Experimental approaches to repression

Nikolai Axmacher
Overview

• Introduction: repression and suppression

• Intentional memory suppression

• Repression
Overview

• Introduction: repression and suppression

• Intentional memory suppression

• Repression
Repression

- Central mechanism for generation of the psychodynamic unconscious
- Conversion: link between body and mind, energetic and hermeneutics

„The theory of repression is the corner-stone on which the whole structure of psycho-analysis rests.”

Freud, On the history of the psycho-analytic movement (1914)
Repression and suppression

- Freud (Repression, 1915): “the essence of repression lies simply in the function of rejecting and keeping something out of consciousness”

- Is unconscious repression the same as conscious suppression?

- Indeed: Freud’s original definition only referred to a process regardless of its cause or motive (see also Erdelyi, BBS 2006)
Repression ≠ suppression

<table>
<thead>
<tr>
<th></th>
<th>Repression</th>
<th>Suppression</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Executive control</strong></td>
<td>Driven by internal conflicts that reduce executive control</td>
<td>Recruits executive control</td>
</tr>
<tr>
<td><strong>Process characteristics</strong></td>
<td>Unconscious / automatic</td>
<td>Voluntary and conscious (but....)</td>
</tr>
<tr>
<td><strong>Consequences</strong></td>
<td>No erasure: „return of the repressed“</td>
<td>Erasure</td>
</tr>
<tr>
<td><strong>Content</strong></td>
<td>Only wishes/desires in psychodynamic conflicts</td>
<td>Anything</td>
</tr>
<tr>
<td><strong>Link to resistance</strong></td>
<td>Induces resistance</td>
<td>Does not induce resistance</td>
</tr>
</tbody>
</table>

Axmacher et al., Front Hum Neurosci 2010
An integrative model

Repression may consist of 2 consecutive phases (cf. talk by Beate Krickel)

Phase 1
• Inhibitory intention is conscious
• Suppression occurs deliberately / controlled
• Suppression may be successful (erasure of suppressed contents)
• Adaptive process that helps in emotion regulation (see Engen and Anderson, TICS 2018)

Phase 2 (in case phase 1 was not successful?)
• Intention to repress has become unconscious
• Repression occurs automatically / unconscious
• Repression is not successful: repressed affects remain, repressed contents may come back
• Maladaptive pathogenic process
Overview

• Introduction: repression and suppression

• Intentional memory suppression

• Repression
Intentional memory suppression: The „Think/No-Think“ paradigm

<table>
<thead>
<tr>
<th>Suppression</th>
<th>Study/Training</th>
<th>Think/No-Think Phase</th>
<th>Test Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ordeal-Roach</td>
<td>Ordeal</td>
<td>Insect r___</td>
</tr>
<tr>
<td>Respond</td>
<td>Steam-Train</td>
<td>Steam</td>
<td>Vehicle t___</td>
</tr>
<tr>
<td>Baseline</td>
<td>Jaw-Gum</td>
<td>Jaw</td>
<td>Candy g___</td>
</tr>
</tbody>
</table>

Voluntary control

**DLPFC**

Suppression

Suppressed contents are erased

**Hippocampus**

- Suppression during retrieval
- Memory for No-Think items < baseline

*Anderson et al., Science 2004*
Intentional memory suppression: The „directed forgetting“ paradigm

- Suppression during encoding
- Neural correlates: DLPFC ↑, hippocampus ↓
- Problem: Is there really inhibition in the directed forgetting paradigm (or just reduced encoding/consolidation)?
- Talks by Marie Fellner and Gerd Waldhauser: EEG evidence for consecutive employment of active inhibition and rehearsal

*Anderson and Hanslmayr, TICS 2014*
Intentional memory suppression: The „directed forgetting“ paradigm

- Intracranial EEG recordings in presurgical epilepsy patients
- DLPFC electrodes: n=13; hippocampal electrodes: n=15
- Both areas: n=6 (5 right, 1 left)

Oehrn et al., Curr Biol (in press)
Intentional memory suppression: The „directed forgetting“ paradigm

To-be-forgotten items
- DLPFC theta power ↑ → voluntary control processes
- Hippocampal alpha power ↑ → memory inhibition

Oehr et al., Curr Biol (in press); Jensen et al., TICS 2012
Intentional memory suppression: The „directed forgetting“ paradigm

To-be-forgotten items
- DLPFC theta power $\uparrow$
  $\rightarrow$ voluntary control processes
- Hippocampal alpha power $\uparrow$
  $\rightarrow$ memory inhibition

Oehrn et al., Curr Biol (in press); Jensen et al., TICS 2012
Intentional memory suppression: The „directed forgetting“ paradigm

Increased DLPFC-hippocampal communication for to-be-forgotten items

- Power correlations: DLPFC theta power, HC alpha power (lagged correlations consistent with conduction delays)

- DLPFC-HC phase synchronization (with phase lags consistent with conduction delays)

- Granger causality: directional coupling DLPFC → HC

_Fell and Axmacher, Nat Rev Neurosci 2011; Oehrn et al., Curr Biol (in press)
Overview

• Introduction: repression and suppression
• Intentional memory suppression
• Repression
Repression and free association

