Exploring the Safety of Knowledge Transfer from University Hospital to "Real-Life" Doctor-Patient Treatment Environs

Simon Thompson

BOURNEMOUTH UNIVERSITY

Summary

- Governance of knowledge transfer
- Developing a product for clinical use
- Exemplar applications
- Responsible monitoring
- Conclusions

Why is Governance important?

- Interactions between university professors and companies can be traced back to the development of the chemical industry in the 19th century.

- Possibly the first “academic revolution” was the introduction of research together with teaching – where everyone employed in a university was involved in both research and teaching activities.

Why is Governance important?

- In the US in 1975, the National Science Foundation established the first set of University-Industry Cooperative Research Centers (UICRCs).
- In the UK, hospitals have welcomed closer collaboration with universities to create “University Hospitals” for teaching and research initiatives.
- Subsequently, University Hospital Trusts and Foundations have forged strong links between academia and “real-life” evidence-based practice environs.

Why is Governance important?

- These initiatives have brought with them risks because of the different mechanisms of working and because of the different types of personnel involved.

- In the past, Academia has tended to focus on in-house isolated testing before in-field testing.

- Hospital environments are high risk and have high levels of accountability.

Why is Governance important?

- Governance rules are appropriately different in each environment but need to be revised when objectives are shared such as with in-field testing.

Developing a product for clinical use

"Knowledge is dangerous"

– has some *validity*.

But knowledge is useful when it *informs consent* and *advances understanding*.

Developing a product for clinical use

- Investigation into application of novel devices for rehabilitation of leg injuries.

- Knowledge transfer from rehabilitation of gun shot wounds in lower limbs in Belfast, Northern Ireland.

- Snow skiing, surgical intervention (removal of leg carcinomas), lower limb incomplete innervation (stroke).

Developing a product for clinical use

- Developed a switching device that allows interaction between equipment used in occupational therapy and computerised graphics – *Thompson Digital Switch.*

Developing a product for clinical use

- Collaboration: Universities at Portsmouth, Bournemouth; Hospitals at Salisbury, Nottingham, Royal Navy (RNH Haslar).

Developing a product for clinical use

- Checkland Methodology (1981) – and the use of “rich” pictures - helped understand how this new technique would impact on the whole process of rehabilitation.

Exemplar applications

- A stroke can vary in severity from a weakness in a limb with some perceptual problems to a profound paralysis and considerable impairment. Causes: embolus, thrombosis, ruptured aneurysm.

- Other causes of leg immobility require similar rehabilitation when there is *incomplete innervation*.

Exemplar applications

Biofeedback has been used for some time:

