Reduced Interference Effect on Topographical Working Memory in Military Pilots./ L'effet d'interférence Réduit sur La Mémoire de travail topographique chez les pilotes militaires.

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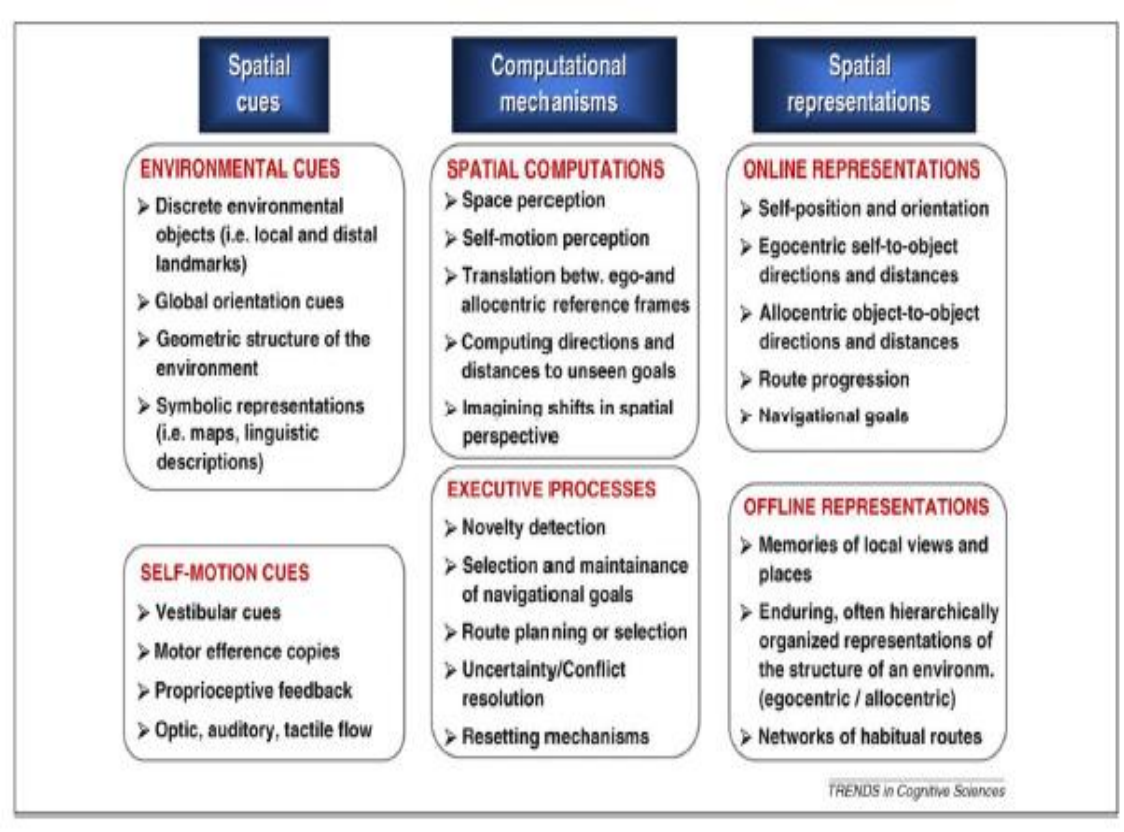
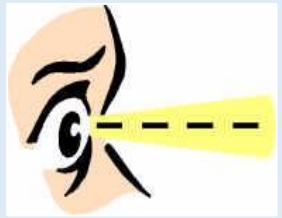
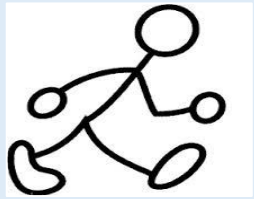
Cognitive processes and representations Involved In human navigation



