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increased activity in sensory areas of the brain normally associated with stimulus-driven processing, and decreased activity in areas normally associated with higher-cognitive processing. Magnetic resonance imaging (MRI) morphometry shows volume deficits in the cerebellum, the brainstem, and posterior corpus callosum. Regarding the cerebellar abnormalities, a subgroup shows increased cerebellar volume. Using either MRI volumetric analysis or measures of head circumference, the autistic brain appears to involve transient postnatal macroencephaly. Using functional MRI (fMRI), abnormalities in autism have also been found in the amygdala and the orbito- and the medial frontal cortex, and these are associated with the empathizing deficits.

Genetic and hormonal aspects

The sibling risk-rate for autism is approximately 4.5%, or a four-fold increase over general population rates. Regarding twin studies, when a narrow phenotype is considered, 60% of monozygotic (MZ) pairs are concordant for autism versus no dizygotic (DZ) pairs. When a broader phenotype is considered, 92% of MZ pairs are concordant versus 10% of DZ pairs. Molecular genetic studies are under way. The marked sex ratio in autism may reflect genes and/or hormonal factors. Currently there are clues that foetal testosterone (FT) may play a role: within normal development, FT is inversely correlated with frequency of eye contact, rate of vocabulary development, empathy and social skills; and within normal development, FT is positively correlated with narrow interests and systemizing.

Early diagnosis and intervention

The earliest age at which classic autism has been reliably diagnosed is at 18 months, following a screening using an instrument called the CHAT (Checklist for Autism in Toddlers) which tests for the absence of 'joint attention' behaviours such as pointing and gaze following, and the absence of pretend play, all behaviours that are normally present by this age. Asperger syndrome has been reliably diagnosed by age 5 years, following a screening using an instrument called the CAST (Childhood Asperger Screening Test). The most effective interventions are special education, such as social skills teaching and speech therapy, the key ingredients being that the methods are highly structured, intensive, one-to-one, and begin early.

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http://www.nas.org.uk/ The National Autistic Society is the main charity in the UK for families with a child on the autistic spectrum.

http://www.autismresearchcentre.com/ The Autism Research Centre, Cambridge University, contains a searchable database of publications.

automatic appraisal The notion of automatic appraisal accommodates important observations regarding the elicitation of emotions. A first observation is that there are few if any one-to-one relations between stimuli and emotions. The same emotion (e.g. *anger) can be produced by different stimuli (e.g. an insult, a computer crash), and the same stimulus (e.g. an insult) can lead to different emotions (e.g. anger, *fear) on different occasions or in different individuals. Appraisal is invoked to explain this variable relation. It is the process that determines whether an emotion follows, and which one (see APPRAISAL THEORIES). Appraisal theorists have listed a number of appraisal variables or criteria, each of which deals with a specific aspect of the encounter, such as *novelty, *goal relevance, *motive consistency, *intrinsic pleasantness, *agency/intentionality, and *coping potential. The outputs of these components combine into patterns of appraisal, which determine the nature of the ensuing emotion.

A second observation is that emotions are often elicited unexpectedly and unbidden. Thus, it is assumed that appraisal is often automatic. Most appraisal theorists assume that appraisal comes in (at least) two flavours: one is automatic, the other is nonautomatic. The assumption that appraisal can and often does occur in an automatic way is not an accessory assumption. Within the prevailing scientific climate, a process is accepted as a valid cause of emotions only when it is able to operate in an automatic sense. The notion of automatic appraisal also dovetails with the idea that emotions are adaptive in that they are able to mobilize the organism in a fast, automatic sense (e.g. in response to a life-threatening event).

The concept of automaticity is an umbrella term for a number of independent features such as unconscious, uncontrolled in the counteracting sense, unintentional (i.e. uncontrolled in the promoting sense), efficient (i.e. requiring only minimal attentional capacity), and fast. According to a decompositional view of automaticity (Moors and De Houwer 2006), each feature should be investigated separately. The presence of one feature cannot be inferred from the presence of another. For instance, evidence that a process is unconscious is not evidence that it is also unintentional. Features of (non) automaticity can be taken to provide information about operating conditions (Bargh 1992). Automatic processes are those that operate under suboptimal conditions

(such as a lack of intention, consciousness, attentional capacity, and/or time); nonautomatic processes are those that require optimal conditions.

