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The Brain Factor in Understanding Psychological Development: An Introduction

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Developmental neuroscience has traditionally focused on questions of brain plasticity and the development of neuronal connections. While these can be dry topics of little direct relevance to developmental psychology, the two fields are quickly finding common ground. The concept of plasticity turns out to be the complex answer to the nature-nurture question; the pattern of neuronal development addresses major issues in both general child development and individual differences. The discoveries of how the brain builds itself speak to some of the basic theoretical constructs of developmental psychology (Segalowitz essay). The plasticity issue is at the core of social development, especially as one tries to trace the growth and implications of the stress response and the mechanisms of emotional self-regulation (Gunnar & Townsend essay).

These issues have implications for temperament, sociability and internalizing and externalizing disorders (Schmidt essay). Throughout all discussions of child development, a special focus is always on the chronology of development, and this has been especially prominent in discussions of the prefrontal cortex and the fact that it continues to mature and change much later than other regions. Measuring this non-invasively in children is difficult, and the promising new measure that is presented here has been related to ADHD, long associated with disturbed development of the prefrontal regions (Klein essay).

These essays are meant to touch on just some of the ways that neuroscience and developmental psychology find interfaces. With this very different level of explanation, neuroscience data can provide important convergent validity for our measures and constructs in developmental psychology.

There are of course many topics we could cover, topics linking developmental neuropsychology to issues as divergent as the understanding of social deviance, learning disabilities, and various behavioural disorders. Sometimes this perspective informs us as to new therapeutic strategies, and sometimes we gain only another larger perspective on the complexity of child psychology that will hopefully translate into a useful service for children someday. One particular complexity is our attempts to understand the outcome after early brain injury has damaged some critical functional component early in development. Without this component, the entire trajectory of maturation is altered in a major way. Such a major abnormality in the brain alters the flow of information processing. For example, in adults there are quite striking losses after damage to ventromedial prefrontal cortex (the middle and underside of the frontal lobe) – including the ability to read facial affect, especially for negative affect expressions, and occasionally loss of affective mirroring response, i.e., empathy. From a developmental perspective, the situation is more complex, for what would development be like without such information being available to the child? Some cases have suggested this can lead to classic sociopathy and lack of moral cognitions in the normal sense (Anderson, Bechara, Damasio, Tranel, & Damasio, 1999). In other cases, there develop extremely strange social behaviors as the child copes with the loss (Ackerly, 1986), or simply social irresponsibility (Gratton & Eslinger, 1992). Other forms of perinatal damage can lead to a developmental episodic memory disturbance (arising from damage to the hippocampal formation), which may be associated with certain forms of autism (Delong, 2003).

Taking a developmental perspective on brain models of information processing forces us to imagine development in a different perspective. However, besides being relevant to clinical syndromes, developmental neuroscience also relates to normative development, and our essays here focus primarily on that perspective.

* Sidney Segalowitz served as Guest Editor for this issue.

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The Concept of Constructivism in Developmental Psychology and Neuroscience

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One of the major theoretical dilemmas of developmental psychology has been the issue of determinism, i.e., how can a person not be a deterministic sum of biological background and environmental experiences? Developmental neuroscience has traditionally been associated with this reductionist-determinist view of development. In opposition to this position is the concept of *constructivism*, i.e., the notion that a person can influence his or her own psychological growth. This essay outlines how times have changed, and how developmental neuroscience now provides the best evidence in favor of the notion of constructivism in developmental psychology.

This theme through much of the 20th century was exemplified in the tension between two schools of thought about the nature of the developmental process. One school argued that psychological development proceeds somewhat mechanically in terms of environmental influences shaping the behavioral repertoire, and by extension, the repertoire of thoughts. Of course, the main inspiration was a behaviorist perspective, but in fact this tradition also had a long history outside of psychology in predeterministic embryology, where the path of development was seen to be mechanistic with respect to biological signals. The other school argued that children are active players in their own development, and pointed to the impoverishment of the concepts of the mechanical school, and replaced them with constructs of self-discovery and equilibration from Piaget's theory. Especially attractive was the construct of constructivism, whereby the child is seen as psychologically directing his or her own development, and has its inspiration in the tradition of probabilistic epigenetic embryology. (Of course, these constructs were seen as circular and undefined by adherents to the behaviorist school who complained that "self-directing" was often defined by the outcome; similarly, arguing that prediction is impossible because probabilistic epigenesis is in fact probabilistic did not convince skeptics, and thus direct debates were rather inconclusive). That both these traditions found scientific foundations in the early biological growth of the nervous system is interesting, but drawing the link to psychological development has proved somewhat tenuous, or at least, was only convincing to those already firmly within the fold. As we are all well aware, the two perspectives have somewhat different implications for policy in child rearing, models of education, and the idea of human rights and responsibilities, and therefore the debate has serious repercussions. The mechanistic approach was associated with a perspective limiting the breadth of important psychological states such as intention and free will. For reasons that are more ironic than historically accurate, the neuroscience influence in developmental psychology was often seen to be favoring the mechanistic school. It is perhaps for this reason that an approach in child psychology that emphasizes brain growth and brain processes has met with considerable resistance at times in the fields of cognitive and social development. The underlying problem is that there has been a widely held assumption that an appreciation of a biological perspective necessarily implies a form of reductionism that necessarily entails strict determinism, i.e., that a neuroscience perspective on development necessarily leads to a deterministic view of the person. This view is now out of date and, more importantly, concrete evidence for the constructivism of mind comes from contemporary neuroscience.

"tension between two schools of thought about the nature of the developmental process"

Eight-year-old girl with the 40-electrodes cap for EEG testing. (Photo supplied by Christoph Klein).

The Problem of Constructivism and the Biological Reality of the Brain

The notion that we construct our own reality is well accepted in the post-modern existentialist world, and to deny the possibility of being involved in our own development appears to denigrate human initiative and dignity. It also leads to serious societal and legal problems, because at least in the West, our sense of justice is predicated on free will and intention. The problem in psychological science has always been that the mechanistic view appears sensible because our ideas of how systems work come from watching mechanical objects that we have around us. Most people saw this as compatible with a biological emphasis in child developmental psychology. However, there has been a revolution in neuroscience in the last decades. The new view is that biological systems certainly provide structure, but that this structure is tailored for flexibility, that brain growth is the basis for individuality, and even that there are genes for adaptability. The notion that the brain is a fixed entity from birth is wrong (although that was accepted as fact when Piaget developed his theory); it is instead a dynamically growing organ in which we can see the evidence for the selfconstructivist principle in child development. As long as we accept that mental structures are stored in the brain, the constructivist principle requires that one's actions and thoughts must influence the brain structuring related to them.

Building Blocks of Constructivism

What does one need in order to have a system that is involved in its own construction? There are three key components or principles: (1) Experience must influence the maturational path of the brain; (2) the period of this influence must cover the entire developmental period of the brain (essentially lifelong); and (3) these influences must be accessible to mental manipulation by the individual by means of conscious choices. This last component is critical, since without it we are still left with a deterministic system that the individual does not direct. [In describing a constructivist vs. selectionist model of cortical maturation, Quartz and Sejnowski (1997) present much of the neuroscientific details for the first two points, but omit this last essential psychological component.]

The first principle – the notion that experience influences brain structure – is now well established empirically (besides being a logical necessity for learning to occur). Early work beginning in the 1960s established that dendritic spread and synaptic growth varies as a function of stimulative experience, that experience-deprivation can dramatically reduce this growth, and that continued stimulation helps ward off the reductions expected with aging. It also showed that specifically which neural networks become dominant is a function of which get stimulated (well documented in the visual system, but relevant for other modalities as well). This work has continued to document, for example, how a second language learned fluently after childhood has a different neural base than one learned as a young child, and so on.

"synaptic growth varies as a function of stimulative experience"

The second component involves relatively recent discoveries. The connectivity of the brain is a constantly dynamic process, made especially so by the proliferation of connections that later need to be pruned back. Recent reports indicate that there is continual birth of new neurons in the hippocampus, a key structure for memory and learning, and the fate of these new neurons is affected by stressors, both psychological and physical. The pattern of growth of dendrites and synapses generally, and hippocampal neurons specifically, extends well past childhood, and therefore there is plenty of time for the brain to be affected by experience, even that generated by the individual in question.

The third component has an obvious psychological corollary: For experience to influence the growth of skills, one must be mentally active in it. This was shown for perceptual-motor learning by Held and Hein's (1963) classic study with kittens (where an active kitten that explores the environment develops normally while one yoked to passively experience the same perceptions as the active one does not develop well), and we all know that children's spontaneous engagement in a learning activity increases the likelihood of success. In other words, attention is a major catalyst for learning. How this works at the neurological level involves the basic principle of top-down control, whereby attending to a certain aspect of one's experience over others increases the neural activation associated with the experience. For example, while experiencing a visual input certainly activates the visual cortex, covertly attending to one side (while maintaining a straight-ahead gaze) increases the cortical activation on the side to which the more-attended input arrives. Similarly, when a visual display containing both moving and stationary dots is presented to someone, the visual-movement region of the cortex (area V5) increases or decreases in activation depending on which set of dots are attended. In the same way, attending to a vibratory stimulus increases activation in the somatosensory cortex. Thus, thinking about an activity activates tissue and fine-tunes the primary cortex at the most basic level, not developing circuits only at the abstract level of planning the activity. Practicing a task that requires one to identify the visual orientation of objects improves coding in the primary visual cortex, even in adult brains.

This top-down effect is, of course, critical for learning what one wants to learn, and may be linked through the basic reward system. When dopaminergic neurons in an area critical for processing unexpected stimuli and rewards (the ventral tegmental area) are stimulated following an auditory stimulus, the cortical representation of that sound is increased and the representation of nearby sound frequencies is reduced. The overall effect of this top-down effect is to increase neuronal activation in certain areas by voluntarily shifting attention; as indicated in the first component discussed, increased activation leads to increased connectivity in the tissue involved. Therefore simply attending to particular input, i.e., being interested in a certain way, ultimately has a role in shaping the growth of the cortex. This component contributes more critically to the developmental notion of constructivism than simply arguing for reorganization on the basis of activity, although clearly it is related. Learning theories of development capture the concept (if not the mechanisms) of experience acting to reorganize associationist networks. But we now know that maturational changes in the child's brain involve more than simply raising and lowering the strengths of connections. There is major postnatal growth in the cortex, visible with various imaging technologies, which can be guided by activation. Now we know this activation can be covert and self-directed through attentional control. Some of this growth is inherently linked to a schedule of nervous system development and would therefore encompass what Greenough termed "experience-expectant" circuits (Greenough & Black, 1987). The "experience-dependent" circuits are a function of the continual lifespan readjustment. Both types of circuits would be fine-tuned and directed to some extent by this aspect of consciousness – the person's motivated attention to some aspects of mental life over others. This does not remove, of course, the basic questions surrounding the sources of one's motivations (e.g., what are the factors that prompt one child to self-direct to music and another to entomology).

While the construct of attention has been considered a mystery since at least William James' time, we are starting to understand at least some of the details. For example, increased attention synchronizes neural firing, and the more challenging the task, the greater is the increase in synchronized firing. No doubt there are many more fundamental mechanisms involved in the process, and when we are able to measure such neuronal coordination noninvasively, we will be much closer to understanding the fundamental deficit in children with attentional difficulties.