Wolbers & Hegarty, 2010

Information Coding



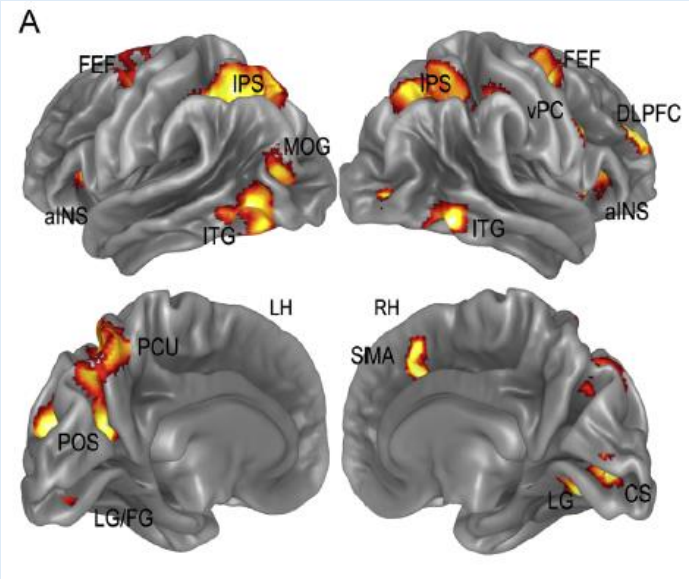


Planning

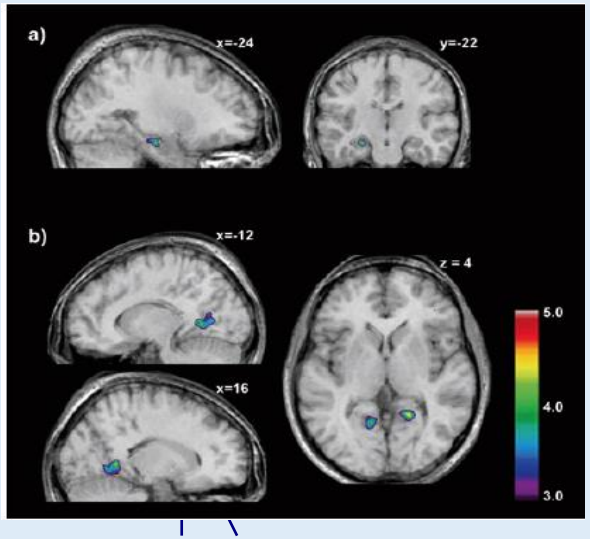
Mental Representation

Monitoring,
Decision Making,
Problem Solving

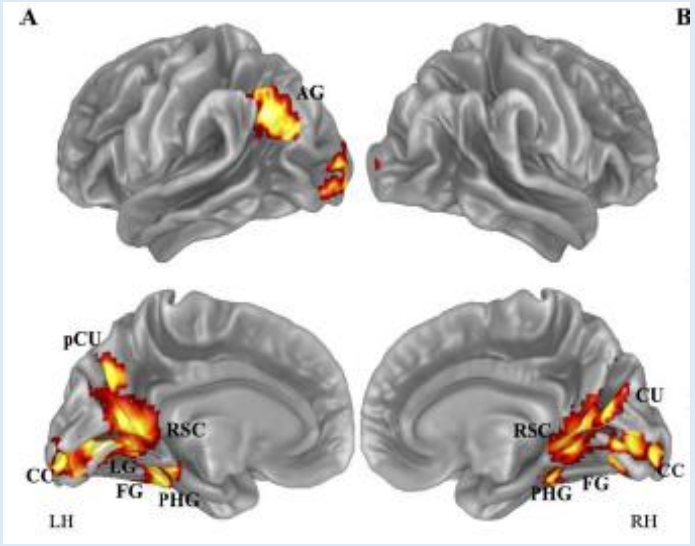
Memorizing a path (Nemmi & coll., 2013)



