memory performance 11 months after training without the need for reinstruction, presumably pointing to a powerful alliance between learning and maturation in middle and late childhood. Older adults showed decreasing trend in their memory performance 11 months after training, but improved further after reinstruction. Adapted from Brehmer et al. (2008).

The Lifespan Dissociation between Strategic and Associative Components of EM

The two-component model of EM development posits two evolving components of EM, one strategic and the other associative, and portrays the ontogeny of EM as the interaction between the two. The *strategic* component refers to cognitive control processes that aid and regulate memory functions at both encoding and retrieval. These processes include elaborating and organizing memory content at encoding, as well as specifying, verifying, monitoring, and evaluating relevant information at retrieval (cf. Simons & Spiers, 2003). The *associative* component refers to binding mechanisms that integrate features of the memory content into coherent representations (Treisman, 1996; Zimmer, Mecklinger, & Lindenberger, 2006). Based on behavioral and neural evidence, the core propositions of the framework are that (1) the associative component of EM matures in middle childhood, and undergoes senescent decline in late adulthood and old age; (2) the strategic component of EM matures later, in approaching adolescence and young adulthood, and undergoes senescent decline in late adulthood and old age. The distinction between strategic and associative components is meant to provide a productive platform for understanding the lifespan development of EM.

To empirically test the developmental predictions emanating from the two-component model, Shing et al. (2008) conducted a lifespan study in which they manipulated the demands on associative and strategic components with a recognition memory task. Participants in the study encoded a list of word pairs. At retrieval, participants received some originally intact pairs, which appeared as pairs at the study phase; some new pairs not studied before; and some rearranged pairs, which included items that were presented at study but paired differently (see Naveh-Benjamin, 2000). Participants were supposed to accept the intact pairs and reject the new and rearranged pairs.

The study manipulated demands on the associative component by using word pairs with (a) low and (b) high associative demand (i.e., German-German “GG” vs. German-Malay “GM” word pairs). At the same time, instructions manipulated the demands on the strategic component by emphasizing (a) incidental item encoding, (b) intentional pair encoding, and (c) elaborative strategic encoding. A practice-based follow-up study for the GM condition sought to induce further improvements in participants’ performance in this condition.

The results are shown in Figure 2. In comparison to children, older adults showed slightly higher initial performance in item- and pair-instruction sessions, presumably reflecting older adults’ ability to make use of their larger repertoire of semantic knowledge to help with encoding new information. At the same time, children showed higher performance gains from strategy instructions for the GG condition and from practice for the GM condition than older adults. Thus, children improved more than older adults in forming associations between memory features when provided with a combination of strategy instruction and task-relevant practice. Older adults’ performance gain was especially low in the high-associative-demand GM condition, supporting the hypothesis that the associative component is impaired among older adults (cf. Old & Naveh-Benjamin, 2008). Age differences in false-alarm rates for rearranged pairs were especially pronounced in the high-associative-demand GM condition, showing older adults’ great difficulties in rejecting rearranged pairs that presumably elicited a strong familiarity response (see also Old & Naveh-Benjamin, 2008). In sum, these data are consistent with a model that posits divergent lifespan trajectories for strategic and associative components of EM.

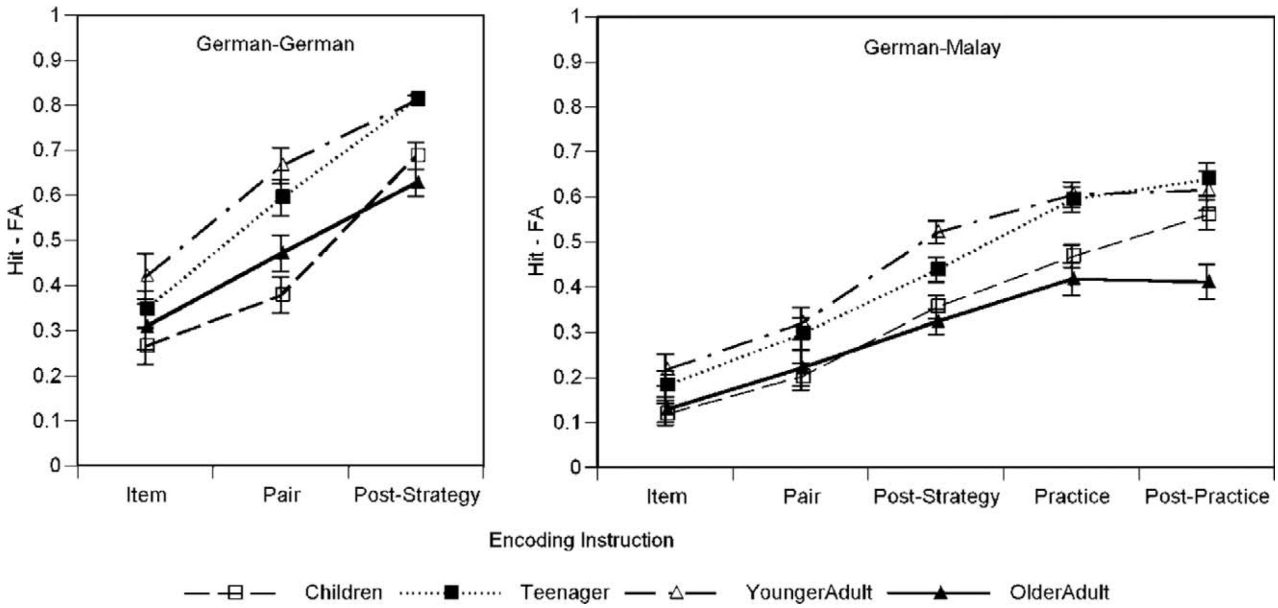

Figure 2. The lifespan dissociation between strategic and associative components of episodic memory. Memory performance refers to correctly recognized pairs (hits) minus erroneously recognized lure pairs (false alarms). Here, the lure pairs consist of words that had been separately presented during encoding. As predicted, children (aged 10–12) overcame their initial strategy deficit through strategic instruction and subsequent practice, and eventually surpassed older adults, demonstrating the efficacy of their associative component. Adapted from Shing et al. (2008).

EM across the Lifespan: Drawing the Neural Picture

Neurocognitive models of EM postulate that the strategic component depends primarily on the prefrontal cortex (PFC), whereas the associative component mostly relies on the medial temporal lobes (MTL), especially the hippocampus (e.g., Simons & Spiers, 2003). The posterior parietal cortex (PPC) is also considered important in more recent conceptions of memory network (e.g., Cabeza, 2008). Anatomical studies show that the PFC, its dorsolateral regions in particular, undergo profound maturational changes well into adolescence (e.g., Gogtay et al., 2004, 2006; Sowell et al., 2003). With respect to brain aging, prefrontal regions show linear declines in cortical volume beginning in the mid-20s (e.g., Raz, Ghisletta, Rodrigue, Kennedy, & Lindenberger, 2010). The MTL, on the other hand, mature at a relatively faster rate than the PFC, with some evidence pointing to protracted development of some MTL regions (e.g., Gogtay et al., 2006). At the other end of the lifespan, accelerated patterns of decline are observed in MTL regions, with a marked shrinkage observed in the hippocampus and the entorhinal cortex (Raz et al., 2005; Raz, Rodrigue, Head, Kennedy, & Acker, 2004; see also Shing & Lindenberger, 2011 for age patterns in hippocampal subfields).

These structural changes are paralleled by functional activation changes whose patterns are often less clear. Functional magnetic resonance imaging (fMRI) studies support the hypothesis of a link between the slower development of memory for context and detail and the prolonged maturation of lateral PFC (e.g., Ofen et al., 2007). However, a recent study by Ghetti, DeMaster, Yonelinas, and Bunge (2010) also showed age-related differences in functional selectivity in the anterior hippocampus, which may underlie memory for the associations between item and contextual details. Furthermore, age-related increases in the activation of the posterior parahippocampal gyrus were observed for scenes with higher but not with lower complexity (Chai, Ofen, Jacobs, & Gabrieli, 2010). These results reflect the heterogonous factors that contribute to memory development, including the increasingly sophisticated use of strategies and control, likely supported by maturation in the PFC, and the evolution of the ability to form complex representation, likely supported by increasing functional specialization within the MTL.

At the other end of the lifespan, age-associated functional impairments in the MTL regions (the hippocampus particularly) have been linked to older adults' difficulties in forming new associations in EM (Daselaar, Veltman, Rombouts, Raaijmakers, & Jonker, 2003; Grady, McIntosh, & Craik, 2003), and in separating new associations from existing memory traces stored in long-term memory (e.g., Daselaar, Fleck, Dobbins, Madden, & Cabeza, 2006; Wilson, Gallagher, Eichenbaum, & Tanila, 2006). Interestingly, the age-related reduction in activity observed in posterior areas of the brain is often coupled with increased bilaterality in frontal activity (Davis, Dennis, Daselaar, Fleck, & Cabeza, 2008). Increased bilateral activation may indicate a failure to appropriately engage specialized regions, reflecting dedifferentiation in processing (Lindenberger & Baltes, 1997; Logan, Sanders, Snyder, Morris, & Buckner, 2002). Alternatively, additional PFC activation in older adults, assumed to indicate additional strategic effort, may reflect attempts to compensate for deficient MTL activation (Cabeza, 2002; Park & Reuter-Lorenz, 2009). The latter interpretation has been challenged by a recent longitudinal study (Nyberg et al., 2010), which revealed longitudinal activity reductions in dorsal frontal cortex, in contrast to cross-sectional analyses suggesting an age-related increase in activation for the same frontal region. The observed discrepancy between longitudinal and cross-sectional evidence shows that cross-sectional age group differences may not approximate age group changes, underscoring the need for longitudinal investigations of EM development (cf. Nilsson et al., 1997; Schneider, Knopf, & Sodian, 2009).

Future Directions in the Lifespan Study of Episodic Memory

Available behavioral, neuroanatomical, and neurofunctional evidence supports the premise that EM functioning requires the interactive operation of associative and strategic components, and that the two components memory follow different lifespan trajectories, leading to predictable patterns of age-related differences in EM performance. However, the exact nature in which the components of the MTL-PFC network develop throughout the lifespan and how they interact to support memory functioning remains unclear.