Given these three principles of growth and functioning, the child's decision to focus on one aspect of their multimodal experience over another shapes their brain to have the capacity to better deal with that aspect. This is a positive feedback loop, one that is highly adaptive in a complex environment. Brain circuits keep changing physically by growing connections, and the functioning of the brain alters the degree to which regions become activated, thereby feeding back on the growth pattern. In this way, early propensities and interests lead to later talents. The system is built to take advantage of the experiences available, so that expertise is efficiently developed to deal with the world. As many developmental psychologists have noted, the play behavior of the child is serious business indeed, being the method for the self-construction of hardware with which the world will be challenged. Contemporary developmental neuroscience is supplying the concrete details of, and therefore the basic justification for, this fundamental tenet of child development.

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Recommended Readings

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Cortisol Measures in Studies of Children

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Psychological experience affects the central nervous system not only in terms of cognitive content, but also with respect to affective arousal. The hypothalamic-pituitary-adrenocortical (HPA) system is one system through which these effects may operate. Cortisol, a steroid hormone produced by the HPA system, is now a common measure in studies of child development. However, confusion exists regarding what this measure reveals about the stress, health and well-being of children. This brief essay will not eliminate all confusion, but will offer a beginner's guide, explaining why salivary cortisol is *not* a simple index of stress and summarizing evidence that in humans, as in other mammals, activity of the HPA system is strongly regulated by early social relationships.

Why Cortisol Findings are Difficult to Interpret

When measuring the HPA and other stress-sensitive systems, we often do so to *index* stress, or the extent to which demands outweigh the child's coping resources. Larger responses are viewed as indicative of failed coping and/or greater stress. This interpretation of salivary cortisol measures is not wrong, but incomplete. The *index* approach leaves us puzzling when higher cortisol levels correlate with positive child or environment characteristics or, very commonly, when cortisol is highest at the beginning of our experiment and decreases as we expose the child to our laboratory stressor. Clearly, stress-sensitive neurobiological systems did not evolve as research tools, nor did they evolve as a means for nature to damage the brain and body. They evolved to foster survival. Only through understanding the complex role stress physiology plays in survival can we come to understand how its activity may contribute to physical and mental health and disorder.

Unfortunately, summarizing the role of the HPA system in survival is not trivial; no one has yet been able to do so satisfactorily. Cortisol and other glucocorticoids affect nearly every organ and tissue in the body. Cortisol levels increase in response to threat or challenge, but require nearly 30 minutes to reach a peak in circulation. Because cortisol operates through regulating genes, hours are required for brain and body effects to be realized. In contrast, the other major stress-sensitive neuroendocrine system, the adrenaline-producing, sympathetic adrenomedullary (SAM) system, has activation on the order of seconds and produces effects through cellular processes that take moments to actualize. The role of adrenaline is straightforward: it is a mobilization hormone that rapidly prepares the body for fight or flight. Therefore, if a research question is based on an assessment of rapidly changing states of mobilization, adrenaline (or its effects on organs such as the heart) is probably the preferred measure. Unfortunately, SAM system activity is sensitive to children's activity levels. Thus, to assess variations related to psychological (rather than motor) activity, children must remain still: a problem in research with young children.

Cortisol is readily measured in saliva, is not affected by low intensity, non-aerobic exercise, and can accurately be assessed without constraining a child's activity. However, this hormone plays multiple and sometimes conflicting roles in promoting survival. It serves permissive functions, allowing the actions of other stress-sensitive systems to occur. Basal or pre-stress levels of cortisol influence whether or not an organism can mount an effective fight-or-flight response. It serves suppressive functions, restraining the activity of other stress-sensitive systems. Chronic failure to exhibit physiologically-potent elevations in cortisol to stimuli that activate sympathetic and immune responses may promote damage from inadequate restraint of these systems; whereas, chronic hyper-activation may promote damage due to over-constraint. It serves mobilization functions, increasing the energy available to sustain body functioning in the face of long-term stressors. Finally, it serves preparatory functions, fostering retention of information at many levels, thus allowing rapid reactions to repeated encounters with similar stressors. Because of cortisol's myriad functions, both hyper- and hypo-responsivity are associated with mental and physical disorder.

"the role of adrenaline is ... for fight or flight"

The Neurobiology of Stress

The neurobiology of stress centers around regulation of two endocrine systems, the HPA and SAM systems, in conjunction with the complex weave of emotional, cognitive, and motor action systems that allow us to approach, avoid, and retain information about threat. Activation of these systems involves stressor specific pathways resulting in different patterns of responses depending on the stressor. It should come as no surprise that physiological measures of *stress* are not highly intercorrelated. Regulation of the HPA and SAM systems involves pathways that converge on nuclei in the hypothalamus (HPA) and brainstem (SAM). Psychologists are primarily interested in distributed neural pathways in limbic-cortical regions of the brain that process perceptions of threat and transduce these perceptions into emotional, cognitive, and motor responses. The amygdala clearly plays a critical role. Pathways from the amygdala are integral to activation of the HPA and SAM systems in response to *psychosocial* stressors. These pathways *are not direct*. They are multi-synaptic, allowing integration and modulation of HPA and SAM activity based on information about the current state of the body, recent activity of these pathways, dampening activity in other brain regions (e.g., hippocampus and cingulate cortex), and so on. Therefore, whether and to what extent increases in HPA and SAM system activity occur reflects an integration of highly processed information converging from many regions of brain and body.

CRH (corticotropic releasing hormone) and its family of receptors may play a central role in orchestrating responses to *psychological* stressors. CRH is the principal neuropeptide that stimulates the cascade of neurochemical events in the HPA system resulting in cortisol production. Neurons that produce CRH are widely distributed in the brain. The central nucleus of the amygdala is rich in CRH-producing neurons. Dysregulation of the *amygdala-CRH* system is argued to play a principal role in affective disorders. The amygdala-CRH and hypothalamic-CRH systems are distinct, albeit mutually influencing. Measuring cortisol does not permit inference about the amygdala-CRH system, the system that is likely more closely aligned with negative emotionality.

We suspect that the reader, at this point, may be prepared to abandon any thought of delving into the literature on the HPA system, or assessing cortisol as part of a research study. This was not our goal. Rather, our aim was to encourage researchers to be physiologically sophisticated in their use and interpretation of cortisol data. Armed with this awareness, cortisol measures can tell us much about the nature and regulation of stress during human development.

Developmental Changes in Responsivity

The HPA system begins to produce cortisol prenatally by the second trimester. Animal models demonstrate that mother's cortisol levels influence the development of the fetal brain in ways that affect later reactivity and regulation of the HPA system. Human and animal studies link maternal experiences of stress with fetal vulnerability such as low birthweight and prematurity. At birth, the HPA activity of a full term infant sensitizes to repetitive painful experiences like heel sticks, yet habituates to repeated mild stressors, such as physical examinations. This early responsiveness of the HPA system appears to decline around 3 months of age for most infants, and again more markedly between 6 and 12 months.

The marked decrease in cortisol elevations to stressors between 6 and 12 months suggests that children, like the infant rodent, enter a period of relative stress (or more accurately glucocorticoid) hypo-responsivity as they near their first birthday. In rodents, highly specific forms of contact with the mother regulate responsiveness during this period. In non-human primates, contact and proximity to the attachment figure serves as a powerful buffer of the HPA system to stimuli that elicit infant distress and contact seeking. In humans, it also appears that social relationships become powerful regulators of cortisol activity over the first year of life. Separation from attachment figures provokes increases in cortisol; however, the magnitude of elevation depends on the context of the separation. When an infant or toddler finds supportive care from a substitute care provider, the cortisol response is dampened or prevented, even if the child protests the separation. When separations are prolonged, as in full-day childcare, cortisol levels tend to rise over the day, in contrast to the typical diurnal pattern. However, again, the nature of the context matters. Increasing cortisol values are more likely and larger as standard quality indices of childcare decrease, and are more likely in childcare centers with larger groups of children and less individualized care than in smaller family-based child care contexts when they are of high quality. The likelihood and magnitude of increases over the childcare day vary with age. In cross-sectional studies, larger increases are observed among toddlers compared to preschoolers. By school age, a day away from home in the company of other children and care providers does not result, on average, in rising levels of cortisol as the day progresses.

The consequences of physiologically small, but statistically significant increases in cortisol over the childcare day are unclear. These consequences likely depend on the neurobiological context as reflected in dispositional characteristics of the child. Shyness and social reticence have been associated with rising childcare cortisol levels among toddlers and preschool boys. Extreme shyness has also been associated with higher early wakeup levels of basal cortisol, and has been prospectively correlated with higher levels of late afternoon cortisol measured in the home. The impact of cortisol on the developing brain may differ when co-occurring with heightened activity in the neurobiological circuits supporting fearful, anxious, inhibited behavior than when co-occurring with neural activity supporting angry, aggressive, under-controlled behavior. The latter dispositional pattern is also associated with increasing cortisol levels in group-care situations. Indeed, some evidence exists that higher cortisol concentrations for angry, aggressive, under-controlled children may partly be mediated by social relationships, specifically peer rejection.

Qualities of the relationship between parent and child also appear to affect and, perhaps, help organize activity of the HPA system. Secure attachment relationships seem to provide more powerful buffers of the HPA system in toddlers than do insecure attachment relationships. Family stress and discord during the first years of life and maternal depression in the child's first year predict higher baseline cortisol activity in children several years later. Conflict between parent and child activates the HPA axis in adolescence. These same family and parent-child factors influence the child's ability to form and maintain supportive, equitable relationships with children and care providers, suggesting that difficulties in regulating HPA activity may develop through multiple, intersecting psychosocial processes that affect children's social competence, ability to recruit and use social support systems, and their capacity for behavior and emotion regulation. Not surprisingly, increasing evidence suggests that catastrophic failure of the caregiving environment during development, as in cases of neglect, frequent relationship disruptions, and physical or sexual maltreatment, produces changes in the activity of the HPA axis and other stress-sensitive systems. The nature of these effects and their implications for human development are just beginning to be explored and are beyond the scope of this brief essay.

> ***"Conflict between parent and child activates the HPA axis in adolescence"***

Conclusions

Psychobiological studies of the HPA system in children strive to broaden our understanding of how social and emotional processes influence stress neurobiology and how the biology of stress impacts human adaptation. In order to usefully measure and interpret HPA system data in developmental studies, we must move beyond an *index* approach and attain a physiologically sophisticated understanding of the role of the HPA system in human survival and functioning. Nevertheless, continued interest in the HPA system in human development research is encouraged by evidence that facets of social relationships influencing social and emotional competence also strongly regulate cortisol activity.

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Shyness *and* Sociability: A Dangerous Combination for Preschoolers

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Although there has been considerable research attention directed toward the study of childhood inhibition and shyness over the last two decades (see, e.g., Kagan, 1994 for a review), there has been relatively little focus devoted toward the study of individual differences in shyness. As well, there has been scant discussion on how the emergence of different types of shyness may be risk factors for developing internalizing and externalizing-related problems during the preschool and early school age years. This is now changing.

Some 20 years ago, Cheek and Buss (1981) attempted to understand the origins of individual differences in shyness by examining the role of sociability. They noted that some people appear quiet and reserved in social situations. Cheek and Buss then asked: Are these people shy and reserved because they feel anxious and inhibited in social situations (i.e., they are shy) or are these people quiet and reserved because they have little need to affiliate with others (i.e., they are introverted)? Cheek and Buss then developed short self-report measures of shyness and sociability, noting that the two were only modestly inversely related and suggested that the two dimensions were essentially orthogonal. They selected young adults who were high and low on self-report measures of shyness *and* sociability and had them interact in unfamiliar dyads in order to see if sociability moderated shyness. They found that individuals who were shy *and* social exhibited significantly more behavioral anxiety in the unfamiliar social encounter compared with adults who differed on other combinations of shyness. Shy *and* social adults appeared conflicted in their behavioral reactions to novel social situations. Similar patterns of behavioral responses have been noted in children who are both shy *and* social during social encounters.

