



Effects of Tropical Climate and Language Format on Imagery Ability Among French-Creole Bilinguals

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Introduction

Guadeloupe: French West Indies island with **tropical climate**

Communication **French & Creole.**

Creole: particular links with **mental imagery** (Anciaux, 2003)
influenced by **heat** (Robin et al., 2017).



Aim of study: Evaluate whether Tropical Climate (TC) differently influences participants' imagery ability when using Creole versus French during mental imagery.

Introduction (2)



1) Mental Imagery



Introduction (3)



Movement Imagery Questionnaire (MIQ, Hall & Pongrac ,1983)

- VI & KI abilities.
- poor \neq good imagers.

Good imagery :

- ↗ acquisition (Goss et al., 1986; Robin et al., 2007).

good imagers > poor imagers

Introduction (4)



2) Relation between MI and Creole

The "Creole" = inhabitants & manners to speak (Véronique, 2000).

French and Creole : particular status & specific role (Anciaux et al., 2002).

- ✓ French = Official language: information & education (Anciaux, 2008).
- ✓ Creole = **Cultural, symbol of the identity**, (Ferguson, 1959).

Guadeloupean = French-Creole bilinguals (Massina et al., 2000).

Introduction (5)

Guadeloupean build linguistic, behavior, attitudes correlation with, French & Creole (Anciaux et al., 2002).



Education => French.

Creole : school (regional language & optional education) 2001.

Creole positive : - **learning and perf.** (Durizot Jno-Baptiste, 1996),
- **participation** (Giraud, Gani, & Manesse, 1992),
- **clarification of the instructions** (Vasseur, 1997),
- **application of acquired knowledge** (Gauvin, 1977).

MI in Creole ↗ memory capacities + motor actions reminding (Anciaux, 2007).

Introduction (6)



Language:

- social relationship systems
- **control of cognitive processes** (Ardila & Ramos, 2010).

Additional language reflected in the pattern of brain organization & activity.

Learning 2nd language ↗ **density of grey matter** (Mechelli et al., 2004).

Introduction (7)



3) Influence of TC on cognition and language

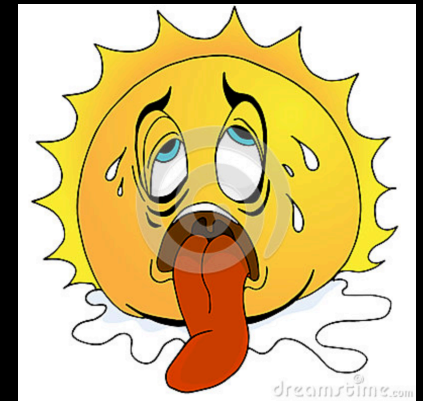
Heat stress => decreased perf. (Berg et al., 2015).

Difficult tasks decrements above 30°C (Ramsey & Kwon, 1992).

The global workspace theory (Baars, 1997) => Limited cognitive capacity

Perf. ↓ if the total resources are insufficient (Hocking et al., 2001) .

Introduction (8)



Heat :

- ➔ **Fatigue** (Qian et al., 2015)
- ➔ **Thermal discomfort** (e.g., Hue, 2011).

Exposure to a Heat (TC) = competing variable to cognitive processes

The effect of TC on MI ability & different language instructions remains unstudied to our knowledge.

Aim of this study

Evaluate if TC differently influences MI scores (Creole vs. French versions) upon participants' imagery ability.

Predictions

1°) Imagery ability : good imagers less affected (TC) than poor imagers.

2°) Language : Creole (learned in TC), representation of action in TC facilitated?

=> MIQ-C scores TC > AC

=> MIQ-F scores AC > TC

Methods

PARTICIPANTS

110 (*M*age = 31.01 years, *SD* = 2.47).

French-Creole bilingual (primary school teachers).

