Ergonomía & Patología Digital

Conflicto de intereses: Ninguno.

Eduardo Alcaraz-Mateos MD PhD

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#DPCádiz2018

Qué es ergonomía?

Productos

Equipos

Sistemas

Ambientes

Tareas

Qué es ergonomía? Factores

EQUIPOS

SENTIDOS

ESFUERZO

TAREAS

TAMAÑO CORPORAL

AMBIENTE

POSTURA

MÚSCULOS

Precisión

ESTRÉS

FORMAS

Conocimiento

EXPERIENCIA

ILUMINACIÓN

Temperatura

Peligros en Anatomía Patológica

Peligros en Anatomía Patológica

Agencia Europea para la Seguridad y la Salud en el Trabajo

Working in awkward postures:		
Sitting without effective breaks/with lack of movement	Low Back Pain Neck Shoulder MSDs	Special workplaces/tasks: Microscopy workplaces Seated (primarily) activity at a process control system, control panel work Tasks in drivers' cabs Surveillance workplaces
Standing without effective relief	Lower Limb Disorders	Meat-processing industry: meat portioning Nursing and health services: sustained standing at operating tables, in some cases in conjunction with constrained postures Retail trade: sales tasks Construction sector: carpenters
Working in awkward trunk postures, static/dynamic, high proportion of the time	Low Back Pain Intervertebral lumbar disc disorders/injuries (e.g. protrusion, prolapse)	Metals industry: tank construction, shipbuilding, welding in confined spaces, visual weld inspection Mining: at faces with a free working height of less than approx. 160 cm Construction sector: concrete technicians, steelfixers, composition floor layers, tilers, plumbers, bricklayers Transport trades: aircraft loading personnel

Problemas Músculo-Esqueléticos – Microscopio Convencional

Fritzsche et al. 2012

George E. 2010

Problemas Músculo-Esqueléticos – Microscopio Convencional

Virchows Arch (2010) 457:509–511
DOI 10.1007/s00428-010-0965-x

LETTER TO THE EDITOR

Occupational problems with microscopy in the pathology laboratory

Richard John Flavin · Mark Guerin · Donal Sean O'Briain

Fritzsche et al. BMC Public Health 2012, 12:1054
http://www.biomedcentral.com/1471-2458/12/1054

BMC Public Health

RESEARCH ARTICLE Open Access

Occupational health risks of pathologists - results from a nationwide online questionnaire in Switzerland

Florian Rudolf Fritzsche[1,2*], Constanze Ramach[3], Davide Soldini[2], Rosmarie Caduff[4], Marianne Tinguely[2], Estelle Cassoly[3], Holger Moch[2] and Antony Stewart[1]

Diagn. Cytopathol. 2003;29:364–367.

Ergonomics and Cytotechnologists: Reported Musculoskeletal Discomfort

Sophie K. Thompson, MHS, CT (ASCP, IAC)[1*] Eileen Mason, Ph.D., CSP, CIH[2] and Stephanie Dukes, MBA, MT (ASCP)[1]

Rev Esp Patol. 2015;48(1):9–13

Problemas músculo-esqueléticos en patólogos españoles. Prevalencia y factores de riesgo

Eduardo Alcaraz-Mateos[a,*] y Fuensanta Caballero-Alemán[b]

Problemas Músculo-Esqueléticos – Microscopio Convencional

Anatomic Site	Respondents With Symptoms (%)		
Any	85	69*-76	83
Headache	54		53
Neck	55-60	78	58
Upper back	53	46	53
Lower back	57	40	41
Elbow	35		5
Wrist, left/right	37/55	28	20
Hands, left/right	38/48		

Thompson et al. 2003. n = 244 (cytotechs). Fritzsche et al. 2012. n=163 (pathologists). Alcaraz et al. 2015. n = 557 (pathologists).

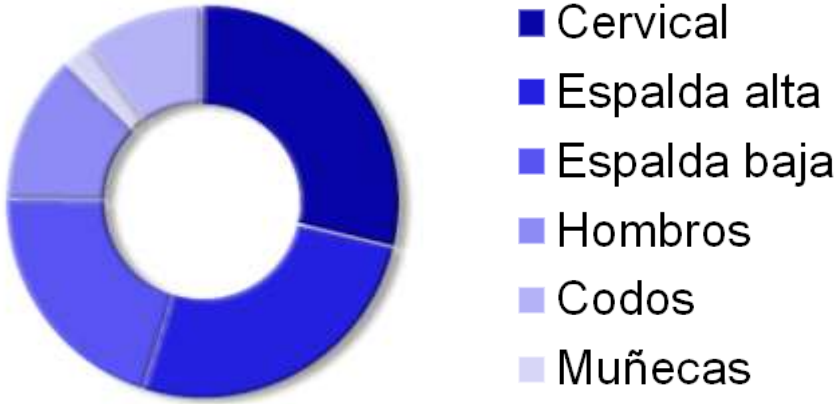
Problemas Músculo-Esqueléticos – Microscopio Convencional