Free Association
↓
Repressed contents may be expressed
Resistance: delay, emotional reaction
↓
Renewed repression
C.G. Jung's association experiment
C.G. Jung's association experiment

- Operationalization of resistance and repression
- Reading of word list
- Recording of association, reaction time (RT) and skin conductance response (SCR)
- Hypothesis: RT ↑, SCR ↑ → unconscious / repressed conflict

Free association → Resistance → Repressed content (delay, emotional reaction)
Adaptation of Jung's method + subsequent cued recall

Levinger & Clark (1961): „Emotional factors in the forgetting of word associations“

Results
High SCR → forgetting
Long RT → forgetting

Replications: Rossmann, 1983; Köhler and Wilke, 1999; Thöns, 2002
Study 1: Free association to word list (Jung’s paradigm in the scanner)

- 18 healthy subjects
- 150 words (Jung’s list, extended)
- Recordings during association: RTs, SCR, fMRI – dependent on later memory

Schmeing, Kehyayan et al., PLoS One 2013
Study 1: Free association to word list (Jung’s paradigm in the scanner)

Which free associations can not be consciously remembered afterwards?

• RT ↑ → resistance?
• SCR ↑ → autonomic arousal

ACC ↑ → conflict processing?

$p_{FDR} < .05$

Schmeing, Kehyayan et al., PLoS One 2013
Study 1: Free association to word list (Jung’s paradigm in the scanner)

Control analyses for relationship between RT/SCR and memory

- Response entropy (effect can be partialed out)
- Word length (no effect on memory)
- Word frequency (no effect on memory)
- Semantic similarity (no effect on memory)
- Semantic relatedness (no effect on memory)
- Subjective valence (no effect on memory)
- Subjective arousal (no effect on memory)

But are these words really related to conflicts?

Schmeing, Kehyayan et al., PLoS One 2013
Two major changes

- stimulus sentences: neutral, negative or conflict-related
- naming of 3 words, then 1 minute of free association

Schmeing, Kehyayan et al., PLoS One 2013
### Study 2: Free association to conflict sentences

**6 neutral sentences:**
“**I try to follow the news on a regular basis**”

**6 negative sentences:**
“**I am afraid sometimes when I'm walking alone in the dark**”

**12 conflict-related sentences:** typical psychodynamic conflicts

<table>
<thead>
<tr>
<th><strong>Conflict Sentences: Desire for Care vs. Autarchy (Passive)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>All my life I got a raw deal.</td>
</tr>
<tr>
<td>I wish that finally someone is taking care of me.</td>
</tr>
<tr>
<td>I have the feeling that I always get too little.</td>
</tr>
<tr>
<td>I actually only feel good when someone is taking care of me.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Conflict Sentences: Desire for Care vs. Autarchy (Active)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>I give so much, without getting really rewarded.</td>
</tr>
<tr>
<td>I cannot say “No” if someone else is asking me for help.</td>
</tr>
<tr>
<td>I do not need nothing or anybody to be happy.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Conflict Sentences: Self-value</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Usually I have a very low self esteem.</td>
</tr>
<tr>
<td>I am often embarrassed about myself.</td>
</tr>
<tr>
<td>Sometimes I am disgusted by myself.</td>
</tr>
<tr>
<td>I often estimate myself as little competent.</td>
</tr>
</tbody>
</table>

Schmeing, Kehyayan et al., PLoS One 2013
Study 2: Free association to conflict sentences

Free associations that cannot be remembered later
RT $\uparrow$ (resistance?)
SCR $\uparrow$ (arousal)

Associations to conflict sentences:
• RT ($\uparrow$) (resistance?)
• SCR $\uparrow$ (arousal)
• Memory $\downarrow$ (repression?)
• ACC $\uparrow$ (conflict?)
• hippocampus ($\downarrow$) (memory)

Schmeing, Kehyayan et al., PLoS One 2013
Are the conflicts personally relevant?

- Analysis of free associations by two psychodynamic therapists: evidence for relevant conflict based on subjective reactions?
- Possible conflicts in 23/209 associations (8/18 subjects)
- Free associations to personally relevant conflicts
  - \( \rightarrow \) SCR \( \uparrow \)
  - \( \rightarrow \) Ratings: mood\( \downarrow \), valence\( \downarrow \), agreement\( \uparrow \)
  - \( \rightarrow \) ACC \( \uparrow \)

Still – these conflict sentences are not autobiographically derived

*Keivyayan et al., Front Hum Neurosci 2013*
Assessment of individualized conflicts: OPD interviews

- OPD: Operationalized Psychodynamic Diagnosis
- Diagnostic tool beyond DSM/ICD: based on psychodynamic theory
- Background: e.g., Core Conflictual Relationship Theme (CCRT; Luborsky et al.)
- Axes: perception of disease, relationship patterns, main conflict, structural pathology

*Kessler et al., Front Psychol 2017*
**Study 3: Free association to autobiographical conflict sentences**