Movement Imagery Questionnaires :

- Creole version
- French version

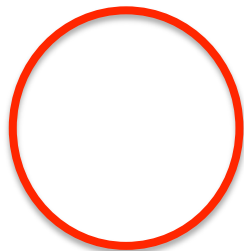
Methods

MATERIAL: MOVEMENT IMAGERY QUESTIONNAIRES

RATING SCALES

Visual Imagery Scale

1	2	3	4	5	6	7
Very hard to see	Hard to see	Somewhat hard to see	Neutral (not easy nor hard)	Somewhat easy to see	easy to see	Very easy to see



Addition: higher score => greater ease of imaging.

Methods

PARTICIPANTS

110 ($M_{age} = 31.01$ years, $SD = 2.47$), French-Creole bilingual: teachers.

2 versions of the Movement Imagery Questionnaires :

- Creole version : MIQ-C scores: poor imager ($n = 24$) + good imager ($n = 24$).
- French version : MIQ-F scores: poor imager ($n = 24$) + good imager ($n = 24$).

2 Sessions :

- AC ($M = 24.07^{\circ}\text{C}$, 47.2 % rH)
- TC ($M = 31.12^{\circ}\text{C}$, 73.4 % rH).

1-week interval between sessions : Each session: in AC then TC

Results : Visual Imagery, MIQ-F

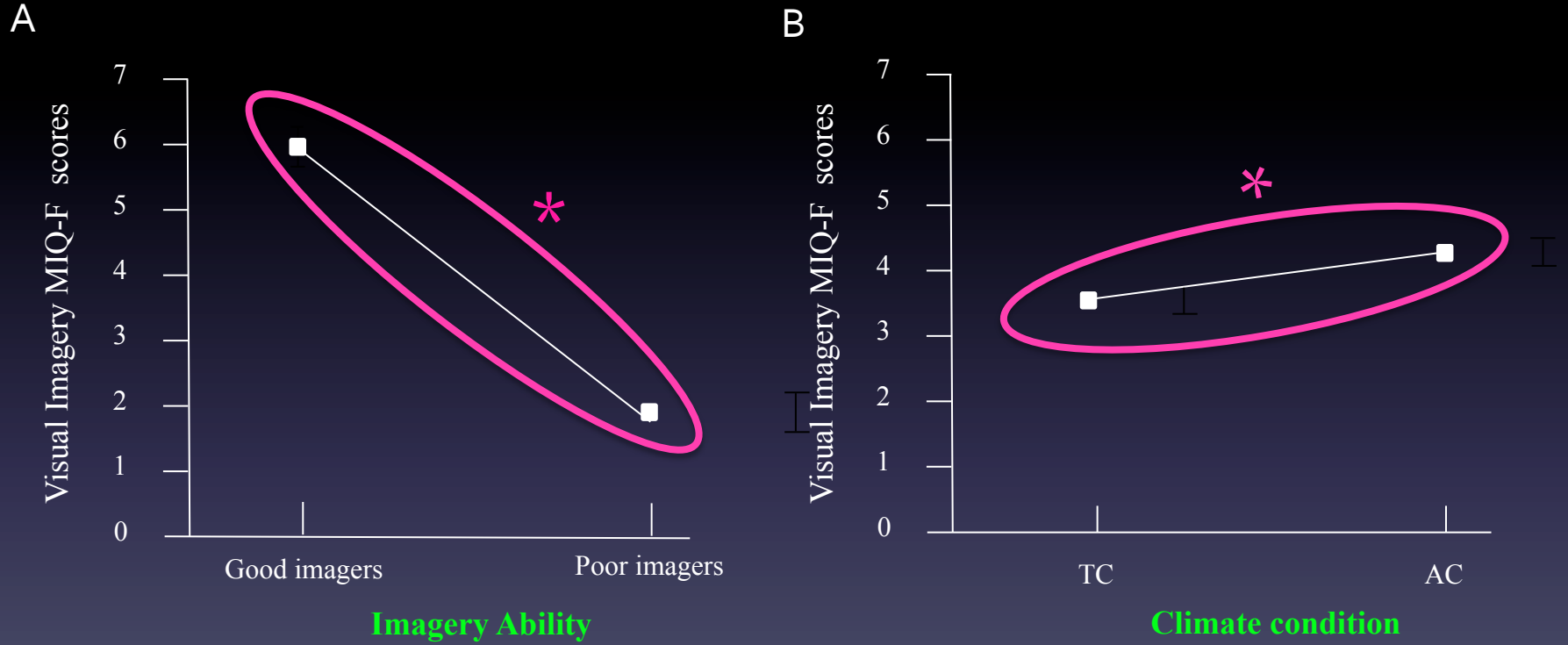


Figure 1. Main effects of imagery ability (A) and temperature condition (B) on visual imagery MIQ-F scores.

* Significant difference by ANOVA: $p < .05$.

