Sleep Deprivation Produces False Memories in the DRM Paradigm: Event-Related Potential (ERP) Evidence

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Is Memory Always True?

Deese-Roediger-McDermott false memory paradigm (Deese, 1959; Roediger III & McDermott, 1995)

Learning
Test

Recognition
Old, ex:床铺
→Hit
New, ex:麵包
→Correct Rejection
Lure, ex:睡眠
→False Memory

Studies of Sleep and False Memory

Inconsistent
- Sleep enhanced false memory (Payne, Schacter, Propper, Huang, Wamsley, Tauber, Walker, & Stickgold, 2009)
- Sleep reduced false memory (Fenn, Gallo, Margoliash, Roediger III, & Nusbaum, 2009)
- Sleep deprivation before retrieval increased false memory (Dukelman, Landoh, Lahl, Born, Wagner, 2008)

Objects of Present Study

- Behavioral level
  - could not distinguish different memory retrieval process
- Physiological level
- Event-related potentials (ERPs)
- N400
  - An index of Familiarity
- Late Positive Complex (LPC):
  - An index of Recollection

ERP Old/New Effects

Nessler et al., 2001

- True recognition old/new effects
- False recognition old/new effects
Present Study

Sleep
Sleep Deprivation
Familiarity
Recollection
False memory

Materials & Methods: Procedures

12:00 p.m. | 08:00 a.m.
Day 1 | Day 2 | Day 3
※ S.D. = Sleep Deprivation

Materials & Methods: Stimuli Presentation

Learning phase
32 DRM word lists
96 Old (3 from each list)
32 Lure (those word from each list)
64 New (4 from each non-studied list)

Test phase
32 DRM word lists
96 Old (3 from each list)

Results: Behavioral Data
Recognition (%)
Hit | False | Correct | Rejection
n.s. | n.s. | n.s.

Results: Electrophysiological Data
True recognition Old/New Effect
One way ANOVA (Hit, Correct rejection)
Sleep | Sleep Deprivation
N400 | LPC

False recognition Old/New Effect
One way ANOVA (False recognition, Correct rejection)
Sleep | Sleep Deprivation
N400 | LPC

Results: Behavioral Data
Recognition (%)
Hit | False | Correct | Rejection
n.s. | n.s. | n.s.

Results: Electrophysiological Data
True recognition Old/New Effect
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False recognition Old/New Effect
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Results: Behavioral Data
Recognition (%)
Hit | False | Correct | Rejection
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Results: Electrophysiological Data
True recognition Old/New Effect
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False recognition Old/New Effect
One way ANOVA (False recognition, Correct rejection)
Sleep | Sleep Deprivation
N400 | LPC
Conclusions

- For True recognition
  - Both group rely mainly on familiarity process

- For False recognition
  - Sleep deprivation may impair the recollection process for memory retrieval

Thank for your attention

Thanks for help from all members of NCCU Sleep Lab