La compression temporelle des événements continus en mémoire

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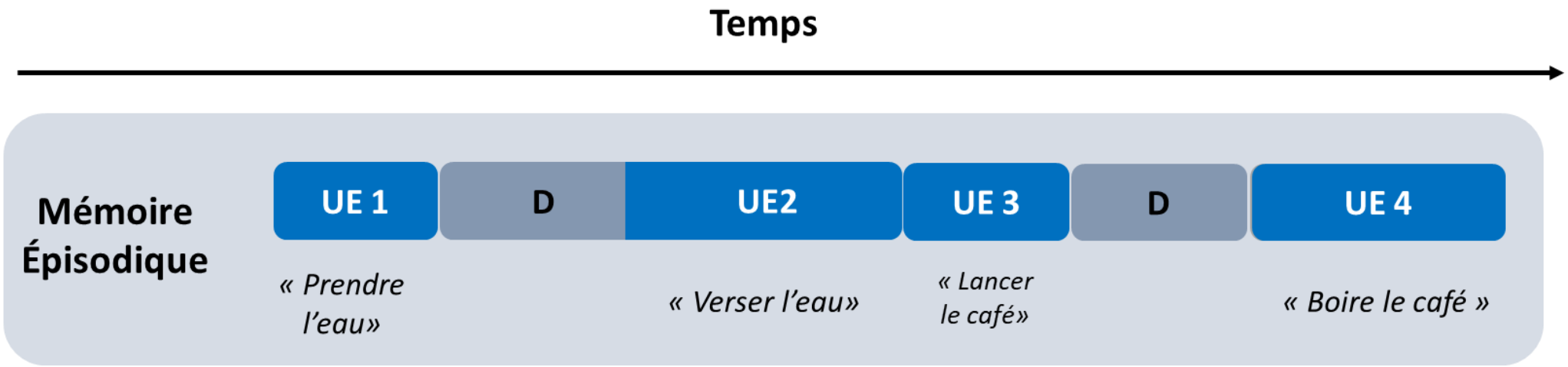
LA COMPRESSION TEMPORELLE DES SOUVENIRS ÉPISODIQUES

Durée de remémoration < Durée réelle

(Jeunehomme & D'Argembeau, 2019)

UN MODÈLE DE LA COMPRESSION TEMPORELLE

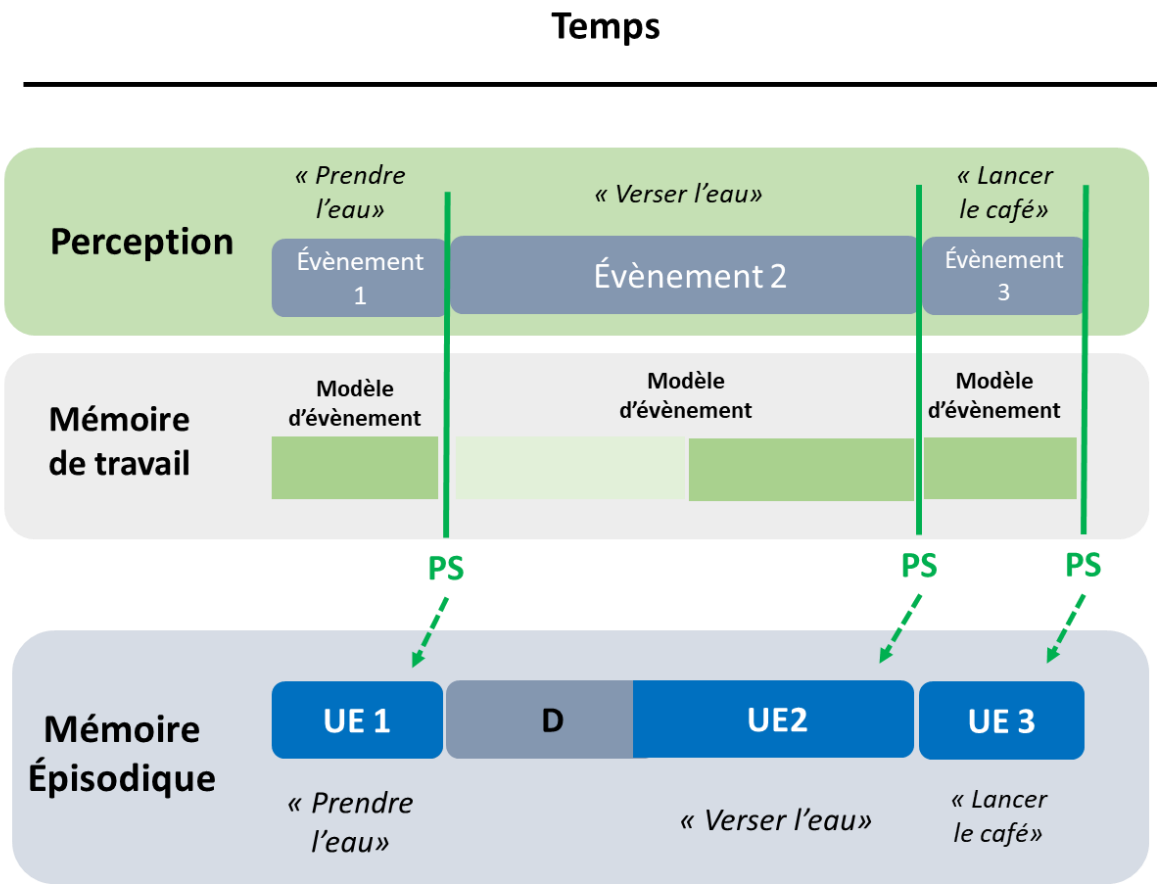


Discontinuités → **Compression temporelle**

UE : Unité d'Expérience; **D** : Discontinuité temporelle

(Pour une revue, voir D'Argembeau et al., 2022)

FORMATION DES UNITÉS D'EXPÉRIENCE

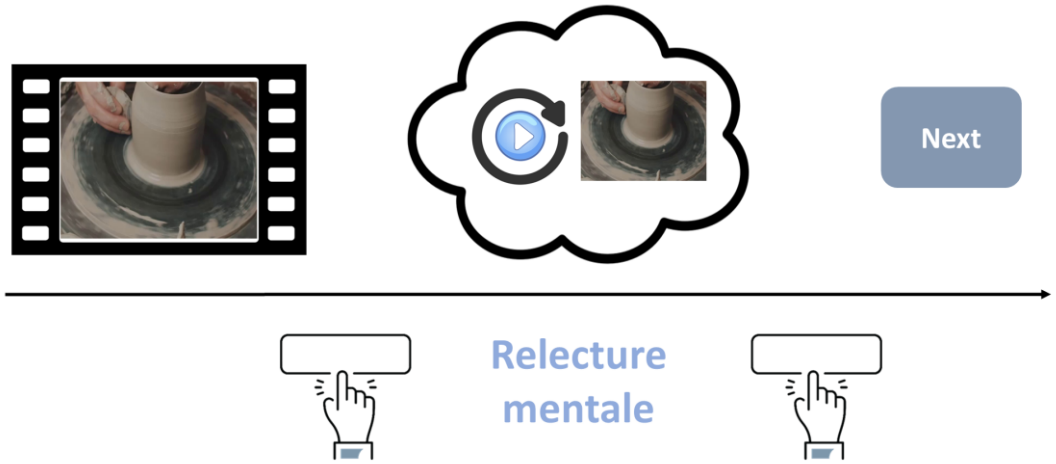


PS : Point de segmentation; **UE** : Unité d'Expérience; **D** : Discontinuité temporelle

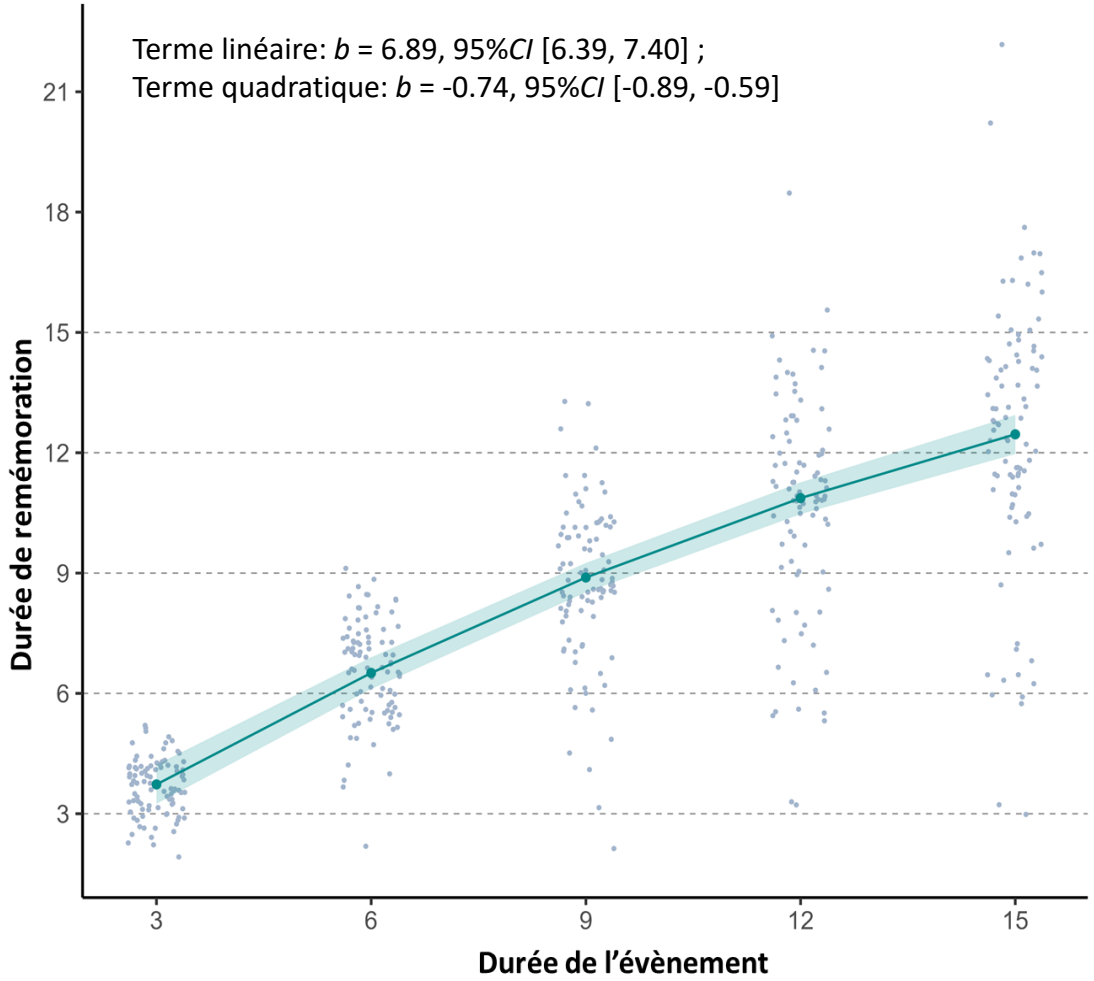
(Bird, 2020; Jeunehomme & D'Argembeau, 2020; Loschky et al., 2020; Zacks, 2020)