Results : Kinesthetic imagery, MIQ-F

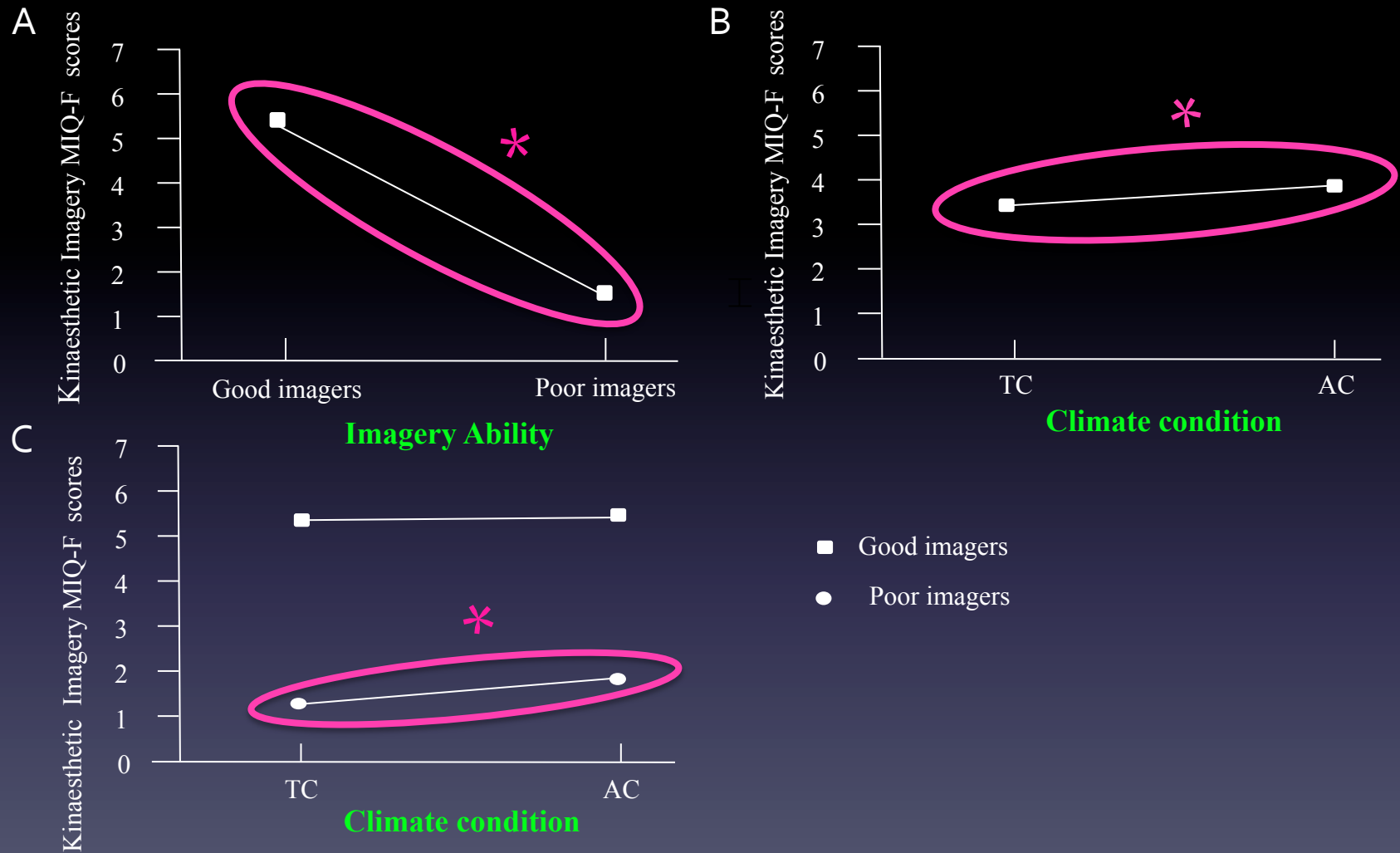


Figure 2. Main effects of imagery ability (A) and temperature condition (B) and Imagery ability \times temperature condition interaction (C) on kinaesthetic imagery MIQ-F scores. * Significant difference by ANOVA: $p < .05$.

