

# PRÉVENIR LES SORTIES DE PISTE

Objectif sécurité  
LES SYMPOSIUMS



## APPROCHE NEUROSCIENTIFIQUE DE LA PERSISTANCE DANS L'ERREUR



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«Neuroergonomie pour la sécurité des vols»





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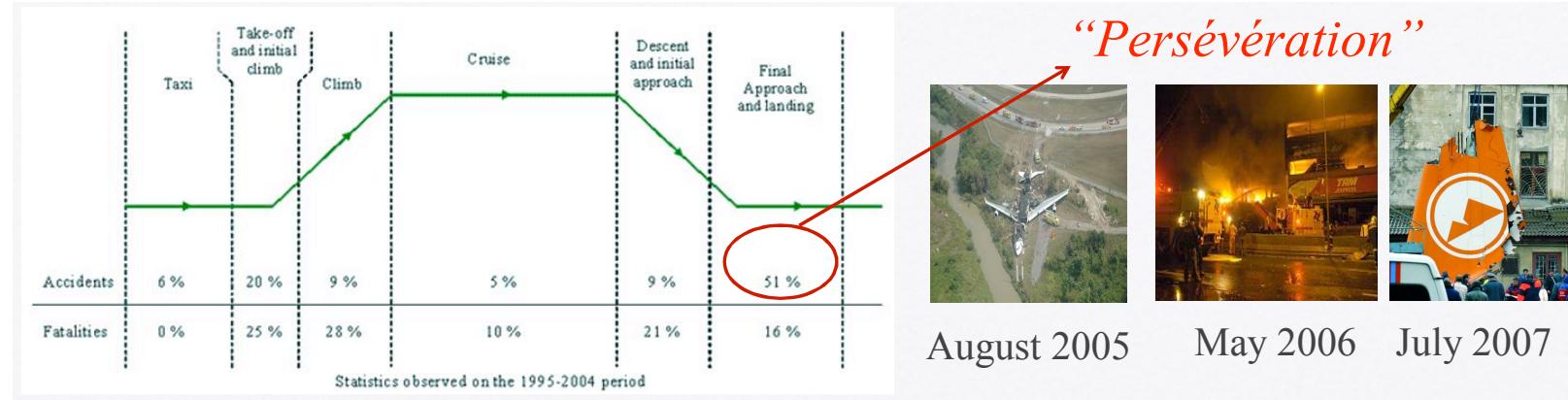
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LES SYMPOSIUMS

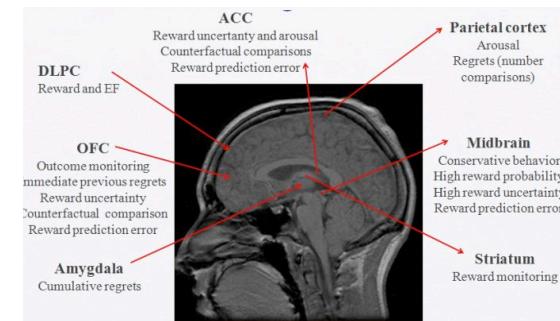
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## PERSEVERATION ET ATTERRISSAGE



83% of all unstabilized approaches end up with a decision to land [Curtis & Smith, 2013]

- ❖ Emotional bias :
  - ❖ economical/ passengers pressure
  - ❖ aversive situation
  - ❖ uncertainty & complexity
  - ❖ a defeat...





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LES SYMPOSIUMS

- Target fascination, Plan Continuation Error, Get-Homeitis, syndrome, Tunneling..
- Fixation errors (De Keyser et Woods, 90):
  - Type 1: the human operators are unable to make up their mind to achieve their current goal
  - Type 2: the human operators keep on doing the same erroneous sequence of actions without any apparent control
  - Type 3: the operators have overconfidence in their strategy and neglect or do not trust any information such as alarms





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LES SYMPOSIUMS

- Perseveration (Neisser, 1895!): the inappropriate repetition or continuation of an earlier response after a change in task requirements





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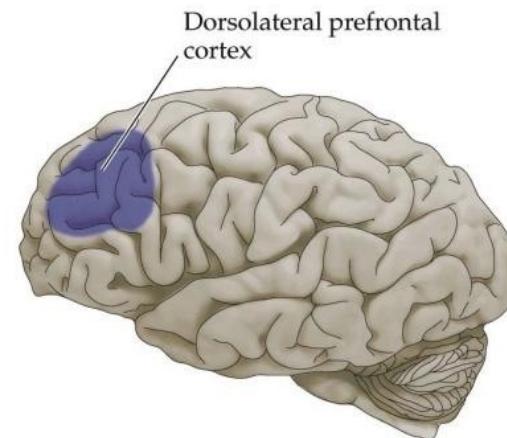
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- Perseveration (Neisser, 1895!): the inappropriate repetition or continuation of an earlier response after a change in task requirements
- Sandson & Albert (82)'s typology: Stuck in set perseveration (DLPFC)