LEROY, MAJERUS & D'ARGEMBEAU (COGNITION, 2024)

- 90 participants
- Tâche de relecture mentale
- Évènements continus (sans point de segmentation)
- 3, 6, 9, 12, ou 15 secondes



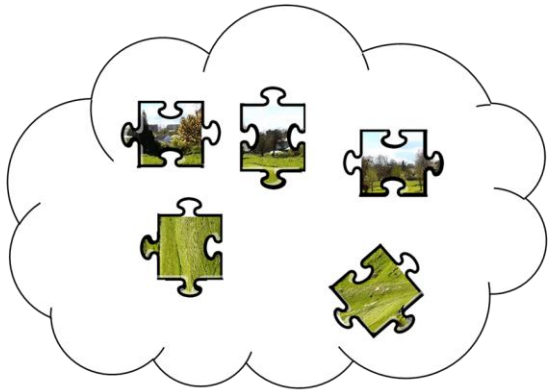
LEROY, MAJERUS & D'ARGEMBEAU (COGNITION, 2024)



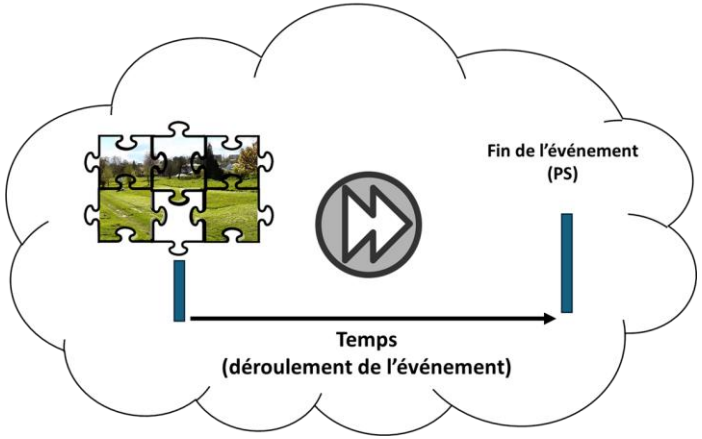
Modèle linéaire mixte robuste (Koller, 2016)

Expérience 1 :
Temps d'initialisation

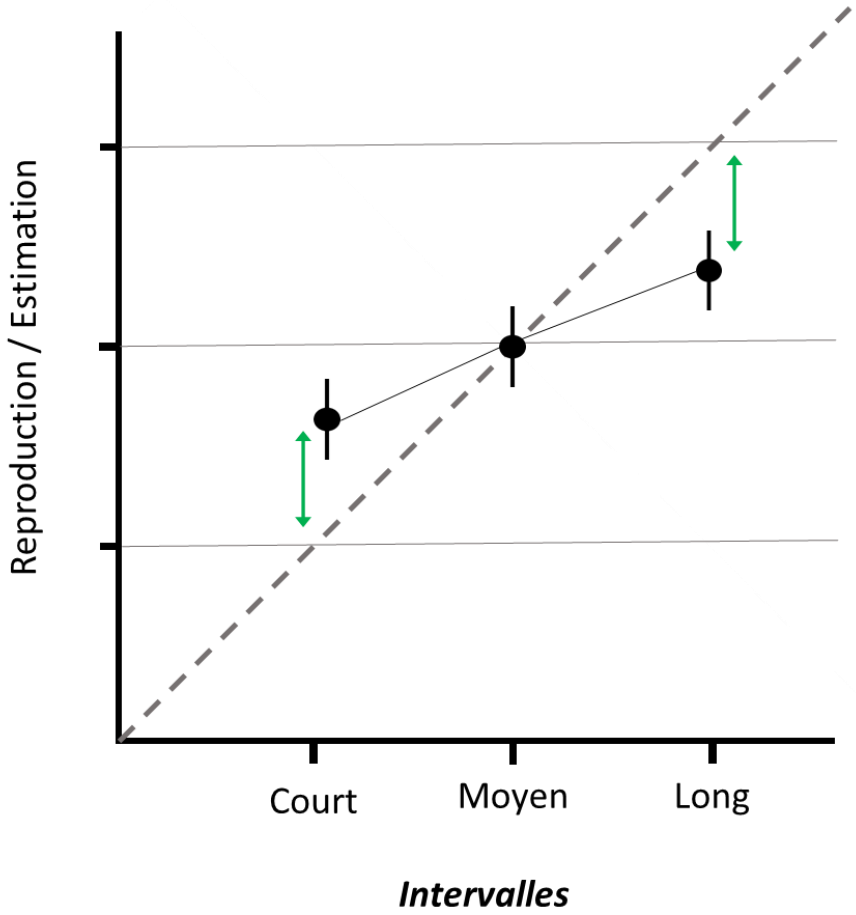
Étape1
(Initialisation)



Étape2
(Relecture mentale)



Expérience 2 :
Tendance centrale



EXPÉRIENCE 1

MÉTHODE

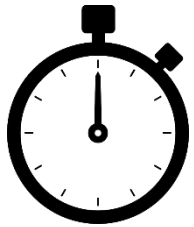
- 50 participants
- Évènements de 3, 6, 9, 12, 15 secondes
- Initialisation du rappel

1 s

2, 5, 8, 11, 14 s

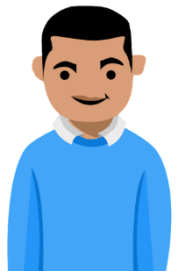
« Faites réapparaître l'image dans votre esprit »

MÉTHODE



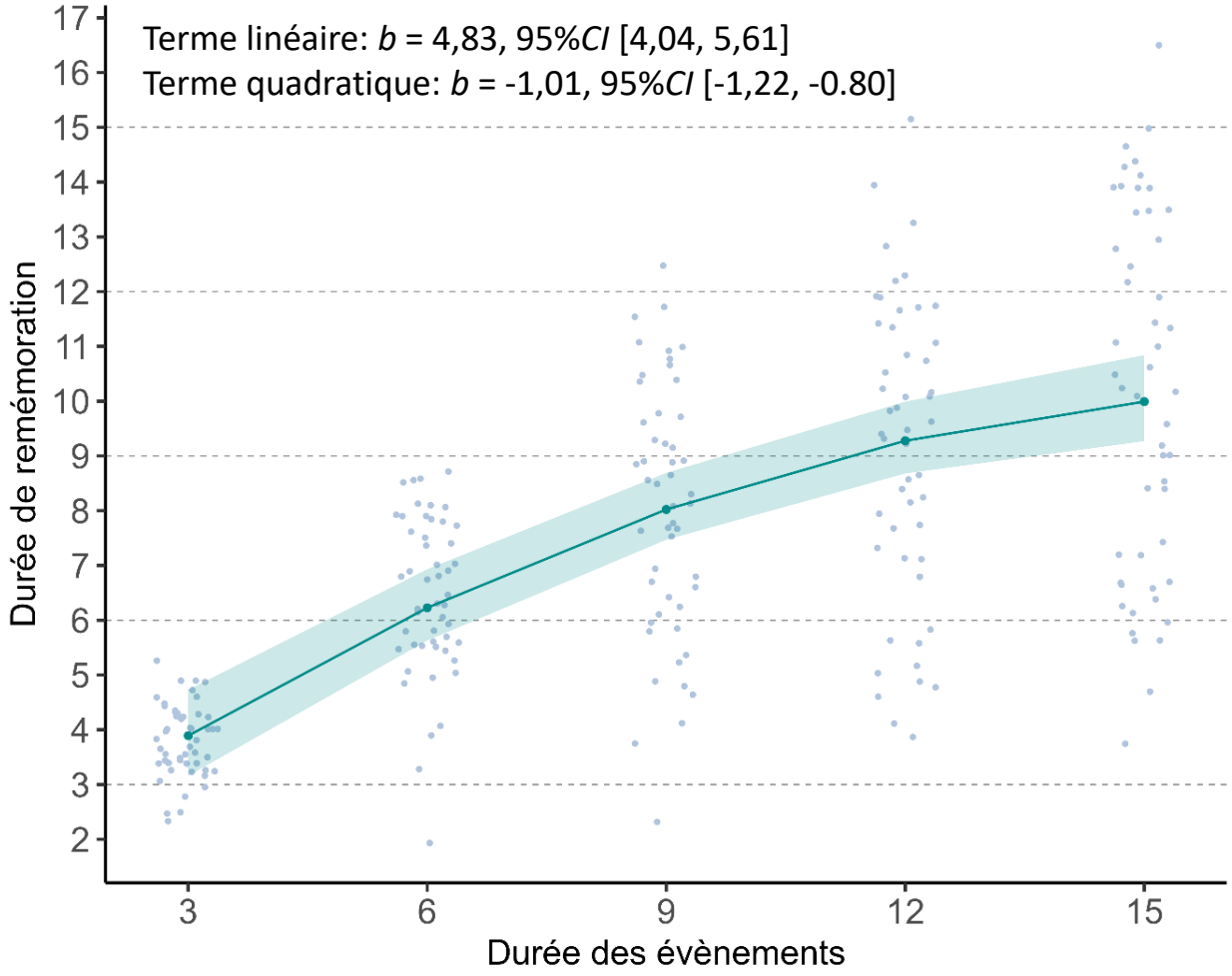
Durée de remémoration corrigée = Durée de remémoration - Temps d'initialisation

Exemple :