A major task for future research will be to comprehensively chart the ontogeny of the two components, testing and refining the guiding propositions of the framework. In particular, there is a clear need to better understand how interactions between the two components are reflected by age-graded changes in the overall EM network. The parietal cortex appears to be particularly important in this context, as it connects PFC and MTL (Cabeza, 2008).

Furthermore, studies motivated by the two-component model of EM development across the lifespan thus far have not included children under the age of eight years (e.g., Brehmer et al., 2007; Shing et al., 2008). Clearly, the model's implications extend into earlier childhood and require further specification. Binding mechanisms, in particular, are fundamentally important for the functioning of EM from early age on (Mitchell & Johnson, 2009), with significant progress around five to six years of age (Sluzenski, Newcombe, & Kovacs, 2006). The neural changes that underlie this behavioral improvement remain to be identified.

Research EM in adulthood and old age also faces difficult challenges. For instance, it remains to be determined (a) whether declines in the strategic component precede declines in the associative component, or vice versa; and (b) whether declines in the associative component are as normative as declines in the strategic component, or foreshadow, to some degree at least, the later onset of dementia (cf. Bäckman, Jones, Berger, Laukka, & Small, 2005; Buckner, 2004).

Lifespan comparisons exacerbate some of the methodological difficulties reflecting the complexities of human development. These challenges range from age-related differences in the physiology of the neuronal and vascular networks (e.g., Harris, Reynell, & Attwell, 2011) to selecting measures that assess the same or equivalent processes across the age ranges under investigation. The productive discussions and helpful recommendations in relation to these issues are encouraging (e.g., D'Esposito, Deouell, & Gazzaley, 2003; Luna, Velanova, & Geier, 2010), and are likely to promote lifespan comparisons.

In sum, the two-component model of EM development portrays the dissociation between associative and strategic aspects of EM across the lifespan. The exact way in which these two components, and the corresponding MTL-PFC neural network, interact and develop throughout the lifespan remains to be elucidated, and offers exciting venues for future research. Conducting lifespan research poses great methodological challenges, but the conceptual insights emanating from lifespan comparisons are well worth the effort.

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Note

1. For the distinction between baseline performance, baseline plasticity, and developmental plasticity, see Baltes (1987).

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Reports from the Lab

Why do adolescents take risks?

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The main goal of the ongoing research in our lab is to reveal the mechanisms of adolescent risk-taking. In particular, we aim to examine an oversensitive reward mechanism and its neurofunctional basis as a contributing factor to adolescent risk-taking.

Risk-taking in adolescence

Risk-taking in adolescence has recently regained favor as a hot topic for research (e.g. Bjork et al., 2004; Galvan et al., 2006; Haase & Silbereisen, 2011; Jessor, 1991; Steinberg, 2005, 2007b, 2008, 2010; Steinberg et al., 2006) and results have demonstrated repeatedly that adolescents show increased risk-taking in many different contexts (e.g. Simons-Morton, Lerner, & Singer, 2005; Steinberg, 2004, 2007b).

In general, humans are risk-averse, meaning that we are more cautious in our decision-making than the optimal behavior according to rational choice might lead us to be (e.g.Pratt, 1964). Accordingly, if humans generally act more cautiously than would be optimal, it might be argued that some increased risk-taking in adolescents compared to adults is due to an evolutionary adaptive mechanism. This mechanism may bring decision-making closer to optimal choice in order to increase the chance of reproduction, whereby for our ancestors, social status and mating success was partly based upon success during adolescence so that higher risk-taking may have had beneficial effects on reproduction. However, increased risk-taking can of course be disadvantageous for psychosocial adjustment as well, and this is probably particularly true for modern society.

One process through which a change in level of risk-taking during the life span may be implemented is a difference in the pace of the maturation and development of reward systems in the brain compared to the change of cognitive mechanisms that control and reduce risk-taking. Research on the development of different brain regions shows that cortical gray matter peaks in adolescence (e.g. Giedd et al., 1999; Steinberg, 2004, 2007a). In particular, frontal brain regions, which are (e.g. Casey et al., 1997; Sowell, Delis, Stiles, & Jernigan, 2001; Sowell, Thompson, Tessner, & Toga, 2001) essential for cognitive control (e.g. Bishop, Duncan, & Lawrence, 2004; Cohen, Botvinick, & Carter, 2000; Kerns et al., 2004; Miller, 2000; Ridderinkhof, Ullsperger, Crone, & Nieuwenhuis, 2004) and fluid intelligence, which reaches a maximum in late adolescence (Bugg, Zook, DeLosh, Davalos, & Davis, 2006; Fry & Hale, 1996), seem to show important developments in adolescence (e.g. Casey, et al., 1997; Sowell, Delis, et al., 2001; Sowell, Thompson, et al., 2001). In addition, it has recently been shown that nucleus accumbens – a key structure in the dopamine system and essentially involved in reward processing – shows increased activity in adolescents expecting a reward and there are reasons to suspect that its accelerated development is responsible for risk-taking in adolescence (Ernst et al., 2005; Galvan, 2006; Galvan, Hare, Voss, Glover, & Casey, 2007; Galvan, et al., 2006). In summary, individual differences in the timing of the development of different brain systems may contribute to increased risk-taking in some individuals, and an asymmetry of earlier maturation of reward mechanisms and later maturation of cognitive control may predispose some individuals to increased risk-taking.

Risk-taking and event-related potentials of the brain

Recent evidence from the analysis of the event-related potential of the brain (electrophysiological responses of the cortex) enables us to measure directly the activity of the reinforcement learning system using feedback potentials. Feedback potentials reflect the electrophysiological response of the brain to positive feedback or reward and to negative feedback or punishment. The feedback negativity (also known as the feedback error-related negativity) is a negative deflection in the event-related potential of the brain, the maximum amplitude of which is recorded at the scalp over frontal brain regions at about 250-300 ms following negative compared to positive performance feedback (Holroyd & Coles, 2002; Miltner, Braun, & Coles, 1997) and other kinds of negative versus positive feedback, such as losses as compared to wins in gambling situations (Hewig et al., 2007; Nieuwenhuis, Yeung, Holroyd, Schurger, & Cohen, 2004; Yeung & Sanfey, 2004). It has been suggested that feedback negativity indicates reinforcement learning (Holroyd & Coles, 2002) and it appears to be implemented by the midbrain dopamine system and the anterior cingulate cortex (Hewig et al., 2009; Hewig, et al., 2007; Holroyd & Coles, 2002; Holroyd et al., 2004; Miltner et al., 2003; Ullsperger & von Cramon, 2003). The anterior cingulate cortex has been related to mechanisms of both reward learning and cognitive control (e.g. Botvinick, Braver, Barch, Carter, & Cohen, 2001; Botvinick, Nystrom, Fissell, Carter, & Cohen, 1999; Holroyd & Coles, 2002). Recent mathematical models of reinforcement learning (Sutton & Barto, 1998) suggest that individuals learn from the detection of differences between the expected and actual outcome of a behavioral act. Thus any outcome of a decision or behavior can be either better or worse than expected, and the size and valence of the discrepancy is proposed to be reflected in the feedback-related brain-electrical potentials. In line with this model, a feedback-related positivity is observed when an outcome is better than expected and a feedback-related negativity when the outcome is worse than expected (e.g. Hewig, et al., 2007; Holroyd & Krigolson, 2007; Holroyd, Pakzad-Vaezi, & Krigolson, 2008). According to this theoretical framework, the anterior cingulate cortex is thought to integrate reinforcement history to guide voluntary behavior (Holroyd & Coles, 2008). It has also been suggested that feedback-related potentials may reflect somatic markers of reinforcement and punishment (Holroyd, Nieuwenhuis, Yeung, & Cohen, 2003). The somatic marker hypothesis (e.g. Bechara & Damasio, 2005; Bechara, Damasio, & Damasio, 2000) holds that somatic markers, which are autonomic signals that indicate the positive and negative consequences of experienced stimuli, guide decision making. For example, if someone drove a mountain bike fast and riskily and fell then the negative consequences, such as small injuries and pain, would be associated cognitively to driving fast and riskily and would make such behavior less desirable. Positive somatic markers like the feeling of butterflies in one's stomach when dating a loved person, or associated with an action, increase the likelihood of its selection, whereas negative somatic markers of an action decrease the likelihood of its selection. Such markers may also be an important source of motivation for decision-making under risk. Accordingly, feedback negativity is associated with negative somatic markers and should be related to the avoidance of unsuccessful risky behaviors whereas feedback positivity is presumed to be associated with positive somatic markers which should contribute to the consolidation of risk-taking behavior.

In recent studies we have used a computer version of the card game "Blackjack" to investigate reinforcement learning mechanisms in risk situations in adults (Hewig et al., 2010; Hewig et al., 2009; Hewig et al., 2007; Hewig et al., 2008). The aim of this game is to score 21, generally, with as few cards as possible (certain card combinations can override this rule); the player with the highest score and the least number of cards wins. In our version of the game, a player is dealt two cards and can then choose up to two additional cards. The higher the initial point score of the first two cards, the higher the risk when drawing another card of exceeding 21 points (and hence losing the game). We were able to demonstrate systematic individual differences in the level of risk players are prepared to take (Hewig, et al., 2007). On average, in 50% of the trials, players with a score of 16 did not take another card.

Measuring brain activity with event-related potentials of the brain and functional magnetic resonance imaging, we showed that choices that are too risky elicit activity in the anterior cingulate cortex and a response-locked negativity – a potential that is closely related to feedback negativity – already at the time of the decision even before the outcome of the decision is known (Hewig et al., 2009; Hewig et al., 2007). This indicates that a brain process detects suboptimal risk-taking directly after the decision and likely reflects that something is worse than expected. This process may further lead to the conscious experience of a negative somatic marker (e.g. "oops, that was too risky"). Moreover, we demonstrated that more cautious players show a stronger response-locked negativity and stronger activity in the anterior cingulate cortex after making high-risk choices compared to more reckless participants (Hewig et al., 2009; Hewig et al., 2007). This result indicates that cautious players who show a strong neural punishment response (higher response-locked negativity and more activity in anterior cingulated cortex) when taking high risks avoid high risks more intensively, whereas the opposite is true for reckless participants.