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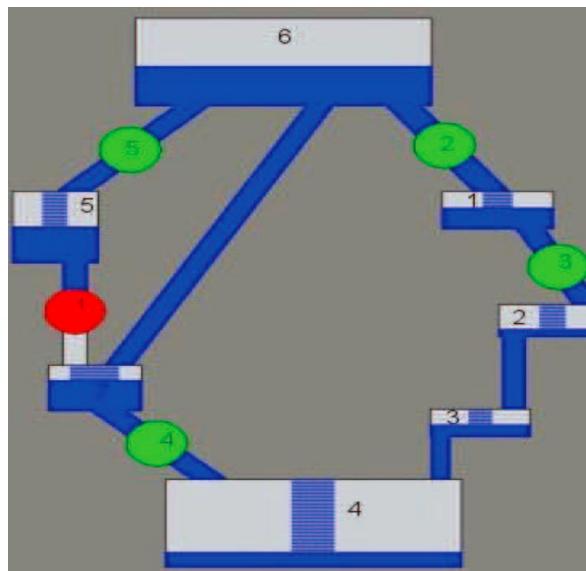
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## Dysexecutive syndrome (Patients with PFC lesions)

Abulia

Perseveration on psychomotor response

Lack of mental flexibility,  
incapacity to adapt to changes





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Fixation errors (Human operator)	Dysexecutive syndrome (Patients with PFC lesions)
Type 1: decision-making impairment	Abulia
Type 2: repetition of same response/sequences of actions	Perseveration on psychomotor response
Type 3: persistence in initial goal	Lack of mental flexibility, incapacity to adapt to changes





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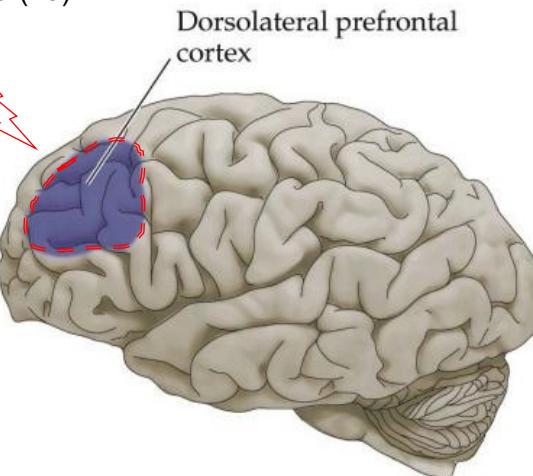
LES SYMPOSIUMS

## Normal aging/brain atrophy:

Kalpouzos et al (11), Kennedy et al (13)

rTMS:

Para et al (06)



Dorsolateral prefrontal cortex

## Brain lesion:

Milner(63)

MPTP  
injection

Luciana(01)





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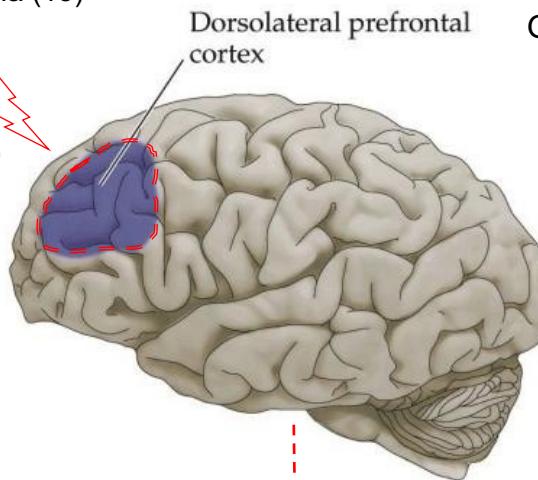
Para et al (06)

## Brain lesion:

Milner(63)

## MPTP injection

Luciana(01)



## Emotion/stress

Simpson et al (00), Quin et al. (09)  
see Lachaud (15), Causse et al (13)

## Low demanding task

Goldberg (98), Harrivel, (15), Durantin et al (14)

## High demanding task

Durantin et al (14)  
Goldberg (98)

## Fatigue/time on task

See Borragan (16) Smith et al (99,05)