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Overview of OPD conflicts (derived from OPD-Task-Force, 2008).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brief description</strong></td>
<td></td>
</tr>
<tr>
<td>C1 Individuation vs. dependency</td>
<td>Existential importance of attachment and relationship. Relationship is oscillating between extremes of yearning for close relationship and symbiotic closeness (dependency), and striving for explicit independence and marked distance (individuation). (...) Seeking of closeness and attachment at all cost, versus exaggerated independence and forced avoidance of attachments.</td>
</tr>
<tr>
<td>C2 Submisison vs. control</td>
<td>The control motive is to dominate the other, or to submit to the other. Open or latent aggressive impulses play a control role. Submission and control are non-adaptive extremes on the continuum of being able &quot;to be guided,&quot; or &quot;to guide others,&quot; respectively. Behavior norms, and other personal and societal rules are given a high value.</td>
</tr>
<tr>
<td>C3 Desire for care vs. autarchy</td>
<td>Desire for care versus autarchy refers to the fundamental need of individuals to obtain something, to be assured of attention and care, or to give attention and care, as opposed to not needing any care. (...) Losing something or someone plays a central role as a trigger situation.</td>
</tr>
<tr>
<td>C4 Conflicts of self-value</td>
<td>Self-worth versus object worth as the extreme poles of the theme &quot;being able to question oneself,&quot; and &quot;to attach a value to oneself.&quot; Subjects consider themselves constantly inferior or superior in regard to others and can't find the right balance between those extremes. The conflict may show as a trait (&quot;narcissistic personality&quot;).</td>
</tr>
<tr>
<td>C5 Guilt conflicts</td>
<td>Constant tendency to attribute blame to others or to blame oneself; excessive taking of responsibility, or shifting of guilt and responsibility onto others.</td>
</tr>
<tr>
<td>C6 Oedipal sexual conflicts</td>
<td>Difficulties in self-value considering specifically the role as a woman or man. The extreme poles are characterized by rivalry versus identification with gender-specific roles, wanting to be someone as a woman or man versus keeping in the background, being able to enjoy sexual pleasure versus sexual abstinence.</td>
</tr>
<tr>
<td>C7 Identity conflicts</td>
<td>Delineable, but contradictory self-representations (&quot;identities&quot;), chronic struggle for identity and well-being, concealment of identity dissonance.</td>
</tr>
</tbody>
</table>

*Kessler et al., Front Psychol 2017*
Study 3: Free association to autobiographical conflict sentences

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**TABLE 3** | Frequency of conflict themes (rows) and number of conflict themes per subject (columns).

<table>
<thead>
<tr>
<th></th>
<th>(1) Conflict</th>
<th>(2) Conflict</th>
<th>(3) Conflict</th>
<th>n each conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Dependence vs. autonomy</td>
<td>4</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>C2</td>
<td>Submission vs. control</td>
<td>7</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>C3</td>
<td>Desire for care vs. autarchy</td>
<td>9</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>C4</td>
<td>Conflicts of self-value</td>
<td>8</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>C5</td>
<td>Guilt conflicts</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>C6</td>
<td>Oedipal sexual conflicts</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C7</td>
<td>Identity conflicts</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

\[n\text{ total}\]
\[29\]

\[n\text{ total}\]
\[19\]

\[n\text{ total}\]
\[1\]

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- 6 autobiographical conflict sentences
- 6 autobiographical negative sentences putatively NOT related to conflict
- 6 autobiographical positive sentences

_Kessler et al., Front Psychol 2017_
Study 3: Free association to autobiographical conflict sentences

- Conflicts: RT (↑), SCR ↑, memory ↓

- Subjective ratings of feelings and arousal cannot explain conflict effects

Kessler et al., Front Psychol 2017
Repression and free association: Summary

Free association to later forgotten vs. remembered words or sentences
• Study 1: RT ↑, SCR ↑, ACC ↑
• Study 2: RT ↑, SCR ↑

Free association to conflict vs. negative/neutral sentences
• Study 2: RT (↑), SCR ↑, memory ↓, ACC ↑, hippocampus ↓
• Study 3: RT ↑, SCR ↑, memory ↓
• Study 4: RT ↔, SCR ↔, memory ↓

Free association to personally relevant vs. irrelevant conflict sentences
• Study 2b: RT ↔, SCR ↑, memory ↔, ACC ↑, hippocampus ↔
• Study 4: RT ↑, SCR ↔, memory ↔

Reliable general effects, less pronounced effects of personal relevance
Voluntary suppression vs. repression

Voluntary control: DLPFC ↑ → Suppression → Suppressed contents are erased → Hippocampus ↓

Psychodynamic conflict: ACC ↑ → Repression → Conflict-related material becomes unconscious → Hippocampus ↓

Repression - related material becomes unconscious

Hippocampus ↓
Overall summary

Voluntary memory suppression in the directed forgetting and think/no-think paradigms

• Can permanently reduce the accessibility of memories
• Occurs for various kinds of material
• Depends on interactions between lateral PFC and hippocampus

Repression in the free association paradigm

• Occurs specifically for conflict-related material
• Is related to increases in SCR and RT during free association
• Depends on interactions between ACC and hippocampus

Does repression lead to paradoxical (rebound) effects?
Bochum Neuropsychoanalysis Group