Furthermore, we also found that players showed more negative amplitudes if an opponent unexpectedly had a higher score (Hewig et al., 2007). In addition, a "good" additional card elicited more positive amplitudes or a feedback positivity reflecting a positive temporal difference error or reinforcement (Hewig et al., 2007). Recently, we showed that if a high-risk decision to take another card resulted in a successful score increase, players characterized as being problem gamblers according to DSM IV and questionnaire measures showed even more positive amplitudes than non-problem gamblers (Hewig et al., 2010). This effect was also directly related to increased risk-taking in such problem gamblers (Hewig et al., 2010). We suggest that the increased feedback positivity at frontocentral electrodes reflects hypersensitivity to reward in problem gamblers and thus contributes to excessive risk-taking (Hewig et al., 2010). Accordingly, the excessive experience of reward or reinforcement during occasional gambling is likely to lead to further consolidation of gambling behavior and may contribute to the development of problem gambling.

The aim of the current line of research is to expand the research on adults reported above and to provide analogous evidence concerning increased risk-taking in adolescents. First, it may be expected that adolescents show a hypersensitivity to reward in risky situations or an increased feedback positivity; second, the question of whether adolescents show a diminished sensitivity to punishment in risky situations or a decreased neural negativity in the event-related potential of the brain may be examined.

An experimental approach to adolescent risk-taking and event-related potentials

To examine adolescent risk-taking we referred to Lejuez, Aklin, Zvolensky and Pedulla's (2003) Balloon Analogue Risk Task (BART). They showed that adolescents' real life risk-taking measured with a 10-item measure based on the Youth Risk Behavior Surveillance System (Centers for Disease Control, 2001) is related to the degree of risk-taking in the BART. In addition, both decision-making in the BART and the amplitude of the feedback negativity have been found to be related to trait-like impulsivity, which is an important aspect in risk-taking behavior (e.g. Pailing et al., 1999; Potts, George, Martin, & Barratt, 2006; Vigil-Colet, 2007). In the BART, participants have to decide whether they want to pump air into a balloon to increase its volume, which also increases the monetary value donated to them after the blow trial, or whether they want to cash in the current value of the balloon without further inflating the balloon. The aim is to get the largest amount of money possible without the balloon exploding, whereby all money would be lost. With each decision to further inflate the balloon, the risk of it exploding, which happens according to a predetermined algorithm, increases. Accordingly, the number of decisions to pump indicates the individual degree of risk-

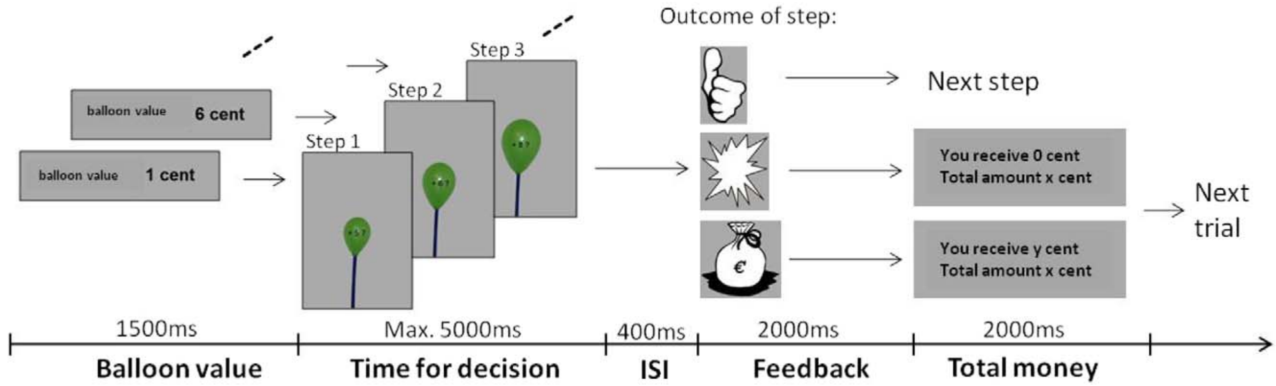

Figure 1. Timeline of a single decision in the BART (timeline of one step of one trial). Participants were first shown the current balloon value. Subsequently, the balloon was shown with the amount imprinted that a successful pump would bring about. The participants then had to press a button indicating whether they wanted either to pump or to quit. A feedback stimulus signaled their response to quit or the outcome of the pump (the latter being a blast or a successful pump). After a successful pump the next step started with the current balloon value. Alternatively, the monetary outcome of the trial (zero after blast and the balloon value after a quit decision) and the current total money were shown and subsequently the next trial started.

taking of a participant. It has been shown that the explosion of the balloon elicits feedback negativity in the event-related potential of the brain whereas successful pumps lead to more positive amplitudes in the event-related potential (Fein & Chang, 2008). In line with this finding, Rao, Korczykowski, Pluta, Hoang, & Detre (2008) have also demonstrated increased activity in the anterior cingulate cortex for high-risk decisions compared to low-risk decisions in the BART.

In a first study, we investigated the relationship between risk-taking and brain potentials (see Figure 1) with 22 student participants (13 females, average age: 24 years) measuring event-related potentials using the electroencephalogram. The participants could decide whether they wanted to inflate the balloon up to six times of its starting volume in two different experimental conditions with a fixed probability of an explosion of the balloon at every single step of inflation (20% and 40% of blasts at each step/pump respectively for the two conditions). With each successful step of inflation, the value of the balloon increased from 1 to 6, 12, 20, 30, 42, and 57 Cents, the whole value being lost if the balloon exploded. Each participant played 300 modified BARTs. An analysis of the event-related potentials revealed that each successful pump elicited a frontocentral feedback positivity that increased with the number of successful preceding pumps and a rise in monetary value (see Figures 2 and 3). In contrast, feedback negativity in response to an explosion was not modulated by the level of monetary value lost or the number of preceding pumps. These results provided the basis to design the experimental parameters (probability of blasts and the levels of the monetary incentives) for a currently ongoing study on risk-taking in adolescents utilizing this version of BART. The BART has the advantage of being lower in visual complexity compared to car driving tasks used by Steinberg and colleagues (Chein, Albert, O'Brien, Uckert, & Steinberg, 2011; Gardner & Steinberg, 2005). This is necessary for the precise measurement of event-related potentials of the brain (e.g. avoiding ocular artefacts by eye movements and other activities during virtual car driving).

In an influential study, Gardner and Steinberg (2005) used a car-driving computer task and showed that

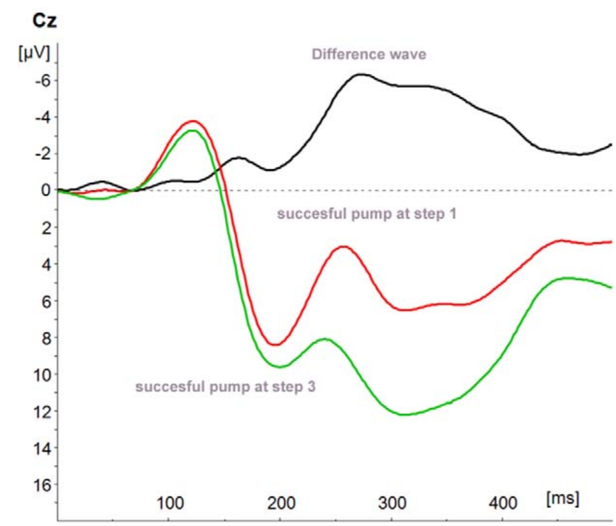

Figure 2. Event-related potentials towards the outcome of a decision to pump at electrode Cz (Vertex). The graph shows the brain response to the feedback stimulus that indicated a successful pump at step 1 in red and at step 3 in green. The black line represents the difference wave between pumps at step 1 as compared to step 3.

adolescents (13-16 years old) took more risks when under peer influence than two older control groups (18-22 and 24 and older). In this study participants were indeed in the same room and communicated during the task in the peer condition. More recently, Chein et al. (2011) reported increased activity in reward-related brain regions of adolescents in the presence of peers. In this study participants were only observed by a friend through a monitor and only communicated with one another during breaks. In line with these findings, our current research aims to show that peer presence – as implemented in the latter study – influences the riskiness of decisions by adolescents, both in our modified BART and in feedback-related potentials. For this purpose, we are currently investigating male participants (20 participants in an age range of 13-16) playing our version

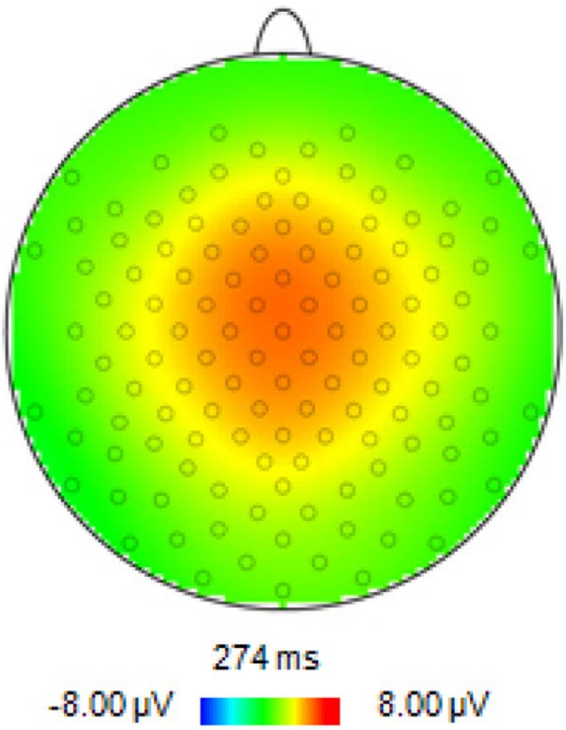

Figure 3. The Figure shows the topography of the difference wave between successful pumps at step 1 minus successful pumps at step 3 (in Figure 2). There is a stronger frontocentral positivity for successful pumps at step 3 as compared to step 1 reflecting the stronger reward or reinforcement experienced at the higher step.

of the BART under two conditions balanced across participants. First, the participant plays the BART while simultaneously being observed through a monitor by a friend. Second, the participant plays the BART alone without observation by a friend. The participants came in pairs (close friends) and both of them played 150 trials per condition (single and peer presence conditions). At the first step of each trial the value of the balloon is 2 Cents and the value can increase at subsequent steps by 2, 4, 6, 8, 10, and 13 cents resulting in a final value of the balloon of maximally 45 cents. We additionally manipulated the probability of blasts with each subsequent step from 20%, 25%, 30%, 35%, 40%, to 45% at the last step. We expected that the adolescents would show increased risk-taking – making more decisions to further inflate the balloon at higher steps – when playing the BART in the presence of a peer using a within-person variation. In addition, we expected to find stronger feedback positivities in adolescents after successful balloon pumps in the BART – especially as the number of pumps increased, and when playing in the presence of a peer. Such a finding would corroborate and extend the view that adolescents exhibit an oversensitive reward mechanism contributing to adolescent risk-taking (Chein et al., 2011; Ernst et al., 2005; Galvan, 2006; Galvan et al., 2007; Galvan et al., 2006). Increased knowledge of these processes will help in developing better prevention strategies to avoid maladaptive adolescent risk-taking in the future.