Results: kinesthetic imagery MIQ-C

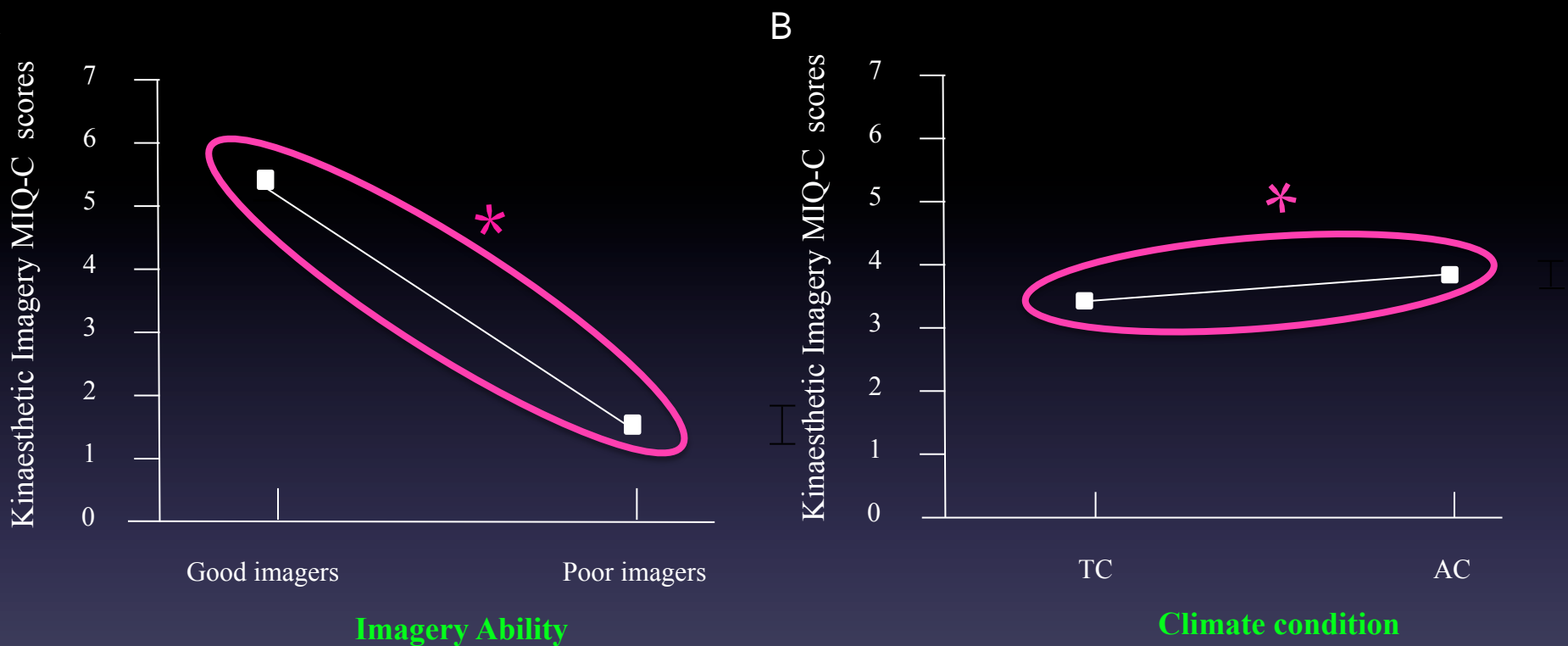


Figure 4. Main effects of imagery ability (A) and temperature condition (B) on kinaesthetic imagery MIQ-C scores. * Significant difference by ANOVA: $p < .05$.