Rev Esp Patol. 2015;48(1):9–13

Problemas músculo-esqueléticos en patólogos españoles. Prevalencia y factores de riesgo

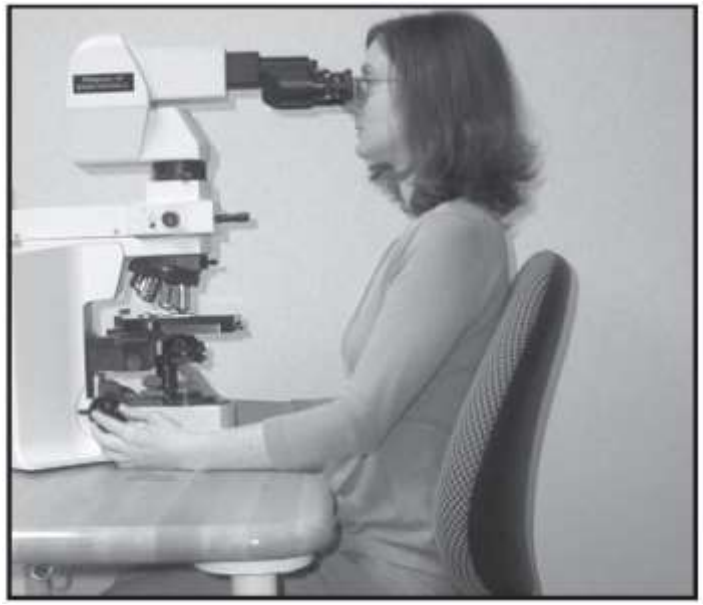
Eduardo Alcaraz-Mateos[a,*] y Fuensanta Caballero-Alemán[b]

PME	Hombres %	Mujeres %	General %
Cervical	62,2	56,5	58,4
Espalda alta	55,8	51,9	53,2
Espalda baja/lumbar	41,0	41,2	41,1
Hombros	24,4	25,3	25,0
Codos	3,2	5,0	5,0
Muñecas	19,9	21,3	20,8
Global	82,7	83,3	83,0



Problema ocular/visual	Antes de comenzar %	Actualmente %
Miopía	59,5	73,3
Hipermetropía	8,6	11,2
Astigmatismo	40,1	63,5
Presbicia	1,5	51,4
Sequedad ocular	5,1	48,4

PME – Microscopio convencional vs microscopio ergonómico



George E. 2010

PME – Microscopio convencional vs microscopio ergonómico

Underestimated health hazard: proposal for an ergonomic microscope workstation

Alfons Kreczy, Markus Kofler, Andreas Gschwendtner

Working daily for a long time with a standard microscope causes back pain, fibromyalgia, or tension headache in up to 80% of microscopists. These complaints may be prevented by an orgonomic design of the microscope workstation, leading to a beneficial and significant reduction of electromyographical activity in the most strained muscle groups as shown by surface electromyographic recordings.

Up to 80% of professionals working daily for a long time with a light microscope complain about eye strain, back pain, fibromyalgia, or tension headache.[1-3] Whereas eye strain cannot be prevented due to the construction principles of microscopes and repetitious eye movements when screening slides, other complaints may be resolved by an ergonomic design of the workstation. We fitted a microscope stand (Olympus type BX50) with a dual-observation attachment, two distance rings, and an ergonomic observation tube to allow an upright sitting posture with a down-gaze of about 5° below the horizontal plane, preventing excessive tension in the neck muscles. For further elevation, we build a unique table with adjustable slanting wings to permanently support the forearms and to relax the shoulder girdle (figure 1). A special ergonomic chair (Hagax, Capisco, 8005) with support for the lower back allowed an upright sitting posture, with an open angle between thigh and abdominal wall rendering the spine in a natural flexure. Despite a slightly reduced optical quality and inclined armrest, this arrangement represents our best prototype of an ergonomic microscope.