In addition to processes related to reward or reinforcement, individual differences in brain responses to punishment may contribute to high risk-taking. Interestingly, Chang, Davies, and Gavin (2009) showed reduced error-related negativities (responses to punishment) in students with attention-deficit/hyperactivity disorder. Accordingly, we presume that a subpopulation of high-risk adolescents shows reduced responses to punishment. This could contribute to excessive risk-taking if those individuals had problems in learning from negative feedback, e.g. from negative outcomes of risk-taking. For example, an adolescent who drank too much alcohol and got sick afterwards would only avoid the risk-taking behavior if he or she were sufficiently sensitive to the negative consequences (sickness), and would otherwise continue drinking.

In summary, we hope to increase knowledge about the processes that lead to adolescent risk-taking. Future studies aim to continue exploring adolescent risk-taking and the effect of peer presence using both electroencephalography and functional magnetic resonance imaging. The use and combination of these two methods enables us to demonstrate the neurofunctional basis of the psychological processes involved with both high temporal resolution and spatial resolution. Electroencephalography is particularly suited to reveal the temporal dynamics of information processing with excellent temporal resolution in milliseconds, while functional magnetic resonance imaging has a lower temporal but a better spatial resolution (millimetres), which helps to identify brain regions involved in risk perception, subsequent processing of risks, and behavioral risk-taking. We also plan to examine emotions as moderators of adolescents' decision-making in future studies (e.g. Haase & Silbereisen, 2011). Haase and Silbereisen (2011) recently examined groups in early adolescence (mean age 13), middle adolescence (mean age 17), and young adulthood (mean age 23) and showed that risk perceptions in adolescents (and also in young adults) could be influenced by the induction of positive mood. In particular, positive background mood lowered risk perceptions concerning drinking alcohol, smoking a cigarette, riding in a car with a drunk driver, getting into a fight, and having unprotected sexual intercourse. In future studies we plan to target the influence of positive mood on risk perceptions, on behavioral risk-taking and on the underlying neurofunctional mechanisms.

Taken together, both the extensive responsiveness to reward and the susceptibility to positive mood induction hint at the importance of emotion and emotion regulation in adolescent risk-taking. Accordingly, it may be speculated that attempts to improve emotion regulation strategies and abilities for cognitive control could become new elements in programs aimed at preventing maladaptive adolescent risk-taking.

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The Developing Biliterate Brain

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Recent advances in neuroscience hold immense promise not only to unravel the mystery of brain structure and function but to also provide better understanding of learning and organization in the brain development of people both with and without a brain disorder. The National Brain Research Centre (NBRC), located in Manesar on the outskirts of Delhi, has been designed as the platform on which the Department of Biotechnology, Government of India brings together scientists to address the complexities of the brain.

NBRC was established as a national apex center for brain research in India and is tasked to consolidate, network, and undertake basic research of high caliber in neuroscience and to establish linkages with national/international organizations involved in neuroscience research. Research at NBRC is carried out through a multidisciplinary approach by bringing together scientists working in different disciplines in the mainstream of neuroscience. Typical and atypical brain structure and function are investigated at NBRC and some prominent areas of research are neurodevelopment, neurodegeneration, neurinflammation, neuroplasticity and cognition and neuroimaging. I will discuss here some work at NBRC focused on understanding the development of literacy in a multilingual multiscriptal society.

In modern day knowledge societies, literacy skills are a necessity. A UNESCO report on literacy states that literacy can be pivotal for development—at personal, family and community levels, as well as at macro-levels of nations, regions and the world (EFA Global Monitoring Report, 2006). Yet the cultural environments in which literacy is acquired vary vastly around the globe. With increasing immigration, multilingualism is now a global phenomenon (Agnihotri & McCormick, 2010), resulting in an educational milieu wherein readers are required to learn to read in a non-native language. This novel cognitive challenge is no longer restricted to a non-native English speaker learning English in the United States or the United Kingdom but also the challenge of a native English speaker having to learn to read Chinese, Hindi or Japanese in China, India and Japan respectively. In countries like India, wherein the state education system has a three-language formula, children are often required to learn to read as many as three distinct languages by age 10. The situation can be daunting for the child and the parent, particularly in situations when parents themselves are unable to read the language and thereby unable to help the child at home. It is critical that school instruction be adequate and paced at the appropriate level for the child. We outline here the design and challenges of investigating the development of literacy in children simultaneously exposed to instruction in two distinct languages.

A few points that need to be considered while conducting such studies are discussed (Bialystok, Luk, & Kwan, 2005): 1) The linguistic environment of the child. Reading builds on spoken language skills and it is critical to ascertain whether the child is exposed to two or more language environments at home or a single language. This is important because children may be imparted instruction in a language that they do not speak in the home environment; 2) Writing systems vary in script and orthography. Orthography is sound-letter mapping and describes the correspondence between script and sound. Orthographies that have simple one-to-one sound-letter mapping are termed transparent whereas those in which sound-letter mapping is complex are classified as deep. Since learning to read requires children to understand the rules of the writing system, if languages belong to the same writing systems there can be a transfer of literacy skills across languages whereas if writing systems differ the child has the additional challenge of learning the rules of both.

We discuss here research that has been initiated in our laboratory to ascertain the patterns of development in bilingual children exposed to simultaneous literacy instruction in Hindi and English. The reading skills of children, bilingual in Hindi and English, between 5-10 years were ascertained. All the children belonged to similar SES and attended school in the National Capital Region of New Delhi where the medium of instruction was English. They were provided daily instruction in both languages using a phonics-based approach. While English was spoken primarily in the classroom, at home and in the playground children primarily spoke Hindi, which was also their mother tongue.

Learning to read Hindi and English is a cognitively challenging process for a young child entering school since Hindi and English belong to writing systems that differ in script and orthography (Das, Bapi, Padakannaya & Singh, 2011). Hindi is written in the Devanagari script which is visually complex whereas English is written in the Roman script. The Devanagari script, like almost all Indic writing systems, is derived from Brahmi. The script has syllabic as well as alphabetic properties and hence is called an alphasyllabary. Like alphabetic systems (English, for example), alphasyllabaries distinguish vowels and consonants and like syllabic systems, the grapheme is mapped to a syllable (Bright, 2000). Devanagari is used by about 200 million people in South Asia. It is used to write several languages in North India including Hindi, Sanskrit, Marathi, Nepali, Bihari, and Konkani. Devanagari script differs from the Roman-derived English script in terms of transparency as well as orthographic layout (Vaid & Gupta, 2002). The basic written unit is called an *akshara*, which stands for an orthographic syllable (written unit). Devanagari characters have a complex spatial organization and are asymmetric, free flowing and have highly intricate shapes (see examples below).

English letters are designed with basic geometric shapes using vertical, horizontal, and diagonal lines, circles, and are visually simple as compared to those of Devanagari. While English has a linear organization in that vowels and consonants are only written in a linear left-to-right fashion, in Devanagari, the consonants are mostly written in a linear left-to-right order (कमल, 'kamal', meaning lotus) and vowel signs may be positioned nonlinearly above (खेल, 'khel', meaning to play), below (खुल, 'khul', meaning 'to open') or to either side of the consonants (खाल, 'khal', meaning 'skin'). In addition, for certain words in Devanagari, the vowel precedes the consonant in writing but follows it in speech (खिल, 'khil', meaning 'to blossom'). Thus the visual-spatial organization of Devanagari is not necessarily linear and is visuo-spatially complex.

Hindi and English also differ in orthography. Orthography is sound letter mapping. English has a deep orthography in that the same letter or set of letters can be pronounced differently. For example 'cough and bough'; /ough/ is pronounced differently in each case. Hindi on the other hand is orthographically transparent with a nearly perfect one-to-one correspondence between akshara and sound. To summarise, Devanagari is visuo-spatially demanding while English is orthographically challenging.

Learning to read is also one of the most elegant examples of the neuroplasticity of the brain. According to the neuronal recycling hypothesis proposed by Dehaene (Dehaene & Cohen, 2007), in order to learn to read, children need to learn to associate sounds with letters, forming neural circuits between brain structures, originally specialized for seeing (the occipital cortex) and for hearing (the auditory cortex) (Dehaene & Cohen, 2007). Functional neuroimaging, which allows brain activity to be recorded while performing a task, provides a unique opportunity to understand and visualize the neural circuits that are formed during the period reading is learned and mastered. Despite conventional instruction, adequate intelligence and socio-cultural opportunity, a few children fail to achieve age-appropriate reading skills. This is defined as Developmental Dyslexia (DD) and is known to occur due to structural or functional disruption of the reading network in the brain. The incidence of dyslexia worldwide in has been reported to be around 15–17% (Snowling, 2000) and is a matter of great educational concern. However, if detected early, children with dyslexia can be provided systematic personalized instruction which can help them cope with reading but this needs to be done as early as possible. It is therefore critical to identify typical reading patterns in populations of children learning two writing systems from both a neural and a behavioral perspective so that those with dyslexia may be identified early.

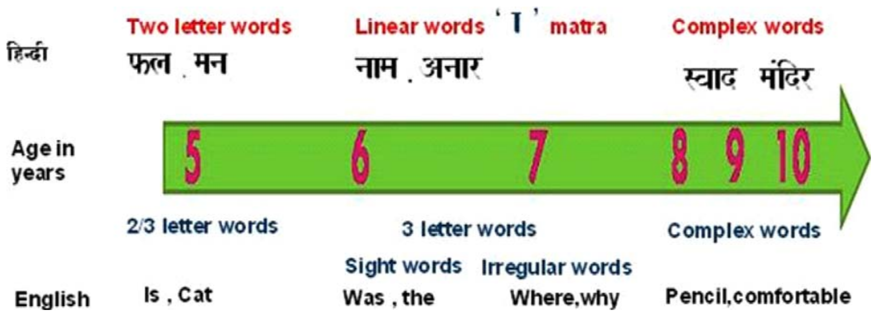

Figure 1. Patterns of development for children between 5-10 years provided simultaneous reading instruction in Hindi and English.