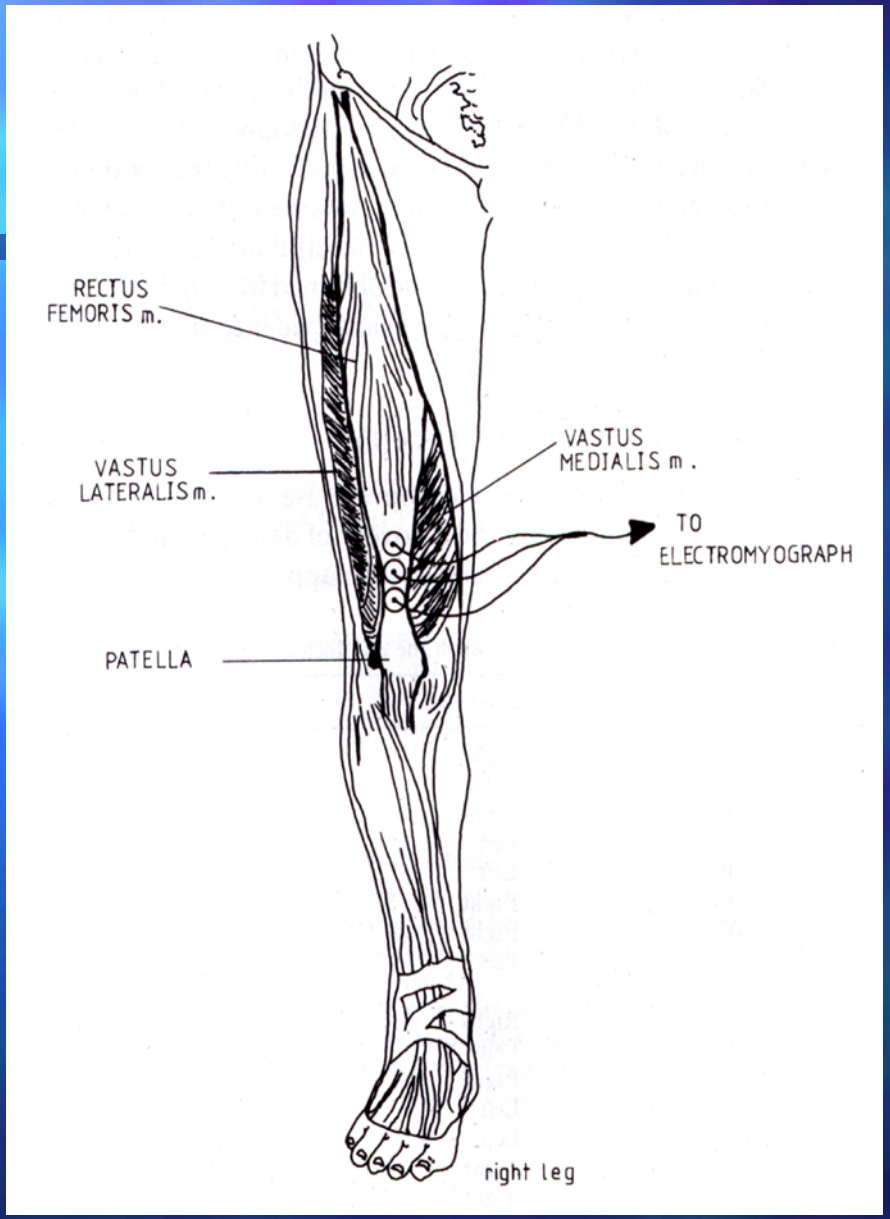
- Ward, Beattie & Wyper (1989) - Computer-linked apparatus for upper limb therapy.
- Thompson, Hards & Bate (1986) - Computer-assisted visual feedback for hand and arm therapy apparatus.

Exemplar applications

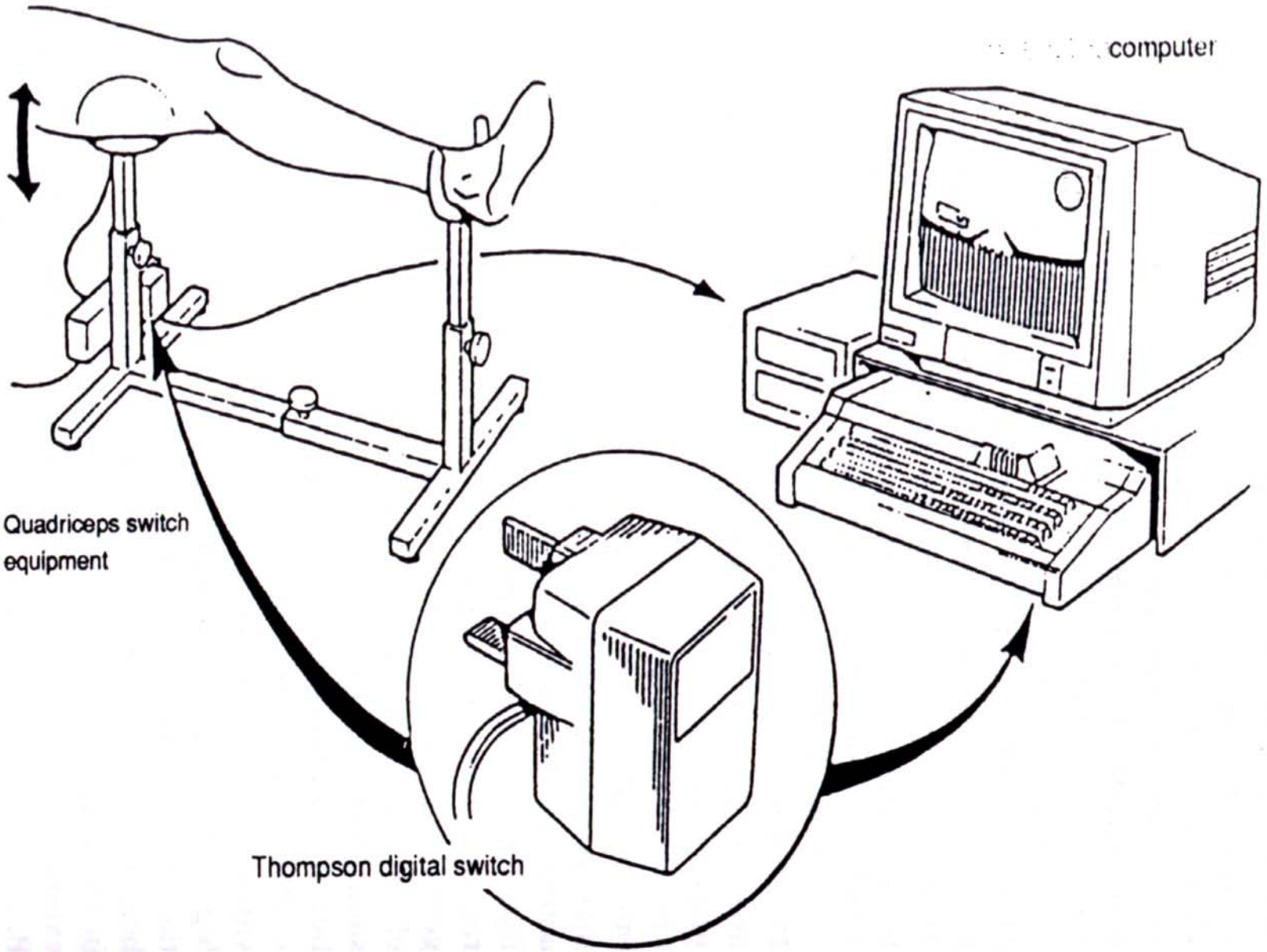
A few studies have looked at improving *proprioception* in stroke patients.