Are Children Who Are Shy and Social at Risk for Problems?

The answer to this question appears to be yes. Children who are shy *and* social (i.e., conflicted) may be on a pathway for developing both internalizing and externalizing-related problems during the preschool and early school age years. Conceptually, the origins and maintenance of the conflicted child's behavior is thought to be due to psychological conflict in approach-avoidance tendencies. Behaviorally, conflicted children exhibit high amounts of unoccupied-onlooking and anxious behaviors during group play involving unfamiliar peers. They have problems joining the playgroup even though they have a high desire to be a part of the group. Conflicted children are likely to be rejected by their peers and at risk for internalizing problems such as anxiety, social withdrawal and depression. Physiologically, conflicted children exhibit distinct patterns of frontal brain electrical activity (described below).

"Conflicted children are likely to be rejected by their peers"

Recent research also suggests that conflicted children may be at risk for externalizing-related problems. There is an emerging literature from studies of adolescents and young adults that suggests that people who are both shy *and* social are likely to engage in risky behaviors as a means by which to cope with the ongoing psychological conflict that they experience in social situations or anticipation of social interactions. For instance, teenagers (Page, 1990) and undergraduates (Santesso, Schmidt, & Fox, 2002) who are shy *and* social are more likely than shy and low social and non-shy people to engage in illicit drug use and are likely to use and abuse alcohol as a means by which to cope with their stress in social situations. It seems reasonable to speculate then that children who are shy *and* social may be at risk for developing externalizing problems during the early school age years because they are likely to engage in risky and antisocial behaviors in order to cope with the stress of being rejected by their peers. These risky behaviors can take many forms, including early substance use and abuse, aggression, and bullying just to name a few. In addition to helping with the stress of rejection, these antisocial behaviors may be reinforced by some peer groups and may thus serve as an avenue for the conflict child to be accepted in less than "optimal" peer groups.

Are There Temperamental or Biological Antecedents of the Conflicted Child?

One line of our research program is focused on this very question. There do indeed appear to be temperamental predictors of shyness and sociability that are identifiable during the opening months of post-natal life. For example, infants' reactions to the presentation of novel stimuli during the first half of the first year of post-natal life are known to predict timidity and boldness during the preschool years. Infants who exhibit a high degree of distress and negative affect in response to these stimuli are likely to be shy preschoolers; infants who display little reluctance to approach these same stimuli and high degrees of positive affect are likely to be social and outgoing children. In addition to these temperamental predictors, we have noted differences on psychophysiological measures during baseline and in response to social stress in people who are shy *and* social. For example, we have noted a distinct pattern of resting frontal EEG activation in people who are shy *and* social (Schmidt, 1999). We found that adults who self-reported high shyness and high sociability exhibited greater relative right frontal EEG activity that was characterized by increased activity in both the left and right frontal brain regions during resting conditions compared with adults self-reporting other combinations of shyness and sociability. We speculated that the pattern of heightened activity in both the left and right frontal region during resting conditions may have reflected a predisposition to experience heightened positive and negative affect, resulting in an approach-avoidance conflict (i.e., a conflict between an individual's desire to affiliate with others, but also the experience of fear in doing so) as suggested by Cheek and Buss (1981). We have also noted that shy *and* social people exhibit a distinct pattern of autonomic activity in response to social challenge (Schmidt & Fox, 1994). Interestingly, heightened autonomic activity has also been noted in shy *and* sociable children in their everyday environments (e.g., Asendorpf & Meier, 1993).

Is a Model Emerging That May Help Us Understand the Origins of the Conflicted Child?

We have been developing a model that may help to understand the conflicted child. This model includes a complex interaction among environmental factors, the frontal cortex, forebrain limbic structures (e.g., the amygdala), and the hypothalamic-pituitary-adrenocortical (HPA) and serotonergic systems, all areas and systems known to comprise the fear circuit. The frontal cortex is thought to play a regulatory role particularly with regard to controlling the action of psychological processes related to forebrain areas such as the amygdala and HPA system. We also speculate that genes that code for the transportation of serotonin may play an important role in the regulation of some components of the fear system. Serotonin has been implicated as a major neurotransmitter involved in anxiety and withdrawal. It is possible that some temperamentally shy individuals may possess genetic polymorphisms that contribute to a reduced efficiency of the transportation and/or regulation of serotonin. Such a genetic polymorphism has been noted in adults who score high on measures of neuroticism, a major feature of shyness. The action of reduced serotonin expression may be particularly evident in the forebrain limbic and frontal cortex where there are dense concentrations of serotonin receptors. It is possible that the reduction of serotonin may play an important role in regulating the amygdala and HPA system: "normal" serotonin concentrations may serve to inhibit (or regulate) the action of amygdaloid firing and activation of the HPA system. The reduction of serotonin contributes to a release of chronic overactivity of the amygdala and the HPA system in some individuals. An overactive amygdala may stimulate the HPA system and the release of increased cortisol. The increase in cortisol may contribute to the pattern of frontal EEG activity noted early between shyness subtypes. The frontal cortex is rich in corticosteroid receptors and has been implicated in regulating the HPA system in other mammals. The overactive amygdala and dysregulated HPA system perhaps lead to the increased activity noted on resting psychophysiological and neuroendocrine measures that index forebrain and frontal cortical functioning. (Interestingly, the startle response, autonomic, and frontal EEG measures are all known to be sensitive to the manipulation of cortisol and have been linked to emotion dysregulation). Accordingly, it may not be a coincidence that some temperamentally shy children are characterized by elevated basal cortisol levels, high and stable resting heart rate, exaggerated baseline startle, and greater relative resting right frontal EEG activity. Resting EEG and heart rate measures may be "by-products" not casual agents of a dysregulated fear system. The left frontal area may have a more dense collection of glucocorticoid receptors or a greater binding affinity for cortisol in shy and social people (i.e., the *conflicted*) compared with people who are shy and low in sociability, hence the pattern of greater activity in the left than right frontal area as noted earlier. Thus, it is at the level of the frontal cortex that we observe individual differences in shyness. It is important to point out, however, that there are a number of environmental factors that contribute to social stress, including parenting style, peer relations, school environment, and familial and extra-familial variables among many others that can trigger social inhibition in this model.

"it is at the level of the frontal cortex tht we observe individual differences in shyness"

What Lies Ahead?

Timidity and boldness represent two of the most salient temperamental features that are conserved across mammals and whose neural substrates underlying their expression are beginning to be well-mapped. An interaction of these temperamental features may serve as a dangerous combination for the development of internalizing and externalizing problems in children. Future research should consider the tracking of children who exhibit features of both timidity *and* boldness in early infancy.

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Assessing the Development of Executive Functions

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The development from childhood to adolescence is a dynamic period of multi-facetted changes in functions such as cognition, affect, social behavior, and (neuro)physiological regulation. Important to and concurrent with these changes is the development of self-regulation and self-control, and of meta-cognitive processes (Segalowitz & Rose-Krasnor, 1992), as they are considered to exert control over more specific processes. The distinction between specific/ modular and control/ superordinate functions can be illustrated with an everyday example: While a pre-school child will normally be able to run, pick up a ball from the ground, and detect an approaching vehicle perfectly reliably, he or she may fail to coordinate these modular processes with the parents' instruction to be careful when crossing the road, and his or her desire to retrieve a ball lost while playing as quickly as it is safe to do so (superordinate function). In order to comply with parents' instructions, the child must self-regulate his or her behavior, i.e., to inhibit the prepotent response to dash across the road in order to fetch the ball and has, instead, to sequence and plan the subsequent actions: "look right, left and right again. Then cross the road looking and listening as you go".

Self-regulation in developmental psychology has a corresponding term in neuropsychology, namely "executive function" or "executive control". This term emphasizes an ability in which humans seem to be especially proficient: to guide behavior on the basis of internal representations ("memories") of goals or (self-) instructions – instead of being driven by salient environmental stimuli or stuck in well-worn habits. Executive control thus includes, among other abilities, the ability to inhibit prepotent responses, to anticipate and plan goal-directed actions, and the ability to terminate a no longer appropriate action and switch to another.

The importance of executive (self-) control in development becomes readily apparent when we look at children with severe deficits in these functions. In their comprehensive model of attention-deficit hyperactivity disorder (ADHD), Lauth and Schlottke (1999) have postulated a primary deficit in central nervous activity and behavioral regulation (including sustained attention, inhibitory control, and a tendency for seeking stimulation). This primary deficit results in impulsiveness and hyperactivity and it impairs strategic planning and meta-cognitive processes. Such distorted behavioral self-regulation provokes negative responses in the social environment, with the experience of failure and the development of dysfunctional "compensatory" behavior as a consequence. As a result, children with attention-deficit hyperactivity disorder (ADHD) encounter serious academic and social problems (Tannock, 1998).

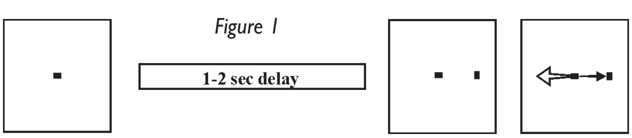
That executive functions are considered to exert control over modular functions, such as running, picking up the ball, detecting an approaching vehicle in the example above, has two important implications. *First*, if we want to assess the executive function's efficiency, we must assure that the modular functions are intact. Ideally, both the executive function under investigation and the modular functions it controls should be assessed together, with performance in the latter being statistically controlled. *Second*, it is plausible to assume that the executive functions do not develop before but concurrent with or even after the modular functions they control. In line with this reasoning, developmental neuropsychological research has shown that executive functions show protracted development during childhood and adolescence (Kirk & Kelly, 1985). Furthermore, those cortical regions, the functional integrity of which seems necessary for executive control, appear also to show protracted development, especially in particular portions of the frontal lobes (Jernigan, Trauner, Hesselink, & Tallal, 1991).

"children with ADHD encounter serious academic and social problems"

The assessment of the development of executive functions is hence a promising starting point for understanding cognitive development from the neuro-psychological perspective. An executive paradigm that has attracted close attention of neuroscientists interested in the prefrontal cortex is the antisaccade task (Hallett, 1978). As outlined in the rationale for the study of executive functions, performance in the anti-saccade task (executive function) should be compared with performance in the prosaccade task (modular function). During the prosaccade task, a fixation point is presented in the middle of the screen for 1-2 seconds (left "screen" in figure 1). Subsequently, a peripheral cue appears to the left or right (typically in random order; middle "screen" in figure 1), and subjects are instructed to look at the peripheral cue when it appears (small arrow in the right "screen" in figure 1). By contrast, during the antisaccade task subjects are instructed to look to the mirror-image position of the peripheral cue upon its appearance, as illustrated by the large white arrow in figure 1.

The antisaccade task is a very pronounced test of executive functions. This is because a strong peremptory response, the glance at the peripheral cue, must be inhibited

Figure 1



Schematic illustration of the pro- and antisaccade tasks.