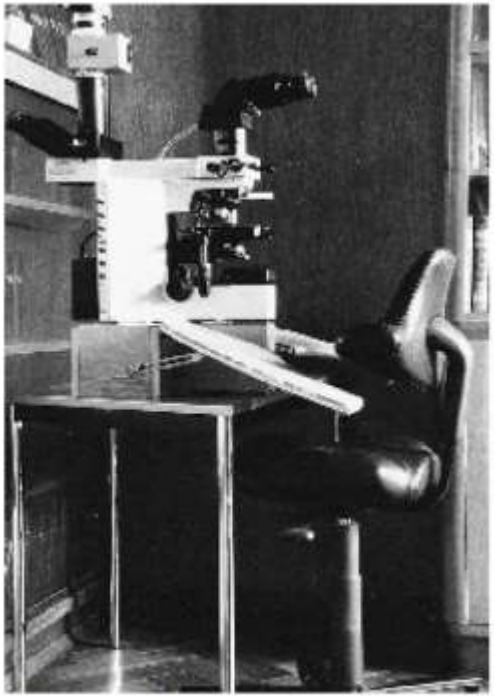


Figure 1: **Ergonomic microscope**

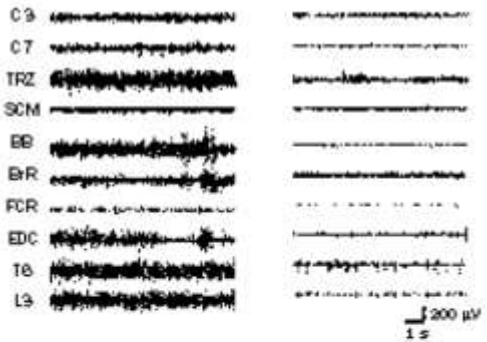


Figure 2: **Representative surface electromyographical recording of one individual. Left: conventional microscope (control condition); right: ergonomic microscope (test condition)**

Recordings from below to above represent lower and mid-back (L3 and T8), extensor digitorum communis (EDC), flexor carpi radialis (FCR), brachioradialis (BrR), biceps brachii (BB), sternocleidomastoid (SCM), trapezius (TRZ) muscles, and lower and upper neck (C7s and C3s).

THE LANCET • Vol 354 • November 13, 1999

Guías – Prevención de PME (CDC modificado por George E.)

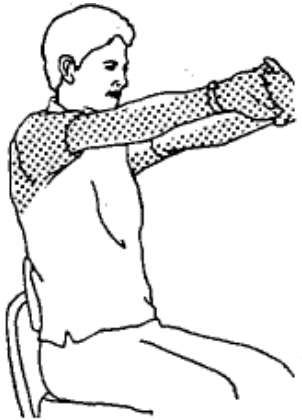
1 – Diseño de la estación de trabajo.

2 – Pausas. No utilizar el microscopio más de 5 horas diarias.

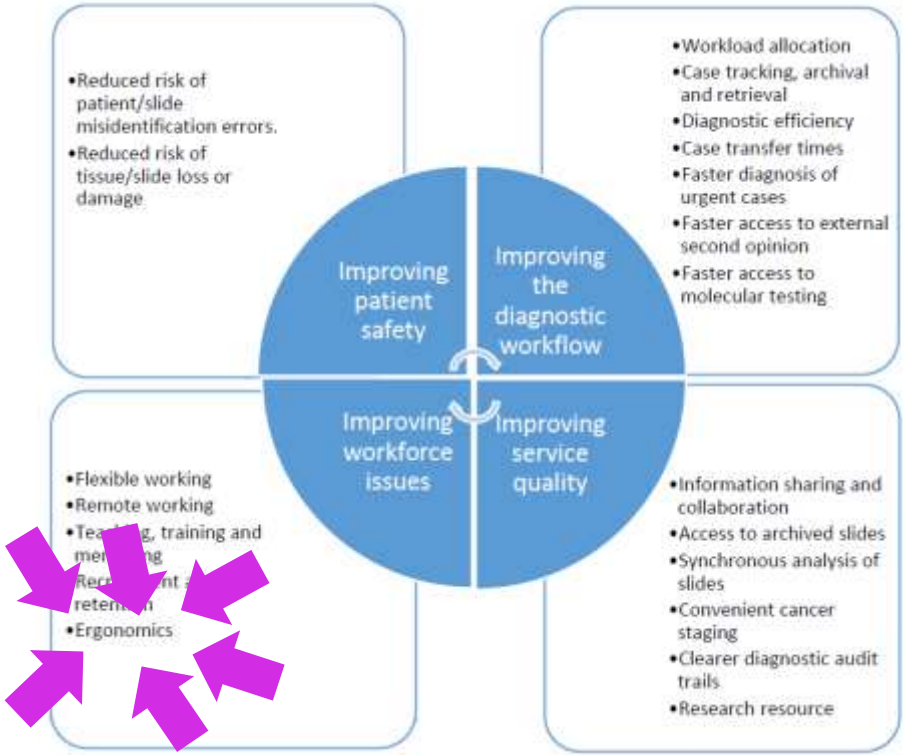
3 – Ejercicios/Estiramientos.