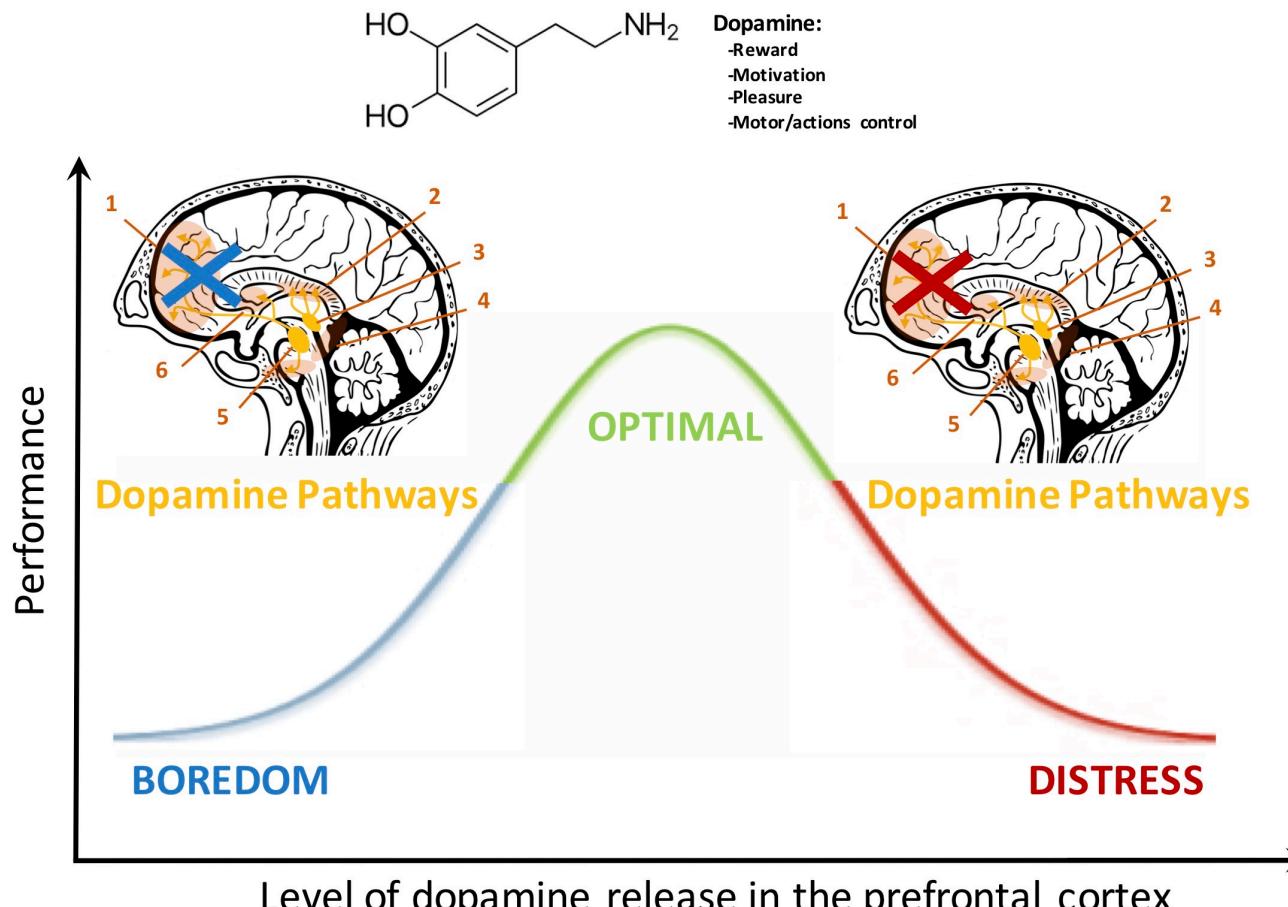
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LES SYMPOSIUMS



1-Prefrontal cortex 2-Striatum 3-Substantia nigra 4-Hippocampus 5-Ventro Tegmental Area 6-Nucleus accumbens





