Detecting signs of consciousness in severely brain injured patients with voluntary control of sniffing: a cohort study.

Vanessa Charland-Verville

Coma Science Group
Neurology Department
& Cyclotron Research Centre
University of Liege & Liege University Hospital
Liege, Belgium
in collaboration with
Weizmann institute of science
Rehovot, Israel

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Weizmann Institute of Science

Université de Liège

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Introduction

PNAS

Sniffing enables communication and environmental control for the severely disabled

Anton Plotkin[a,1], Lee Sela[a,1], Aharon Weissbrod[a], Roni Kahana[a], Lior Haviv[a], Yaara Yeshurun[a], Nachum Soroker[b,c], and Noam Sobel[a,2]

[a]Department of Neurobiology, The Weizmann Institute of Science, Rehovot 76100, Israel; [b]Loewenstein Rehabilitation Hospital, Raanana 43100, Israel; and [c]The Sackler Faculty of Medicine, Tel Aviv University, Ramat Aviv 69978, Israel

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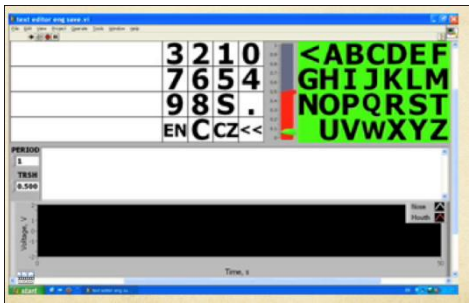
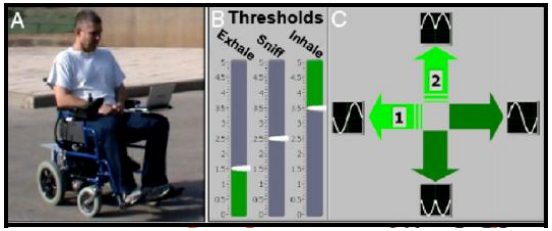
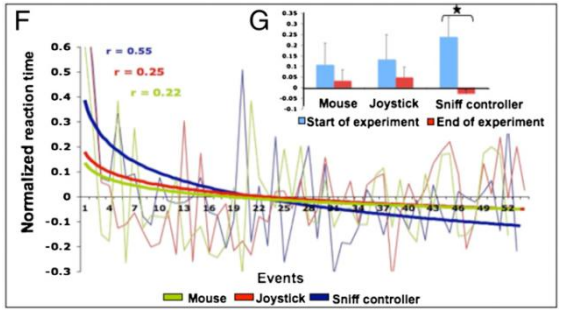






Introduction

Aim: Detecting signs of consciousness in non-communicative patients with disorders of consciousness.

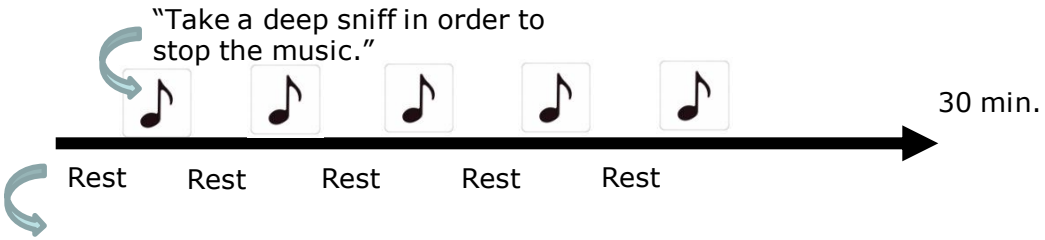
- Through voluntary control of respiration (non-invasive)