4 – Posición neutra.

5 – Apoyos.



Estación de trabajo en Patología Digital



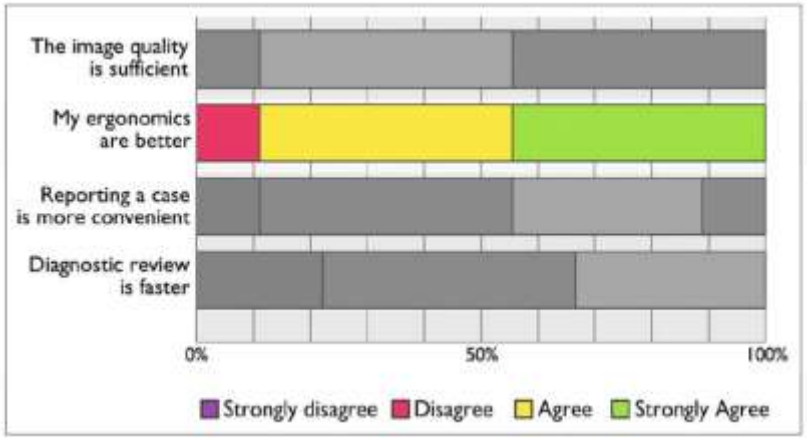
Future-proofing pathology: the case for clinical adoption of digital **pathology**.

Williams BJ, Bottoms D, Treanor D.

J Clin Pathol. 2017 Dec;70(12):1010-1018.

Implementation of large-scale routine diagnostics using whole slide imaging in Sweden: Digital pathology experiences 2006-2013

Sten Thorstenson, Jesper Molin[1,2,4], Claes Lundström[2,3,4]



Estación de trabajo en Patología Digital

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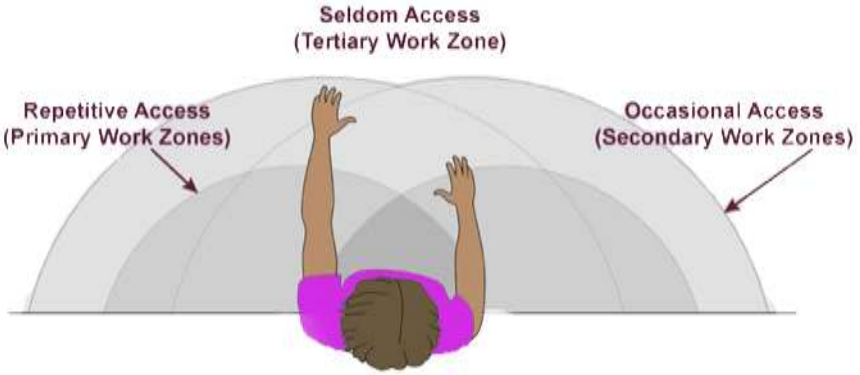
Seldom Access
(Tertiary Work Zone)
Repetitive Access
(Primary Work Zones)
Occasional Access
(Secondary Work Zones)

Radiología Digital

J Digit Imaging (2014) 27:255–261
DOI 10.1007/s10278-013-9642-3

Musculoskeletal Symptoms Amongst Clinical Radiologists and the Implications of Reporting Environment Ergonomics—A Multicentre Questionnaire Study

Jonathan C. L. Rodrigues · Steven Morgan · Katharine Augustine · Gavin Clague · Tim Pearce · Adrian Pollentine · Adam Wallis · David Wilson · Paul McCoubrie

Anatomic Site	Respondents With Symptoms (%)			
Any	85	69*-76	83	38
Headache	54		53	
Neck	55-60	78	58	25
Upper back	53	46	53	
Lower back	57	40	41	41
Elbow	35		5	7
Wrist, left/right	37/55	28	20	20
Hands, left/right	38/48			12

Thompson et al. 2003. n = 244 (cytotechs). Fritzsche et al. 2012. n=163 (pathologists). Alcaraz et al. 2015. n = 557 (pathologists). Rodrigues et al. 2014. n = 123 (radiologists).

Intervenciones

Int Arch Occup Environ Health
DOI 10.1007/s00420-012-0838-5

ORIGINAL ARTICLE

Effects of ergonomic intervention on work-related upper extremity musculoskeletal disorders among computer workers: a randomized controlled trial

Sina Esmaeilzadeh · Emel Ozcan · Nalan Capan

– El entrenamiento ergonómico y las intervenciones resultaron en alteraciones en la postura de trabajo y diseños de estaciones de trabajo.

– La intervención ergonómica es eficaz para reducir la intensidad de los síntomas debido a la mejora en las posturas de trabajo y los diseños de las estaciones de trabajo.