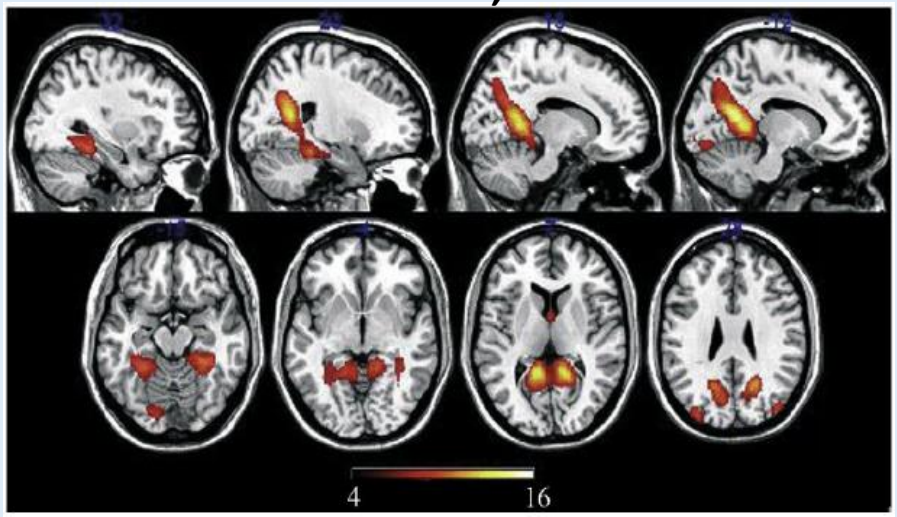
Memorizing a place (Iaria & coll. 2007)



