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Executive control / Cognitive control

A key component in modern theories of mental functioning is the executive control system. Humans plan and carry out many complex tasks; some of which can be carried out automatically but many of which seem to require higher-level control (processes such as planning, abstract thinking, learning rules, or inhibiting appropriate actions). Since human beings' mental resources are limited it is hypothesized that in order to make efficient use of them there must be a coordinating system.

Originally, theories of an executive system came about via observation of patients who had suffered damage to frontal regions of their brain. These patients seemed to perform normally on many laboratory-based tasks of memory, language and intelligence, but performed poorly on everyday tasks (such as planning a visit to the shops).

Norman and Shallice's (1986) influential model proposes two interacting systems of cognitive control: **contention scheduling**, and the **supervisory attentional system**.

At the lower level is the **contention scheduling system (CS)**. Contention scheduling is for well-learned, habitual tasks which are performed automatically (unconsciously). Independent modular neural structures, called schemata,

control these actions.

Contention

scheduling controls

the selection of

schemata through a

decentralised process

(i.e. there isn't

normally a higher-

level bit that decides

which schemata is

selected for a

particular task)

process of

competitive and

cooperative activation

of schemata by

sensory input, and

input of other

schemata. A specific

schemata becomes

active, and its

corresponding action

or cognitive operation

is performed, when

its activation

threshold is reached.

Above the level of the

contention scheduling

system is

the **supervisory**

attentional system

(SAS). The SAS

doesn't have to be

engaged for simple

tasks which can be

performed

automatically, instead

it is needed for:

1. Tasks that
involve

planning or
decision
making.

2. Tasks that
involve error
correction or
troubleshootin
g.
3. Situations
where
responses are
not well-
learned or
contain novel
sequences of
actions.
4. Dangerous or
technically
difficult
situations.
5. Situations
which require
the
overcoming of
a strong
habitual
response or
resisting
temptation.

The SAS does not
control actions
directly, but instead
modulates the
activation thresholds
of particular schemata
- this way it can cause
a bias towards or

away from particular schemata. Shallice (1988) says that the experience of willed volition is equivalent to this biasing of schema activation thresholds.

Below is a simplified diagram of how the SAS and CS systems are thought to interact:

**How
executive**

control relates to hypnosis

A key goal of many hypnosis researchers is to tie theories of hypnosis in with mainstream theories of human psychological functioning. Hilgard was one of the first to discuss hypnosis with reference to control systems, and he believed that "*any satisfactory theory of hypnosis should also be a theory bearing on psychology at large*" ([Hilgard, 1991](#)). Modern theories discuss the ability of hypnotised individuals to shift and divide attention: as such, an understanding of how hypnosis and suggestion affect the functioning of the executive control system is fundamental to a full theoretical understanding of hypnosis. See the [theories](#) page for information on how modern theorists have

tried to explain
hypnosis using
concepts from
cognitive
neuroscience.

Key readings in cognitive control

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