Guías – Usuarios de ordenador

1 – Promover la postura erguida y el apoyo.

2 – Asegurar la altura correcta del teclado.

3 – Colocar el ratón al lado del teclado.

4 – Considere otros dispositivos para las personas con síntomas existentes.

5 – Coloque los monitores a una distancia del usuario alrededor de 50-80 cm.

6 – Coloque los monitores de manera que la parte superior de la pantalla esté al nivel de los ojos.

7 – Proporcionar reposapiés.

8 – Pausas.

Intervenciones - Dispositivos

- “Today there is no consensus on which is the best human interface device to control panning and zooming”. **García-Rojo 2016.**

- “Conventional mouse seems only sufficient for panning and zooming for sporadic use, but not as a routine tool”. **Thorstenson et al. 2014.**

- “The type of input device one uses with a workstation is a matter of personal preference”, “The keys to choosing the input device relate to user comfort and task”, “many of the devices other than the mouse will require a learning period so there may be an initial period in which workflow actually slows down before it speeds up with familiarity”. **Krupinsky 2009.**

- “Future studies could investigate other devices and should especially focus on the effects of long-term use”. **Molin et al. 2015.**

Comparación de dispositivos

SurfaceSlide: A Multitouch Digital Pathology Platform

Yinhai Wang[1]*, Kate E. Williamson[1], Paul J. Kelly[2], Jacqueline A. James[1], Peter W. Hamilton[1]

1 Centre for Cancer Research and Cell Biology, Queen's University Belfast, Belfast, United Kingdom, 2 Department of Pathology, Royal Victoria Hospital, Belfast, United Kingdom

Analytical Cellular Pathology 35 (2012) 65–73
DOI 10.3233/ACP-2011-0042
IOS Press

An ultra-high speed whole slide image viewing system

Yukako Yagi[a,b,*], Shigeatsu Yoshioka[c], Hiroshi Kyusojin[c], Maristela Onozato[a,b], Yoichi Mizutani[a], Kiyoshi Osato[c], Hiroaki Yada[c], Eugene J. Mark[a,b], Matthew P. Frosch[a,b] and David N. Louis[a,b]

[a]*Pathology Service, Massachusetts General Hospital, Boston, MA, USA*
[b]*Department of Pathology, Harvard Medical School, Boston, MA, USA*
[c]*Sony Corporation, Tokyo, Japan*

J Pathol Inform

Symposium - 2nd Nordic Symposium on Digital Pathology

A comparative study of input devices for digital slide navigation

Jesper Molin, Claes Lundström[1], Morten Fjeld[2]

the diagnostic pathology journal DIAGNOSTIC PATHOLOGY

E. Alcaraz-Mateos, et al., diagnostic pathology 2016, 2:232
ISSN 2364-4893
DOI: http://dx.doi.org/10.17629/www.diagnosticpathology.eu-2016-2:232

Research on Devices for Handling Whole Slide Images on Pathology Workstations. An Ergonomic Outlook

E. Alcaraz-Mateos[1], F. Caballero-Alemán[2], M. Albarracín-Ferrer[2], F. Cárceles-Moreno[3], R. Hernández-Gómez[3], S. Hernández-Kakauridze[3], L. Hernández-Sabater[3], I. Jiménez-Zafra[3], A. López-Alacid[3], C. Moreno-Salmerón[3], M. Pérez-Ramos[1], A. Nieto-Olivares[1], N. Sánchez-Campoy[4], I. Martínez González-Moro[5], E. Poblet[6].

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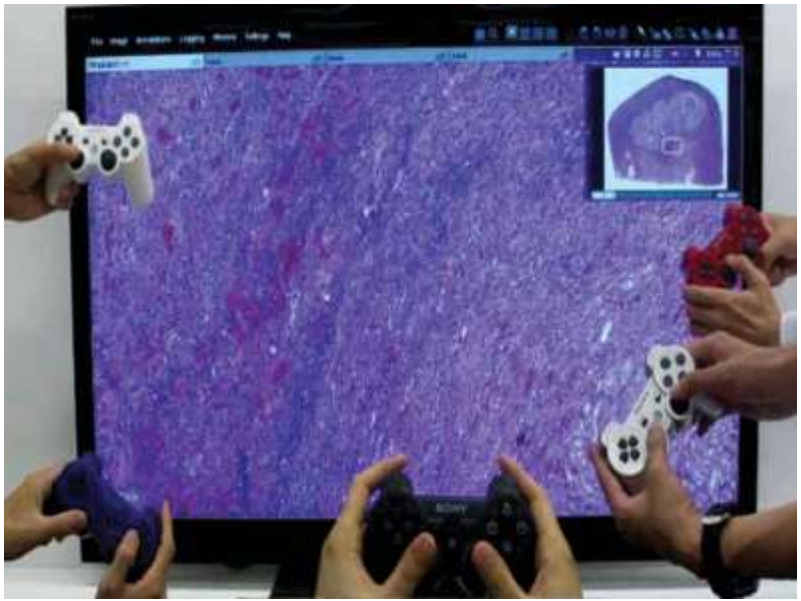
1 Centre for Cancer Research and Cell Biology, Queen's University Belfast, Belfast, United Kingdom, 2 Department of Pathology, Royal Victoria Hospital, Belfast, United Kingdom