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LES SYMPOSIUMS



## « PILOT VISION » STUDY



D S A C





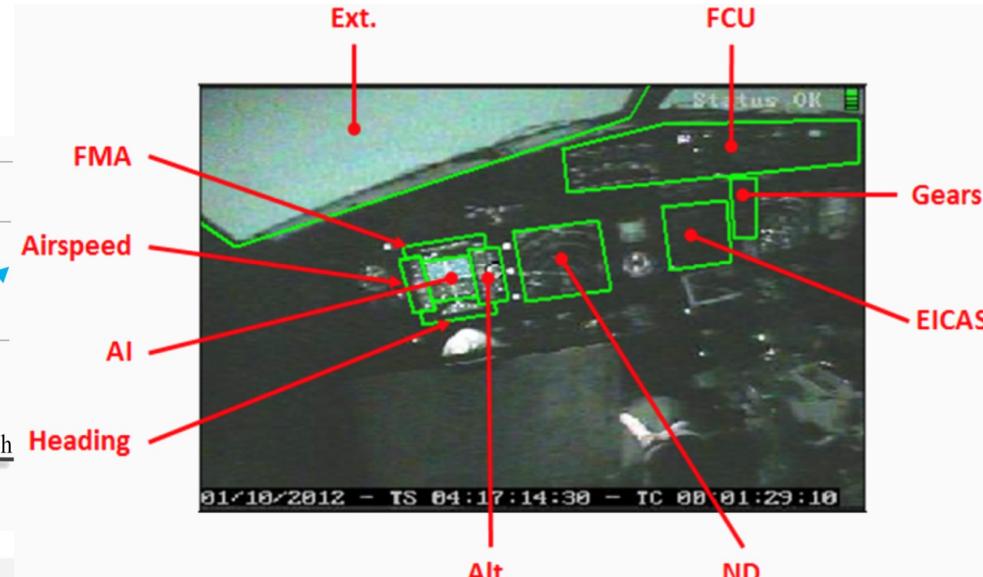
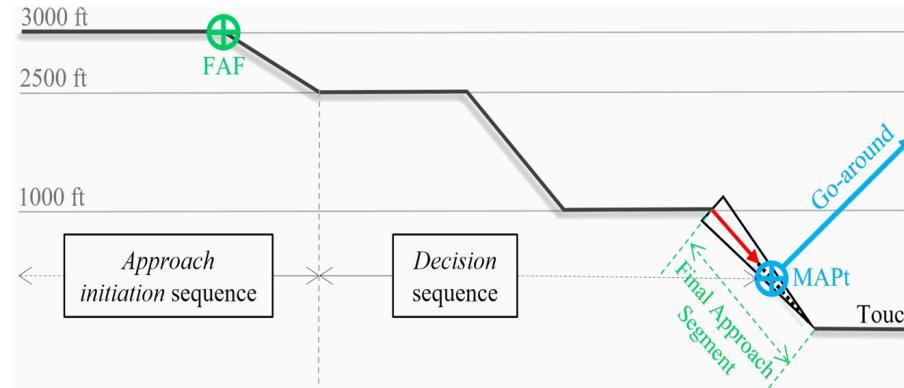
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LES SYMPOSIUMS

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## Participants

- 10 European airline pilots (8 pairs of Captain + First Officer)
- PF: mean age = 41,6 years; flight experience = 8900hours

- **Experiment:** Each PF flew 1 unstabilized approach to Hamburg airport, beginning at approx. 50 NM
- Unstabilization due to strong tailwind conditions, resulting in a runway change that shortened the distance to touchdown by 25 NM
- Full auto-flight system function available (AP + FD + A-THR)
- Landing was impossible (Go-Around)!



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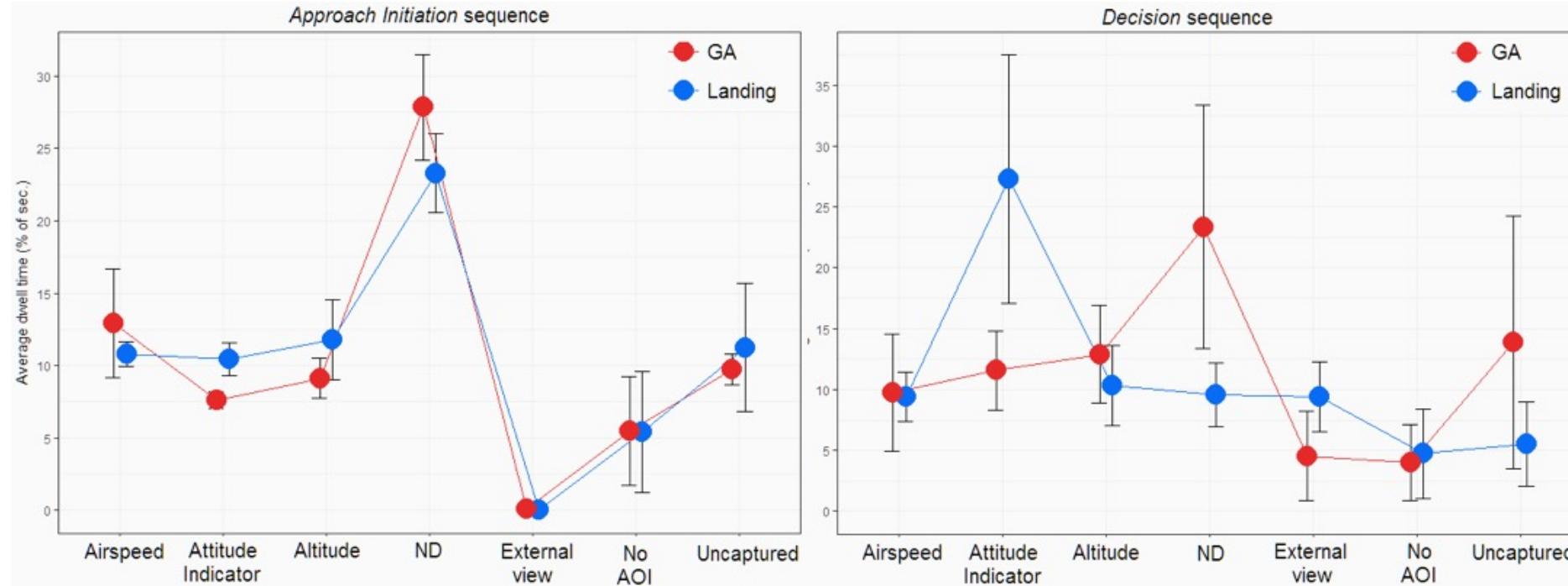
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50 % of participants (PF) persisted in an erroneous landing decision!!!!