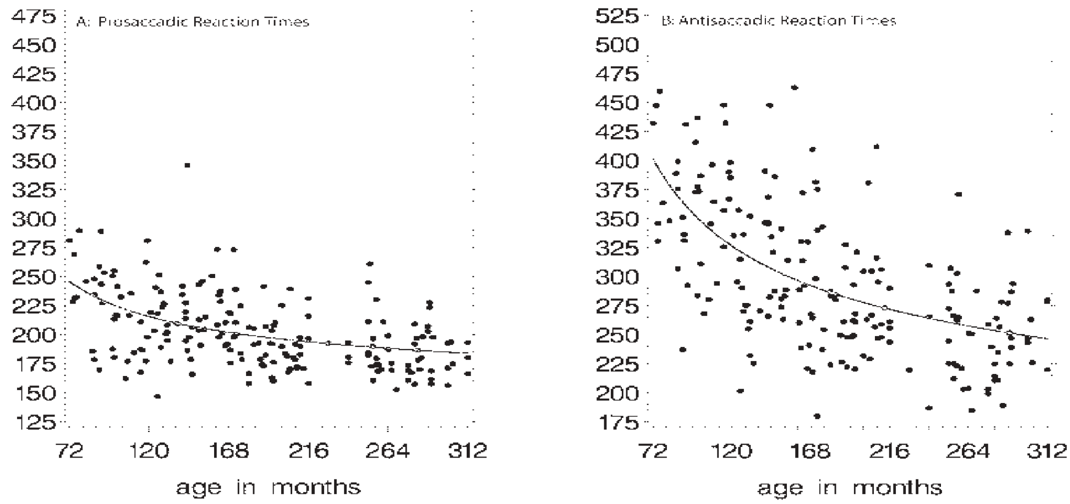
in favor of a response executed in accordance only with the task instruction held active in working memory and the perceptual representation of the cue. Studies with neurological patients have shown that frontal lobe regions (dorsolateral or ventrolateral prefrontal cortex, frontal eye fields) must be intact in order to accomplish the antisaccade task; conversely, regions in the parietal cortex seem necessary to execute prosaccade tasks with normal reaction times (e.g., Pierrot-Deseilligny, Rivaud. Gaymard, & Agid, 1991; Walker, Husain, Hodgson, Harrison, & Kennard, 1998).

The *comparative* investigation of pro- and antisaccade task performance is hence an elegant research tool to investigate prefrontal cortex/executive functional development with relatively high specificity. In that regard and because of its relative simplicity, the antisaccade task does better than many of the cognitively complex "frontal lobe tests" commonly used in neuropsychology.

For that reason we were interested in a precise statistical modeling of the developmental trajectories of pro- and antisaccade task performance in healthy children, adolescents, and young adults aged 6–28 years. Our sample comprised 199 participants aged 6–28 years (66% males). All participants were tested with the pro- and antisaccade task from which various parameters of saccade control were derived (Klein, 2001). Univariate multiple regression models comprising age and its inverse as predictors were fitted for each parameter of saccade control. We generally found that all of the parameters relating to the antisaccade task performance showed more protracted development and stronger relations with age than those parameters that derived from the prosaccade task. An illustrative example of our results is given in figure 2 for the pro- (2A) and antisaccadic (2B) reactions times. This figure documents the superposition of linear and curvi-linear age effects on saccade control, which are significantly stronger for the anti- as compared to the prosaccadic reaction times (plotted on the y-axis). Hence, the antisaccadic reaction times provide an *incremental* developmental validity above and beyond that of the prosaccadic reaction times. This pattern of results thus confirms the hypothesis of protracted development of prefrontal executive functions.

Tracing the development of specific neuropsychological functions in healthy children is a logically necessary prerequisite to the detection and description of developmental alterations in children with those psychiatric disorders that can be conceived of as "neurodevelopmental". ADHD is such a disorder, because there is evidence of alterations in fronto-striatal regions in ADHD. Hence, we were interested in exploring whether ADHD patients exhibit alterations from healthy children in the development of antisaccade control. Data from forty-six carefully diagnosed patients with ADHD and 46 healthy controls, matched with patients for age (135.9±23.8 months), gender (38 boys, 8 girls), and IQ (Raven's SPM: 106.2±16.2) were available for analyses. As can be seen in figure 3A, there were significant, but small differences between the groups in prosaccadic reactions times. Antisaccadic reaction times showed the expected significant decrease in controls, but not in patients. (Because of the restricted age range in this study compared to Klein, 2001, a simple linear model explained the relation between age and the dependent measures). This pattern of

Figure 2
Pro- and antisaccadic reaction times



results suggests differential developmental processes in ADHD patients in executive functions and point to a frontal involvement in the disorder (Klein, Brandenbusch, & Raschke, in press).

The two studies cited above have demonstrated that the *comparative* investigation of anti- and prosaccades may reveal two kinds of *differential* developmental processes: (a) within samples of healthy children and differentiating "frontal" and "non-frontal" measures, and (b) between healthy children and ADHD patients. In both cases the antisaccade task parameters act as indicators of executive functions and provide incremental validity either with respect to functional development in healthy subjects or with respect to the separation of patients from controls. These results are in line with the assumed protracted development of prefrontal cortical functions and the involvement of fronto-striatal dysfunctions in ADHD.

Traditional models of cognitive development, for example, Piaget's constructivist theory, are largely devoid of *explicit* references to the neurobiological correlates or foundations of cognitive development (Segalowitz & Rose Krasnor, 1992). Cognitive neuropsychological constructs and tests of executive functions may thus be in a good position to bridge the existing gap between cognitive development theories on the one side and developmental brain research on the other. This ambitious endeavor would involve research programs in addition to the well-documented description and explanation (e.g., in constructivist theories) provided by developmental psychology. Such programs may include (a) the description of development of functions rooted in neuropsychological theorizing (as shown here), (b) the establishment of empirical relations between selected construct indicators of both psychological traditions, along with (c) attempts to link these disciplines on the theoretical level, and (d) the development of common research paradigms and tests. No doubt, this endeavor is still in its infancy.

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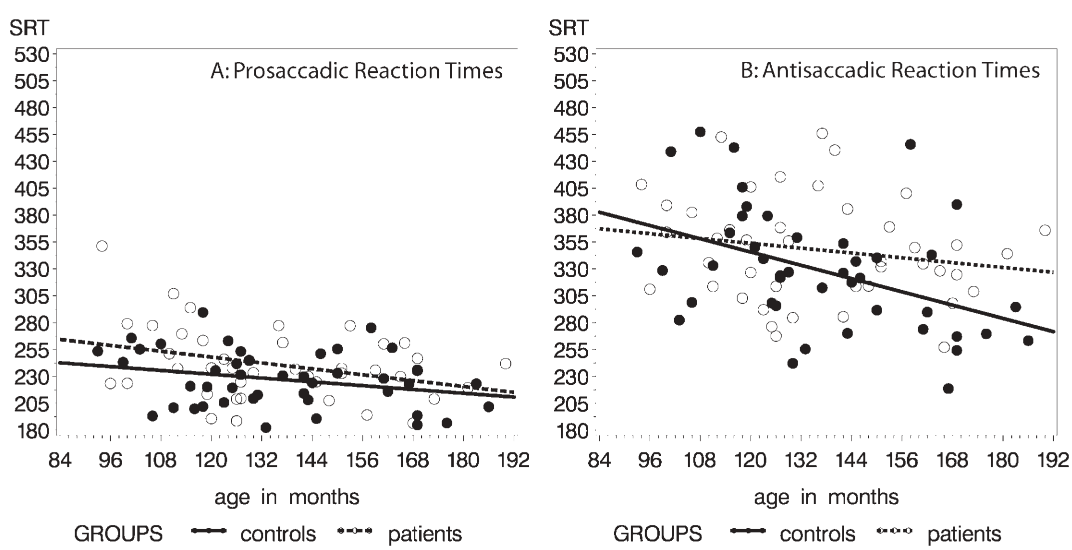

Figure 3
Pro- and antisaccadic reaction times in healthy children and ADHD patients

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COMMENTARY: *An Integration of Neuroscience into the Study of Child Development*

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It seems to me that there are currently two new major trends in the research into child development. One trend is to push the frontier of research into even earlier stage of development. Younger babies' surprisingly advanced cognitive abilities become a focus of interest (Colombo, 2001; Dehaene-Lambertz, Dehaene, & Hertz-Pannier, 2002; Fiser & Aslin, 2002; Saffran, Aslin, & Newport, 1996; Stager, & Werker, 1997). The second trend is to investigate the relations between children's cognitive and social development and their brain activation and maturation (Frith & Frith, 2001; Dehaene-Lambertz, et al., 2002; Perner & Lang, 1999). Another trend, probably still in its infancy, is to link directly children's cognitive and behavioral development with their genes and genetic inheritance (Backes, Genc, Schreck et al., 2000; Fagerheim, Raeymaekers, Tonnessen et al., 1999; Paterson, Brown, Gsodl et al., 1999; Dale, Simonoff, Bishop, et al., 1998).

I am very glad to see that the present special section focuses on developmental cognitive neuroscience, that is, the second trend I outlined above. Although I think the current trend is more influenced by the growing cognitive neuroscience (Gazzaniga, 2000) than by the traditional developmental neuroscience studying brain plasticity and neuronal connections (Segalowitz, Introduction), this new line of research can nevertheless answer many developmental questions, old and new, at different levels. The Guest Editor did a great job in assembling papers tackling some of these questions. But as the Editor pointed out, broader perspectives may need to be taken up, and new arguments and findings in cognitive neuroscience may need to be taken into consideration when we attempt to link brain and mind development.

The essay by Segalowitz discussed two schools of thought about the nature of the developmental process and promoted the concept of *constructivism*. This concept emphasizes the importance and flexibility of biological systems in child development and the brain basis for individuality. The author delineated three key components of the constructivism: 1) experience influencing the maturation of the brain; 2) lifelong interaction between experience and brain; and 3) conscious mental manipulation of the experience. While the first two principles of growth and functioning are widely backed up by empirical evidence and accepted by most cognitive neuroscientists, questions perhaps can be raised concerning the third component. The author suggested that attention is a major catalyst for learning and top-down control is critical to children's experience. However, recent neuroimaging studies (e.g., Willingham, Salidis, Gabrieli, 2002) found that conscious and unconscious learning may activate many common brain regions and it is an empirical question to what extent learning in children can happen in the absence of awareness (attention). Moreover, in conducting experiments and theorizing about role of attention in children's learning, we perhaps need to differentiate attention and awareness (consciousness) (Lamme, 2003). Such a distinction has been made both on psychological/theoretical grounds and on neurobiological grounds. It remains to be seen whether this distinction has different consequences for children's learning from experience. Furthermore, we may also need to differentiate top-down processing at the psychological level and at the physiological level (Frith, 2001), especially when we investigate the neural correlate of children's learning and top-down control. In short, the concept of *constructivism* needs to be delineated in more detail and a large body of evidence should be accumulated directly from studies on children. Advances in cognitive neuroscience could provide a guideline for such research. A good example is perhaps the attempt to link cognitive neuroscientific studies of executive functions with developmental theories (Perner & Lang, 1999; Perner, Lang, & Kloo, 2002; Klein, this issue).