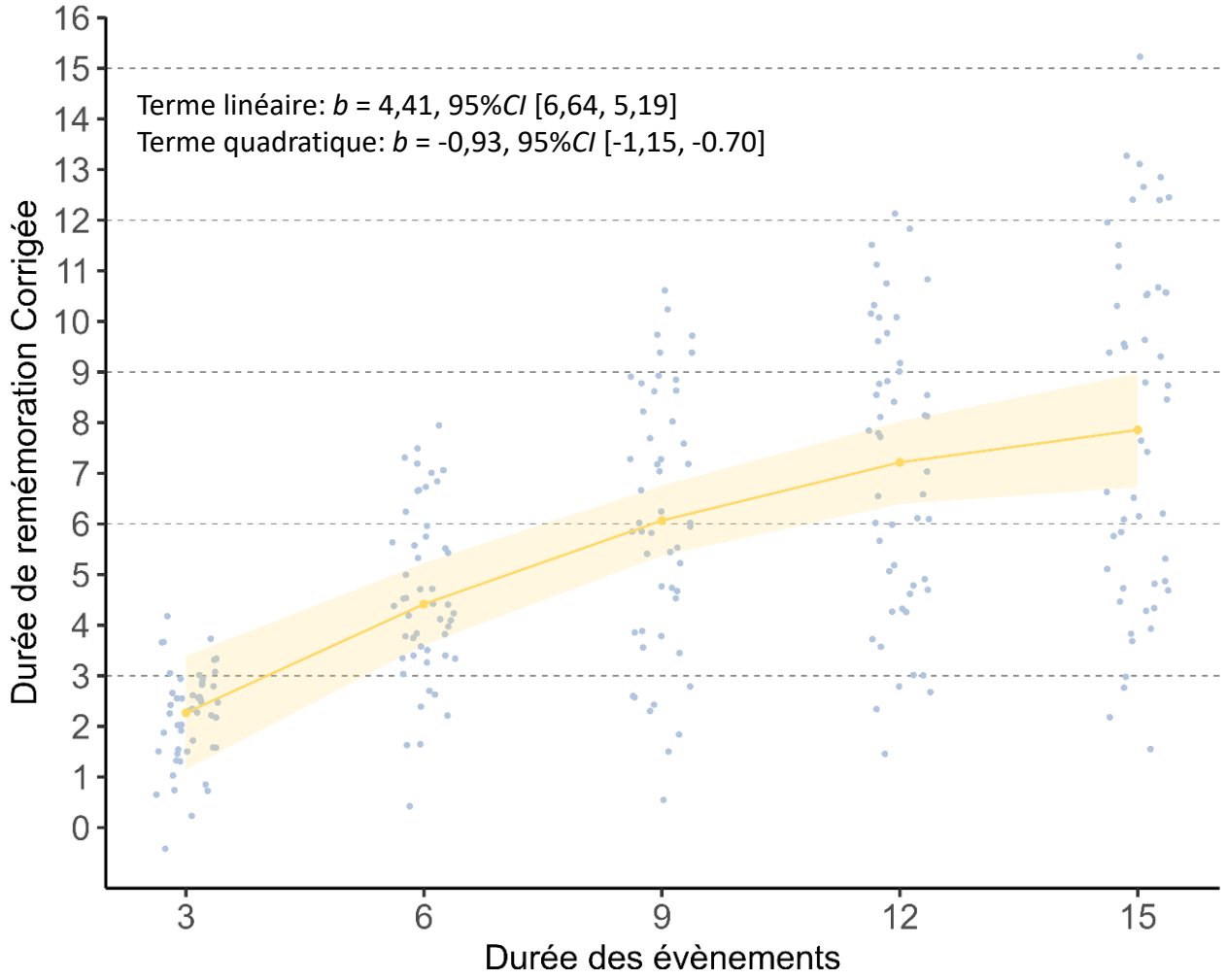
Durée de remémoration moyenne pour les évènements de 9 s	Temps d'initialisation moyen pour les évènements de 9 s	Durée de remémoration corrigée
8,5 s	**0,5 s** →	**8 s**

RÉSULTATS



Modèle linéraire mixte robuste (Koller, 2016)

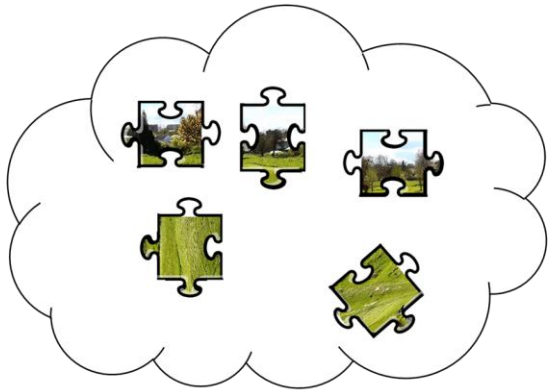
RÉSULTATS



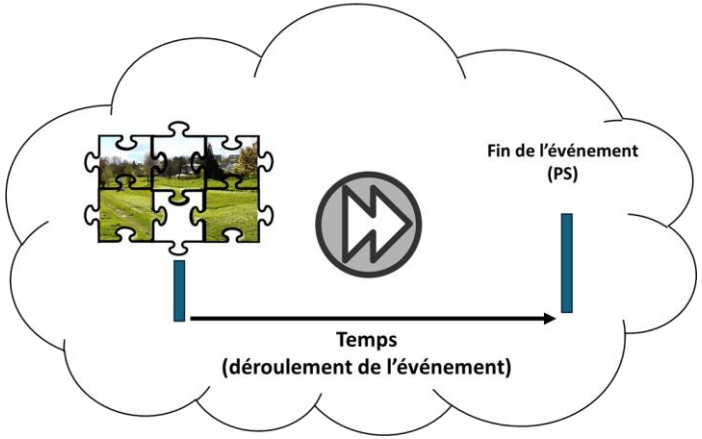
Modèle linéaire mixte robuste (Koller, 2016)

Expérience 1 :
Temps d'initialisation

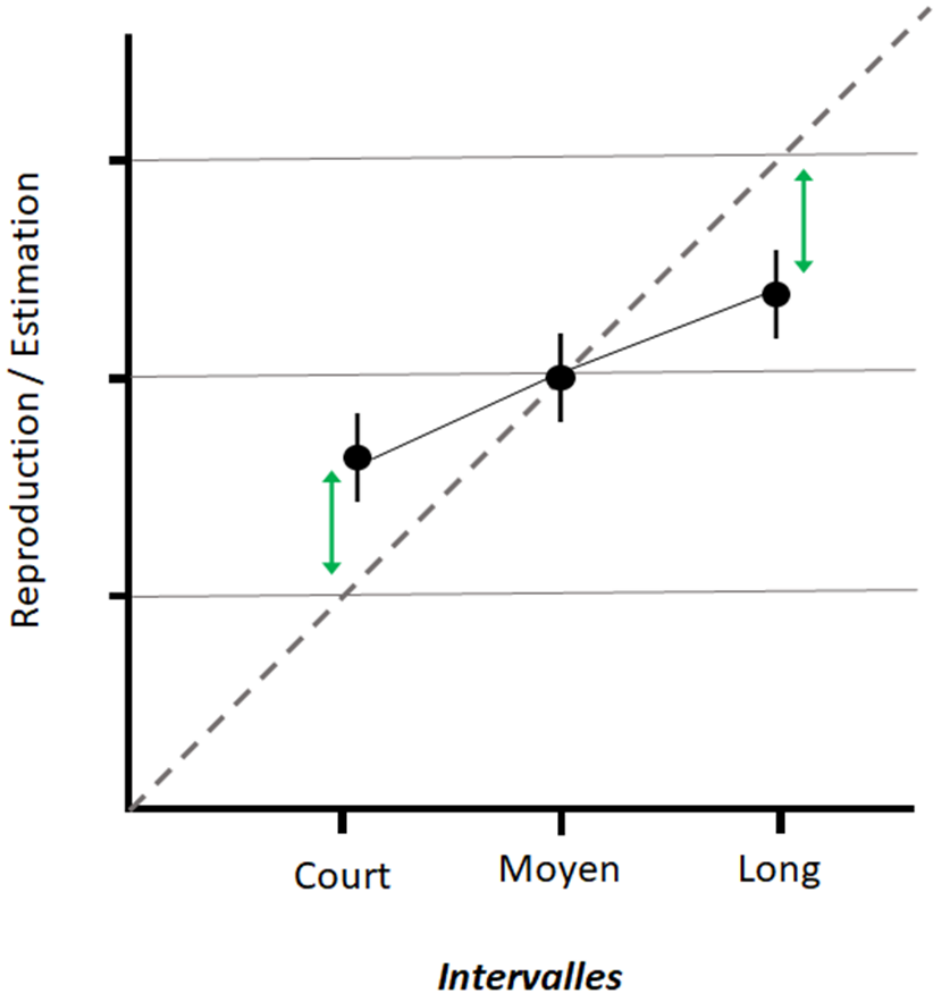
Étape1
(Initialisation)



Étape2
(Relecture mentale)