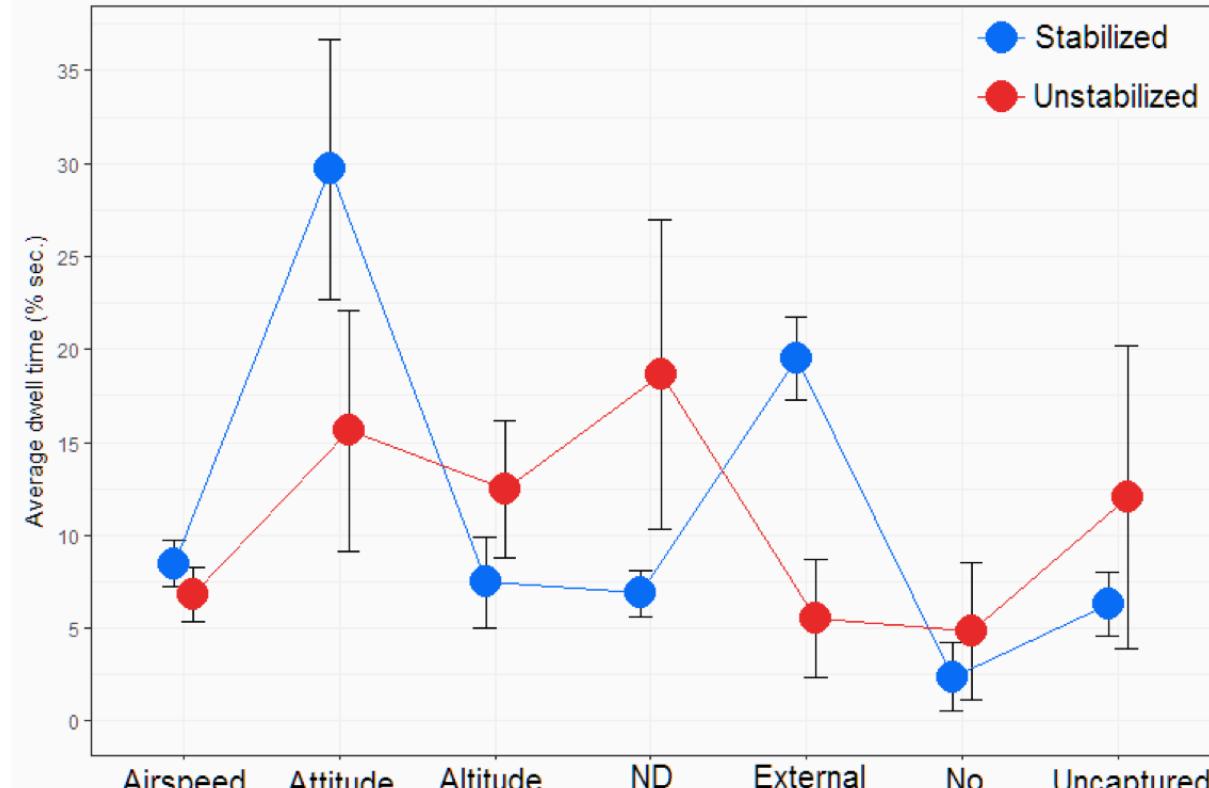
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Unstabilized approach impact on ocular behavior