The papers by Gunnar and Townsend and by Schmidt tried to illustrate the relations between child's social behavior and its brain basis, more from the perspective of neurobiology. Gunnar and Townsend urged us to be more physiologically sophisticated in interpreting HPA system data while Schmidt suggested that we build up a model for conflicted children incorporating a complex interaction among environmental factors, the frontal cortex, forebrain limbic structures, and the HPA and serotonergic systems. Once again, I feel that recent advances in cognitive neuroscience can be brought into the areas. For example, we can ask whether these conflicted or stressed children have abnormal performance or brain (especially prefrontal) activation when they carry out executive function tasks, and whether there are correlations between children's approach-avoidance tendencies and their inhibitory skills. Klein's paper argued for a special role of the constructs and tasks of executive functions in bridging the gap between cognitive developmental theories and brain developments. I agree with him and I suggest that we need also to be more sophisticated in executive functions (and other functions studied extensively in cognitive neuroscience such as attention) and their brain bases. After all, executive functions can be fractionated and they may have distinct neural correlates (Dreher & Berman, 2002; Shallice, 2001). One challenge for developmental cognitive neuroscience is to find the correlational or even causal relations between different aspects of children's executive functions and children's social behaviors and skills.

To summarize, I think that the advances of cognitive neuroscience provide a guiding role for research into child development. Developmental psychologists, whether studying cognitive or social development, whether studying normal children or abnormal populations, just cannot ignore theories and data coming from the brain imaging techniques. Papers in this special issue give us good examples of taking advantage of this trend, either directly or indirectly.

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COMMENTARY: *Good Reasons for Integrating Neuroscience and Developmental Psychology*

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There are many reasons to study the interface of developmental psychology and neuroscience. Among them are an increased understanding of deviant behavior or psychopathology that is a result of this interface and a reductionist approach to studying behavior. Knowledge of the way in which neurotransmitters work in the brain has provided information for the development of certain drug therapies, which at the very least alleviate symptoms of individuals who suffer from an array of behavioral problems including depression, bi-polar illness and schizophrenia. This biological approach to psychology (and psychiatry) has also led to a reformulation of the etiology of certain types of psychopathology. For example, not so long ago, autism was thought to be the result of ineffective caregiving behavior. Neuroscience research on autism has dispelled this theory and current work is attempting to identify the genes that play a role in the expression of autistic behavior while scientists examine specific brain systems that may be affected in this condition.

There is a notion within both psychology and neuroscience that if one could describe the pattern of neural activation of a particular psychological state this would provide a clear and precise understanding of the behavior. Reducing behavior to the chemical or electrical action of neurons illuminates the underlying basis of that behavior. There is a sense among some neuroscientists that description of the neural pattern of firings, or activation by region in the brain, will supplant description of behavior as the best reflection of psychological state. The information provided by the pattern of neural activation is the most elemental form from which psychological state is to be understood. This assumption however may be incorrect. If the goal is to understand behavior, then even identifying the precise neural state of a behavior will only help if the behavior itself is well specified. Thus, specification of behavior, which is the realm of the psychologist, is critical for the behavior-neuroscience interface.

The issue of the effects of early experience on the developing child is of critical concern to developmental psychologists. It is an area that has been illuminated by neuroscience research. Workers have for some time studied the manner in which the brain forms beginning at conception and throughout fetal development. These studies describe the timing of events during gestation during which neurons migrate to their predetermined regions of the brain and link up to form the connections of the central nervous system. What is clear from this work is that the processes of synapse formation, overproduction and synaptic pruning continue after birth. These processes appear, as well, to occur in different regions of the cortex, with differing developmental trajectories. Thus, for example, synapse production in the visual cortex appears to peak early in the first year of life. The process of synaptogenesis continues on for a much longer period of time in anterior portions of the cortex (particularly the frontal lobes) (Huttenlocher and Dabholkar, 1997). The timing and nature of postnatal brain development has led to work on the effects of environmental input on these processes. It has raised questions about the flexibility of brain development—what is the effect of different types of experience, ranging from deprivation to enrichment (Greenough, Black, & Wallace, 1987).

These questions are crucial for those interested in development for they focus on the role of experience (and environment) as it may shape brain development and hence the ontogeny of cognitive and social behavior. This work raises questions regarding critical or sensitive periods and the timing of environmental input.

The papers, edited by Sid Segalowitz for the ISSBD Newsletter (Spring 2003) are an attempt to provide answers to the question of why developmental psychologists should be interested in neuroscience. Segalowitz and Gunnar & Townsend directly address the issue of early experience and its affects upon the developing organism. Segalowitz raises the important point that the modern synthesis of neuroscience and developmental psychology is best viewed through the lens of constructivist theory. Psychological and brain development are not deterministic but a function of environmental input and the child's effect on that environment. An important corollary of Segalowitz's position is that psychology must carefully describe the environment so that interactions between biology and context may be fully understood.

Gunnar and Townsend's piece rests squarely in the tradition of the effects of early experience on brain development. They focus on the HPA axis and the role of different experiences in shaping reactivity of this physiological system. The HPA axis is a model system for understanding the effects of early experience on brain and behavior and there is a long history of animal research examining these relations with the notion that HPA responsivity may index the animal's response to stress. Gunnar and Townsend rightly point out that hypo or hyper reactivity of this system do not easily map on to an animal's inactive or reactive response to stress. Rather, the physiological role of the HPA system as a mobilization for both short term and long term energy needs in response to acute and chronic environmental challenge must be considered.

"calls for greater detail with regard to etiology of shy behavior"

Schmidt raises an important point in his piece with regard to the study of the interface of neuroscience and social competence. One of the byproducts of this interface has been the increased need and demand from neuroscientists for greater specificity and description of behavior. Schmidt calls for greater detail with regard to etiology of shy behavior and for increased behavioral description of this phenomenon. This level of analysis is critical if progress is to be made in understanding the underlying brain processes for complex cognitive or social behaviors.

Along the same lines, the paper by Klein provides the reader with important behavioral distinctions in the attention phenomenon known as inhibition of return. Klein argues convincingly that if one is to understand the brain bases of tasks putatively thought to tap frontal lobe functioning (often called executive function tasks) one must tap both these functions and those he calls "modular functions" processes controlled by but not identical to the executive tasks under study. Data from his laboratory show quite elegantly how two behavioral measures, proscaccadic reaction time and antisaccadic reaction time may be useful in examining executive attention. The important point is again that the brain behavior link can only be successful if there is a high level of specificity about the processes being assessed and at the same time control over related functions.

The four papers in this special issue highlight the reasons we can be excited about the coming years of work linking brain and behavior especially from a developmental context. Each provides a link to the issues that are important in this line of study: the need for greater specificity of behavioral description, the need to develop tasks which tap specific processes, the importance of early experience in the sculpting of brain systems involved in cognitive and social behaviors and the role of the child as an active constructor of their environment during development.

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COMMENTARY: *Challenges and Contributions of Neuroscience in Developmental Psychology*

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The present essays exemplify the excitement and promise of neuroscience in developmental psychology, as this rapidly growing perspective yields important empirical findings linking brain development to psychological outcomes as well as contributes to an understanding of basic developmental mechanisms. Rather than focus on the many provocative empirical findings emerging from the work discussed, my focus here is on identifying some of the challenges that neuroscience research in developmental psychology must address and insights that it can be anticipated to provide.

The broad-based knowledge and subtlety that must inform neuroscience research in developmental psychology, as an interdisciplinary field of inquiry, is underscored in Gunnar and Townsend's discussion of the demands and potential pitfalls for psychologists in the incorporation of cortisol measures in their research. Common in studies of child development, these measures are attractive to psychologists because of their relative ease of measurement and link to important outcomes related to stress, health, and well being. However, as Gunnar and Townsend caution, it is critical not to treat cortisol measurement as an "index" that can be applied in a linear manner to tap stress levels. Rather, a sophisticated understanding of the HPA system and of its adaptive role in human survival must inform use of this measure. Thus, as they note in highlighting some of this complexity, cortisol serves multiple, sometimes conflicting, functions and relates to other measures of stress through complex pathways that are sensitive to particular circumstances, such as the current state of the body. Their call importantly is not for psychologists to abandon research on the HPA system but to approach this work with a more physiologically sophisticated understanding. This type of message, it may be noted, represents a more general caution that applies to other interdisciplinary efforts in psychology, in which researchers may adopt what has become a popular approach, without a sophisticated understanding of the nature of the phenomena being assessed. Thus, for example, similar types of cautions have also been raised in the interdisciplinary perspective of cultural psychology regarding the need to treat the construct of culture in more process-oriented terms, rather than in terms of readily available and easily administered indexes, such as individualism/collectivism scales (Kitayama, 2002; Miller, 2002).

The importance in developmental neuroscience of being sensitive to issues of method variance is raised by Klein's discussion of his exciting research on the development of executive functioning. Klein adopts a widely used and logically sound methodological strategy that typifies much work in developmental neuroscience, i.e., that of identifying an age-related psychological effect that is related both conceptually and empirically to a parallel age-related effect on the neurological level. In the case of Klein's research discussed here, the age-related psychological effect is executive functioning, as measured by performance on the antisaccade task, and the underlying neurological process is the protracted development of prefrontal cortical functions. As Klein observes, this same biological mechanism would appear related as well to the protracted pattern of cognitive developmental change captured in the Piagetian stage model. A central challenge in this type of effort to tap the biological grounding of developmental processes, however, is taking into the account the absence of a one to one relationship between psychological constructs and the measures constructed operationally to tap them. In this regard, it must be recognized, for example, that many of the original Piagetian tasks were later criticized as being overly complex and as using materials that are unfamiliar, unclear, or non-sufficiently motivationally engaging for children and thus that underestimate children's competencies. It has been this recognition that has played a major role in rethinking the empirical claims of Piagetian theory and in moving the field into what has been heralded recently as a Post-Piagetian era (Gopnik, 1996). More generally, the present considerations highlight the need in neuroscience research in developmental psychology, as in psychology more generally, to avoid identifying a psychological construct with a single methodological approach but rather to be sensitive to the context and task dependence of all psychological phenomena.

The challenges of taking into account the socio-cultural grounding of psychological processes, in turn, are raised by Schmidt's exploration of shyness, a phenomena whose behavioral manifestations are, at least partially, culturally variable. Schmidt discusses the distinct patterns of frontal brain electrical activity linked to individual differences in the tendency to experience anxiety in participating in social activity. In future work on this topic, however, it is important to examine whether the same types of neurophysiological correlates are observed in socio-cultural contexts in which reserved behavior is socially valued. This type of culturally based inquiry would stand to make possible a broadened understanding of the positive feedback loops existing between brain and behavior. For example, research on Chinese cultural populations has shown that the interpersonal correlates of shy-anxious behavior are not the same as in North American samples, with such children scoring higher than their average peers on sociability and leadership, performing better in school, and being evaluated more positively by both their parents and teachers (Chen, Rubin & Li, 1995; Chen, Hasting, Rubin, Chen, Cen & Stewart, 1998).

Beyond presenting examples of the types of exciting findings of neuroscience research in developmental psychology, the present essays also importantly make clear the nature of the theoretical contributions of this approach. The contemporary widespread enthusiasm and interest in neuroscience in departments of psychology may reflect a desire to locate a "firm" grounding for the discipline through identifying deterministic physiological underpinnings for psychological effects. However, it is made clear in Segalowitz's powerful arguments and in the important empirical findings reported throughout the various essays, that the activities of the individual impact on brain structure throughout the life course. The fact of psychological processes reflecting brain development is compatible not only with individual agency but also with sociocultural processes affecting the course and endpoints of psychological development.

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Notes from The President

In my last Notes to you, I mentioned six issues that the Steering Committee and I myself in particular wanted to pursue. I am happy to inform you that we have made progress on all, but certainly there is still a way to go before I can announce the final outcomes.