Expérience 2 :
Tendance centrale



EXPÉRIENCE 2

MÉTHODE

Prolific

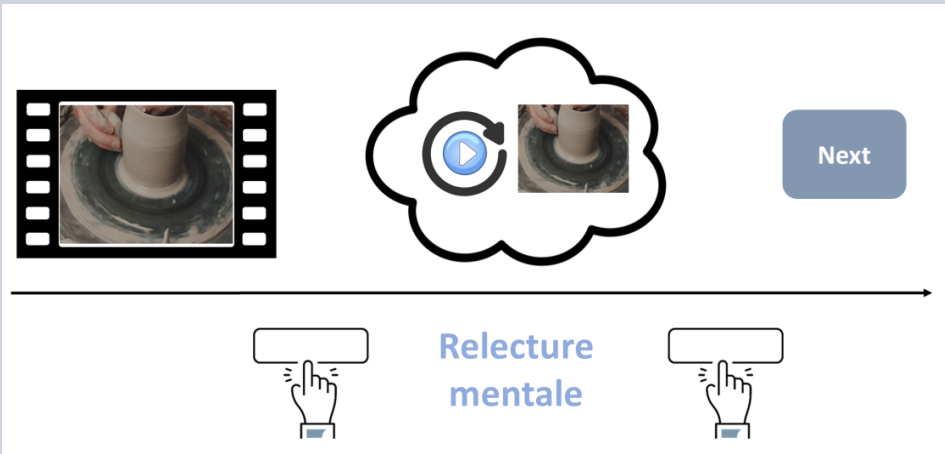
Groupe A
N = 55
Durées = 3, 6 et 9 s

Groupe B
N = 54
Durées = 6, 9 et 12 s

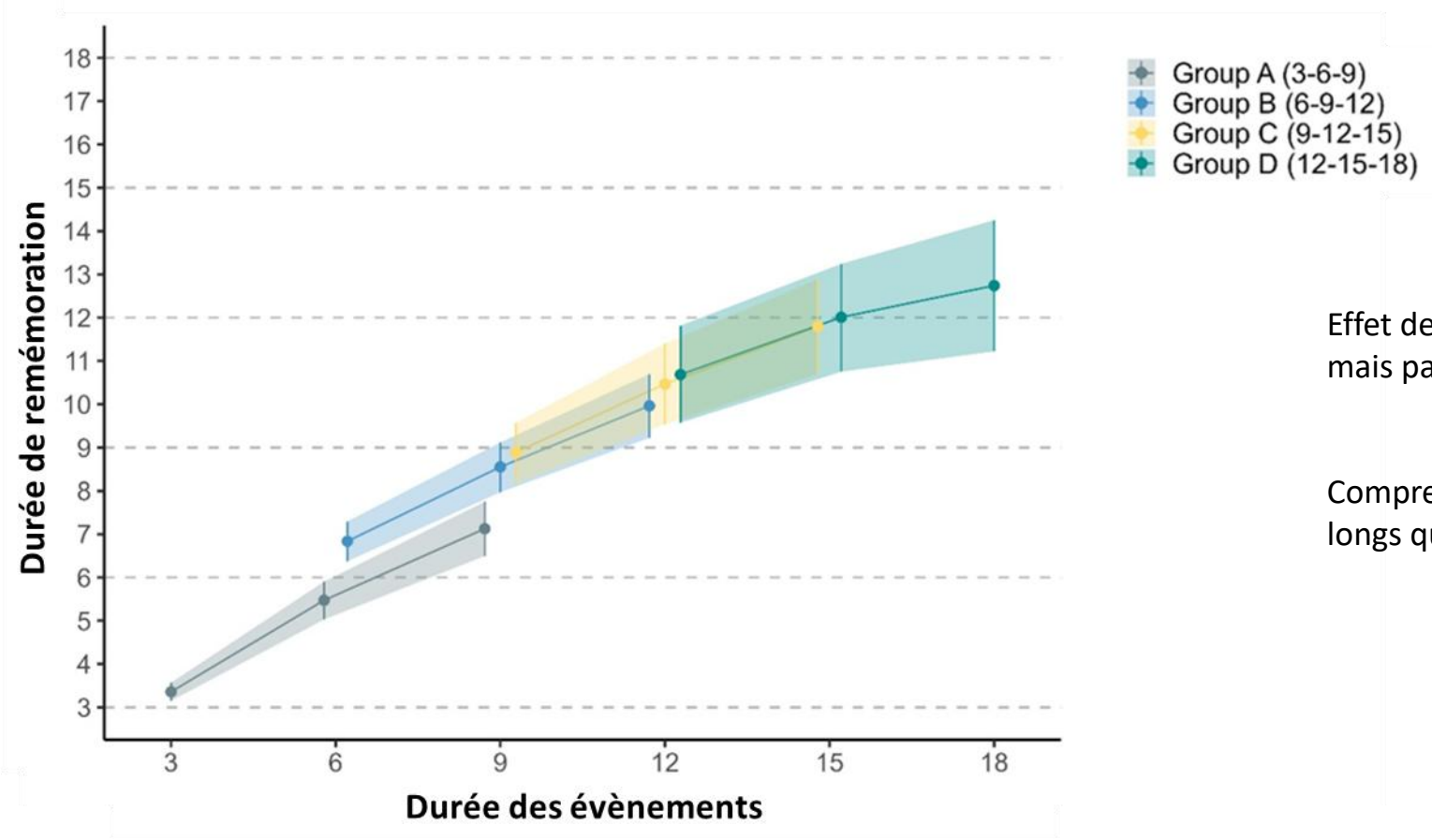
Groupe C
N = 54
Durées = 9, 12 et 15 s

Groupe D
N = 55
Durées = 12, 15 et 18 s

www.gorilla.sc



RÉSULTATS



Effet de tendance centrale pour les groupes A et B mais pas pour les groupes C et D

Compression systématique pour les événements plus longs que 9 s

Modèles linéaire mixte robuste (un par groupe; Koller, 2016)

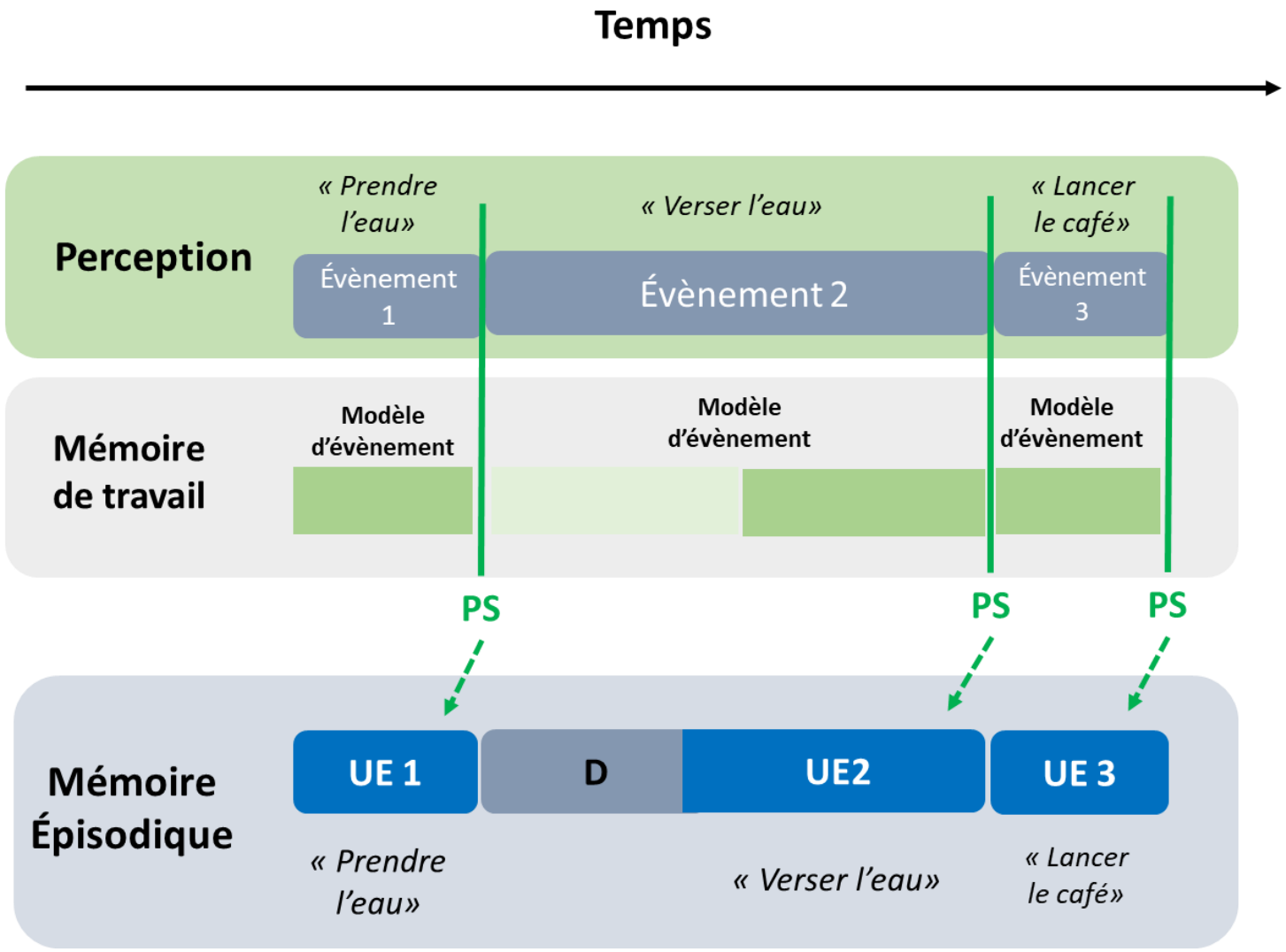
DISCUSSION

- Durées de remémoration supérieures à la durée réelle potentiellement dues au fait que le temps d'initialisation n'était pas pris en compte (Expérience 1)

- Effet de tendance centrale lors de la relecture mentale d'évènements continus (Expérience 2)

  - Néanmoins, on peut observer de façon consistante l'émergence d'une compression temporelle lorsque la durée des évènements dépasse quelques secondes

⇨ Suggère une capacité limitée du système cognitif à intégrer en mémoire des événements continus



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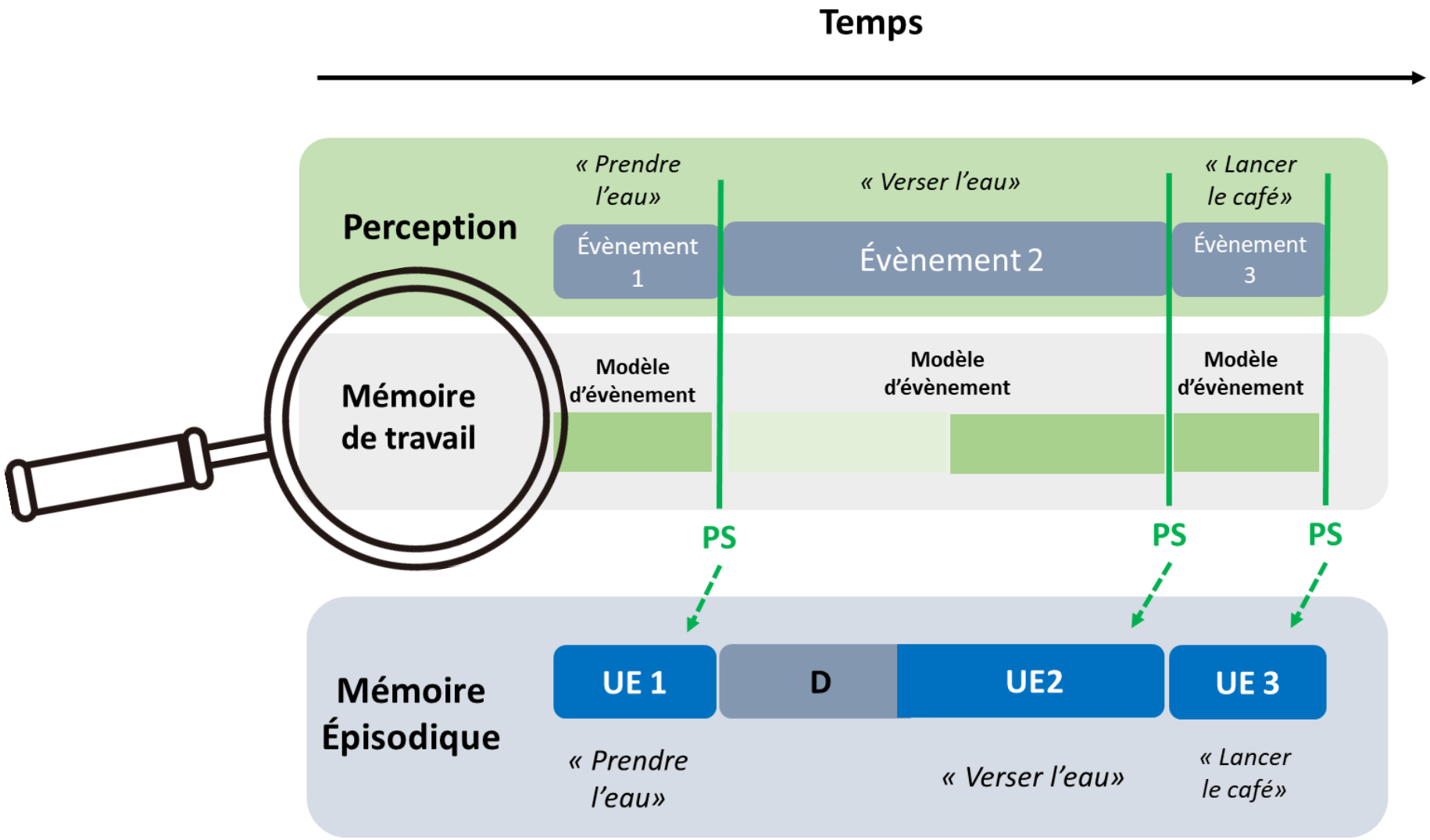