Reading Patterns of Children Learning to Read Hindi and English

In the first phase of our study, we developed reading batteries, to obtain patterns of development in English and Hindi. Our first set of reading batteries consisted of word lists from both languages. We contacted schools, made lists of words from textbooks in Hindi and English and then sent them to the teachers to be rated for readability. These had to be age and grade appropriate and batteries were developed for both Hindi and English for ages 5-10 years. These were then administered to 350 children and the data collected suggests the reading pattern described below for the two languages.

In the second phase of the experiment we developed non-word reading batteries and tests for phonological awareness in both languages. In order to control for familiarity with words, nonwords were constructed. Non-word reading requires decoding which taps into processes of sound-letter mapping and are constructed by replacing a single letter from various positions of the words (see Bialystok, Luk, & Kwan, 2005 for examples). Phonological awareness on the other hand does not involve reading but only tests the ability to manipulate sounds. A vast body of research has shown that phonological awareness is critical for the development of reading skills (Ehri et al., 2001).

Functional Neuroimaging with Children

The second part of the study involved studying the neural pathways in children 8-10 years old. The participants in the study were required to read words and non-words while inside an MRI scanner, during which time the brain areas involved in performing such tasks are ascertained. After obtaining parental consent and prior to the MRI scan, the children were shown a video wherein they were provided details about the experimental procedures, and those who felt apprehensive and agitated were not included for the scan. Children were also allowed to be accompanied by their parents or a friend inside the scanner. As MRI does not use ionizing radiation like CT or X-ray, this procedure does not present any risk to the health. Care was taken to ensure that the head was stable to avoid motion artifact-free scans. A doctor was always on call to address any emergency situation that may arise. No volunteer was forced to undergo the scanning procedure and could opt out any time they wished to do so.

Care was taken to prepare an environment that was friendly and comfortable for the child. This was done by setting up a play area with toys and interactive media to ensure that the child felt reassured and secure There was also a resident psychologist present at all times to ensure the child and parents were at ease with the procedure. A mock scanner was employed to adapt the child to the scanner environment. A colorful play tunnel easily available in a toy store was combined with a colourful tent to mimic the MRI scanner.

Once the child was familiarized with the set up, he/she was asked to enter the scanner for the scanning procedure, which took place in two phases. The first was a 15-minute-long structural imaging scan, during which external stimulation is provide in the form of an audio-visual aid such as a movie. It is extremely useful to have a large collection of cartoon films which include those in local languages. This forms the basis for selecting children for the second functional scan. Only those children found to be calm and relaxed in the scanner were asked to perform a task in phase two.

The second phase was a functional paradigm lasting about 15 minutes included word and non-word reading in the two languages. This two-phase procedure ensures that, for the functional paradigm, only those children who are comfortable in the scanner are scanned. Each participant performing the experiment is provided a copy of his or her structural scan on a CD and a T-shirt for participation. A detailed report of the reading skill of each child is also provided to the school.

The functional imaging and behavioral data are currently being analyzed and will be submitted to an international journal for peer review. The reading assessment batteries are currently being standardized and validated over larger populations following which they may be used as screening tests for dyslexia. They could also serve as a prototype for similar reading tests to be developed in local languages, a feature which is extremely important and critical for cultural variability.

The preliminary results suggest that biscriptal children learning English and Hindi cope remarkably well with the increased cognitive demand of reading two scripts and, despite the differences in transparency and visual complexity, achieve well-paced acquisition of both scripts. Our behavioural findings have two direct implications for curriculum developers and teachers. Firstly, children exposed to learning Devanagari and English first master words that have a linear organization namely those in which vowels and consonants are written sequentially in a linear manner thereby suggesting that literacy skills transfer across languages where writing systems have a similar organization. Secondly our results suggest that children benefit from

Figure 2. The left panel shows a mock scanner designed to prepare children for functional neuroimaging experiments to be performed in an MRI scanner shown in the right panel.

Figure 3. Pictures of some children participating in the functional neuroimaging experiments.

phonics instruction and therefore should be first exposed to regular words in both languages.

In conclusion, our findings provide evidence for plasticity of the developing brain and its amazing ability to conjure simple algorithms to perform a complex task like reading. Clearly the human brain is capable of adapting to novel cultural challenges; bilingual children learn to read two writing systems in approximately the same time monolingual children learn to read one.

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Country Focus

The Scope of Canadian Research on Adolescent Romantic Relationships

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The Scope of Canadian Research on Adolescent Romantic Relationships

The awakening of romance is a critical psychosocial marker of adolescence that sets the stage for committed partnerships in young adulthood and beyond. Canadian researchers are at the forefront of understanding the developmental significance of normative influences as well as risk processes involved with adolescent romantic development. The theoretical framework proposed by Canadian researchers Connolly and McIsaac (2009a) offers a useful rubric for mapping romantic patterns. Consistent with this theory, findings from numerous Canadian studies demonstrate intraindividual, interindividual, and sociocultural variations in romance. They also highlight how the demands of this developmental task pose a risk for vulnerable populations of youth, and offer timely ideas for intervention. The purpose of this review is to showcase the contributions of Canadian researchers to theory and empirical findings on normative and risk processes in youth romance.

Theoretical Framework

Connolly and McIsaac (2009a) are among a group of international scholars who study romantic relationships in adolescence; their theory on the stages of romantic development lends an appreciation of adolescent romance as a pivotal bridge between the relationship contexts of childhood and adulthood. They suggest entry into romantic attractions is catalyzed by pubertal maturation and sexual need fulfillment during early adolescence. During this first stage, shared infatuations become new ways of joining with same-sex friends and gently move youth into mixed-sex groups. Next, romantic exploration emerges during middle adolescence. Pairs of adolescents who are mutually attracted to one another may casually date, usually for no more than a few weeks. These adolescent pairs frequently interact within their mixed-gender peer groups, which regulate the pace of involvement and prevent overinvestment in serious relationships before skills for negotiating sexuality and intimacy are established. Finally by late adolescence, couple relationships are formed, characterized by strong emotional bonds and autonomy. According to the theory, this prototypical sequence of stages is affected by intraindividual, interindividual, and sociocultural influences, which are associated with normative and risk processes in adolescent romance.

Normative Romantic Development

Intraindividual factors. Intraindividual variation in adolescent romance has been linked to biological markers, psychopathology, and romantic cognitions. While sexuality expands across adolescence, it is normally preceded by social and romantic events and the majority of encounters occur within committed and emotionally connected partnerships (Hensel, Fortenberry, O'Sullivan, & Orr, 2011; O'Sullivan, Harris, Cheng, & Brooks-Gunn, 2007; Vannier & O'Sullivan, in press). While normative pubertal maturation is linked to lighter sexual involvement, early pubertal timing has been associated with precocity in the romantic domain (Friedlander, Connolly, Pepler, & Craig, 2007; Williams, Connolly, & Cribbie, 2008).

Psychopathology is also linked with a precocious romantic debut – shown in youth with both externalizing problems such as delinquency and alcohol use, and internalizing symptoms such as depression and low self-esteem (Brendgen, Vitaro, Doyle, Markiewicz, & Bukowski, 2002; Doyle, Brengden, Markiewicz, & Kamkar, 2003; Friedlander et al., 2007; Margolese, Markiewicz, & Doyle, 2005; Ronis & O'Sullivan, 2010). On the other hand, shyness and dating anxiety are linked with delayed entry into romantic and sexual arenas (Boyle & O'Sullivan, 2012; Dhariwal, Connolly, Paciello, & Caprara, 2009). Furthermore, difficulties with emotion regulation are linked to romantic instability for older youth while a prosocial orientation is linked with romantic commitment (Dhariwal et al., 2009).

Turning to romantic cognitions, Canadian researchers are beginning to understand adolescents' personal motives for romantic involvement. In line with the stage theory of romantic development, early adolescents' expectations pertain to more affiliative and recreational ways of connecting with a partner; young people expect intimacy and caretaking to become more important with age (Connolly, Craig, Goldberg, & Pepler, 1999). When confronted with a failure of fit between such expectations and current partnerships, adolescents will dissolve their relationships (Connolly & McIsaac, 2009b).

Interindividual factors. The effects of parents and peers on romance have been a major focus of Canadian research. Family divorce and conflict are linked to intense early dating (Doyle, et al., 2003; Heifetz, Connolly, Pepler, & Craig, 2010). Moreover, insecure attachment with mothers is associated with insecurity with romantic partners and, at the same time, with turning to romantic partners in times of need (Doyle, Lawford, & Markiewicz, 2009; Markiewicz, Lawford, Doyle, & Haggart, 2006). Alongside such parent effects, a robust body of longitudinal evidence suggests the

Jennifer Connolly (left) and Amrit Dhariwal (right) at the 14th biennial meeting of the Society for Research on Adolescence, March 8-12, 2012, Vancouver, British Columbia, Canada.

peer group is a primary conduit for romantic development (Connolly, Furman, & Konarski, 2000; Dhariwal, et al., 2009). Spending time with cross-sex groups is a precursory step in the trajectory towards romantic relationships, functioning as testing grounds for managing reciprocal voluntary relationships (Connolly, Craig, Goldberg, & Pepler, 2004). Peers may become romantic partners themselves, thereby exerting influence in adolescents' developing autonomy (Connolly et al., 2004; McIsaac, Connolly, McKenney, Pepler, & Craig, 2008). Together, this body of Canadian research suggests success in prior relationships with parents and friends contributes to adolescents' and young adults' abilities to cope with romantic challenges.