The first issue concerned efforts to maintain and enlarge our membership, with a special emphasis on increasing the number of young investigators and students joining ISSBD. The experience of other learned societies shows that there are basically two ways this can be done – to use the pull of attractive events such as congresses and workshops, and to encourage the push from colleagues already engaged in ISSBD affairs and who are familiar with the conditions for scientists in their own region or country. To this end, we have put together a list of volunteers from various corners of the world who expressed a wish to be more active in ISSBD. This material will now go to Andy Collins, the Chair of the new international membership committee, who will make the contacts and develop a plan of action. This work will be conducted in close collaboration with Barry Schneider, our Treasurer and Membership Secretary. If you are interested yourself in helping the group, please send me an email.

The second issue referred to our biennial congress, the showcase of international research on human development. I commented on the need, and our aim, to make it even more appealing to all generations of scientists and, most importantly, by stressing the life-span conception of continuity and change, to offer something for researchers in all the life periods. Concerning the next venue, Ghent, Belgium in 2004, together with the organizer Leni Verhofstad-Denève, we have already made some steps in this direction. The planned roster of symposia has been amended to include some interesting highlights, and we will see the first results of an international young scholars' initiative. Ghent will have many more attractions, including workshops and programs for young scholars, not to mention this wonderful town. Nevertheless, it is true that there is room for more support by ISSBD for the local organizer and we also want to make sure that the congress helps to fund our activities. Toward this aim, the Steering Committee has been discussing suggestions from myself and others either to have more formal contracts in the future (that will define the roles between ISSBD and the organizers in more concrete detail than has been the case up to now) or to be even more radical and try to organize the congresses more centrally. I personally tend to favor the first solution, which has been used with success by comparable international learned societies, but this needs further study.

While still on the subject of ISSBD's upcoming congresses, I can report on progress concerning the 2006 congress to be held in Melbourne, Australia. Ann Sanson, the local organizer, tells me that things are well underway. A local organizing group and a national advisory group have been formed. The organizers have the support of the Australian Psychological Society, the Australasian Human Development Association, the Australian Institute of Family Studies and the University of Melbourne (the latter two will be co-hosts). The meeting is scheduled for July 3-7. The Melbourne Convention and Visitors Bureau is supporting the local organizers in preparing the proposal to ISSBD (that is expected to arrive very soon). All in all, things look very promising, so be sure to make a note of the date.

The third issue concerned our series of successful workshops that more recently faced some funding difficulties. As promised, President-Elect Anne Petersen and I have been working on this. A suggestion for further discussion in the Steering Committee and the Executive Committee will be prepared in the next few weeks. The main challenge here is to develop a master plan that sets out our aims for a number of years and that presents a comprehensive picture, rather than continuing to apply to foundations on an ad hoc basis.

The fourth issue referred to the better recognition of scientific achievements by a special ISSBD award program. Past-President Ken Rubin has been working on this and I hope that initial results will be visible at the Ghent congress.

All of the above are certainly interrelated, and thus my sixth issue was no surprise – as an organization we need to find ways to be more efficacious (in terms of efforts and costs). The leadership of ISSBD has been working as a group of volunteers, and we certainly want to maintain the advantage of such an intrinsic motivation for our actions. However, other learned societies had similar problems related to the growth of the organization and the changes in the support by officers' institutions. In some cases, their solution was to outsource parts of their operations, such as the payment of dues, membership services, administrative support for their journal, or even concerning the organization of congresses. As promised and announced in my last Notes, I have contacted other societies and this resulted in a draft proposal that describes ways in which we could streamline our operations. Inspired by this, we have begun a second round of discussions in the Steering Committee for which I and others have collected more information about how others deal with similar problems. Right now we are in the middle of a lively exchange – after all there is a concern that outsourcing could be beyond our financial means, at least short-term, and that we might lose some of the volunteer spirit we all appreciate. It is too early to envision the final solution, but I can assure you that we will discuss every possibility, bearing in mind that our international format requires flexibility (e.g., concerning the organization of the congresses) in order to adapt to regional customs and opportunities for funding. Jari-Erik Nurmi, our Secretary General, has been very supportive in all issues related to the organizational overhaul (an update of our web presentation has priority at this time).

At the end of the day, my colleagues and I are convinced that ISSBD will be stronger than ever – certainly if we can count on your help. If you have ideas related to any of the topics mentioned above, or if you want to volunteer for whatever task within ISSBD, please send me an email (Rainer.Silbereisen@uni-jena.de). I am sure that we will make progress within the next few months, and I will keep you informed. All the best for your work and life.

Yours,

Rainer K. Silbereisen, Ph.D.

President of the International Society for the Study of Behavioural Development

18th Biennial ISSBD Meeting

The 2004 meeting of the International Society for the Study of Behavioural Development will be held in **Ghent,** an exquisite medieval town in the heart of Flanders (Belgium) between Bruges, Antwerp and Brussels, **July 11-15, 2004**.

If you want to receive regularly updated information about this meeting send an e-mail with your name and address to issbd@semico.be

issbd@semico.be

Information about the conference is available from the **Dept. of Developmental, Personality and Social Psychology**
Ghent University, Henri Dunantlaan 2
B-9000 Ghent BELGIUM
Fax: + 32 (0) 9 2646486

website: http://allserv.rug.ac.be/ISSBD2004 (from Feb. 2003 onwards).

Submission deadlines:

- **Symposia:** September 10, 2003
- **Posters:** October 1, 2003

The complete announcement, including submission forms, will be available in February 2003 and sent to all ISSBD members and anyone who requested it.

The social program will be available from September 2003, and will feature various pre- and post-conference tours.

Editorial

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ISSBD Ghent 2004

18TH BIENNIAL ISSBD MEETING CALL FOR PAPERS

The International Society for the Study of Behavioural Development (ISSBD) promotes the discovery, dissemination, and application of scientific knowledge about behavioural development throughout the life span. Your colleagues from the University of Ghent invite you to the 18th biennial meeting to be held on July 11-15th, 2004.

WELCOME TO THE 18TH BIENNIAL MEETING

Karla Van Leeuwen, Prof. Ivan Mervielde, Prof. Leni Verhofstadt-Denève & Leen De Medts, in Ottawa (August 2002), promoting the ISSBD Ghent 2004 meeting

Dear Colleagues,

Together with co-chair Rainer Silbereisen and the members of the International and Local Programme Committees, I have great pleasure in inviting you to participate in and contribute to the 18th Biennial ISSBD meeting, which will be held in Ghent (Belgium) on July 11-15th, 2004. This conference will offer ample opportunities for informal exchanges and organised scientific meetings. You can also register for a pre-conference workshop about developmental psychopathology starting on July 10th.

Besides the opening address by the distinguished primatologist Frans de Waal and the eminent keynote addresses and invited symposia, the programme will provide ample opportunities for presenting your research as part of a symposium or as a poster. Moreover, we are planning various "scientific get-together sessions" for young scholars and discussion groups on current issues in developmental psychology, guided by internationally renowned specialists.

We therefore strongly encourage you to contribute enthusiastically to this truly international conference.

Visit us at:
http://allserv.rug.ac.be/ISSBD2004

Please note that the deadlines for submissions are September 10, 2003 for the symposia and October 1, 2003 for the posters.

As you probably know, Ghent is an exquisite medieval city in the heart of Flanders (Belgium), situated between Bruges, Antwerp and Brussels. We are convinced that the conference venue will offer a splendid occasion for meeting colleagues from all over the world in a pleasant and relaxed environment. Note that the conference banquet will be organised in the impressive, 11th-century Castle of the Counts of Flanders.

We look forward to welcoming you to Ghent in the summer of 2004!

Leni Verhofstadt-Denève
Chair ISSBD Ghent 2004

PROGRAMME OVERVIEW

English is the official language of the meeting. The scientific programme will consist of a pre-conference workshop on developmental psychopathology, keynote addresses, invited symposia and poster presentations. Moreover, we are planning various "scientific get-together sessions".

Opening Address

Frans de Waal (USA):	Principles of primate sociality: From conflict resolution to sympathy and quid-pro-quo

Keynote lectures

Jens Asendorpf (GE)	Personality-relationship transaction over the life span
Lars Bergman (SE)	A holistic approach to individual development: Some methodological considerations
Laura L. Carstensen (USA)	Aging, motivation and emotion
Avshalom Caspi (USA)	(Measured) genes, (measured) environments and behavioural development
Andrew Collins (USA)	Development and close relationships: Precursors and pathways from infancy to adulthood
Thalia Eley (UK)	Anxiety and depression in children and adolescents: A developmental cognitive genetic approach
Giyoo Hatano (JP)	Cognitive development through participation in practices
Ulman Lindenberger (GE)	Cognitive developments in old age
Rolf Loeber (USA)	Developmental aspects of crime: Key knowledge for prevention
Jenny Saffran (USA)	Statistical learning in language acquisitions
James Vaupel (GE)	The demography of aging: Causes and consequences
Suman Verma (IN)	Socialisation for survival: Developmental issues among working-street children in India

Invited Symposia

Marc Bornstein (USA) & Maria Lucia Seidl de Moura (BRA)	Multicultural studies of social development in early life
Huichang Chen (CN)	Children and adolescents in social changes
Michel Deleau (FR)	Language and theory of mind development
Jutta Heckhausen (USA)	Developmental regulation of major life-course transitions
Paul van Geert (NL/B)	Dynamic systems approaches to development: Present and future
Willem Koops (NL)	History of childhood and developmental psychology
Fergus Craik (CA)	Life span cognition: Mechanisms of change

Scientific get-together sessions

These sessions will be organized by different presenters (young scholars, experts…) and aim to create an informal forum for open discussions and information exchange on current topics in developmental psychology. (Timing and format will be announced later).
For information concerning

- The young scholars initiative, mail to:
  Deepali Sharma <deepasharma@glide.net.in>
  Convener: Deepali Sharma
  Topic: Current cross-cultural research issues in which young scholars, from multidisciplinary and multi-ethnic backgrounds, are involved.

- Exchange on current "hot topics" in developmental psychology, mail to:
  Silvia Koller < kollersh@ufrgs.br >
  Convener: Silvia Koller
  Topic: still to be confirmed

  Suman Verma <svermal23@glide.net.in>
  Conveners: Suman Verma & Anne Petersen
  Topic: Positive youth development across cultures

Pre-conference Workshop on Developmental Psychopathology

The pre-conference workshop on developmental psychopathology consists of two parts. The first (status of research) will take place on Saturday afternoon, July 10th; the second (improvement of research & policy implications) will be organized on Sunday morning, July 11th.

The aim of the first part of the workshop is:

- to focus on the current status of developmental psychopathology research. This part will be presented by eminent researchers in this domain
- to stimulate discussions among the participants about their own research (interactive sessions starting from poster presentations)

For the second part, participants can choose between two parallel workshops focusing on:

- the acquisition of tools to ameliorate the participants' research activities (e.g. how to organise more effective developmental psychopathology research, communications, publications…)
- how to transpose research into policy? Implementation of findings on developmental psychopathology in society: how to start? Special attention should be paid to the importance of cultural elements.

A. Caspi, R. Loeber, T. Moffitt and W. Koops have already agreed to participate.

Some speakers and session conveners are still under consideration.