PS : Point de segmentation; **UE** : Unité d'Expérience; **D** : Discontinuité temporelle

MERCI POUR VOTRE ATTENTION

Le pre-print

https://osf.io/preprints/psyarxiv/qgb8n_v2

Données, scripts et matériel

osf.io/2xt93/

RÉFÉRENCES

Bird, C. M. (2020). How do we remember events? *Current Opinion in Behavioral Sciences*, *32*, 120-125. https://doi.org/10.1016/j.cobeha.2020.01.020

D'Argembeau, A., Jeunehomme, O., & Stawarczyk, D. (2022). Slices of the past : How events are temporally compressed in episodic memory. *Memory*, *30*(1), 43-48. https://doi.org/10.1080/09658211.2021.1896737

Jeunehomme, O., & D'Argembeau, A. (2019). The time to remember : Temporal compression and duration judgements in memory for real-life events. *Quarterly Journal of Experimental Psychology*, *72*(4), 930-942. https://doi.org/10.1177/1747021818773082

Jeunehomme, O., & D'Argembeau, A. (2020). Event segmentation and the temporal compression of experience in episodic memory. *Psychological Research*, *84*(2), 481-490. https://doi.org/10.1007/s00426-018-1047-y

Koller, M. (2016). robustlmm : An R Package for Robust Estimation of Linear Mixed-Effects Models. *Journal of Statistical Software*, 75(6). https://doi.org/10.18637/jss.v075.i06

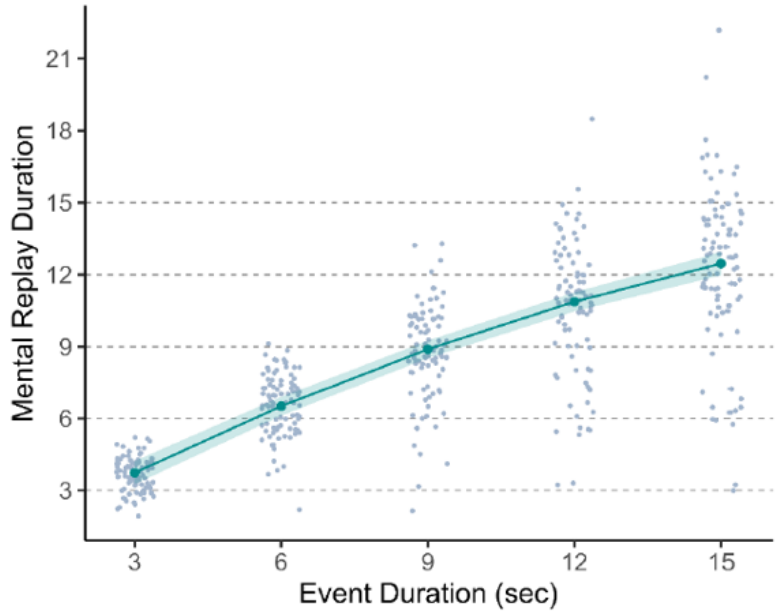
Leroy, N., Majerus, S., & D'Argembeau, A. (2024). Working memory capacity for continuous events : The root of temporal compression in episodic memory? *Cognition*, *247*, 105789. https://doi.org/10.1016/j.cognition.2024.105789

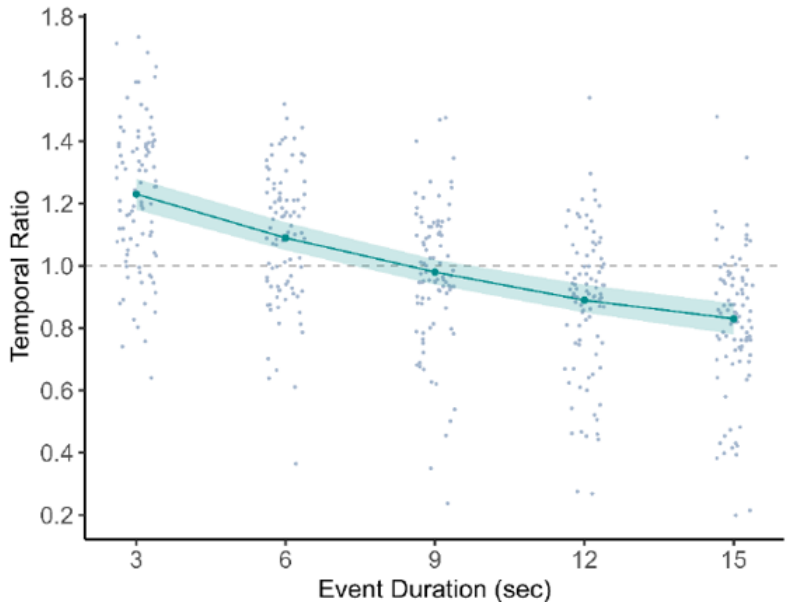
Loschky, L. C., Larson, A. M., Smith, T. J., & Magliano, J. P. (2020). The Scene Perception & Event Comprehension Theory (SPECT) Applied to Visual Narratives. *Topics in Cognitive Science*, 12(1), 311-351. https://doi.org/10.1111/tops.12455

Michelmann, S., Staresina, B. P., Bowman, H., & Hanslmayr, S. (2019). Speed of time-compressed forward replay flexibly changes in human episodic memory. *Nature Human Behaviour*, *3*(2), 143-154. https://doi.org/10.1038/s41562-018-0491-4

Zacks, J. M. (2020). Event Perception and Memory. *Annual Review of Psychology*, 71(1), 165-191. https://doi.org/10.1146/annurev-psych-010419-051101