Comparación de dispositivos



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Comparación de dispositivos – Interfaces Naturales del Usuario

Comparación de dispositivos

the diagnostic pathology journal DIAGNOSTIC PATHOLOGY

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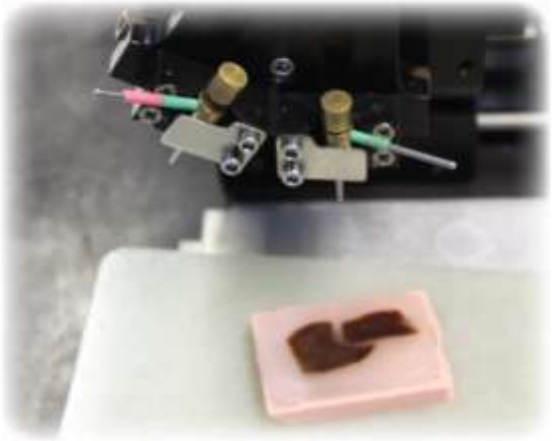


ALCARAZ
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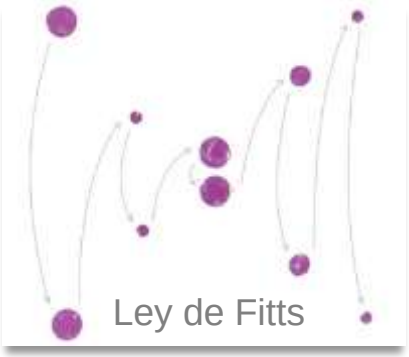
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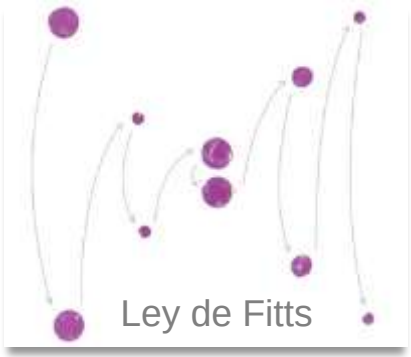
Comparación de dispositivos

Rendimiento

Carga Mental

Activ. Muscular

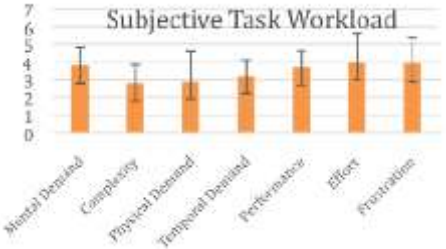


Valoración subj.

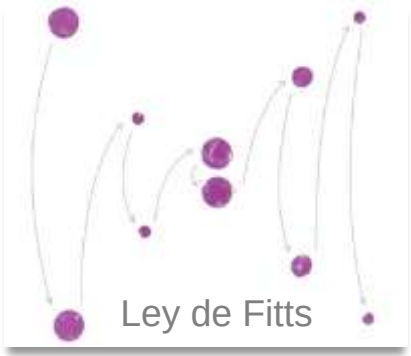
Comparación de dispositivos

Rendimiento

Carga Mental



Activ. Muscular

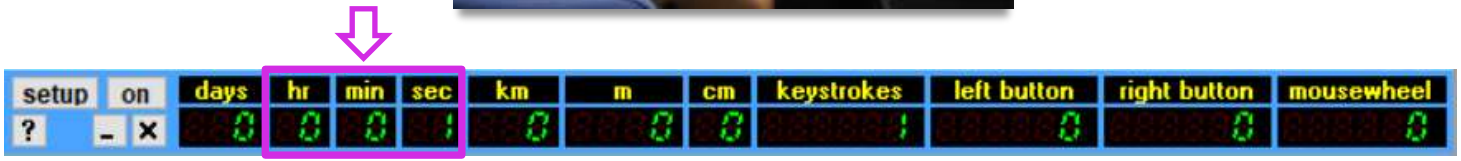


Valoración subj.

