



# Step fusional vergence normative values in healthy adult subjects



A prospective, monocentric, non controlled, non randomised and open study

Marc FAUVEAU, CO / Benoît ROUSSEAU, CO / Marie ASSIE, CO / Marie TILLOUS, CO / Joaquim TESSON, CO / Carole LACAMBRE, CO  
Hôpital d'Instruction des Armées; CPEMPN (Clamart) & Institut Mutualiste Montsouris (Paris) - FRANCE

## AIMS

In healthy adult subjects, step fusional vergence were gathered for distant (5 meters) and near (40 centimeters) viewing conditions in order to compare this normative values with those of well knowns *Morgan*<sup>(1)</sup> and *Scheiman & Wick*<sup>(2)</sup> references. The intent of this study was to obtain normative data from a strictly controlled population of young normal adults passing their hiring Air Crew vision screening assessments.

## PROTOCOL

Visually normal adults underwent four step-vergence amplitude measurements in a specific order :

- 1) Far Negative Vergence (Nasal-Base prisms)
- 2) Near Negative Vergence (Nasal-Base prisms)
- 3) Far Positive Vergence (Temporal-Base prisms)
- 4) Near Positive Vergence (Temporal-Base prisms)

## MATERIALS

The room is a bright space with only diffuse ceiling lights (no natural light), and without shadowing.

The fixation point is :

- 1) For the far : a letter printed on a good shape paper board, with maximum contrast and 6/10 resolution at a distance of 5.0 meters
  - 2) For the near : a Krats-Rousseau fixation palette, hold in primary position, at measured of 40 centimeters. The subject fixe his gaze on a letter (accommodative face).
- The vergence amplitude is measured with a 1 to 40Δ Berens bar.

## METHODS

A detailed ophthalmologic and a refractive examination is systematically performed (Tropicamide cycloplegia).

Inclusion Criterion :

- Adults, aged between 18 and 40y,
- Without any visual disease (Y1 or Y2 Air Crew ranking)

VA Without correction	VA With correction	Myopia	Hypermetropia	Y rank
9/10 for each eye	10/10	-0,50	+1,50	Y1
8/10 for each eye or 9/10 & 7/10 or 10/10 & 6/10	10/10 for each eye	-1,0	+2,0	Y2

Subjects were carefully asked to warn us at once if any blur –even small- is detected on the optotype and, further, when diplopia is observed. The choice of the eye, backside of the Berens-bar, have been done after a flip-coin drawing.

Twelve vergences levels have been assessed :

**Far Negative Vergence** : Blur / Break / Recovery points

**Near Negative Vergence** : Blur / Break / Recovery points

**Far Positive Vergence** : Blur / Break / Recovery points

**Near Positive Vergence** : Blur / Break / Recovery points

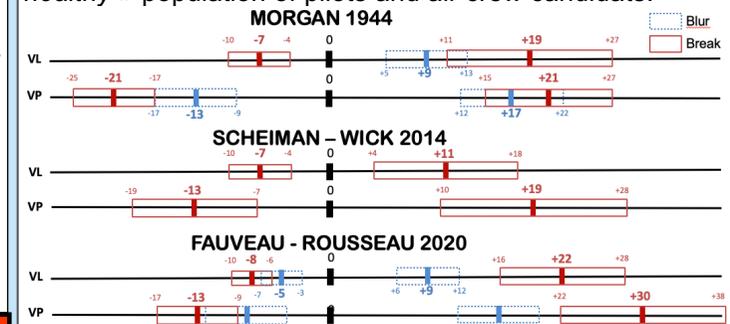
## RESULTS

Measures	Step-Vergences (Δ)		
	Morgan (SD) (T-Score)	Scheiman (SD) (T-Score)	Present (SD)
<b>Distance :</b>			
Blur	9,0Δ (4,0) (49)	NM	<b>8,8Δ (2,8)</b>
Break	19,0Δ (8,0) (54)	11,0Δ (7,0) (66)	<b>22,2Δ (6,1)</b>
Recovery	10,0Δ (4,0) (62)	7,0Δ (2,0) (89)	<b>14,8Δ (4,1)</b>
<b>Positive</b>			
Blur	NM	NM	<b>-4,6Δ (1,7)</b>
Break	-7,0Δ (3,0) (47)	-7,0Δ (3,0) (47)	<b>-7,9Δ (2,1)</b>
Recovery	-4,0Δ (2,0) (41)	-4,0Δ (2,0) (41)	<b>-5,8Δ (2,7)</b>
<b>Negative</b>			
Blur	17,0Δ (5,0) (49)	NM	<b>16,3Δ (4,2)</b>
Break	21,0Δ (6,0) (65)	19,0Δ (9,0) (62)	<b>30,2Δ (8,1)</b>
Recovery	11,0Δ (7,0) (65)	14,0Δ (7,0) (61)	<b>21,8Δ (5,9)</b>
<b>Far</b>			
Blur	-13,0Δ (4,0) (62)	NM	<b>-8,4Δ (3,3)</b>
Break	-21,0Δ (4,0) (71)	-13,0Δ (6,0) (50)	<b>-12,8Δ (3,8)</b>
Recovery	-13,0Δ (5,0) (54)	-10,0Δ (5,0) (48)	<b>-11,0Δ (3,1)</b>

36 adults aged : 22yo (SD 3,5) were recruited (from Oct 2018 to July 2019). Therefore, 33 subjects were finally included : all Y1 ranked, none wearing glasses.

## CONCLUSIONS

The step-vergence obtained differs significantly from the *Morgan* and *Scheiman & Wick* reference, particularly compared to the *Morgan*<sup>(1)</sup> near negative break-point, and to the *Scheiman & Wick*<sup>(2)</sup> far positive recovery-point and for all the near positive points (noticeably higher in our study). Probably due to a selection amongs a « *ultra-healthy* » population of pilots and air crew candidates.



## BIBLIOGRAPHY

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## DISCLOSURE

The authors, have disclosed no relevant financial relationships