SLIDES SUPPLÉMENTAIRES

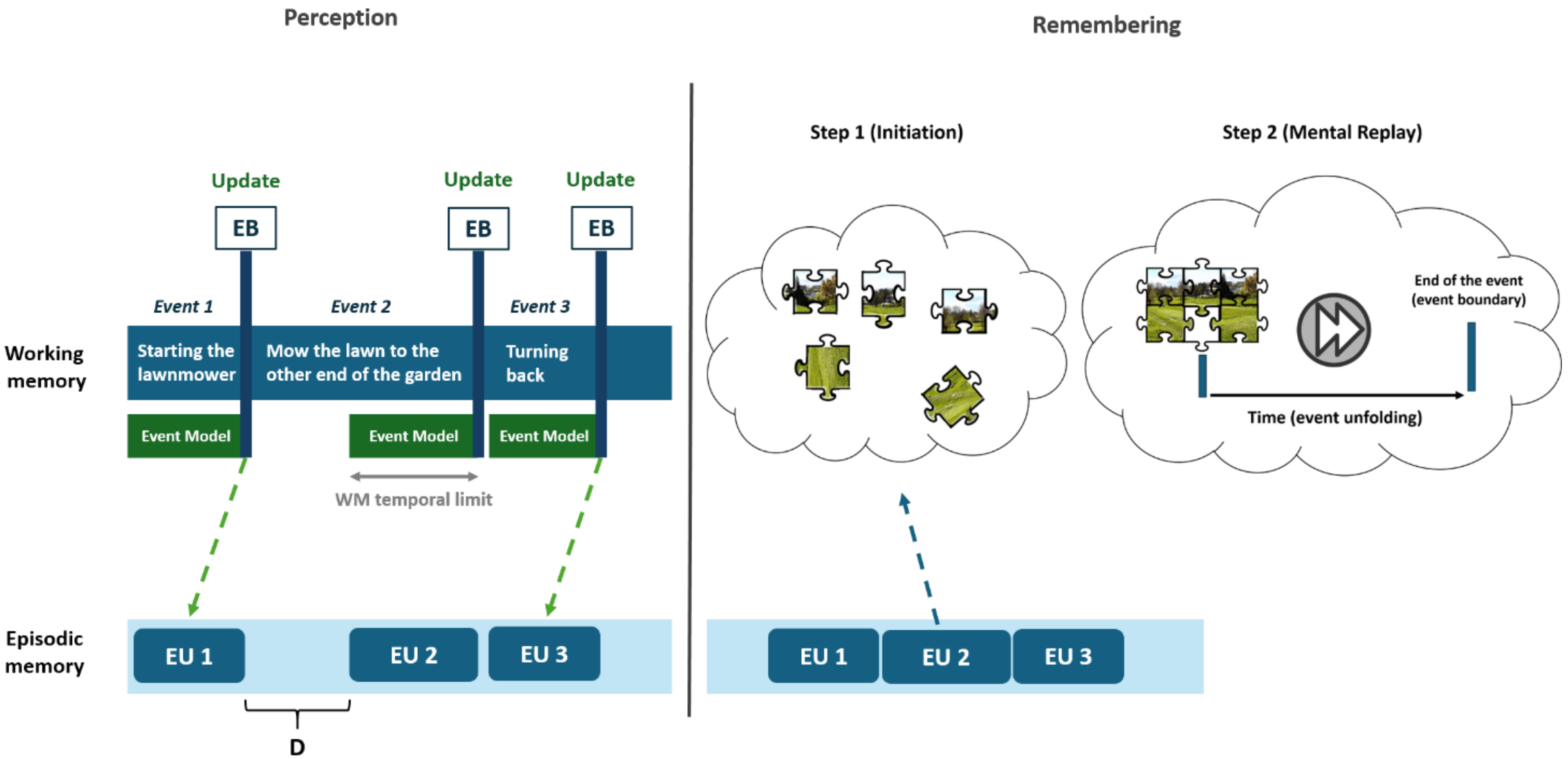


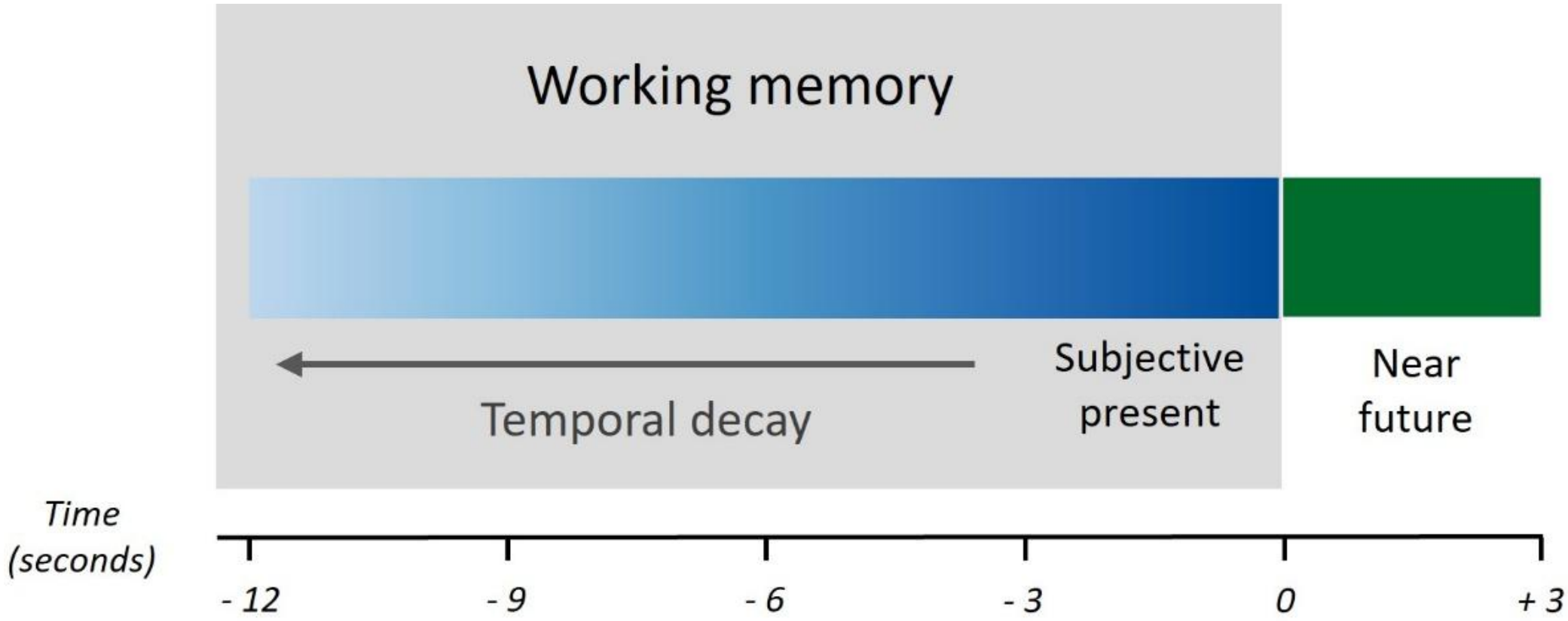


Growth Curve Analyses (robust linear mixed-effects models): estimates across event durations

Event Duration	Remembering Duration		Temporal Ratio	
	Estimate	95%CI	Estimate	95%CI
3 s	3.73	[3.25, 4.22]	1.23	[1.18, 1.28]
6 s	6.51	[6.11, 6.90]	1.09	[1.05, 1.14]
9 s	8.89	[8.52, 9.25]	0.98	[0.94, 1.02]
12 s	10.87	[10.47, 11.26]	0.89	[0.85, 0.94]
15 s	12.46	[11.97, 12.94]	0.83	[0.78, 0.88]

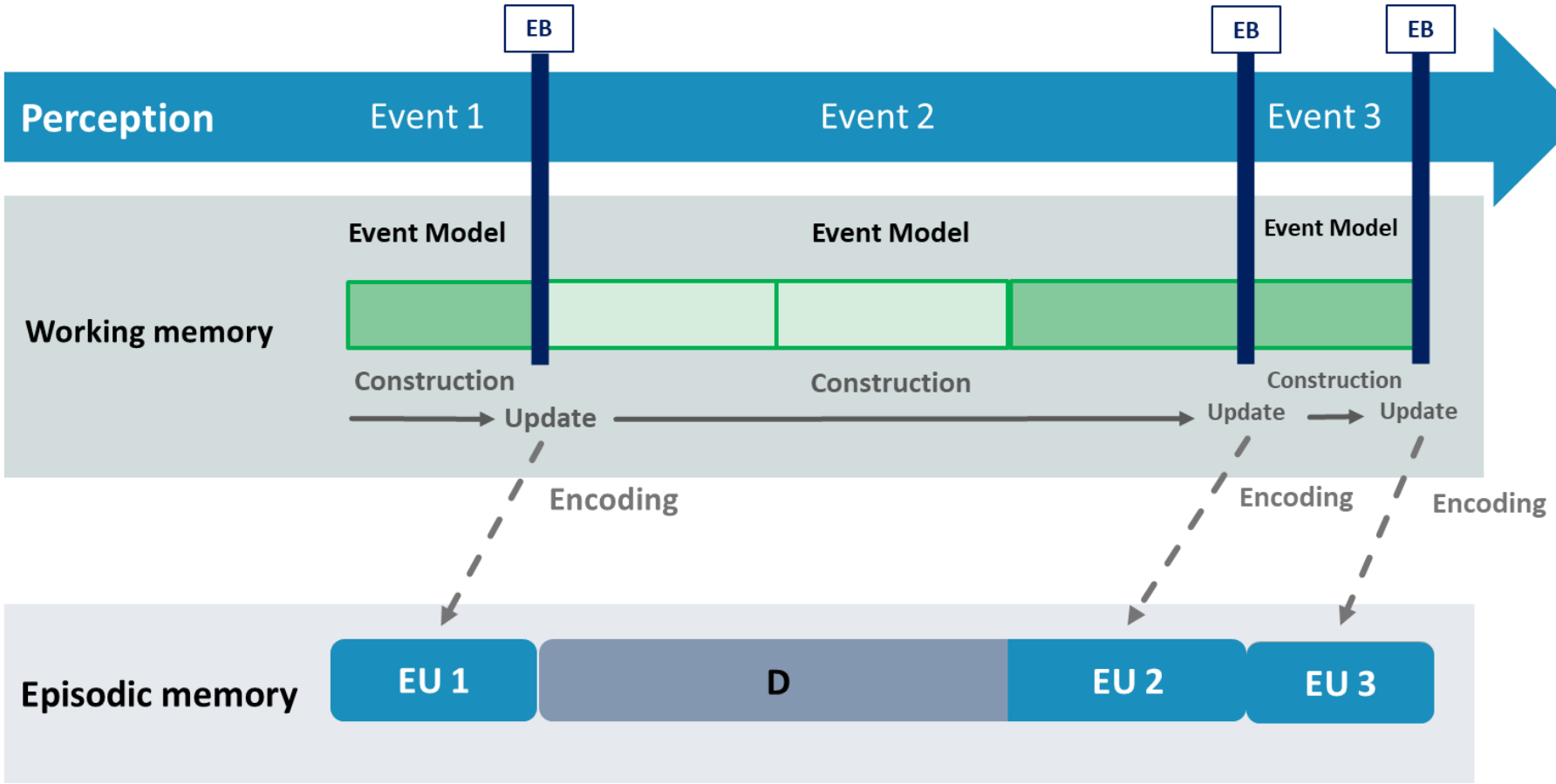
Note. For each event duration: estimated RD (left) and temporal ratio (right), with associated 95% confidence intervals.