CONFORT PRECISION

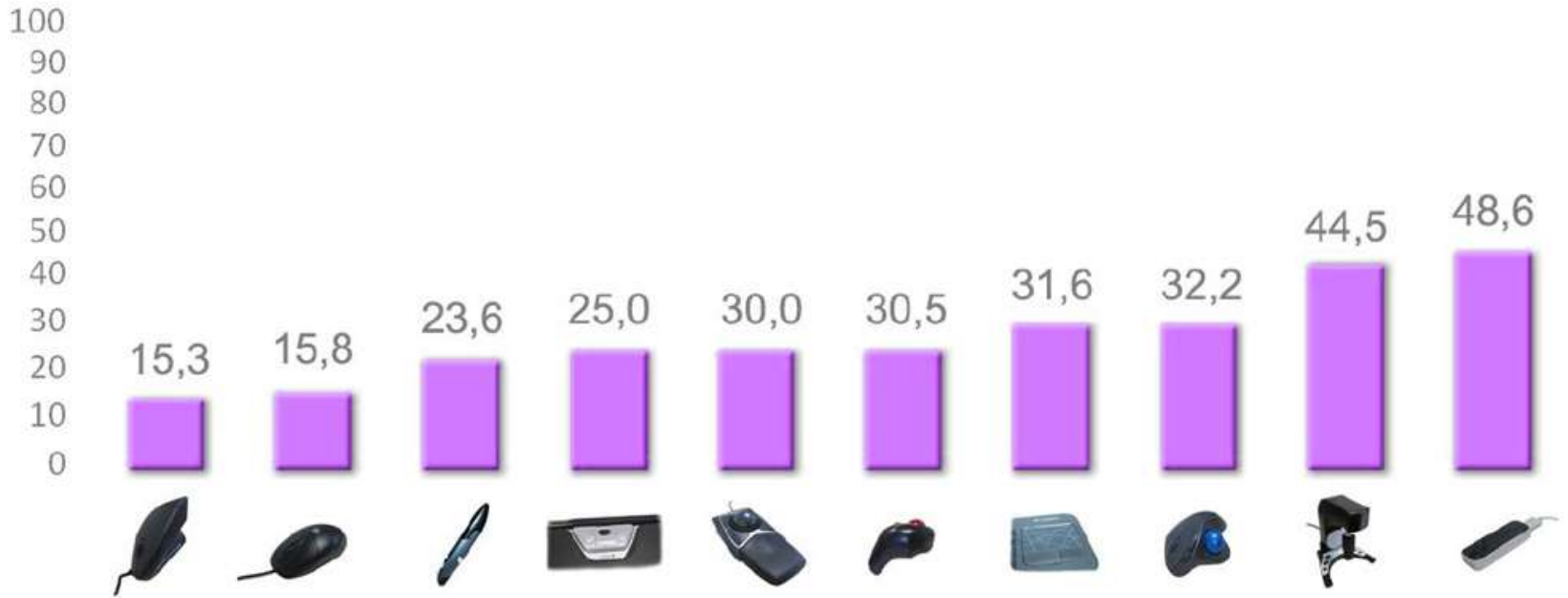
PERSPECTIVAS

Rendimiento



1º 2º 3º 4º 5º 6º 7º 8º 9º 10º

Carga mental de trabajo – NASA TLX



Registro musc. antebrazo

Actividad muscular

+39%





Valoración subjetiva

Detección de movimiento - *NUI*

HEAD-TRACKING AS AN INTERFACE DEVICE FOR IMAGE MANIPULATION IN DIGITAL PATHOLOGY: A COMPARATIVE STUDY

Eduardo Mulero Mateos[1*], Iva Tomić[2], Andrés Nieto-Oliveras[3], Miguel Perez-Ramos[4], Ignacio Martínez González-Moro[4], Enrique Poblet[4*]

1. Pathology Department, University Hospital Morales Meseguer, Murcia, Spain; 2. IFMSA student, Faculty of Medicine, University of Split, Croatia; 3. Faculty of Physiotherapy, University of Murcia; 4. Pathology Department, University Hospital Reina Sofía, Murcia, Spain; *Department of Pathology, University of Murcia, Spain

Contact: eduasp@hotmail.com Twitter: @eduasp

BACKGROUND

Inasmuch as the conventional mouse is not an ideal input device for digital pathology, the aim of this study was to evaluate alternative systems, with the goal of identifying a natural user interface (NUI) for controlling whole slide images (WSI). As such, 3 Head-tracking webcam-based programs were compared.