Sociocultural factors. Canadian investigators are spearheading research on the sociocultural context of adolescent romance. Initial findings showed ethnic differences whereby Asian-Canadians demonstrate more limited romantic activity but similar romantic stage sequencing as other ethnic-Canadians (Connolly, et al., 2004). Following this research, cross-national differences between adolescents in China and Canada have been shown. Compared to Canadians, not only are the Chinese less likely to be romantically involved, but also their parents suppress romantic involvement (Li, Connolly, Jiang, Pepler, & Craig, 2010). In contrast, friends support romantic development in both contexts. During the most recent phase of this research, investigators developed an understanding of the global forces that shape romance by drawing on an innovative sample of South Asian youth from homeland and diaspora contexts. In actuality, all youth desire romance, but diaspora youth exercise more autonomy in romantic decisions and more romantic participation, stimulated via the media and peer culture (Dhariwal & Connolly, in press).

Dating Aggression

Dating aggression is an area of high risk as young people rise to the challenge of developing healthy romantic relationships. Canadian researchers are at the forefront of research in this domain, showing that different forms of dating aggression (physical, sexual, and relational) co-occur and have significant emotional impact on young people (Chiodo, Wolfe, Crooks, Hughes, & Jaffe, 2009; Sears & Byers, 2010; Sears, Byers, & Price, 2007).

Intraindividual factors. Cognitions about aggression provide insight into its occurrence. For example, differential definitions could explain why adolescents engage in behaviors the other sex views as abusive. While boys describe behaviors as abusive if the intent was negative, girls describe them as abusive based on emotional or physical impact (Sears, Byers, Whelan, & Saint-Pierre, 2006). Other cognitive processes shown to underlie dating aggression include violence-tolerant attitudes (Connolly, Friedlander, Pepler, Craig, LaPorte, 2010; Josephson & Proulx, 2008; Williams, Connolly, Pepler, Craig, & Laporte, 2008) and worries about the continuity of the relationship (Leadbeater, Sukhawathanukul, & Yeung Thompson, in press). Individual psychopathology is also linked to the perpetration of dating aggression, such as PTSD (Moretti, Obsuth, Odgers, & Reebye, 2006), externalizing problems (Chiodo, Crooks, Wolfe, McIsaac, Hughes, & Jaffe, 2011; Leadbeater, Banister, Ellis, & Yeung, 2008), and poor self-efficacy and suicidal ideation for girls (Chiodo et al., 2011). Additionally for girls, low self-esteem (Sears et al., 2006) and higher rates of sexual intercourse (Chiodo et al., 2011) are linked to victimization.

Interindividual factors. Canadians have demonstrated that youth who have experienced significant problems in their family-of-origin are at greater risk for dating aggression. In at-risk samples, child maltreatment has been shown be associated with increased dating aggression via the effects of trauma and insecure attachments, and the effect is stronger for cognitively delayed youth (e.g., Moretti et al., 2006; Weiss, MacMullin, Waechter, Wekerle, & MAP Research Team, 2011; Wekerle & Wolfe, 1998; Wolfe, Wekerle, Scott, Straatman, & Grasley, 2004). In normative samples, two additional areas of parental influence have been identified as important. First, parent psychological control whereby parents use love withdrawal, threats, and manipulation to restrict autonomy has been shown to be linked with relational aggression towards romantic partners within and over time (Leadbeater et al., 2008; in press). Second, parental monitoring enhances parents' ability to be aware of and reduce risks for physical victimization by romantic partners (Leadbeater et al., 2008).

The peer ecology has also been a focus of concern for Canadians. Bullying of peers is linked with physical and relational aggression with romantic partners within and across adolescence (Connolly, Pepler, Craig, & Taradash, 2000; Williams, Connolly, Pepler et al., 2008). Continued inquiry into this link has demonstrated that the link persists over time into early adulthood (Leadbeater et al., in press). Furthermore, findings support similar links between romantic relational or sexual victimization by peers and subsequent victimization by partners (Chiodo et al., 2009; Leadbeater et al., 2008; in press). Not only is peer aggression linked with dating aggression, but also poor quality relationships with romantic partners (Connolly et al., 2000; Ellis & Chung-Hall, 2011). Moreover, perpetrating aggression in relationships with both peers and partners puts youth, especially girls, at increased risk for adjustment problems (Ellis, Crooks, & Wolfe, 2009).

Sociocultural factors. A relatively new line of research has begun to explore the sociocultural context for dating aggression. Emerging studies suggest that adolescent dating aggression is a global problem, as approximately equal numbers of Canadian and Italian youth endorse perpetration (Connolly, Nocentini, Menesini, Pepler, Craig, & Williams, 2010). Sociocultural differences become evident whereby power imbalances appear to provide a dyadic context where aggression is more likely to occur – particularly in Italy, where the culture holds more conservative views of power dynamics between men and women (Connolly, Nocentini, et al., 2010). In Canada, ethnic minority youth are more aggressive with partners than majority youth (Connolly, Friedlander, et al., 2010), suggesting sociocultural factors operate to increase risk when minorities grow up in contexts with differential cultural views; in particular, these youth may be at heightened risk for dating aggression via the sociocultural context, as expressed through aggression in the media (Connolly, Friedlander, et al., 2010).

Sexual Risk

Canadian research on sexual risk is an important emergent trend. In the context of committed relationships, young people engage in unprotected sexual intercourse, putting themselves at risk for STIs and pregnancy (O'Sullivan, Udell, Montrose, Antoniello, & Hoffman, 2009). In addition, youth report drinking alcohol to facilitate social encounters and sexual competence, but are unaware of its links to riskier sexual activity (Boyle & O'Sullivan, 2012). Sociocultural considerations are relevant, as shown in the trusting long-term concurrent romantic partnering normative amongst South African youth (Harrison & O'Sullivan, 2010). The constraints of the rural context, including high levels of out-migration of young men and economic vulnerability, have led to declines in monogamous partnerships. The complex multiple relationship dynamics put South African youth at increased risk for HIV and pregnancy.

Intervening in Romantic Development

In Canada, the significant impact of adolescent romance has warranted a public health approach focusing on the promotion of healthy romantic and sexual relationships and the prevention of dating aggression. Of the three empirically validated programs available to our knowledge internationally, two are Canadian. The Youth Relationships Program is an 18-session manualized community-based program, designed to address the needs of youth with abuse and trauma in their families of origin (Wolfe, et al., 2003). In contrast, the Fourth R is a school-based universal prevention program, implemented in a 21-lesson curriculum (Wolfe et al., 2009). To respect the sociocultural context of Aboriginal people in Canada, an Aboriginal perspectives version of the Fourth R has also been developed (Crooks, Chiodo, & Thomas, 2009). Taken together, these programs report success due to their comprehensive nature, focus on skill building, inclusion of parents and peers, and targeting of change in the larger environment.

Conclusion

Canadians have made a significant impact on the field of adolescent romantic development. Their work has advanced theory-building, empirically explored factors affecting romantic experiences, and validated interventions for promoting healthy relationships and preventing dating aggression. A recurring theme in this review involves Canada's unique position for examining not only intra- and interindividual influences, but also sociocultural reverberations. The fast-expanding ethnocultural mosaic of Canada, represented by Aboriginal peoples, immigrants, and Canadian-born visible minorities (Statistics Canada, 2008) allows for a nuanced understanding of macro-level global forces shaping adolescent romance that future research can build on.

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Notes from The President

Since my last notes a lot of progress has been made regarding our efforts to establish our new Jacobs-ISSBD Fellowship program which started at the beginning of this year. As I already mentioned in my last notes, this program designed for early career scholars secures funding for several of ISSBD's young scientist activities, including travel grants for ISSBD preconference workshops and the attendance of International Regional Workshops. Two different Early Career Scholarship Programs, one open to applicants from all countries in the world, the second focusing on early career scholars from "currency restricted" countries were conceptualized, with the aim of recruiting doctoral students in two "waves" or cohorts, the first starting in January, 2012. The aim is to support a total of 20 early career scientists, with each cohort being funded for three years. The Early Career Development Committee chaired by Ulman Lindenberger took on the difficult task of selecting suitable candidates. A final decision was made based on the results of a long phone conference. The ten candidates selected by the committee all accepted the stipend, and we hope to see most of them at our next Biennial Meetings in July. They will be supported by academic mentors, and will also be given the opportunity to participate in workshops and courses offered by the International Max Planck Research School on the Life course (LIFE). I was very impressed to see how carefully all applications were handled by the committee members. Ulman did an excellent job as a chair, greatly supported by his coworker Anke Klingenbiel, and the other members (Toni Antonucci, Silvia Koller, Anne Petersen, Julie Robinson, Ingrid Schoon, Jaap Denissen and Robert Serpell) also put a lot of effort into this project which made a very promising start. My thanks go to all of you!

Given that Jacobs Foundation also promised to provide financial support (in terms of travel grants) for early career scholars planning to attend the preconference workshops at the upcoming ISSBD meeting in Edmonton, we decided to establish an Early Career Scholar Travel Grant Committee. We knew from the last ISSBD meeting in Lusaka that dealing with applications for travel grants can be a very time-consuming task, and responsibilities should be fairly divided between several committee members. Suman Verma was so kind to serve as the chair of this new committee, and Toni Antonucci, Nancy Galambos, Anne Petersen, Ingrid Schoon, Jaap Denissen, Ulman Lindenberger, and Robert Serpell acted as further committee members. The committee invited applications in early December using a standardized, insightful format, and ended up with more than 180 applications. The selection process kept the committee busy until mid-February, 2012. I can tell you that the email exchange among members of the committee was very intense, and all members had to invest many hours of hard work before a final decision was made. In the end, 41 applicants received a travel grant and thus will be able to attend the preconference workshops at the ISSBD meeting in Edmonton. I want to thank Suman and the other committee members for a truly superb job!

As I mentioned in my last notes, there was also good news about the ISSBD Developmental Country Fellowship (DCF) program chaired by Peter K. Smith. The three fellows of the first tranche presented very promising progress reports. A second tranche of four DCF fellows was identified in a very thorough selection process. My sincere thanks go to Peter and his committee, including Catherine Cooper, Silvia Koller, Anne Petersen, Suman Verma, and Jaap Denissen, for their hard work and the constructive discussions regarding the final decisions. The four new fellows of the second tranche will be invited to present their proposals at the Biennial Meetings in Edmonton, together with the fellows of the first tranche who will present the final outcome of their research. Travel costs will be covered by ISSBD. All seven young scientists will participate in an Invited Poster Workshop organized by Peter Smith. We look forward to meeting this group in Edmonton later this year.