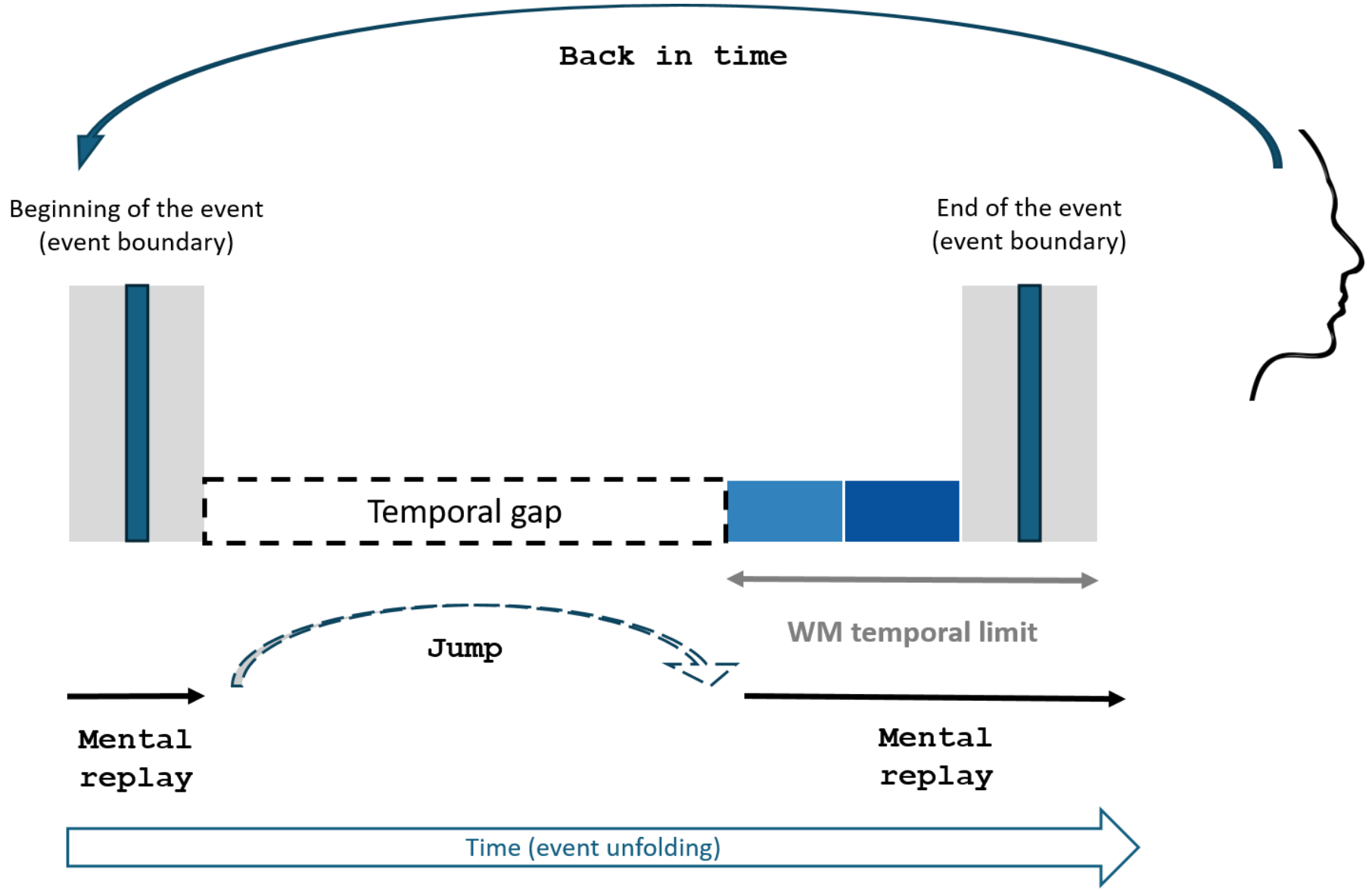

Perception
Remembering
Update
Update
Update
EB
EB
EB
Event 1
Event 2
Event 3
Working memory
Starting the lawnmower
Mow the lawn to the other end of the garden
Turning back
Event Model
Event Model
Event Model
WM temporal limit
Episodic memory
EU 1
EU 2
EU 3
D
Step 1 (Initiation)
Step 2 (Mental Replay)
End of the event (event boundary)
Time (event unfolding)
EU 1
EU 2
EU 3

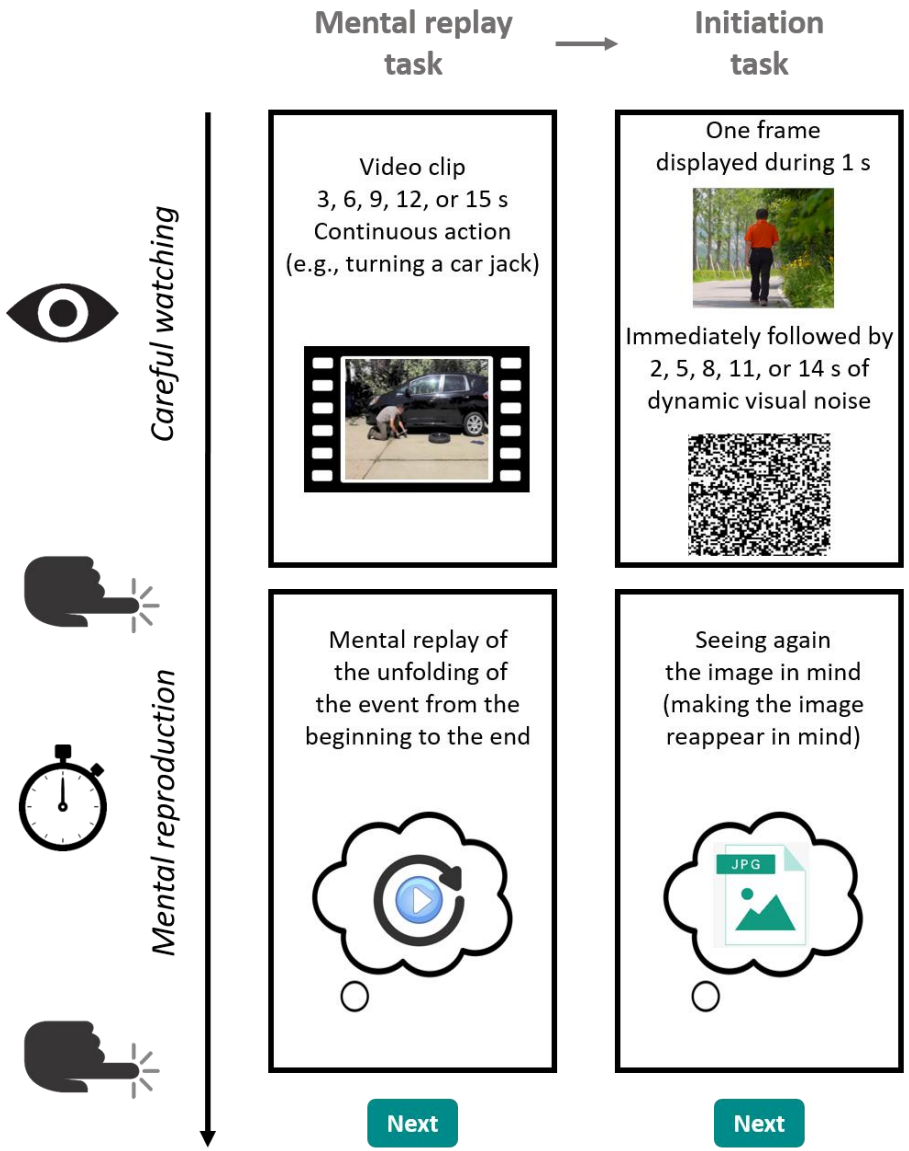

Working memory
Temporal decay
Subjective present
Near future
Time (seconds)
- 12
- 9
- 6
- 3
0
+ 3

= Working memory capacity

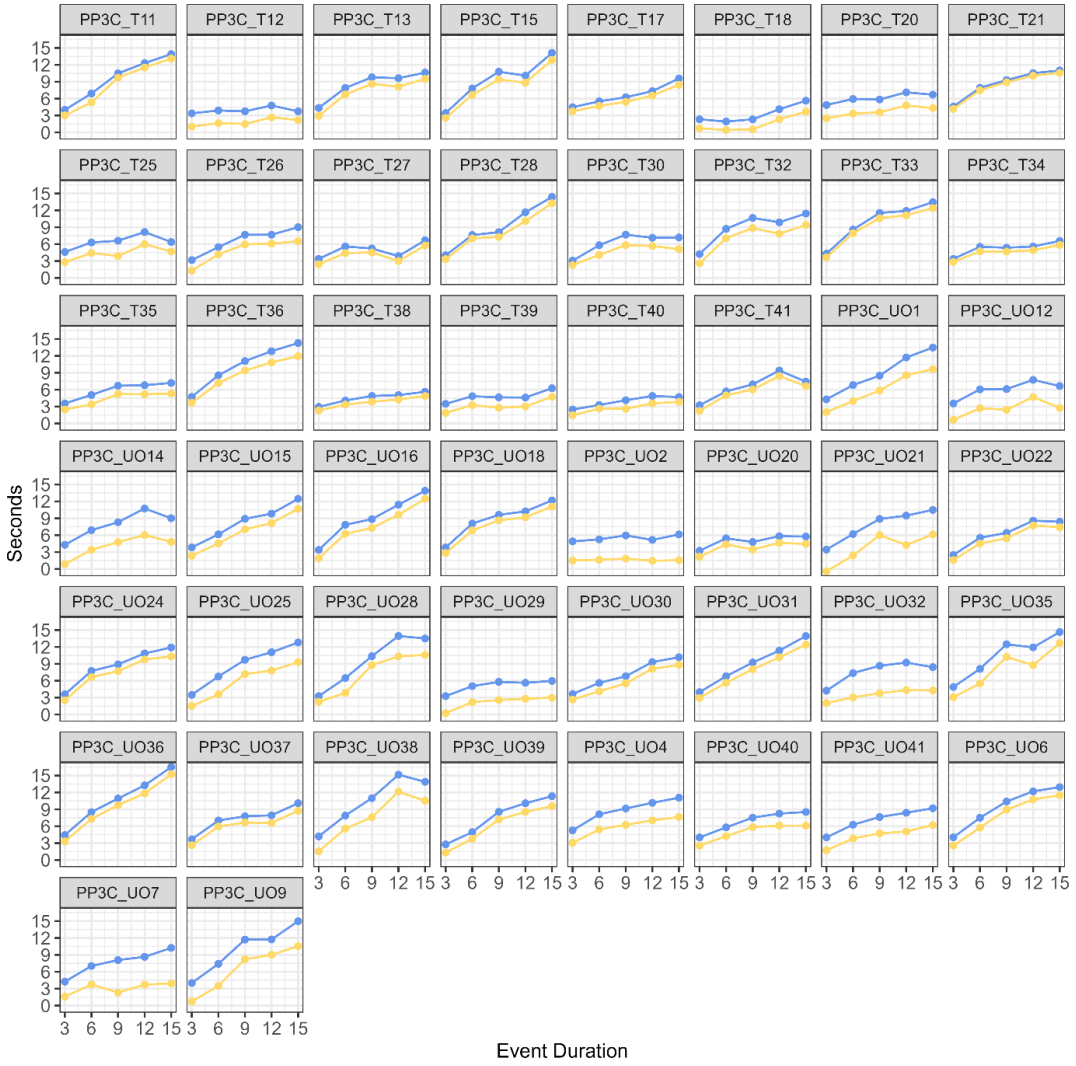
= Part of the event still represented in working memory when an EB is perceived




Back in time
Beginning of the event
(event boundary)
End of the event
(event boundary)
Temporal gap
WM temporal limit
Jump
Mental
replay
Mental
replay
Time (event unfolding)


Mental replay task
Initiation task
Careful watching
Mental reproduction
Video clip
3, 6, 9, 12, or 15 s
Continuous action
(e.g., turning a car jack)
One frame
displayed during 1 s
Immediately followed by
2, 5, 8, 11, or 14 s of
dynamic visual noise
Mental replay of
the unfolding of
the event from the
beginning to the end
Seeing again
the image in mind
(making the image
reappear in mind)
JPG
Next
Next