Committees

International Programme Committee

General Chair:	Leni Verhofstadt-Denève (BE)
Co-chair:	Rainer Silbereisen (GE)
Members:	Avshalom Caspi (UK), Huichang Chen (CN), Silvia H. Koller (BR), Willem Koops (NL), Brett Laursen (USA), Rolf Loeber (USA), Ivan Mervielde (BE), Bame Nsamenang (CM), Jari-Erik Nurmi (FI), Marie Pecheux (FR), Anne C. Petersen (USA), Candida Peterson (AU), Kenneth Rubin (USA), Barry Schneider (CA)

Local Organising Committee

Chair:	Leni Verhofstadt-Denève (BE)
Co-chairs:	Michel Born (BE), Alfons Marcoen (BE)
Secretary-Treasurer:	Luc Goossens (BE)
Secretary-Treasurers (executive assistance)	Peter Dejonckheere (BE), Leen De Medts (BE)
Advisors:	Avshalom Caspi (UK), Marie Pecheux (FR)
Members:	Willem Koops (NL), Ivan Mervielde (BE)

Pre-conference Workshop Committee

Chair:	Caroline Braet (BE), Marcel van Aken (NL)

Co-ordinator of Publishers' Book Exhibits

Karla Van Leeuwen (BE)

Submissions

The Programme Committee invites submissions for symposia and posters to be presented at the 2004 ISSBD Meeting in Ghent, Belgium. Submissions are welcome from ISSBD members, non-members, students, faculty and researchers. Submissions are encouraged from all fields of behavioral development.

Symposia should include presentations on a specific theme and involve an integration of findings from different research projects. Symposia are organized by two co-conveners from different continents (strongly recommended) and will be scheduled for 1 hour and 45 minutes. They will include 3 or 4 presenters (each 30 minutes or 23 minutes respectively), plus 13 minutes for a discussant-lead dialogue with the audience. Symposium papers will be reviewed by two experts. In case of a substantial disagreement, the opinion of a third expert will be solicited.

> *Very important remark: A thorough inspection (both grammatical and stylistical) of your abstract should be made by an academic native speaker of English! This applies also for poster abstracts!*

Individual **posters** will be accepted for the presentation of theoretical or empirical research.

All proposals for **symposia** must be **received** by **September 10, 2003** (decision by December 15, 2003)**.**

The deadline for the **receipt** of **poster proposals** is **October 1, 2003** (decision by December 20, 2003)**.**

Since proposals will be sent to international review panels for evaluation, we will be unable to accept proposals submitted after the deadline.

The scientific programme will span four days, starting on Monday morning, July 12, 2004. Your submission form should state any religious reason for being unable to present on any of the four days. Otherwise, submission indicates willingness to present on any of the four days.

Electronic submission of abstracts is strongly preferred. Abstracts should be submitted in one of the two following ways:

1. ***Online via*** http://allserv.rug.ac.be/ISSBD2004

or

2. ***Electronically by e-mail via*** issbd@semico.be

If electronic submission is impossible, please request submission forms from: ISSBD, Semico n.v., Korte Meer 16, 9000 Ghent, Belgium
Semico n.v., Korte Meer 16, 9000 Ghent, Belgium
Phone: +32 9 233 86 60 // Fax: +32 9 233 85 97

Review panels: topics

1. Infancy
2. Perceptual, sensory, motor & psychobiological processes
3. Children at risk & atypical development
4. Adolescence
5. Language
6. Cognition
7. Educational issues & school context
8. Social development & peer relations
9. Affect & temperament
10. Parenting, family & kinship relations
11. Cultural & cross-cultural studies
12. History, theory & interdisciplinary issues
13. Adult years & ageing
14. Methodology & statistics
15. Life span
16. Development & psychopathology

Review Panels: members

Gerald Adams (Canada), Lieselotte Ahnert (Germany), Francoise Alsaker (Switzerland), Lewis Aptekar (USA), Jeffrey Arnett (USA), Ora Aviezer (Israel), Jeffrey Bisanz (Canada), Kathleen Bloom (Canada), Klaus Boehnke (Germany), Jeanne Brooks-Gunn (USA), John Bynner (England), Charissa Cheah (USA), Catherine Cooper (USA), Ann Crouter (USA), Pierre Dasen (Switzerland), Michel Deleau (France), Anik de Ribaupierre (Switzerland), Alain Desrochers (Canada), Judith S. Dubas (Netherlands), Lutz Eckensberger (Germany), Constance Flanagan (USA), Nancy Galambos (Canada), Xiaojia Ge (USA), Megan Gunnar (USA), Paul Hastings (Canada), Christopher Hertzog (USA), Brian Hopkins (UK), Margaret K. Kerr (Sweden), Thomas Kindermann (USA), Reinhold Kliegl (Germany), Silvia H. Koller (Brazil), Nina Koren-Karie (Israel), Lothar Krappmann (Germany), Michael Lamb (USA), Kang Lee (Canada), Jackie Lerner (USA), Morag MacLean (UK), Alfons Marcoen (Belgium), Zopito Marini (Canada), Greg Moran (Canada), Carmen Moreno (Spain), Ellen Moss (Canada), Tullia Musatti (Italy), Adam Niemczynski (Poland), Peter Noack (Germany), Jari-Erik Nurmi (Finland), David Oppenheim (Israel), Hellgard Rauh (Germany), M. Clotilde Rossetti-Ferreira (Brazil), Colette Sabatier (France), Abraham Sagi (Israel), Wolfgang Schneider (Germany), Rachel Seginer (Israel), Felicisima Serafica (USA), Shmuel Shulman (Israel), Peter K. Smith (UK), Christiane Spiel (Austria), Dale Stack (Canada), Ursula Staudinger (Germany), Howard Steele (UK), Harold Stevenson (USA), Elizabeth Susman (USA), Doug Symons (Canada), Keiko Takahashi (Japan), John Taplin (Australia), Georges Tarabulsy (Canada), Odile Tessier (Canada), Marcel van Aken (The Netherlands), Anna von der Lippe (Norway), Fred Vondracek (USA), Alexander von Eye (USA)

Venue

The congress site (Ghent University & International Congress Centre – ICC) is situated in the charming *Citadelpark*, adjacent to the Botanical Garden of the University featuring more than 7500 different plant species. This congress site underscores the importance of Ghent as a historical business centre in Flanders (Belgium). Its central location, its proximity to the railway station and to the city centre, and the lush green surroundings turn this site into an attractive and convenient venue for the ISSBD Congress.

Accommodation

The local committee holds allocations in all major hotels in Ghent at advantageous rates. The average price, incl. breakfast, is about 80 euros, with prices ranging from 60 to 210 euros. Moreover, low-budget rooms are available in student dormitories (near the congress site) and as Bed & Breakfast accommodation. All prices in Belgium include VAT and service. Because of the peak demand for hotel rooms during the summer season, we advise you to make early reservations. The exact prices will be posted in October 2003.

Twice a day, a free shuttle service will provide transport from a central location near the hotels to the congress site.

Registration information

Registration forms will be posted on the congress website (http://allserv.rug.ac.be/ISSBD2004) in October 2003. They will also be sent to all ISSBD members as a part of the ISSBD Newsletter. Non-members wishing to receive copies by e-mail/post should contact us on issbd@semico.be.

Registration Fee

The registration fee includes participation in the opening ceremony and welcome reception on July 11, 2004, full access to the scientific programme on July 12-15, coffee breaks, the farewell party, congress documentation and the abstract book. Special support will be offered to encourage participants from developing countries. Please check our web-pages for future updates. Separate registration is required for the pre-conference (approximately 40 euros for early registration; reduced fees are possible for delegates from developing countries).

Ghent: a city you never will forget!

Ghent lies in the heart of Flanders, between Bruges, Antwerp and Brussels. Its rich heritage has shaped the city into a living museum with a "medieval skyline". It is by no means a coincidence that Ghent, the capital of East Flanders, is often referred to as the historic heart of Flanders, a city of all times, and as one of the most beautiful historic cities in Europe. The city combines an impressive past with a bustling present. Its historic heart boasts dozens of places of interest. St. Michael's bridge offers a wonderful vista of the Ghent skyline with the three impressive towers of St. Nicholas' Church, the Belfry with its bell tower, and the Cathedral of Saint Bavon, which contains the world-famous painting *The Adoration of the Lamb* by Jan van Eyck.

Traces of the Middle Ages have been preserved in a lot of places. The old port with its guildhalls on the *Graslei* and *Korenlei* is but one example of the beautiful views this town has to offer.

Not far from the Graslei arises the magnificent Castle of the Counts (*Gravensteen*), once the medieval fortress of

Conference Registration and Fees

Registration	Early Before February 1, 2004 Euro	Middle February 2 to May 31, 2004 Euro	Late From June 1, 2004 & on-site Euro
Normal fees			
Members	227	284	351
Non-Members	324	386	448
Students			
Members	103	132	147
Non-Members	156	183	201
Reduced fees *			
Members	103	132	125
Non-Members	113	125	136
Accompanying person **	50	50	60

* The "reduced fee" category in the table applies to scholars from countries with currency restrictions recognized for ISSBD membership

** Including opening ceremony, welcome party and farewell party the Counts of Flanders. Few cities can offer such cultural wealth combined with Flemish charm. The conference venue is at walking distance from the historic heart of the city, blending science and culture. Moreover, there are two famous museums close to the congress centre. **The Museum of Fine Arts** features a superb collection of paintings, sculptures, tapestries, engravings and drawings by European Masters from the 14th to the first half of the 20th century.

The works of the Flemish painting schools, from Hieronymus Bosch to Gustave van de Woestijne and Paulus Potter, constitute the highlights of the collection. They are supplemented by the works of Modernists such as Magritte and Servranckx.

The **Ghent City Museum of Contemporary Art (S.M.A.K)** boasts an impressive collection of Belgian and international modern art. The major artistic trends since 1945 are represented by Bacon, Beuys, Panamarenko, Broodthaers, Long, Neuman. The museum evolves constantly and has earned an international reputation by organizing outstanding exhibitions.

Not only art lovers but literally everyone can find something here to suit their taste. Ghent offers plenty of shops and restaurants and an exciting nightlife. Ghent can be discovered by boat, carriage, bicycle or on foot. The official language in Ghent is Dutch, but most people speak French, English and/or German as well. The Belgian currency unit is the euro. There are exchange offices and banks in the city centre. All major credit cards are accepted in hotels, restaurants and shops.

Participants and accompanying persons are warmly invited to explore the rich historical, cultural and social aspects of Flanders. Excursions to various famous places in Flanders will be organized on every congress day. Coach excursions are organized by licensed coach operators with English-speaking guides.

Ghent is easily accessible by road, railway and airplane. Brussels Airport is located at approximately 50 km from the city of Ghent. From the airport there is a direct railway connection to Ghent. The journey takes about 40 minutes. From London (Waterloo Station), the Eurostar brings you to Ghent in less than 3 hours. Starting from Paris, the Thalys train will take you to Brussels in about 1 hour. Coming by car, you will find Ghent at the intersection of the E17-E40 trans-European motorways.

In 2004 the flamboyant folkloristic “Ghent Festivities” will take place from July 17 to 26, just after the ISSBD meeting. Perhaps this is one more reason to attend the meeting and to prolong your stay in this sparkling city with a few more days… So see you in Ghent in July 2004!

Visit us at: http://allserv.rug.ac.be/ISSBD2004

ISSBD Asian Regional Workshop on Parental Beliefs, Parenting, and Child Development from Cross-Cultural Perspectives

Seoul National University, Seoul, Korea, June 16-18, 2003

On behalf of the ISSBD and Korean organizing committee, we invite you to the International Society for the Study of Behavioural Development (ISSBD) Asian Regional Workshop to be held at Seoul National University, Seoul, Korea, June 16-18, 2003. Please visit our website on www.issbd.or.kr for details.

