Week 5 – Attention – Historical origins, early & late selection:

Attention:
→ The brain's ability to self-regulate input from the environment.
→ Used in two senses in psychology:
1. **Sustained attention (alertness):** related to psychological arousal (a continuum from drowsy & inattentive to alert & attentive) or a problem of vigilance **(**performance declines over a long watch – e.g. in radar operators, quality control inspectors).
2. **Selective attention:** we are limited in the number of stimuli we can process. We attend to one stimulus at the expense of others. People have limited capacity systems – we don't treat all stimuli equally.

The cocktail party problem (*Cherry, 1953*):
→ In a crowed environment, we can 'pick out' one conversation from background noise.
→ 'Picking out' processes take sound energy at the ear, and translate that sound into intelligible speech which then gets translated into understanding/meaning. Translation is selective – stimuli are not all treated equally.
→ Cherry was interested in what happens to unattended messages in this scenario.
→ Cherry asked participants to listen to two simultaneous passages of speech (known as *dichotic listening)*, asking participants to attend to one passage (the attended channel) and ignore the other (the unattended channel).
→ Cherry found that participants had no memory of the unattended message. He then tried switching the language on the unattended channel from English to German, which they still did not notice. Then, he switched the speaker from male to female, which was noticed. He then played the speech backwards, which people noticed was 'something queer' but they still couldn't pinpoint what it was. He then switched the voice to a 400-cps pure tone, which they reliably noticed.
→ Only superficial (physical) features of the unattended message were perceived (i.e. things distinguishing voice & gender). The semantic content of the message was *not* analysed (its language & meaning).
→ This suggests that **sensory (physical or acoustic) features of stimuli are processed *preattentively* (automatically) -** regardless of whether we are attending to the associated stimulus**, whereas meaning requires *focal attention* (where one focusses their attention on a particular stimulus).

Criticisms of Cherry:
→ His experimental method looked at what people remembered rather than what people perceived. This method confounds perception and memory.

Source localisation in space:
How do we select the attended message?
→ **Our ability to localise the source of the sound in space is key**. This is done via phase differences in the arrival times of sounds in our left & right ears. We resolve these

phase shifts cognitively in order to subjectively & psychologically localise sound in space.

Binaural presentation:
→ *Cherry* presented a version of the task involving binaural listening, in which both messages were presented in the same voice to both ears. People were instructed to shadow one of the messages on the basis of the content, which people found next to impossible to do (because they were unable to localize the source of the sound).

Filter theory (*Broadbent, 1958*):
→ Attention acts as a filter to select stimuli for further processing.
→ **Attentional selection** is based on simple physical features (location in space, voice etc.). Those simple features/properties are extracted (processed) pre-attentively – not requiring access to the limited capacity channel.
→ *Meaning* is extracted in a limited capacity channel, which translates sensory information (sound) into conceptual understanding. This can only be done on the contents of one sensory channel at a time.
→ **Meaning** requires access to the limited capacity channel, and can only be extracted if the stimulus is attended to.
→ The selective filter precedes the limited capacity channel, protecting it from overload. There is only one arrow going from the filter to the channel – suggesting that we can only process one thing at a time.
→ All stimuli are stored briefly in the short-term store (STS) – which stores unanalysed sensory material. This is known as iconic (visual) or echoic (auditory) memory.
→ Sensory information decays quickly if not selected.

Evidence for filter theory:
→ Interaction of short-term store (STS) and filter –
Dichotic digit stream: when people were instructed to recall digits in temporal order, they only got 3-4 digits correct. Whereas, when instructed to do ear-by-ear recall, they got 6 digits correct. This is because ear-by-ear recall only needs 1 filter switch, whereas 5 switches are needed to follow temporal order. Switches take time, which decays the STS trace.

The failure of filter theory:
Gray & Wedderburn (1960):
→ *Gray & Wedderburn* conducted a split span experiment ('Dear Aunt Jane') with meaningful material.
→ Broadbent's theory predicted that people would recall words in a way that minimized the number of filter switches.
→ However, this is not what *Gray & Wedderburn* found. Instead, they found that preferred recall order followed the semantic context, not the presentation ear.
→ This showed that people change the way they filter material based on its semantic context.

Moray (1959):

→ Had participants complete a dichotic listening task, where they listened to two passages of continuous speech (one to the left ear and one to the right). Participants were asked to shadow only one of these passages.
→ However, he embedded the person's name in the unattended channel.
→ He found that people often detected the occurrence of their own name on the unattended channel.
→ This selection was based on <u>meaning</u>, and is not consistent with the idea that meaning is only extracted on the attended channel.
→ This presents the same problem for filter theory as *Gray & Wedderburn's* study, because if the filter completely blocks the semantic content (preventing anything from getting through to the limited capacity channel that is being unattended to), then it shouldn't be possible to do this.

The early vs. late selection debate:

Early selection theory (Treisman, 1961):
→ Sensory analysis takes raw wave form and converts it into sound, allowing you to distinguish one sound from another.
→ Understanding sound involves semantic analysis, where sounds are made meaningful by activating stored knowledge. It is intimately connected with our stored knowledge of the meanings of language in long-term memory.

Attenuation model – a feature of early selection (Treisman, 1961):
→ Suggests that the filter partially blocks (attenuates) unattended stimuli – akin to 'turning down the volume' on the unattended channel.
→ This is in contrast to Broadbent's model, which suggests that the filter completely blocks unattended stimuli.
→ Argued that the filter is biased by context & message salience. Highly salient stimuli (e.g. one's name) & semantically related material (e.g. Dear Aunt Jane) get through the filter, shifting attention.

Evidence for early selection (Treisman & Geffen, 1967):
→ Got people to perform a dual task (doing two things at once) – a shadowing task and a detection task. The word tap was embedded in unpredictable places in both the shadowed and ignored passage.
→ This method got people to indicate what they perceived as they perceived it (rather than at the end), avoiding the methodological issues in Cherry's procedures which confounded perception & memory.
→ Found that the percentage of correct detections was higher on the shadowed channel, but was not zero on the unattended channel. This is consistent with the idea of a filter that attenuates unattended stimuli instead of blocking it altogether.

Criticisms of early selection:
→ The complexity of the filter that the theory seems to require – the filter requires an enormous amount of knowledge to respond to semantic context and distinguish related from unrelated stimuli.

$\rightarrow$ In late selection, the filter is located after the long-term memory (LTM) instead of before LTM.