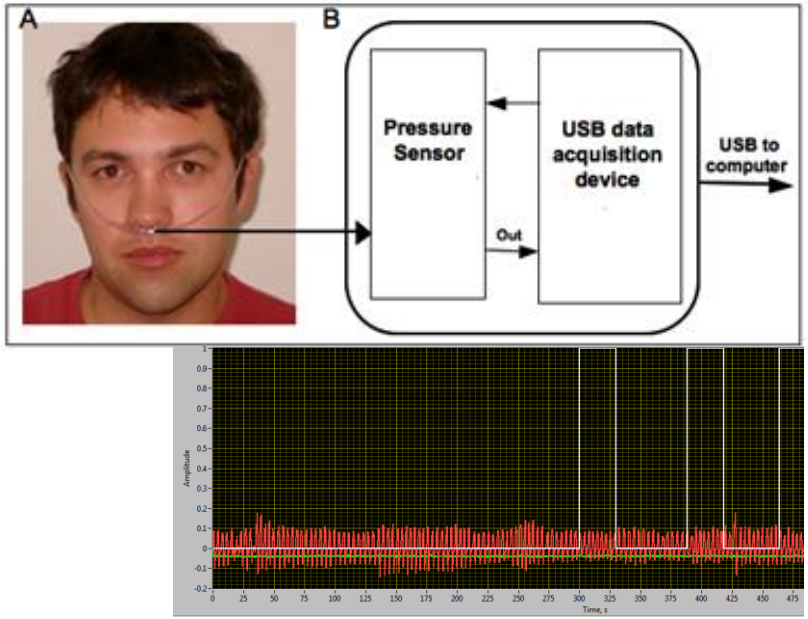
- Sniffs rely on widely distributed neural network, allowing for increased conservation following injury
- Device usage shared neural substrates with language production, rendering sniffs a promising bypass mode of communication

Methods

Sniff Controller ⇨ Sniff-dependent interface that measures nasal pressure and converts it into electrical signals.

Task:
-5 min. baseline
-30 sec. stimulus
-60 sec. rest
- Between 15-25 events





Sniff magnitude beyond a set threshold

Methods

Population

33 DOC patients: 11 VS/UWS; 3 MCS-; 17 MCS+; 2 EMCS (19 men, mean age =35; SD = 13.27)

Etiology (n = 22 traumatic)

Since insult (mean = 40 months; SD = 34.9)

Analysis

STATA Software (version 12, Texas, USA)