Theme of the workshop

The theme of the workshop is "Parental Beliefs, Parenting, and Child Development from Cross-Cultural Perspectives." The aims of the workshop are to introduce Asian scholars to the literature and methodologies pertaining to the study of; (a) parents' beliefs about child development, and (b) parents' socialization goals in Western and Asian cultural settings. Furthermore, it is intended to provide the scholars from Asia and other continents with information about the diversity of parental beliefs within Asian cultures.

Registration and Financial Support

Register for the workshop online: http://www.issbd.or.kr. Deadline for registration is April 15, 2003. Thirty qualified young scholars from developing countries will receive financial support to attend the workshop. Deadline for financial application is March 31, 2003.

Contact Address

For more information, please contact:
Dr. Yi, Soon Hyung, President
Korean Association of Child Studies
Fax: 82-2-887-9579
E-mail: k-children@hanmail.net
Homepage: http://www.issbd.or.kr

MAJOR CONFERENCES OF INTEREST

2003 May 29–June 1

The 15th Annual Convention of the American Psychological Society

Location: Atlanta, Georgia, USA

Contact: Barbara Mitchell-Swain, E-mail: *bmitchell.swain@aps.washington.dc.us*

Website: www.psychologicalscience.org

2003 July 12–16

6th Regional Congress of the International Association for Cross-Cultural Psychology Regional Conference (IACCP)

Location: Budapest, Hungary

Contact: Dr. Marta Fülop, E-mail: *fmarta@mtapi.hu*

Website: www.psychology.hu/iaccp

2003 August 7–10

The 111th Annual Convention of the American Psychological Association

Location: Toronto, Ontario, Canada

Website: www.apa.org

2004 August 8–13

XXVIII International Congress of Psychology

Location: Beijing, China

Website: www.iupsys.org

2006 July 16–21

26th International Congress of Applied Psychology of the International Association of Applied Psychology

Location: Athens, Greece

Contact: *icap2006@psych.uoa.gr*

Website: www.iaapsy.org

International Society for the Study of Behavioural Development
2003 Membership Renewal

1. Membership Information. Please verify the listing below. Cross out incorrect information and enter changes in the space provided. PLEASE PRINT CLEARLY! Use Ø for the numeral zero, and I (three lines) for the letter.

(Please print clearly)

Family Name

Given Name

Address

Country

Phone

Email

2. Membership Status. For all membership categories except *Reduced Regional*, **one or two year membership is available**. Please indicate membership category. Note that only Full members and Student Journal members receive the *International Journal of Behavioural Development*. All members receive the ISSBD Newsletter, a Directory of Members, and reduced registration for ISSBD biennial meetings. Student rates are not available for more than three years. Student applications must be accompanied by a letter from a Professor or university official attesting to current student status.

Membership Category	One Year	Two Year	**NEW!** Two-Year 2-Installment Option
Full	______(U.S. $95)	______(U.S. $160)	______($90 + $70)
Student: Journal	______(U.S. $47)	______(U.S. $80)	(For payment by credit card for full membership only. Details below)
Student: No Journal	______(U.S. $30)	______(U. S. $46)	
Emeritus	______(U.S. $30)	______(U.S. $46)	
Spouse (provide name of spouse paying full dues)	______(U.S. $30)	______(U.S. $46)	
Reduced Regional (see instructions on reverse)	______(U.S. $10)	______(U.S. $15)	
Optional Gift to ISSBD	______	______	______
Total	______	______	______

3. Payment. Choose one of the following two options. No other forms of payment can be accepted. Do not send cash.

(1) Cheque: Cheques must be in U.S. dollars, Euros (E1.00 = $US1.00), or Canadian dollars ($Cad1.60 = $US1.00). Please make check payable to ISSBD. Your name and address should appear on the cheque.

New!

(2) Credit Card: Only Visa or MasterCard can be accepted. Indicate type of credit card and expiration date, write credit card number in large, clear numerals, and sign your name.

(3) Two installment option for two year membership paid by credit card only. Please debit $90 now, and $70 on Dec 1, 2003.

Visa ☐ MasterCard ☐ Expiration Date (MM/YY) __________ Signature ______________________________

Card # ☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

Membership encompasses the calendar year. Applications received prior to October are credited to the current year (and include back issues of publications). Applications received after October are effective the following year. Mail application and payment to ISSBD Membership Secretary and Treasurer, School of Psychology, University of Ottawa, 120 University St., Ottawa, ON, Canada, K1N 6N5. Email inquiries may be addressed to issbd@uottawa.ca. The ISSBD home page is www.issbd.org.

INTERNATIONAL SOCIETY FOR THE STUDY OF BEHAVIOURAL DEVELOPMENT

2003 New Member Application

I New Members should sign the following statement.

I wish to become a member of the INTERNATIONAL SOCIETY FOR THE STUDY OF BEHAVIOURAL DEVELOPMENT. I understand that membership dues entitle me to receive the International Journal of Behavioural Development, ISSBD Newsletters, a Directory of Members, and all other rights and perquisites of members in good standing.

Name ____

Date _________________________

II. Membership Status.

For all membership categories except Reduced Regional, one or two year membership is available. Please indicate membership category and complete the form on the reverse. Note that all members receive the International Journal of Behavioural Development, ISSBD Newsletters, a Directory of Members, and reduced registration for ISSBD biennial meetings. The student rate is available for no more than three years. Student applications must be accompanied by a letter from a Professor or university official attesting to current student status.

One Year Membership (2003)

Full (U.S. $95) ☐

Student (U.S. $47) ☐

Emeritus (U.S. $47) ☐

Spouse (U.S. $47) ☐

Name of spouse paying Full dues: ☐

Reduced Regional (see attached instructions): Category I (U.S. $10) ☐ Category II (U.S. $15) ☐

Two Year Membership (2003 and 2004)

Full (U.S. $160) ☐

Or choose the 2 Year 2 Installment option (available only with the two year full membership option). Pay US$90.00 now and US$70.00 on December 1 2003. In order to choose this option you must pay by credit card. ☐

Student (U.S. $80) ☐

Emeritus (U.S. $46) ☐

Spouse (U.S. $46) ☐

Name of spouse paying Full dues: ☐

INTERNATIONAL SOCIETY FOR THE STUDY OF BEHAVIOURAL DEVELOPMENT

2003 New Member Application *(continued)*

III. Payment.

Cheque: Cheques must be in U.S. dollars, Euros (E1.00 = $US1.00), or Canadian dollars ($Cad1.60 = $US1.00). Please make check payable to ISSBD. Your name and address should appear on the cheque.

Credit Card: Only Visa or MasterCard can be accepted. Indicate type of credit card and expiration date, write credit card number in large, clear numerals, and sign your name.

Two installment option for two year membership paid by credit card only. Please debit $90 now, and $70 on Dec 1, 2003.

Visa ☐ MasterCard ☐

Expiration Date (MM/YY)

Card Number

Signature

Membership encompasses the calendar year. Applications received prior to October are credited to the current year (and include back issues of publications). Applications received after October are effective the following year. Mail application and payment to:

Barry Schneider
ISSBD
University of Ottawa
School of Psychology,
University of Ottawa,
120 University St.,
Ottawa, Ontario, KIN 6N5
Canada
Email: issbd@uottawa.ca

Membership information is also available at http://www.issbd.org.

IV. New Member Survey.

How did you first hear of ISSBD? ....

....

What prompted you to join ISSBD? ....

....

What are the most important benefits of ISSBD membership? ....

....

INTERNATIONAL SOCIETY FOR THE STUDY OF BEHAVIOURAL DEVELOPMENT

2003 New Member Application *(continued)*

V. Membership Information.

Please print or type the following information about yourself.

Name (Given/Middle/Family) ____________________

Title ____________________

Mailing Address

____

____

____

____

Work Telephone ____________________

Home Telephone____________________

E-Mail ____________________

Fax ____________________

Period of life span studied (circle all that apply):

1 = Prenatal; 2 = Infancy; 3 = Preschool; 4 = Middle Childhood;
5 = Adolescence; 6 = Adulthood; 7 = Aging; 8 = Life Span

Scientific discipline and research area (circle all that apply):

1 = Psychology; 2 = Child Development; 3 = Human Development; 4 = Gerontology;
5 = Education; 6 = Sociology; 7 = Psychiatry; 8 = Medicine;
9 = Anthropology; 10 = Developmental Psychobiology; 11 = Linguistics

Reduced Regional Membership.

Dues are based on World Bank categories for lending eligibility. Fees include the International Journal of Behavioural Development, ISSBD Newsletters, a Directory of Members, and reduced registration for ISSBD meetings. Please send payment to the corresponding Regional Office or to the Office of the ISSBD Membership Secretary and Treasurer. Reduced Regional Membership is available in one year increments only.

Baltic Countries:

Tiia Tulviste
Moisavahe 42-29
EE 2400 Tartu
Estonia

Belarus:

Yuri Karandashev
ISSBD Regional coordinator in Belarus
Belarussian State Pedagogical University M. Tank
Department of Developmental and Educational Psychology
Sovietskaya Str. 18
220809 Minsk
Belarus

INTERNATIONAL SOCIETY FOR THE STUDY OF BEHAVIOURAL DEVELOPMENT

2003 New Member Application *(continued)*

China:

Huichang Chen
Institute of Developmental Psychology
Beijing Normal University
Beijing
P.R. China

India:

Suman Verma
Dept. of Child Development
Govt. Home Science College
S10 Chandigarh 160011
India

Indonesia:

Hera L. Mikarsa
University of Indonesia
Faculty of Psychology
Kampus Baru UI
Depok
Indonesia

Russia:

Tatiana Yermolova
UL. Gilyarovskogo 12
K.V. 65
Moscow, 12909
Russia

West and Central Africa:

Jean Tano
Flash Universite D'Abidjan
Department de Psychologie
08 B.P. 168
Abidjan 8
Cote D'Ivoire

Category I ($10 USA)
Afghanistan, Albania, Algeria, Angola, Armenia, Azerbaijan, Bangladesh, Belarus, Belize, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, China, Colombia, Comoros, Congo, Costa Rica, Côte d'Ivoire, Cuba, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Ethiopia, Fiji, Gambia, Georgia, Ghana, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, India, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Kiribati, Kyrgyz Republic, Lao, Latvia, Lesotho, Liberia, Lithuania, Macedonia, Madagascar, Malawi, Maldives, Mali, Marshall Islands, Mauritania, Micronesia, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Papua New Guinea, Pakistan, Paraguay, Peru, Philippines, Romania, Russia, Rwanda, Samoa, Senegal, Sierra Leone, Solomon Islands, Somalia, South Africa, Sri Lanka, St. Vincent, Sudan, Suriname, Swaziland, Syria, Tajikistan, Tanzania, Thailand, Togo, Tonga, Tunisia, Turkmenistan, Uganda, Ukraine, Uzbekistan, Vanuatu, Vietnam, Yemen, Zambia, and Zimbabwe.

Category II ($15 USA)
Botswana, Brazil, Chile, Croatia, Czech Republic, Estonia, Gabon, Grenada, Hungary, Lebanon, Malaysia, Mauritius, Mexico, Palau, Panama, Poland, Slovak Republic, St. Lucia, Trinidad and Tobago, Turkey, and Venezuela.

ISSBD