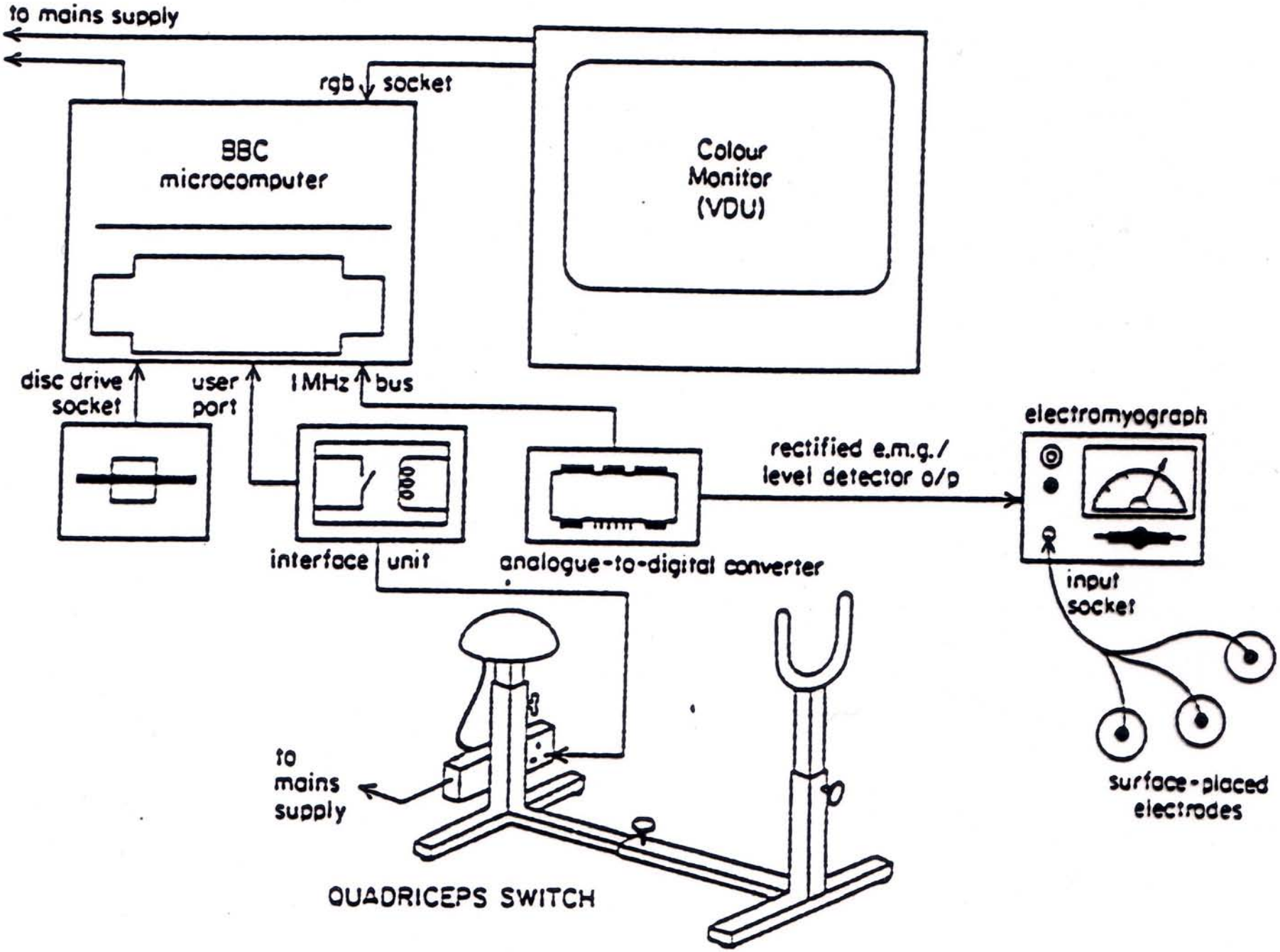
Electromyographical (EMG) feedback combined with computer graphics has since seen considerable success.