Results: visual imagery, MIQ-C

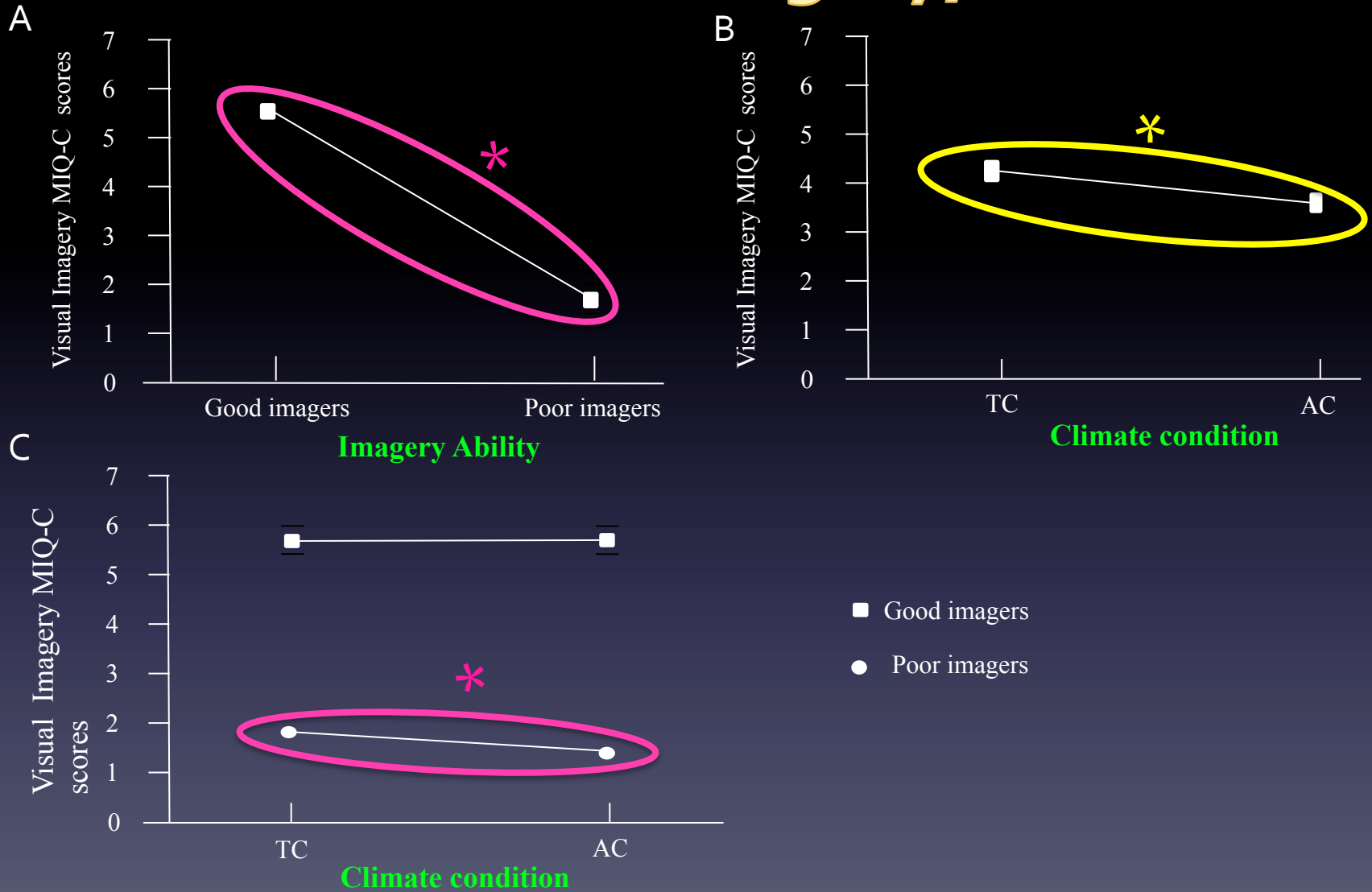


Figure 3. Main effects of imagery ability (A) and temperature condition (B) and Imagery ability × temperature condition interaction (C) on Visual imagery MIQ-C scores. * Significant difference by ANOVA: $p < .05$.

Discussion

Climate and Mental Imagery

Participants had worse VI & KI MIQ-F , and KI MIQ-C scores in TC than in AC.

- Mental rotation (Robin et al., 2017)
- Complex tasks (Cian et al., 2000; Hocking et al., 2001).

The Maximal Adaptability Model : heat exerts its detrimental effects on performance (Hancock & Warm, 1989).

When environmental stress ↗, attentional resources are progressively drained.

Discussion

Climate and Mental Imagery (2)

Humans: limited cognitive capacity due to different external stimuli constantly competing for the limited conscious access to the vast global workspace (Gaoua, 2010).

Hocking et al (2001) perf. in the cognitive tasks would deteriorate when the **total resources are insufficient for both the task and the thermal stress.**

Discussion

Language and Mental Imagery

Results: **Visual Imagery** MIQ-C scores in **TC > in AC**

⇒ Creole & French, although sharing **common brain structures** also activates ≠ neural pathways specific to each language.

Massina et al. (2000): **differential recovery** of French & Creole for a patient

Discussion

Why VI (Creole) was facilitated in TC?

Creole is a language made by **images** (Michelot, 2000).

Language seems to influence the evocation of mental images:

➔ **memory capacities** and **motor reminding** (Anciaux, 2005, 2007).

The language effects could also be situated at the level of the mobilization of the motivation, attention, and cognition.