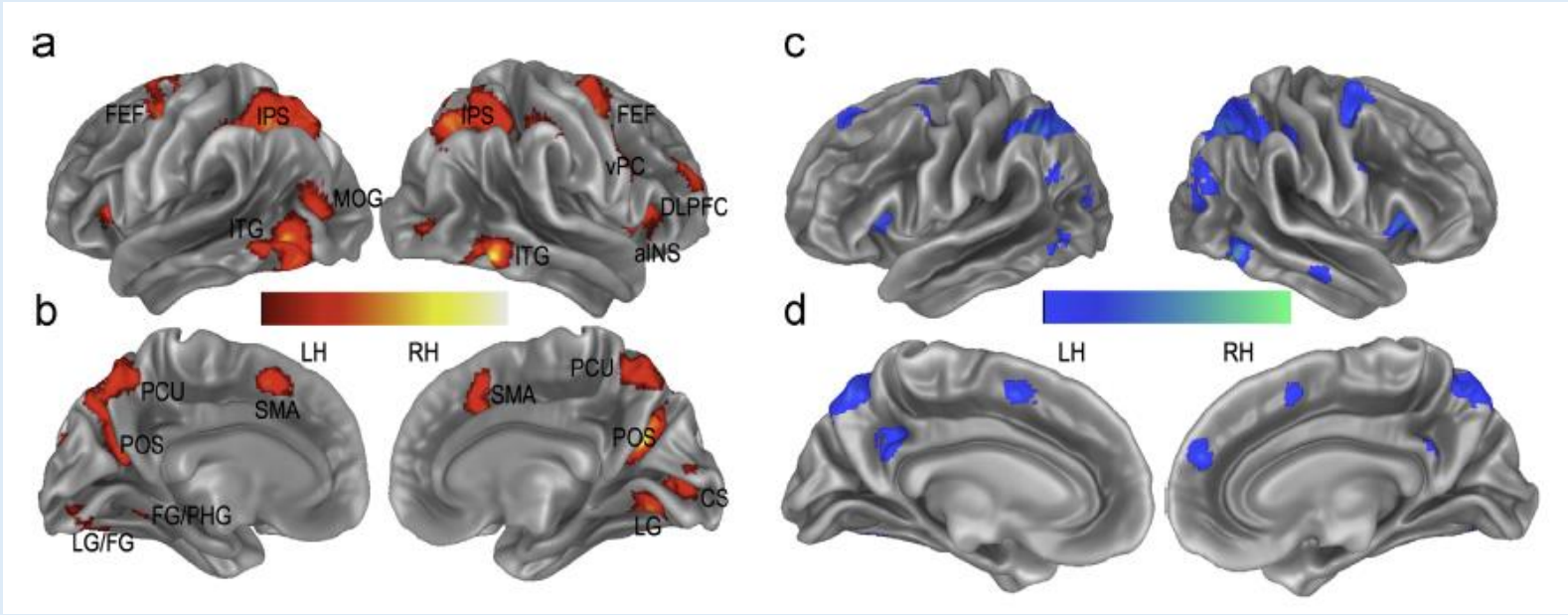
Recalling a Place Boccia & coll., 2015



Recalling a path Nemmi & coll., 2013



Memory in reaching vs. navigational space Nemmi et al. 2013

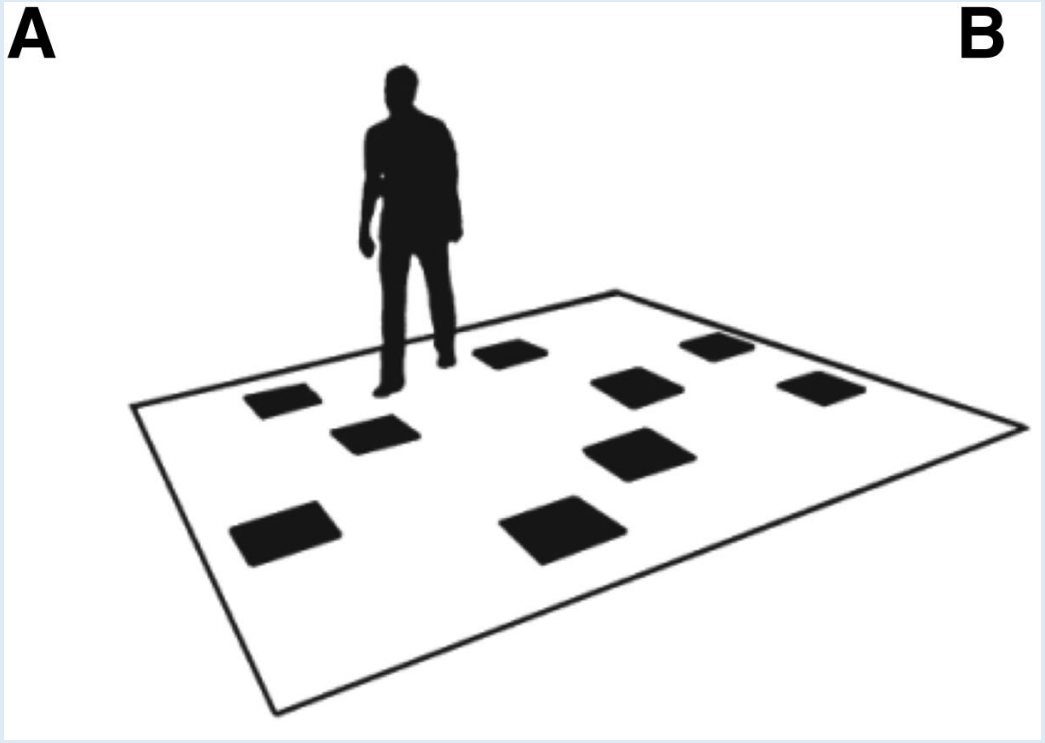


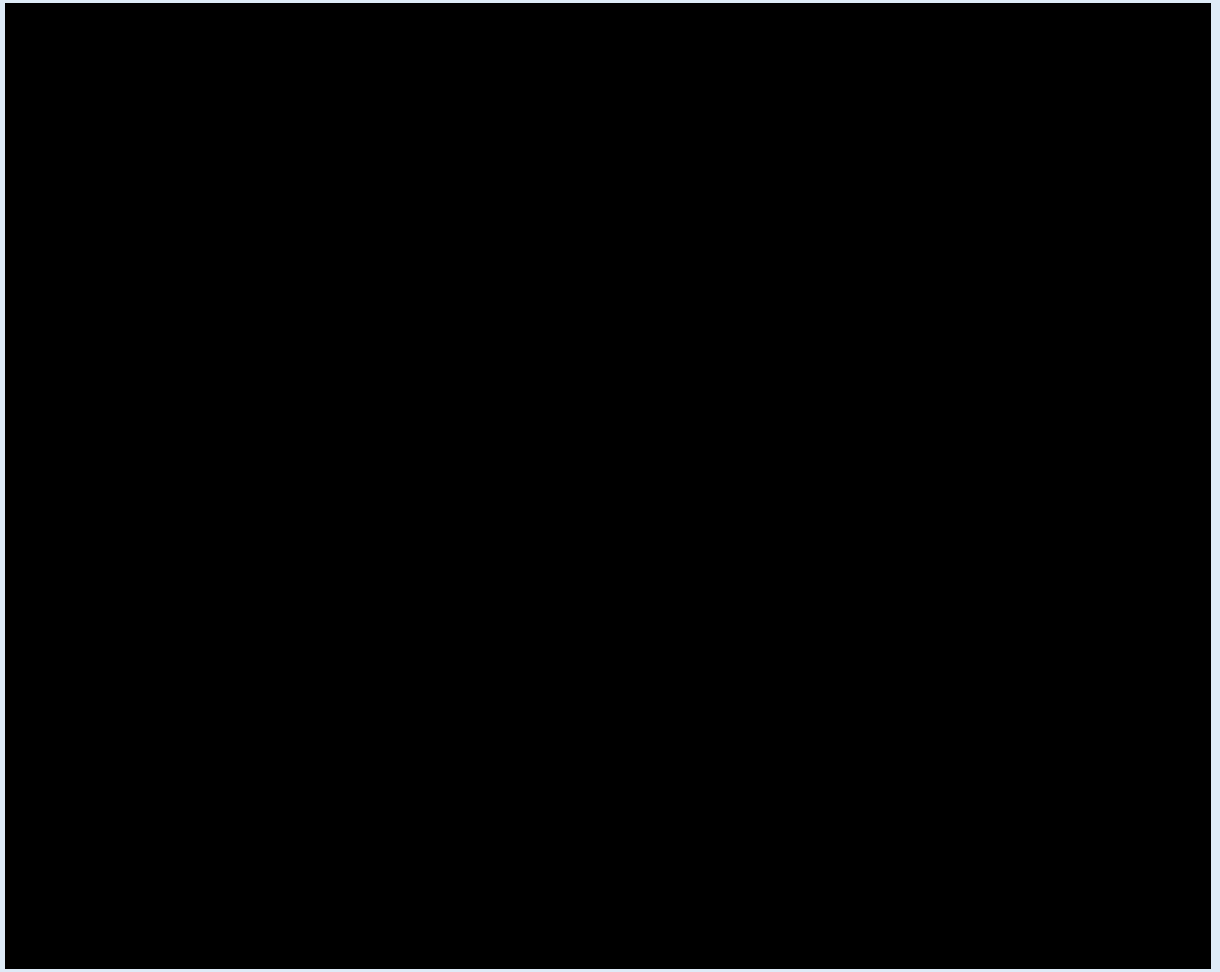
We compared the performance of pilots and non-pilots of both genders performing increasingly complex navigational memory tasks while exposed to various forms of interference.

GROUPS	AGE (YR)	EDUCATION (YR)	FLIGHT HOURS
Male Pilots ($N = 17$)	30.41 (7.91)	16.88 (1.58)	1250.00 (1064.42)
Female Pilots ($N = 17$)	30.71 (6.17)	18.29 (2.20)	774.12 (564.15)
Male Non-pilots ($N = 18$)	28.78 (3.46)	17.28 (2.27)	—
Female Non-pilots ($N = 22$)	27.95 (4.95)	17.96 (1.09)	—

The study was conducted in cooperation with the Italian Air Force, Experimental Flight Center, Aerospace Medicine Department, Pratica di Mare.