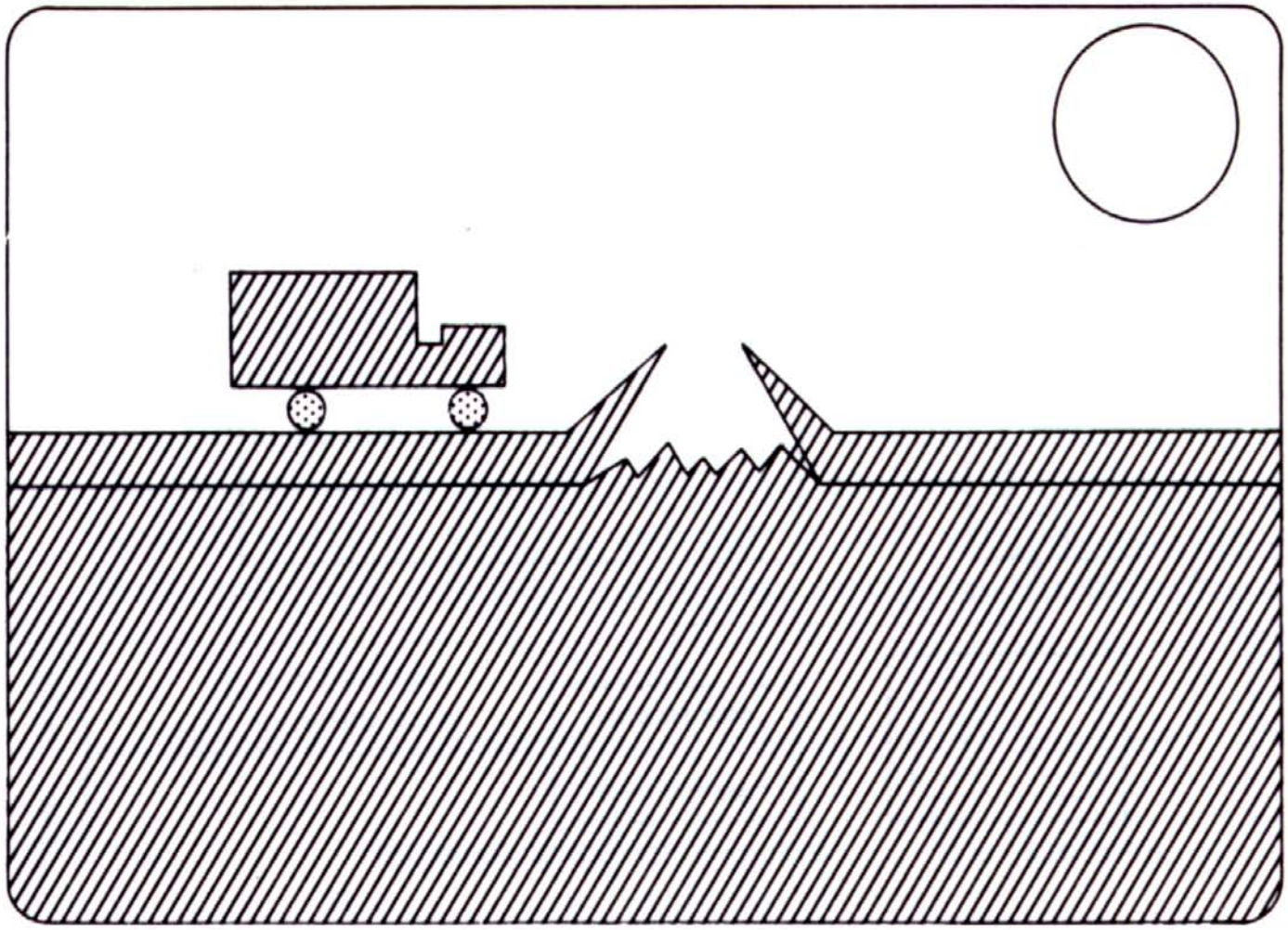
(Thompson, 1987)