Discussion

When participants learned Creole, they built a **representation including environmental elements as climate**.

VI (MIQ-C) in TC may have **facilitated or not limited** the access to this representation.

Creole (bilinguals) => **cognitive load reduction?**

TC represent a **cognitive load** but Creole seems to bring a **kind of comfort zone** or **cognitive facilitation** that ↘ thermal load.

Discussion

Climate, Language and Imagery Ability

Poor imagers : KI (MIQ-F) scores in $TC < AC$.

=> Consistent with (Logie et al., 2011; Robin et al. 2007)

The addition of more difficulties to generate a vivid and accurate KI and TC impose +++ constraint in term of cognitive resources.

Good imagers : $TC = AC$

They have probably more efficiently used the remaining resources using adaptive strategies such as attentional focus.

Discussion

Climate, Language and Imagery Ability (2)

But why Poor imagers : VI MIQ-C scores in TC > AC ????

Creole is a language made by images => facilitates the use of VI

=> learnt in TC

TC favor the use of VI when the imagery instructions are in Creole in particular for poor imagers.

=> The remaining resources were sufficient to obtain a successful outcome.

Imagery ability depends on environment & language

Conclusion

Necessary take into account:

- Imagery ability
- Environmental conditions (e.g., Climate)
- Language instruction



Thank you for your attention



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Further research

Assess and compare imagery ability scores of French-Creole bilingual participants realizing the MIQ-F then the MIQ-C in TC and/or AC.

Use French Creole monolingual participants (Haiti)