Needless to say, the 2012 Biennial Meetings in Edmonton will represent ISSBD's highlight of the year. Nancy Galambos, Lisa Strohschein, Jeff Bisanz, and their team have been working extremely hard to prepare an excellent scientific program for the meetings, and to overcome all expected as well as unexpected problems related to organizing such a big conference. The Local Organizing Committee (LOC) has stayed in very close contact with the International Organizing Committee since the very beginning, and most problems - many related to financial issues – have been solved in a joint effort. Please have a look at the ISSBD 2012 homepage. The list of keynote speakers and invited addresses is truly impressive, as is the collection of interesting themes represented in the invited symposia. Early career scholars may be particularly interested in the two preconference workshops. So contact the ISSBD 2012 website (http://www.issbd2012.com/) for more information on the conference. Do not forget to register early. When you read my notes (my guess is this will be in May), you have already missed the early bird registration rates but still have a chance to pay the standard registration fee valid until the first of June . . . I very much look forward to seeing very many of you in Edmonton in early July.

Although the next ISSBD biennial meeting still seems far away, I want to bring to your attention the fact that our Chinese member and colleague Biao Sang has already begun preparing for this demanding task. The 23rd ISSBD Biennial Meeting will take place in Shanghai, China, in the summer of 2014. I accepted Biao Sang's invitation to have a site visit in October, 2012. I look forward to a stimulating exchange of ideas, and also to getting a better idea of the location as well as the options our Chinese colleagues will provide for the participants of our 2014 congress.

As you will certainly be aware, besides the Biennial Meetings, regional workshops are regularly organized under the auspices of ISSBD. They serve one of the Society's most important functions, namely, to extend the outreach of scholarship in developmental science. Several months ago, I had the opportunity to participate in the ISSBD regional workshop on "Risk. Protection, and Resiliency among Children-at risk: Research and Action Plans", organized by Suman Verma and Deepali Sharma and held at the University of Chandigarh, India. Suman, Deepali, and their coworkers put a lot of effort into preparing the workshop and had to cope with various administrative problems, including immense government formalities. The workshop contributions dealt with highly important topics such as the contexts and environments responsible for risky outcomes, successful coping and resilience, and ways of linking research on these issues with policy and practice. The meetings were well attended, and the scientific quality of the presentations was generally high. Our grateful thanks go to Suman Verma and Deepali Sharma who together with colleagues in India managed to organize a very impressive and successful event.

Although I had very good intentions to attend the 9th ISSBD Africa Regional International Workshop on "Consolidating and Extending Africa Early Career Scholars' Capacity to Do research", I was unable to do so due to a conflict in schedules. The international workshop was organized by Esther Akinsola and her team from the University of Lagos, Nigeria, hosted by the department of psychology at the University of Lagos, and held from November 28-30, 2011. The ISSBD EC was represented by its members Bame Nsamenang and Robert Serpell. The workshop was attended by a total of 73 scientists from 9 (mostly

African) countries. Financial support was provided by ISSBD and the University of Lagos. As Esther Akinsola noted in her brief report, the meeting involved training sessions in research methodology and research capacity building in different areas of human development, dissemination of publishable research information, and developmental research networking. I learned from Esther as well as from other participants that the workshop program was very well received, and that the event was considered a success. I want to thank Esther Akinsola and her team for organizing such an interesting and stimulating event. There are already plans for organizing a 10th ISSBD Africa Regional International Workshop in Pretoria, South Africa, probably in the Fall of 2013. We will learn more about this project later this year. There is no doubt for me that our ISSBD community in Africa is very active, which is also reflected in the increase of membership numbers. We hope to continue this trend.

Of course, our goal to increase membership rates is not restricted to Africa. There are parts of the world where we definitively need to be active as well. I asked our EC member Elena Grigorenko from Yale University to prepare for a Regional Workshop in Russia. She recently informed me that she and her team are ready to go, organizing a workshop on "Executive/ Meta-cognitive Functioning" in Moscow in May or June 2013. I am grateful to Elena for engaging in this very important task.

As I already indicated in my last notes, we have plans to reactivate and reorganize the ISSBD archives located in the North Holland Archief at Haarlem, The Netherlands. Our Dutch EC member and IJBD editor Marcel van Aken meanwhile contacted all previous officers of the Society (presidents, secretaries, treasurers, editors) and asked them to indicate whether they already sent their materials to the North Holland Archief. Most officers responded, and we hope that they will submit relevant materials to the archives. Marcel and I will visit the Haarlem Archives in late February to get a better impression of the state of the art. Marcel will hire an assistant (paid by ISSBD) in the near future to go through the files, categorize the materials, and also identify core documents. According to our estimates, this task should take about a year. We will then try to find suitable ways of electronic archiving of the most important documents. Although there are still a few long-term ISSBD members around who know and remember a lot about the history of the Society, the number is decreasing. We need an additional external memory storage system to ensure that we do not forget about important facts related to the Society. I very much thank Marcel for taking the lead in this project.

To sum it all up, the last few months have been eventful for the Society, and we have made very good progress regarding our early career scientist support programs. Through its very active program of conferences and workshops, ISSBD has maintained its role as a major player in the field of life-span developmental science. This success is mainly due to its active members and its hard-working executive committee, and to them I offer my sincere gratitude. I can assure you that the Society is in good shape, both financially and scientifically, and hopefully will continue to stay that way.

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ISSBD India Workshop 2011 Report

Risk, Protection, and Resilience among Children at risk: Research and Action Plans (South & South-East Asia Region)

Suman Verma and Deepali Sharma
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ISSBD India branch in collaboration with the Department of Human Development and Family Relations, Government Home Science College, Chandigarh, India organized a regional workshop on *Risk, Protection, and Resilience among Children at-risk: Research and Action Plans*, October 13-15, 2011 in Chandigarh, India. The event was sponsored by ISSBD and the United States-India Educational Foundation, New Delhi.

The workshop aimed at addressing the state-of-art in the field of risk, protection, and resilience, especially in the South and South-East Asian region because it is in this region that the countries are facing accelerated processes of change due to economic reasons, globalization, migration and such. Given the changing economic scenario, political instability in many countries across the world, and families undergoing transitions, the children get directly impacted.

The aims of workshop were multi-fold. Not only did the workshop aim at increasing the visibility and discourse of a crucial area of research, but it also aimed at acting as a platform for interaction between researchers, policymakers, and practitioners. While workshops at the national level are held frequently, limited workshops have been conducted in the past keeping a specific region in mind. The present workshop aimed at broadening the scope of the current topic by getting perspectives from South-East Asian countries that are undergoing rapid socio-cultural changes, facing similar challenging social issues related to child survival and protection, and thus share mutually beneficial findings related to successful implementation of policies, interventions, and research with relevant cultural implications.

The workshop reached out to a very important target population, namely, the young scholars seeking opportunities to update their knowledge base, to interact with the senior scientists, and also to get further directions for their areas of work interest.

Objectives of the Workshop

- To advance comparative cross-national research on child development in the South-East Asian region, with a special focus on at-risk children. From a comparative perspective, the workshop investigated the social causes of marginalized juvenile pathways and their consequences for child development.
- To address research and methodological issues related to risk, protection and resilience.
- To identify gaps in research, stimulate further research, and establish an international network of policymakers, researchers, and practitioners working for the welfare of children at-risk in the South-East Asia region.
- To provide an interactive platform for young scholars via poster workshops and related academic sessions. These sessions provided opportunities for skill development, capacity building, and feedback on their work.

A total of 114 participants comprising researchers from the South and South-East Asia region from academic institutions, government organizations, and NGOs working in the field of risk, protection, and resilience among children took part in the workshop. The participants also included ISSBD members, student participants, early career researchers, policymakers and practitioners from India, South and South-East Asia region.

At the inaugural session V. K. Singh, Education Secretary, Chandigarh Administration, welcomed the delegates and addressed the need for conducting more such workshops in the future. In his presidential address, Wolfgang Schneider gave an overview of the activities of ISSBD with a special focus on regional workshops that specially targeted the needs of early career scholars. Shantha Sinha, Chairperson, National Commission for Protection of Child Rights, New Delhi gave the inaugural address. Suman Verma presented an overview of the workshop along with presenting the objectives. The keynote addresses were delivered by Pratibha Singhi, Chief of Pediatric Neurology and Neurodevelopment from the Post Graduate Institute of Medical Education and Research, Chandigarh; Shiva Kumar, Development Economist, Adviser, UNICEF India, New Delhi; and Arnold Sameroff, Center for Human Growth and Development, University of Michigan, USA.

Ceremonial lighting of the lamp at the workshop inaugural.

A. K. Shiva Kumar, Development Economist, Advisor, UNICEF India, New Delhi (Keynote speaker)

"Why is there such a disconnect between economic expansion (or economic growth) and its conversion into human development (or improvements in the well-being of children and women)? This disconnect can be explained in part by four deficits: Resources, Evaluation, Accountability, and Leadership. The intellectual energy and vibrant debates that mark discussions on economic reforms are seldom seen when it comes to issues relating to children and women."

Shantha Sinha, Chairperson, National Commission for Protection of Child Rights, New Delhi

"Child marriage, child trafficking, and discrimination against girls remain crucial challenges. There are a growing number of children being affected by HIV/AIDS, displacement due to natural disasters and civil unrest, representing a new generation of hazards that the child faces in today's world."

Pratibha Singhi addressed the question of how clinical aspects fit into the current workshop theme and mentioned that while all children are at-risk, some are more vulnerable. Arnold Sameroff in his keynote address deliberated on the trends within developmental science and the current understanding of nature and nurture. His presentation focused on a unified theory of development integrating personal change, contextual regulation, and representational models. Sameroff emphasized a dialectical perspective, examining the interconnectedness of individual and context.

Themes Presented during the Workshop

The plenary session topics were selected keeping the overall theme of the workshop in mind and emphasized the important linkages between the domains of biology, the nature of the social context, and the perceived environment for children at-risk. The boxed information presents the themes across the three days. Experts from the academic field, NGOs, early career researchers, and those involved with policy-related decisions for at-risk children presented their viewpoints followed by interactive discussions.