RECTUS
FEMORIS m.
VASTUS
LATERALIS m.
VASTUS
MEDIALIS m.
TO
ELECTROMYOGRAPH
PATELLA
right leg

Thompson digital switch.

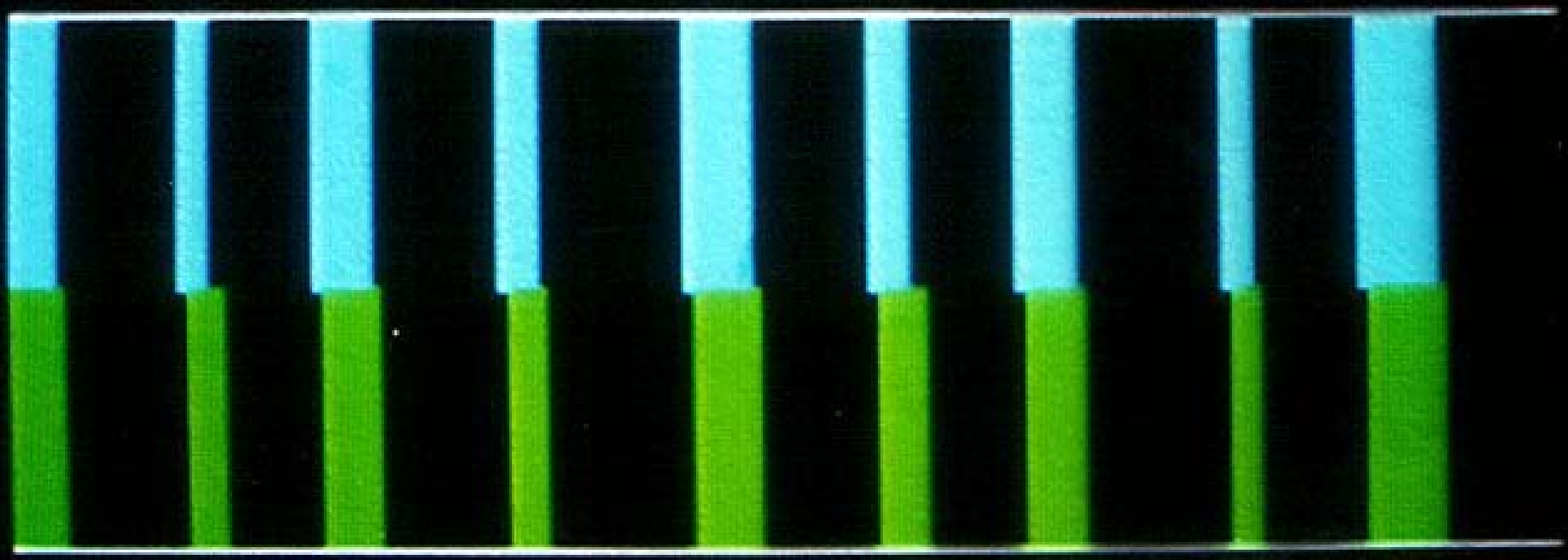



to mains supply
rgb socket
BBC
microcomputer
Colour
Monitor
(VDU)
disc drive
socket
user
port
1MHz bus
electromyograph
rectified e.m.g./
level detector o/p
interface unit
analogue-to-digital converter
input
socket
to
mains
supply
surface-placed
electrodes
QUADRICEPS SWITCH