Non-pilots were college students with no flight experience. They were matched with the pilots for age [$t(73)=1.23$; $p= 0.11$], sex, and educational level (i.e., third year of University or with basic degree) [$t(73)=1.23$; $p=0.89$]

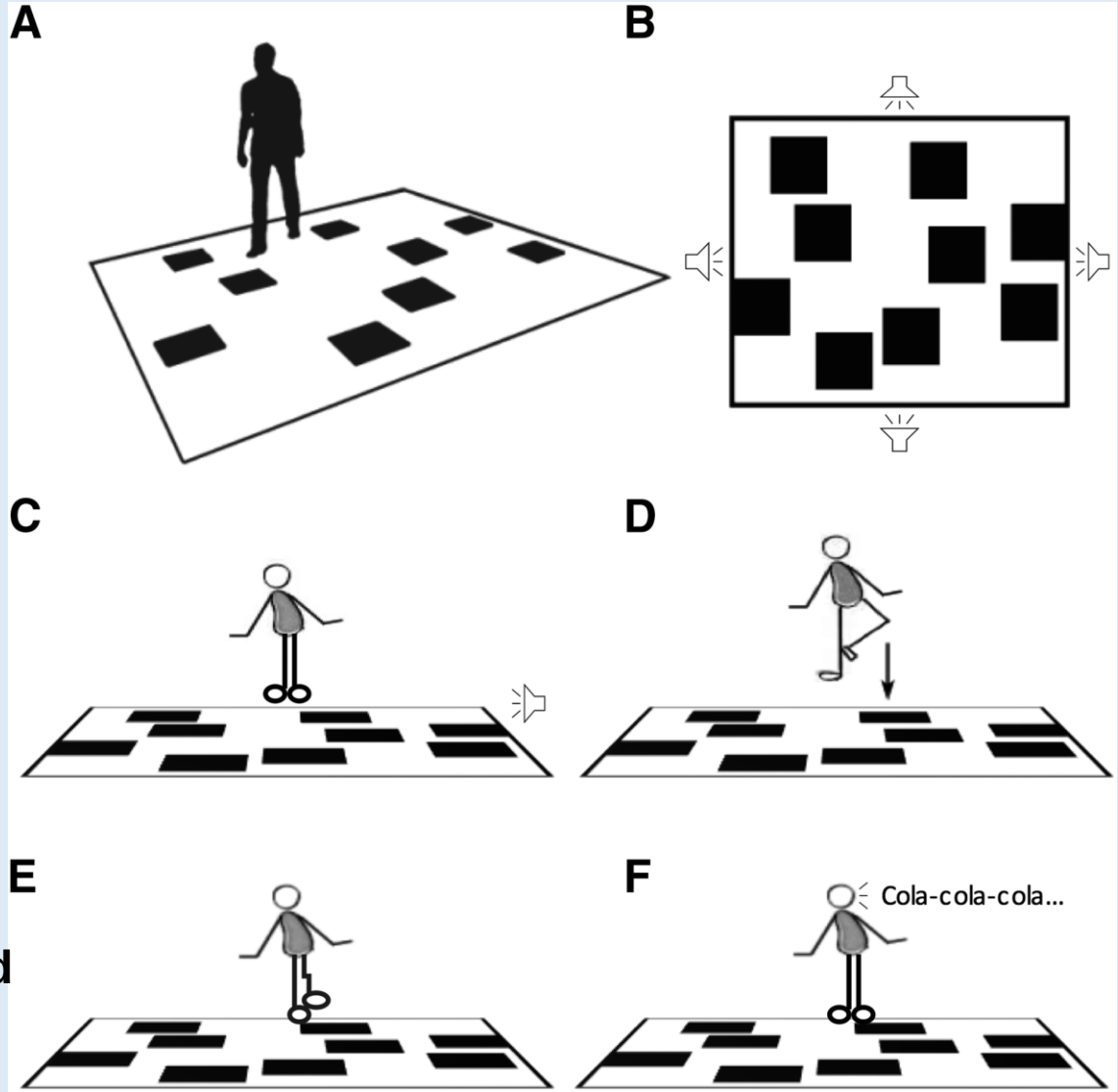




Topographical Memory Task: Walking Corsi Test (WalCT: Piccardi et al., 2008; 2013)

Specifically, we investigated the effects of 4 different sources of interference: motor, spatial motor, verbal, and spatial environment on topographic working memory.

WalCT layout



Sources of sound used during spatial environmental interference

Spatial environmental Interference:
Participant was required to point with his finger index to the source of a sound.

Motor interference:
Participant was required to walk on the spot

Spatial motor interference:
Participant was asked to bend his leg at knee level and then stretch it out backward, alternating the left and right leg, always standing in the same place

Articulatory Suppression:
Partcipant was asked to repeat an irrelevant sound speech