- T-test differences for reaction times in rest periods vs music events

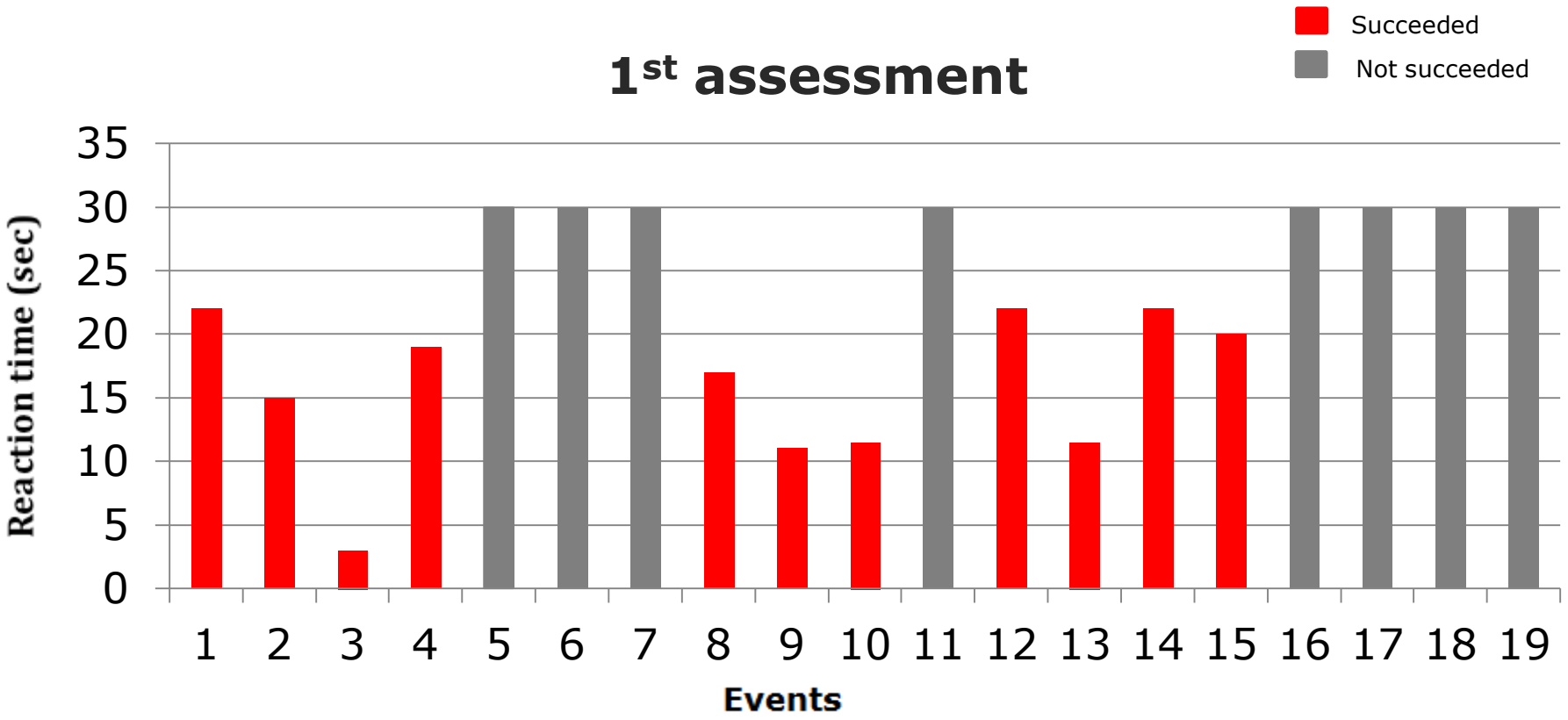
Results

Responders: 0/11 VS/UWS; 1/3 MCS-;
4/17 MCS+; 1/2 EMCS

Patient	Age	Gender	CRS-R	Etiology	Time since
1	48	F	MCS-	Anoxic	1 year 6 months
2	31	F	MCS+	TBI	6 years 7 months
3	36	F	MCS+	Anoxic	1 year 5 months
4	24	F	MCS+	TBI	1 year 9 months
5	5	F	MCS+	TBI	3 years 6 months
6	32	M	EMCS	TBI	2 years 5 months