Evolution of remembering duration (blue) and corrected remembering duration (yellow) with event duration for each participant



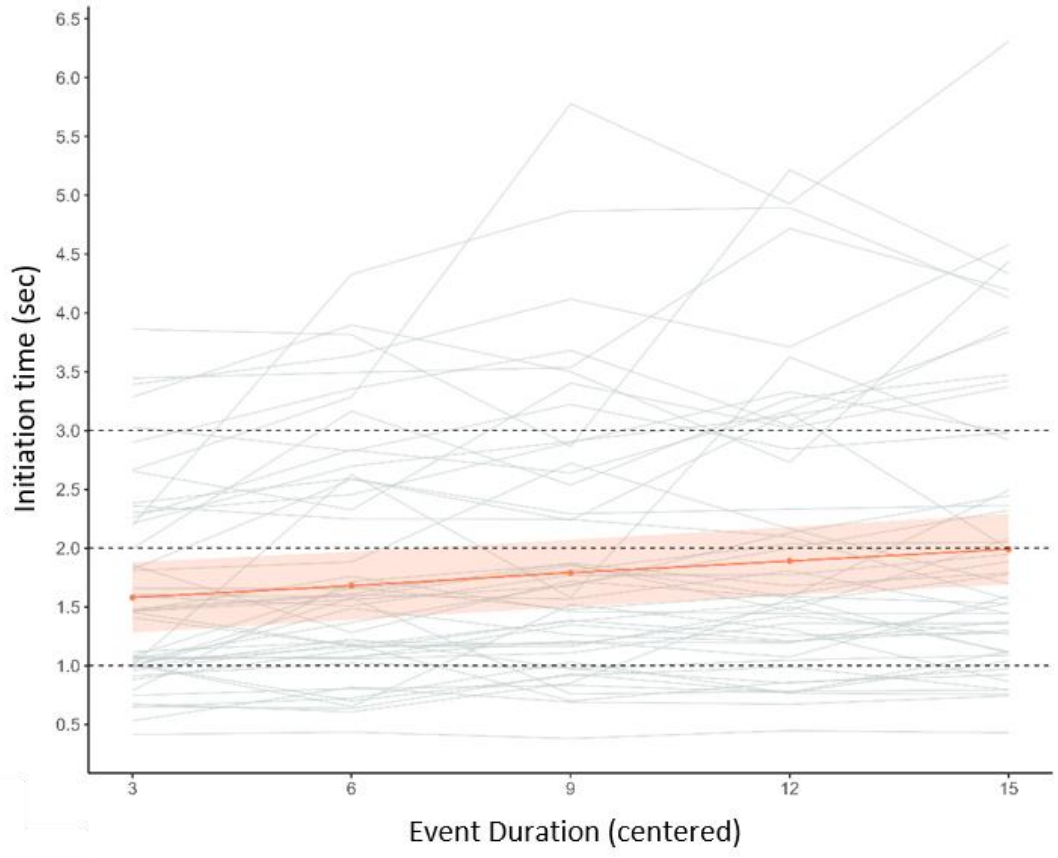
Note. Observed values. Data are averaged by event duration.

Growth Curve Analyses (robust linear mixed-effects models): estimates across event durations

Event Duration	Remembering Duration		Corrected Remembering Duration	
	Estimate	95%CI	Estimate	95%CI
3	3.95	[3.16, 4.73]	2.30	[1.46, 3.15]
6	6.28	[5.63, 6.93]	4.44	[3.72, 5.16]
9	8.08	[7.47, 8.69]	6.09	[5.40, 6.77]
12	9.33	[8.68, 9.99]	7.23	[6.51, 7.95]
15	10.05	[9.27, 10.84]	7.89	[7.04, 8.73]

Note. For each event duration: estimated mean with associated 95% confidence intervals.

Increase of initiation time as a function of event duration

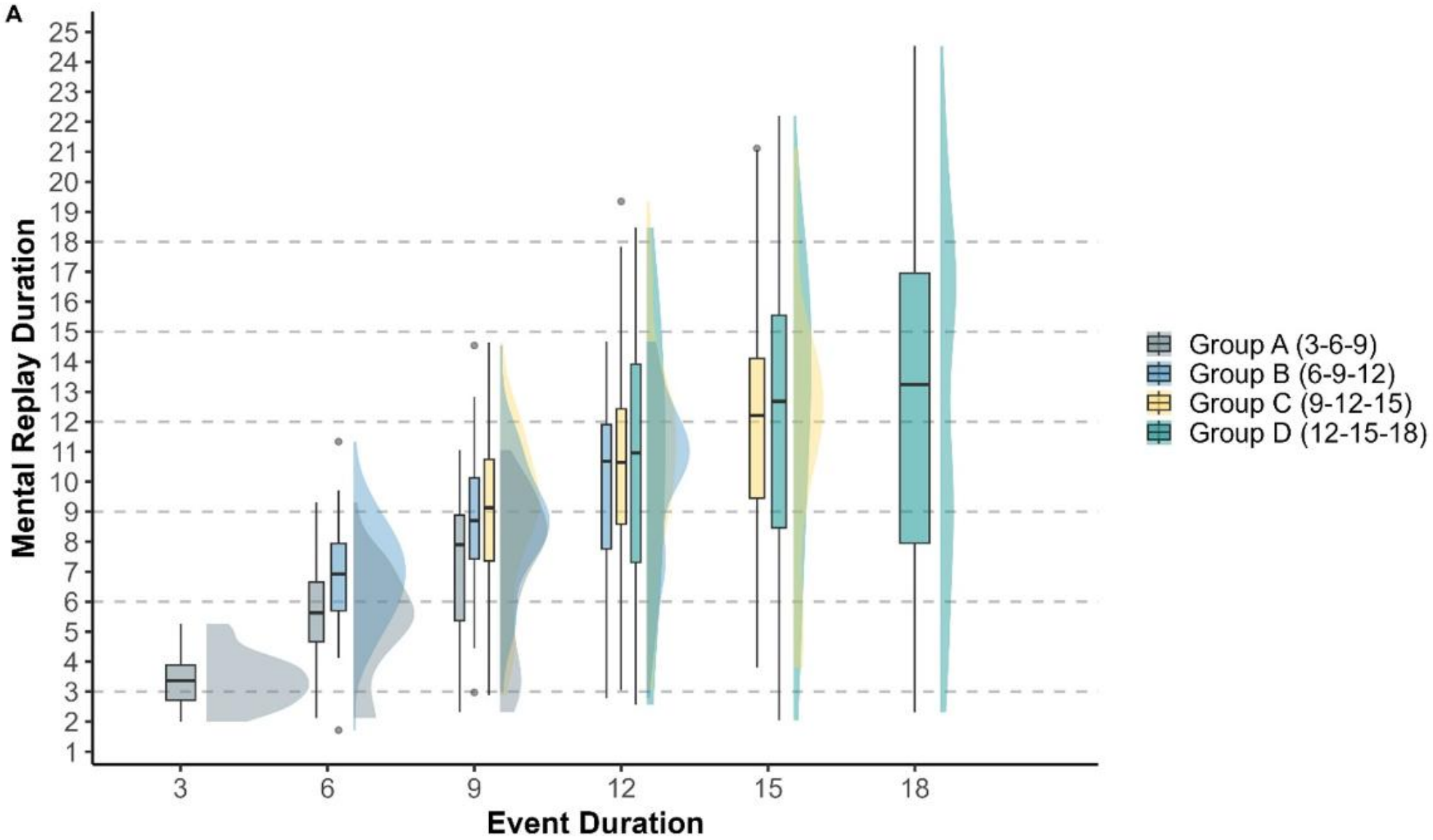


Note. Grey lines represent the observed values. Each line corresponds to the average initiation time of a given participant across durations. The orange dots, line and the ribbon surrounding them represent the model estimates and their 95% *CI*s.

Robust linear mixed-effects model predicting initiation time: estimates across event durations

Event Duration	Estimate	95% CI
3.00	1.58	[1.28, 1.88]
6.00	1.68	[1.39, 1.97]
9.00	1.79	[1.50, 2.07]
12.00	1.89	[1.60, 2.18]
15.00	1.99	[1.69, 2.29]

Note. For each event duration: estimated mean with associated 95% confidence intervals.


A
Mental Replay Duration
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
3
6
9
12
15
18
Event Duration
Group A (3-6-9)
Group B (6-9-12)
Group C (9-12-15)
Group D (12-15-18)

Estimated remembering duration as a function of event duration (across groups)

Group	Event	Estimate	95% CI
Group A (3-6-9)	3 s	**3.36**	[3.15, 3.57]
	6 s	**5.47**	[5.03, 5.90]
	9 s	**7.13**	[6.50, 7.75]
Group B (6-9-12)	6 s	**6.84**	[6.38, 7.29]
	9 s	**8.55**	[7.97, 9.12]
	12 s	**9.96**	[9.23, 10.70]
Group C (9-12-15)	9 s	**8.89**	[8.17, 9.57]
	12 s	**10.47**	[9.54, 11.40]
	15 s	**11.80**	[10.70, 12.89]
Group D (12-15-18)	12 s	**10.69**	[9.58, 11.82]
	15 s	**12.01**	[10.75, 13.24]
	18 s	**12.74**	[11.22, 14.25]

Note. Estimated mean with associated 95% confidence intervals (computed using wild bootstrap).

Effects of the group (i.e., event duration range) on remembering duration

Event	Comparison	Estimate	SE	*p*-value	95% CI
6 s	**Group A vs. Group B**	-1.41	0.33	< .01	[-2.06, -0.76]
9 s	**Group A vs. Group B**	-1.33	0.49	0.01	[-2.30, -0.37]
	Group A vs. Group C	-1.72	0.49	< .01	[-2.68, -0.75]
	Group B vs. Group C	-0.38	0.49	0.44	[-1.35, 0.58]
12 s	**Group B vs. Group C**	-0.50	0.72	0.49	[-1.92, 0.92]
	Group B vs. Group D	-0.68	0.72	0.34	[-2.09, 0.73]
	Group C vs. Group D	-0.18	0.72	0.80	[-1.59, 1.23]
15 s	**Group C vs. Group D**	-0.45	0.93	0.63	[-2.28, 1.38]

Note. For each event contrast: estimated mean with associated standard error, Wald's 95% confidence interval and uncorrected p-value.