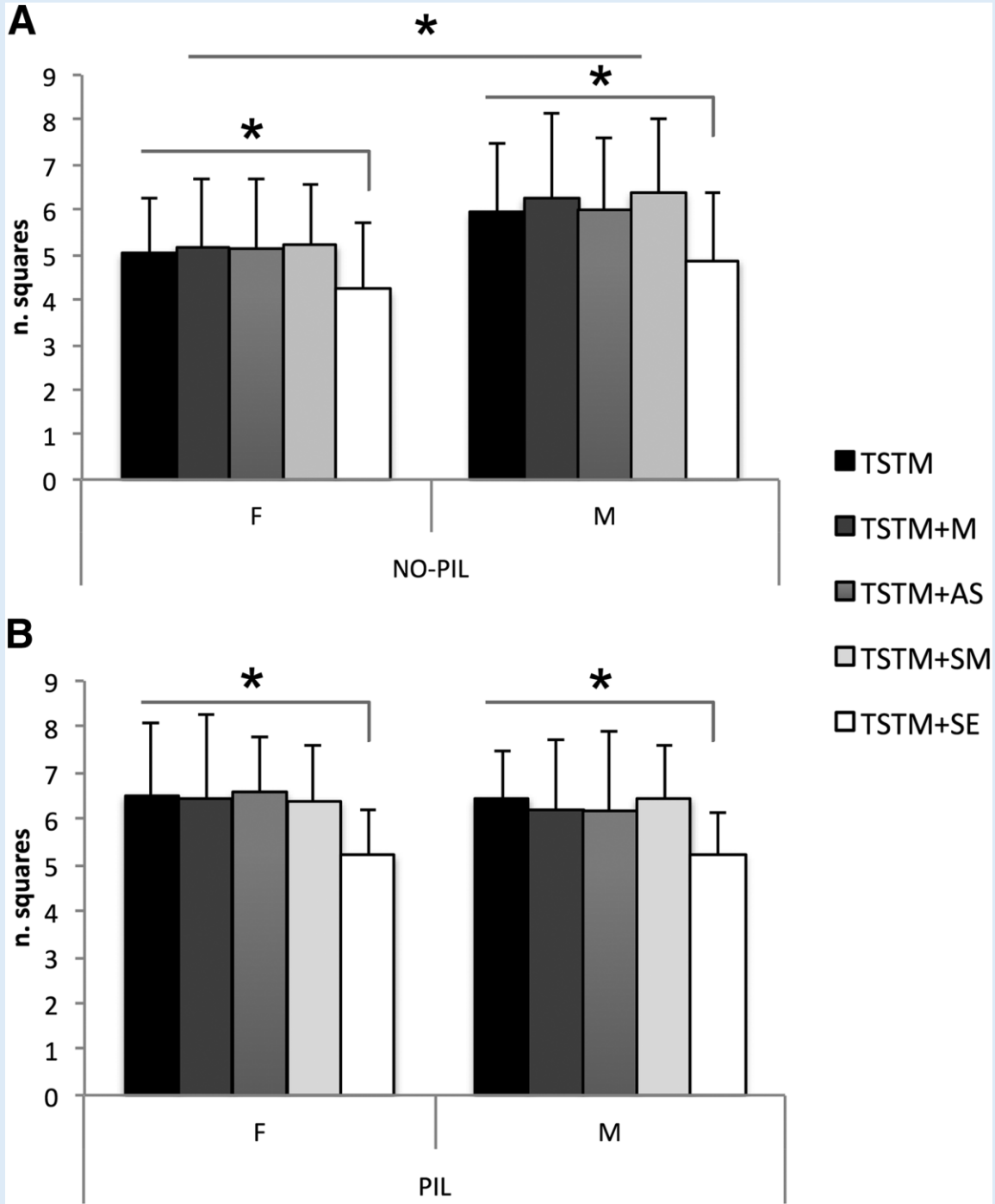
Results

The 2x 2x5 mixed ANOVA revealed a:
-Main effect of the Group [F(1,70)=9.674, p=0.003]with PIL performing better than NON-PIL

-Main effect of the Task [F(4,280)=15.152 p<.0001. Bonferroni post hoc showed that participants performed significantly worse on the TSTM + SE

-GroupxGender interaction [F (1, 70)=5.064, p= 0.028]. Bonferroni post hoc showed that only Males and Females of the NON-PIL group differed in performing the experimental tasks.

The 2x5 mixed ANOVA on PIL ' s performances confirmed
the absence of any gender effect in this group, but also confirmed a main effect of the Task [F(4,128) =7.591, p=0.001]. Also PIL group performed worse on the TSTM + SE.



	Flight Hours	WalCT	WalCT + M	WalCT + AS	WalCt + SM	WalCT + E
Flight Hours						
Pearson's Correlation	1	−0.148	0.087	−0.054	0.203	0.112
P-Value		0.402	0.623	0.760	0.249	0.529
N	34	34	34	34	34	34
WalCT						
Pearson's Correlation	−0.148	1	0.337	0.510	0.156	0.255
P-Value	0.402		0.052	0.002	0.378	0.145
N	34	34	34	34	34	34
WaltCT + M						
Pearson's Correlation	0.087	0.337	1	0.414	0.457	0.068
P-Value	0.623	0.052		0.015	0.007	0.702
N	34	34	34	34	34	34
WaltCT + AS						
Pearson's Correlation	−0.054	0.510	0.414	1	0.280	0.224
P-Value	0.760	0.002	0.015		0.108	0.203
N	34	34	34	34	34	34
WaltCT + SM						
Pearson's Correlation	0.203	0.156	0.457	0.280	1	0.014
P-Value	0.249	0.378	0.007	0.108		0.939
N	34	34	34	34	34	34
WaltCT + E						
Pearson's Correlation	0.112	0.255	0.068	0.224	0.014	1
P-Value	0.529	0.145	0.702	0.203	0.939	
N	34	34	34	34	34	34

Fig. 3. Correlation matrix.

Pearson ' s correlation analysis did not show any significant correlation with flight hours

Conclusions and Discussion

-In pilots and non-pilots, navigational working memory is compromised only by a spatial environmental interference, demonstrating that the motor aspects in navigation, even when present, do not interfere with the normal acquisition of environmental information.

-Gender differences are present only in non-pilots. Women were less able than men. **In Pilots women and men performed at the same level.**

The lack of gender-related effects in pilots compared to nonpilots is partially due to the strict criteria used during the selection testing for entering the Italian Air Force Academy. In fact, women who pass the trials are already strongly selected for their high spatial abilities.

Thank you for the attention

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