Sniffing performance

48 year-old woman; MCS-; 18 months post cardiac arrest



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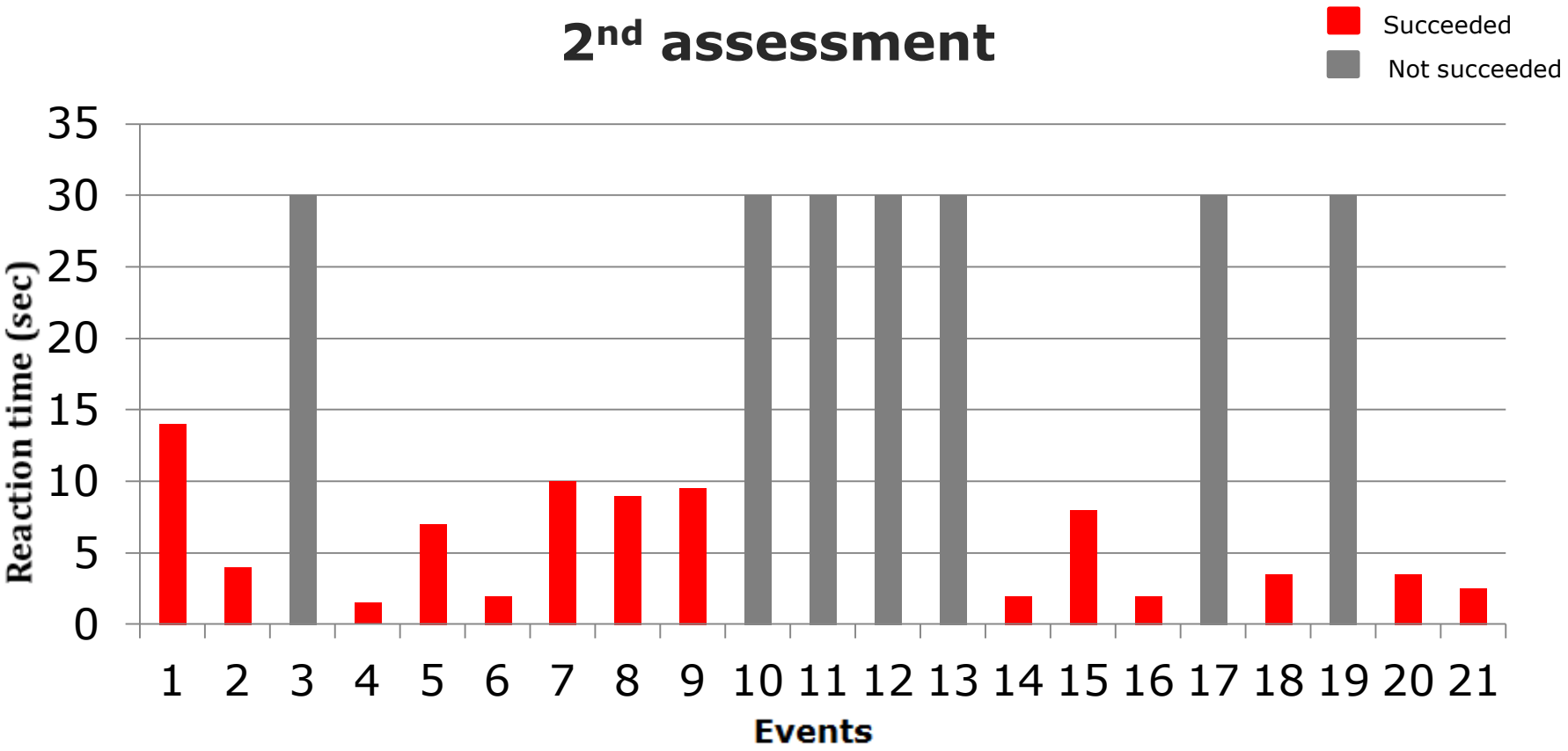

Conclusion

Sniff Controller

Allowed to identify voluntary control of respiration in a patient without command following

- Complementary way to assess the level of consciousness at bedside
- Alternative tool to fMRI[1] or EEG based[2] non-motor dependent communication
- Future perspective: trying more complex communication/self-expression

1. Monti et al. (2010) NEJM 362 (7): 579-89.
2. Schnakers et al. (2008) Neurology 71 (20) : 1614-20.

THANK YOU!

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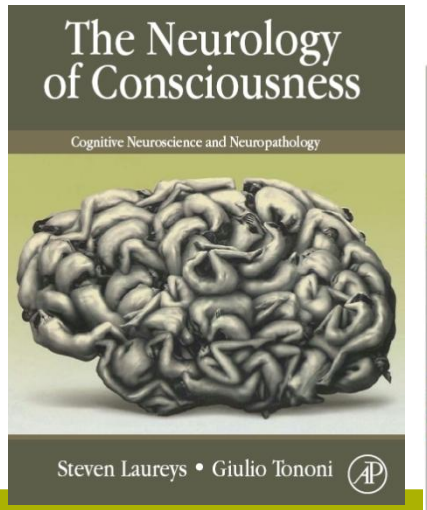

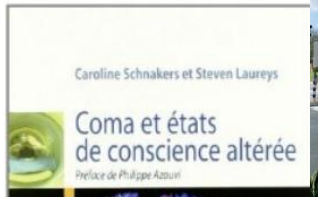

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