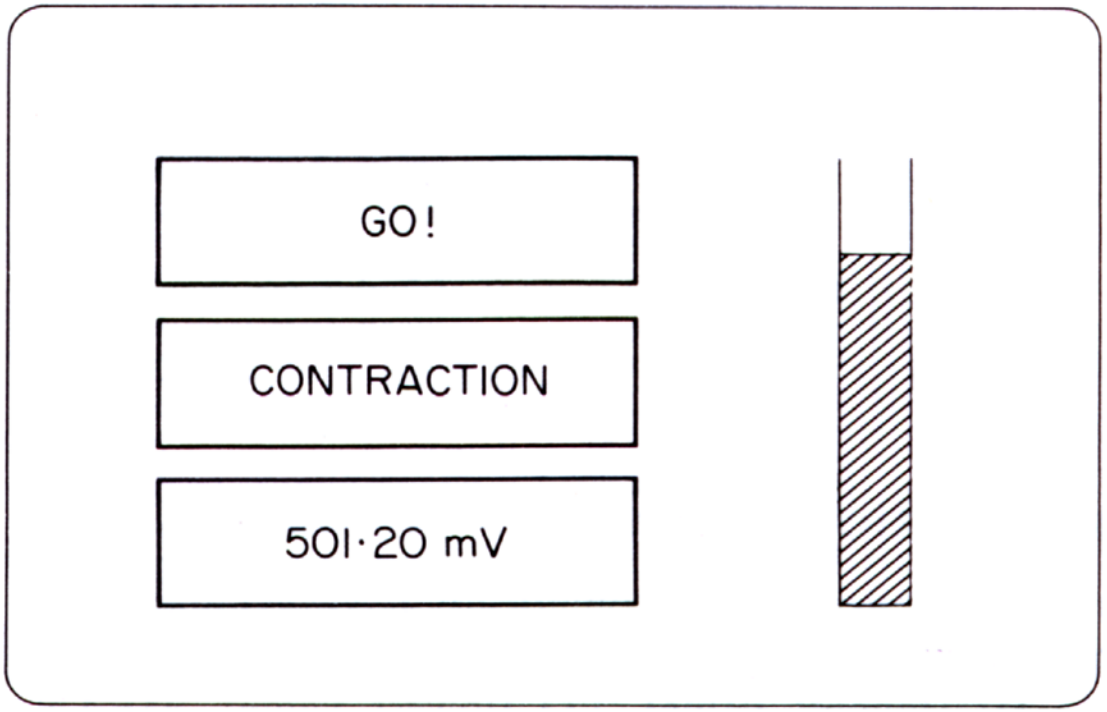


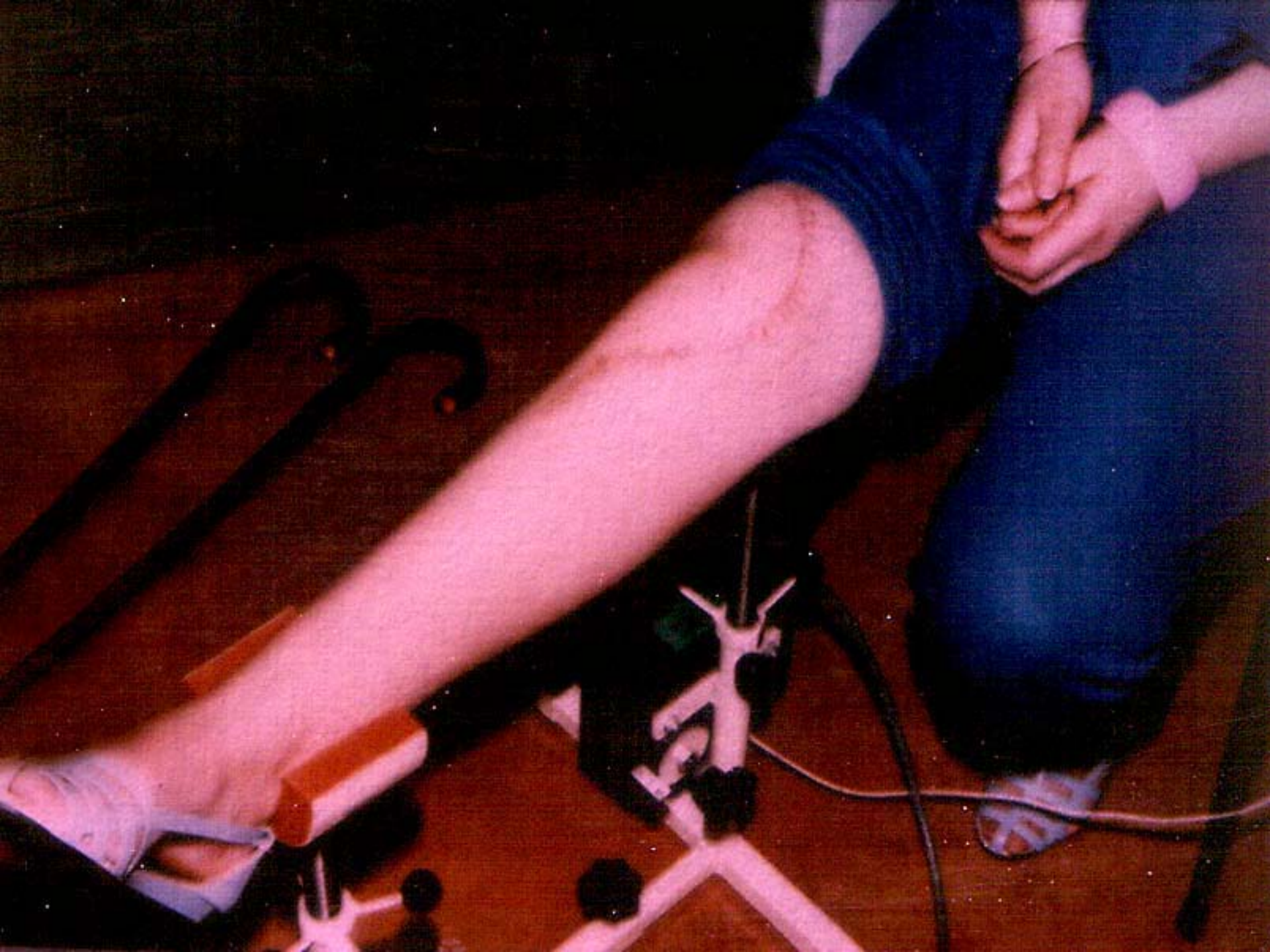
CONTRACTION = 31.7
RELAXATION = 41.9

TONES



RESPONSES


GO!
CONTRACTION
501·20 mV



Responsible monitoring

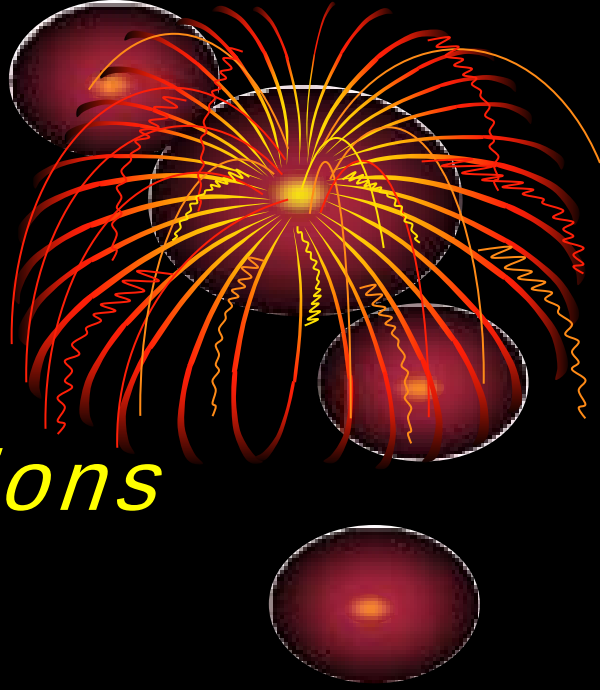
- Early feedback showed clinicians less unfamiliar with routine use of biofeedback techniques for rehabilitation (as compared with assessment – such as ECG).
- Errors in reading results required modifications to results displays.
- Fine-tuning of software ensured that patients did not potentially develop contractures in muscle groups.

Responsible monitoring

- Constant monitoring and dialogue with in-field professionals ensured that modifications were achieved efficiently and rapidly.
- Importantly, risk was reduced.

Conclusions

- Results informed our understanding of the neuroplasticity of brain neurons.
- Aggregated use of the *Thompson Digital Switch* with EMG helped towards the development of an expert system for stroke prognosis.



Conclusions

Safety of transmission of knowledge between domains (University to Hospital) were identified so that risk of application could be reduced.