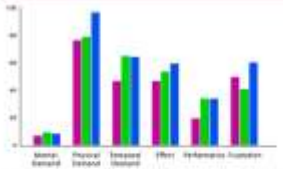
DESIGN

Four experienced pathologists evaluated three head-tracking systems having been previously trained through a tutorial developed by an IFMSA student (figure 1): Enable Viacam (eViacam, CREA Software), Nouse (JLG Health Solutions Inc), and Camera Mouse (CM Solutions Inc). Twenty WSI of different dermatopathology cases selected at random from a general pool of average difficulty cases were examined with Image Viewer (Ventana, AZ, USA) (figure 2). The NASA Task Load index was used to rate the perceived workload while using these systems to reach a diagnosis as time was recorded. In addition, a 5-point scale Likert satisfaction survey was used.

Figure 1. Tutorial by IFMSA student including settings: eViacam (a), Camera Mouse (b) and Nouse (c). Figure 2. Pathologist evaluating the systems through dermatopathology cases. Look at the head/nose position and the camera (arrows).

RESULTS

The mean total time needed for diagnosis with Camera Mouse, eViacam, and Nouse systems was 18'57", 19'37" and 24'48", respectively (56, 58 and 67 seconds per case, respectively). The NASA-TLX weighted average workload score, where lower scores are better, was 49.7 for eViacam, 54.3 for Nouse and 68.16 for Camera Mouse, which correlated with the pathologists' degree of satisfaction on a scale of 1-5: 3.4 for eViacam, 2.8 for Nouse, and 2.4 for Camera Mouse. The NASA-TLX score estimated the physical and mental demand scales as the maximum and minimum scores among the 6 subscales (figure 3).



Watch the tutorial by scanning this QR code!

Figure 3. NASA-TLX results.

CONCLUSIONS

- Head-tracking systems enable pathologists to control the computer cursor and virtual slides handsfree, using only a webcam as an input device while moving the head.
- Among the three systems, eViacam seems to be the best software evaluated in this study, followed by Nouse and, finally, Camera Mouse.
- Head-tracking webcam-based software can be used not only by pathologists with or without physical impairments, but also by other professionals who seek to avoid musculoskeletal disorders or have some sort of difficulty when using a conventional mouse.
- Further studies, integrating speech recognition systems, should be performed in conjunction with software developments to achieve the ideal device for digital pathology.

REFERENCES

Alonso Mateos S. et al. "Research on Devices for Handling Whole Slide Images on Pathology Workstations. An Ergonomic Outlook. Diagnostic Pathology 2016;2:231.

Mah J. et al. "Usability of a Low-Cost Head Tracking Computer Access Method following Stroke. Assist Technol. 2015;27(2):109-71.

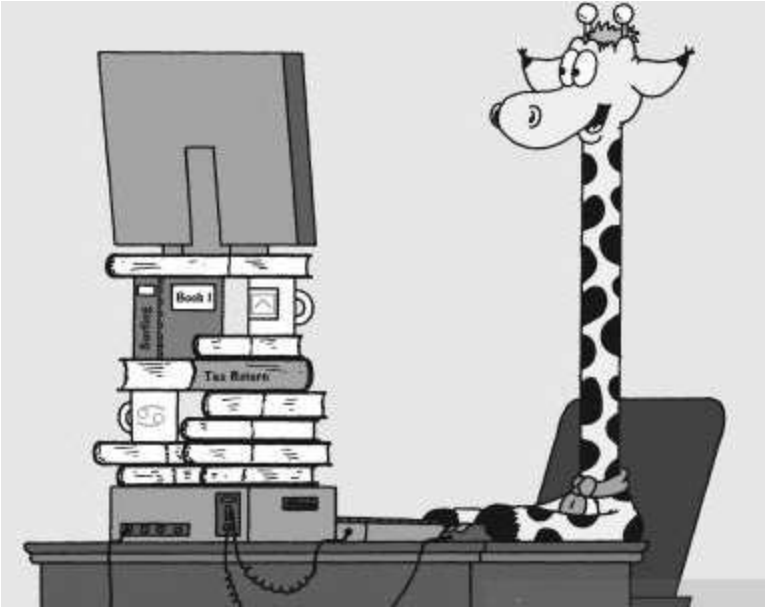
Betke M. et al. "The camera mouse: visual tracking of body features to provide computer access for people with severe disabilities. IEEE Trans Neural Syst Rehabil Eng. 2002;10(1):1-10.

USCAP 107th United States & Canadian Academy of Pathology Annual Meeting, March 17-23, 2016 Vancouver #USCAP2016

Conclusiones

- Desde un punto de vista ergonómico, es posible probar otros dispositivos comercializados distintos del ratón convencional.
- El papel proactivo del patólogo es necesario para lograr una mejorar ergonómica en patología digital.
- Sería recomendable un trabajo conjunto de los patólogos con los desarrolladores de *software*.
- Estudios adicionales son necesarios para lograr el dispositivo ideal en patología digital.

¡Gracias por su atención!



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