The themes of the workshop centered on the following:

- Contexts and environments for risky outcomes: Theoretical frameworks
- Health issues among children at-risk
- Psychosocial risk and protective factors in the social ecology of adolescents in urban settings
- Successful coping and resilience: Some exemplars from the field; and
- Emerging issues and recommendations for research, practice and policy

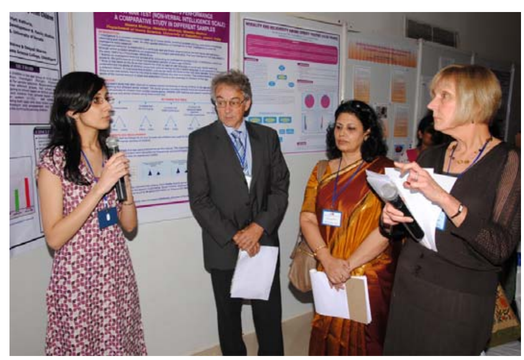
Sessions for Early and Mid Career Scholars

The workshop was specifically designed keeping the career advancement goals of the early and mid career scholars as a priority. These were:

Scholarship Opportunities. At a special session by Gayatri Singhal, Indian Program Manager, United States-India Educational Foundation (USIEF), New Delhi, Dr. Singhal elaborated on the various programs and scholarship opportunities offered by USIEF for young scholars, along with details for the current academic calendar.

Poster Workshops. The early and mid-career scholars displayed their current research work via two parallel poster sessions. Mahmuda Akhter from the Institute of Educational Development, BRAC University, Bangladesh and Susan McDonough from the University of Michigan, USA were the chair and discussant respectively for one of the poster sessions. The participants individually made presentations about their work and questions were taken up. A parallel poster session was chaired by Meena Mathur from the University of Rajasthan, Jaipur, India and Rajalakshmi Sriram from the MS University of Baroda, Gujarat, India who served as the discussant. The early and mid-career scholars deliberated on emerging issues and implications were drawn based on the discussion of the individual posters.

Meet the Scientist Session. This was an informal session that was organized to assist the early and mid-career scholars to address queries related to their career advancement goals.



A poster session for the Early Career Scholars in progress

Taking a breather in between the hectic sessions – participants engage in some fun games

Thus, the idea behind the session was to provide a forum where the participants could deliberate on research issues, both current and those related to future directions, and address questions to senior scientists who were present at the workshop. This was a very well received session which was carried out over lunch.

Panel Discussion. The panel discussion was an interactive session of the early career scholars with publishers/editors

'Meet the Scientist' session in progress

of leading organizations such as SAGE Publications. This session was also organized to assist the participants in exploring various grant opportunities, both national and international. The session was chaired by Wolfgang Schneider and opened by Payal Kumar, Vice President, Editorial & Production, SAGE Publications, India who gave tips to the participants on how to package an article for publication. Arnold Sameroff followed this by giving insights into publishing in peer refereed journals and what the editors typically look for while accepting manuscripts for publication. Adarsh Sharma summed up the panel discussion by identifying the grant opportunities in India and how the early career scholars can apply, keeping in mind the qualifying criteria.

Emerging Issues and Recommendations for Policy, Practice, and Research

Following were the summary points based on the deliberations by the participants:

Recommendations for Policy

- There is a need to pay greater attention to evaluation of policy and programmatic interventions. Though large sums of money are spent on various schemes, very few evaluations exist that assess relevance, effectiveness, efficiency, and sustainability of interventions.
- Revisit the entire existing policy framework, taking into account new emerging knowledge, challenges and research evidence related to varied categories of children at risk. Action to be initiated by academic community in collaboration with the concerned government ministries and NGOs.
- Initiate concerted efforts to bridge the gap between policy and implementation through active stakeholders' participation in networking with appropriate structures and monitoring mechanisms at various levels. ISSBD India in coordination with other professional organizations, nodal agencies and voluntary organizations will take the lead on this aspect.
- Need for evidence-informed advocacy to empower all stakeholders to initiate culturally sensitive need-based measures. Data-generating organizations and technical institutions within the respective countries to strengthen databases related to the reality situation of varied groups of children at-risk.
- Align policies related to children at-risk with adequate legal supportive framework for fulfilling the entitlements and rights. The related global and country context information to be shared and disseminated to politicians, policy makers, and civil society to raise awareness through campaigns on denial of child rights. In the Indian context this could be accomplished by proactive involvement of the National Commission on Protection of Child Rights.

Recommendations for Practice

- Need for evaluation, documentation, and dissemination of successful ongoing intervention projects with a view to replicate and scale the efforts.
- Need to raise awareness through advocacy for improving access and utilization of various government schemes and programs for at-risk children.
- Develop appropriate advocacy material related to comprehensive program content and community participation for diverse settings within the country. The academic organizations need to undertake the preparation of prototypes.
- Program approach and intervention content should be preventative and target the most excluded children to ensure equity and minimization of exclusion.
- Undertake capacity building of the service providers at various levels by enhancing competencies and skills for effective quality service delivery system.
- Strengthen existing institutions and mechanisms of monitoring and supervision for enhanced result-oriented deliveries and services.
- Promote cross-cultural cooperation across countries to study and share good practices in the region.
- ISSBD may take a proactive role with respect to policy advocacy, knowledge generation, capacity building, and partnership within the South and South-East Asia region and liaise with other networks.
- ISSBD in collaboration with other organizations to facilitate mapping of children most at-risk in the region.

Recommendations for Research. Research on the following thrust areas to be undertaken by research institutions, university departments and social scientists soliciting grants from various agencies:

- Identify high-risk groups that need special focus, such as children with special needs, dyslexia and learning disabilities.
- Identify high-risk groups that need study on environment related factors, such as those in chronic poverty; street and

working children; slum children and disadvantaged groups that lack access to basic developmental opportunities.

- Need for a conceptual understanding of the multi-dimensional aspects of gender as a risk factor among children in difficult situations.
- Initiate studies to promote cross-cultural understanding on pathways of risk and protection among adolescents in at-risk settings in the developing world.
- Need to document the cultural notions of risk and resilience among communities and how they buffer experiences of protection and development among children and adolescents.
- Need to conduct multidisciplinary studies with a longitudinal design that have a child rights approach, and those that feed into practice and policy.

News

News from the Early Career Representative

Jaap Denissen
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Dear early career scholars of ISSBD,

This mail will be one of my last as your early career scholar representative. The reason is that my term is coming to an end this summer. From this moment onwards, I will shift into a more advisory role to Julie Bowker, the new representative elected by ISSBD's members. Julie heads the Child and Adolescent Relations Lab at the University of Buffalo. For more information about her very exciting and productive lab, see http://wings.buffalo.edu/soc-sci/psychology/labs/CARL

One of the goals for my ending term was to organize early career scholar activities at the coming ISSBD conference in Edmonton, Canada. I am happy to announce that the conference organizers heeded our call and generously scheduled a host of events (see http://www.issbd2012.com/webpages/program-ecs.html). For starters, workshops are offered to help early career scholars to write grants, publish, and organize their careers. A workshop is also offered on using the statistics suite "R". This program is more versatile and powerful than SPSS and includes packages to run multilevel and structural equation models. And perhaps most important for early career scholars who lack abundant resources: It's free!

On Monday, July 9, of the conference, Julie and I will also host an early career scholar reception, which takes place between 7 and 8 pm. This is a great chance to talk with us about your needs and aspirations in person, and to meet other early career scholars from around the world. Taking part is free, but you will have to make sure that you are registered as an early career scholar to receive an official invitation as part of your conference bag. To qualify as such, the date of your PhD should be registered in the ISSBD member database as not being earlier than 2005. Please check the member database on the ISSBD website to see if this is the case.

Julie and I are looking forward to meet you in Edmonton!

Best, Jaap

News from the IJBD Editor

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The current issue of IJBD (March 2012) brings together a nice collection of papers from authors and about samples from over the world, including Italy, India, the Philippines, and Mexico. The contributions in this issue also address behavioral development in various phases of the life-span, from the role of premature birth to mental and physical health in the transition to older adulthood.

It is also worth looking back to the previous issue: The January 2012 issue of the International Journal of Behavioral Development is an exciting special issue on the effects of early experience and stress on brain and behavioral development, edited by associate editor Nathan Fox, together with Charles Zeanah and Charles Nelson. After an introduction by the guest editors, 10 empirical papers address issues such as the effects of individual differences and context on response to stress; the effects of early neglect in institutions or foster care; the effects of exposure to violence on children and their offspring; and the underlying neurobiology and genetics in response to stress. Please take a look at this high-quality set of papers!

In addition to the information on these two issues, we also have to report a change in the 'line-up' of IJDB's associate editors. Due to an increasing workload and as a result of professional and health pressures, Silvia Sorensen decided to stop with her work as associate editor for IJBD. She covered the life-span domain for our journal. I would like to take this opportunity to thank Silvia for all the marvelous work she did for IJBD. And I also would like to welcome the new associate editor for the life-span domain: Denis Gerstorf from the Humboldt-Universität zu Berlin. For all of you life-span researchers within ISSBD: Denis would be the one to talk with about your publication plans in IJBD!

Also worth mentioning is an interesting technological innovation: IJBD now also has a website modified to fit the smaller screens of smartphones and other handheld devices. You can view the mobile site on a normal computer via the mobile URL: http://m.jbd.sagepub.com. However, remember that it is not designed to be viewed using a normal computer and will look strange on a large screen. If you've got a smart phone, just type in the URL to see what it looks like. What a joy to have our beautiful journal with you everywhere you go!

MAJOR CONFERENCES OF INTEREST

2012 August 29–September 1
Biennial Conference of the European Association for Research on Adolescence
Location: Island of Spetses, Greece
Website: www.eara2012.gr

2012 July 8–12
Biennial Meeting of the International Society for Study of Behavioural Development
Location: Edmonton, Canada
Website: www.issbd2012.com

2012 July 22–27
30th International Congress of Psychology (ICP)
Location: Cape Town, South Africa
Website: www.icp2012.com

2012 October 19–20
5th FPR-UCLA Interdisciplinary Conference: Culture, Mind, and Brain: Emerging Concepts, Methods, Applications
Location: UCLA, Los Angeles, California, USA
Website: http://www.thefpr.org/conference2012/index.php

2012 November 14–18
65th Annual Scientific Meeting of the American Gerontological Society
Location: San Diego, California, USA
Website: www.geron.org/2012