To demonstrate that an appraisal variable can be processed in an automatic way, one has to demonstrate (1) that the appraisal variable under study was processed (and not some other variable), and (2) that it was processed automatically (i.e. under suboptimal conditions). Support for the automaticity of individual appraisal variables has been obtained with various experimental research methods (both behavioural and neuroscientific). Support for the automatic detection of goal relevance and novelty comes from studies using attentional bias tasks (e.g. the modified Stroop task, the dot probe task, the spatial cueing task, and the visual search task) demonstrating selective attention to goal-relevant compared with neutral stimuli (Gati and Ben-Shakar 1990). Support for automatic appraisal of novelty also comes from neuroscientific studies (e.g. Berns *et al.*1997). The automatic appraisal of intrinsic pleasantness is amply documented in affective priming studies (Draine and Greenwald 1998) as well as in studies using the event-related potential method (Grandjean and Scherer 2008). Support for the automatic appraisal of motive consistency has been obtained with variants of the affective priming task, in which goals were manipulated and intrinsic *valence was kept neutral (Moors *et al.* 2005). There is also evidence that the appraisal component of agency/intentionality can be automatic. With regard to intentionality, recent studies have shown that people automatically attribute intentionality when seeing or reading about other people's actions (e.g. Hassin *et al.* 2005). Finally, data on the automatic assessment of control (Aarts 2007) and relative power or status (Moors and De Houwer 2005) suggest the possibility of automatic appraisal of coping potential.

Future efforts in both behavioural and neuroscientific studies should be more concerned (1) with clearly identifying and delineating the appraisal variables at stake, (2) with extending the range of automaticity features examined, and (3) with investigating whether the values on several appraisal variables can also be integrated in an automatic manner.

AGNES MOORS

autonomic nervous system The autonomic nervous system (ANS) is the set of peripheral nerves and ganglia, together with their central brain components, which innervate visceral and other internal organs of the body. This system has variously been termed the sympathetic nervous system, the vegetative nervous system, the visceral nervous system, or the ganglionic nervous system, but is now generally referred to as the autonomic nervous system after Langley (1916; see also Ackerknecht, 1974, for early history). Descending (efferent) influences of the ANS serve to regulate the viscera and internal functions of the body, while ascending (afferent) components carry information on visceral states to reflex systems as well as higher levels of the brain. The ANS comprises the sympathetic division, the parasympathetic division, and the enteric (gut) division, although the latter is often considered its own distinct system but is innervated by the other autonomic divisions.

Table 1. Functional effects of sympathetic and parasympathetic activation

Organ system	Sympathetic	Parasympathetic
Heart	↑ Heart rate	↓ Heart rate
	↑ Contractility	Inhibits sympathetic
Cardiovascular	↑ Blood pressure	↓ Blood pressure
Pupils	Dilates pupil	Constricts pupil
Metabolism	↑ Metabolism	↓ Metabolism
	↓ Insulin release	↑ Insulin release
Gut	Slows digestion	Promotes digestion

Many visceral organs are dually innervated by both the sympathetic and parasympathetic systems, which generally exert opposing actions. Walter Cannon (1871–1945) was an important early experimentalist and theorist, who proposed that the sympathetic system is particularly important in emergency states and adaptive threats, and serves to mobilize the organism for fight or flight. This division, he thought, was especially important in maintaining internal conditions in a steady state that is necessary for life, a process he termed homeostasis (Cannon 1932). In contrast, the parasympathetic system serves more as a conservation system, which promotes calm, decreases energy output, increases digestion, and otherwise opposes the activational effects of the sympathetic division. Table 1 lists some functional consequences of sympathetic and parasympathetic activation.

Because visceral organs are often dually innervated, and sympathetic and parasympathetic systems tend have opposing actions, it is often the case that the two divisions show reciprocal patterns of activation. Increased activity of one branch is often accompanied by decreased activity of the other, which can synergistically effect a common outcome. For example, activation of the sympathetic system, which speeds the beat of the heart (see CARDIOVASCULAR SYSTEM), may be accompanied by inhibition of the parasympathetic system, which normally serves to slow the heart beat. This reciprocal pattern of autonomic control affords a broad, synergistic control over the end organ, and is rather characteristic