UNIVERSITY OF STRATHCLYDE

APPLICATION FORM FOR UNIVERSITY ETHICS COMMITTEE AND DEPARTMENTAL ETHICS COMMITTEES

This form applies to all investigations within the remit of the University's Code of Practice on Investigations on Human Beings. This includes all investigations with human participants undertaken by staff or students of the University of Strathclyde which falls within the remit of the University Ethics Committee (see Code of Practice, para 5.1) or the Departmental Ethics Committees (see Code of Practice, para 5.2).

However, this form should NOT be used for any investigation involving clinical trials (see Code of Practice, para 6.4) or medicinal products, nor for investigations involving staff, patients, facilities, data, tissue, blood or organ samples from the National Health Service. Applications for ethical approval for investigations involving the National Health Service in any way must be made under the governance arrangements for National Health Service Research Ethics Committees (see Code of Practice, para 3.2(d)) and where ethical approval is required from the NHS using the form issued by COREC (see Code of Practice, para 6.1).

Information sheets for volunteers and consent forms to be used in this study should be submitted with the application form for consideration by the Committee.
The application will be judged entirely on the information provided in this form and any accompanying documentation - full grant proposals to funding bodies should not be attached. Please explain any abbreviations, acronyms etc that you use. The Code of Practice (http://www.mis.strath.ac.uk/Secretariat/Ethics.htm) contains guidance on completing this application, on information sheets and on consent forms.

Applications which are not signed and/or do not include the required additional forms (e.g. participant information sheet and consent form) will not be considered by the University Ethics Committee and will be referred back to the Chief Investigator.

The form is designed for completion in Word, and should in any case be typed rather than handwritten. The grey-shaded text boxes on the form will expand to allow you to enter as much information as you require. If you have difficulty filling out the form in Word, please contact Fiona Campbell in the Secretariat (ext. 2101).

Checklist of enclosed documents

Document	Enclosed?	N/A
Participant information sheet(s)	☒	☐
Consent form(s)	☒	☐
Sample questionnaire(s)	☐	☒
Sample interview format(s)	☐	☒
Sample advertisement(s)	☐	☒
Any other documents (please specify below)	☐ ☐ ☐ ☐	☒ ☒ ☒ ☒

Evaluation of the user friendly nature of Strathclyde University Data Logging System (SUDALS)

I. Vivek Padmanaabhan

Supervisor: Prof. Phil Rowe

Introduction

Functional assessment of knee following Total knee Arthroplasty (TKA) is very useful for the health care professionals to know how much of the knee function is actually restored. Currently, there are two techniques available for this purpose. They are questionnaire based assessment and clinical assessment. Even though, the questionnaire based assessment is popular and easy to administer, research reveals that they are highly subjective and give a little information regarding the actual restoration of the knee function. On the other hand, clinical assessment involving the use of camera based complex motion analysis system such as the vicon systems are expensive and time consuming. Hence to bridge the gap, researchers have started using electrogoniometry to record the dynamic knee joint movement during a range of functional activities due to its simpler, cheaper and reproducible nature. (Rowe et al, 2005, Rowe et al, 2001). Flexible electrogoniometer is a device which when placed across the specific joint of interest, produces a signal proportional to the flexion / extension angle of that joint. It is as shown in **figure1a and 1b**. Mostly, such body mounted transducers are used in combination with information storage devices known as "Data Loggers". (Rowe et al, 2005). We have developed a battery operated remote control data collecting system(SUDALS), whereby pushing a single button would enable the user to record, delete and transmit the data obtained from two flexible electrogoniometers and four foot switches in a much simpler and more efficient way compared to existing systems.

However, research reveals that, when developing a prototype medical device, measuring and fulfilling the user requirements would help the designers to improve the effectiveness, safety and usability of the device (Martin.J.L. et al 2006). Further, it would also be useful in improving the patient satisfaction and user efficiency. Hence, we have decided to evaluate our system usability with a group of research nurses and physiotherapists, who we hope would be the end users of our system.

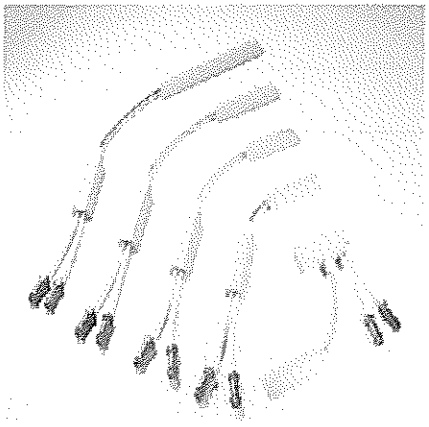


Figure 1a: Flexible electrogoniometer

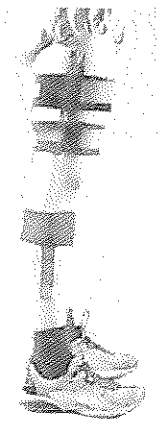


Figure 1b: Device attachment

Aim:

To evaluate the user friendly nature of SUDALS on volunteer subjects during various activities of daily living (ADL) such as walking, deep squatting, in and out of a chair and obtain the user feedback following the data collection process.

Objectives:

The objectives of this study are

1. To develop standard operating procedures for the conventional electrogoniometry system and for the new system.
2. To give training to 5 health professionals in the use of both systems, allow them to collect data with the system and elicit their views on the strengths and weakness of both systems.
3. To determine Inter-rater and Intra rater reliability and
4. To improve the effectiveness, safety and usability of the device based on the user feedback.

Participants:

As mentioned above, the end users of this system would be research nurses and physiotherapists. Hence, we would like to carry out this study with a group of 5 users involving 2 research nurses, 2 physiotherapists from clinical background and 1 clinical researcher.
The individuals from the clinical environment would be blinded to this study. However, prior to the trial, explanation of the data acquisition system with a standard operating procedure (prepared with the assistance of a research nurse) would be given. In addition to this, if the users wish to have a rehearsal prior to the actual data collection, a practice session can also be arranged. For the purpose of the intra-rater reliability, we would like to carry out 2 sessions of data collection from the same subject, one in the morning and the other in the evening. Following the data collection in the morning, the raters / users need to attend a short interview and fill in a short questionnaire so as to obtain their feedback on the usage of the system. Though the actual time involved in collecting data from the subjects is only 40 minutes, due to the training, interview and different data collecting sessions; it would be greatly appreciated if the participants are able to spend about 6-7 hours for this experiment. However, sufficient breaks and refreshments would be provided to the participants on request.

Experimental Apparatus:

1. Two Flexible electrogoniometer attached to the lateral side of the right and left knee through attachment strips which in turn is fixed to the skin using hypo allergenic adhesive tape.

2. Four force sensing resistors, two on each foot between foot and shoe interior to determine the heel strike and mark the start and stop of events.

3. Battery powered user friendly data logger system placed in a pouch and hung on the back or front of the subject depending upon their convenience, with the above mentioned transducers interfaced with this system as shown in the diagram.

What we will do:

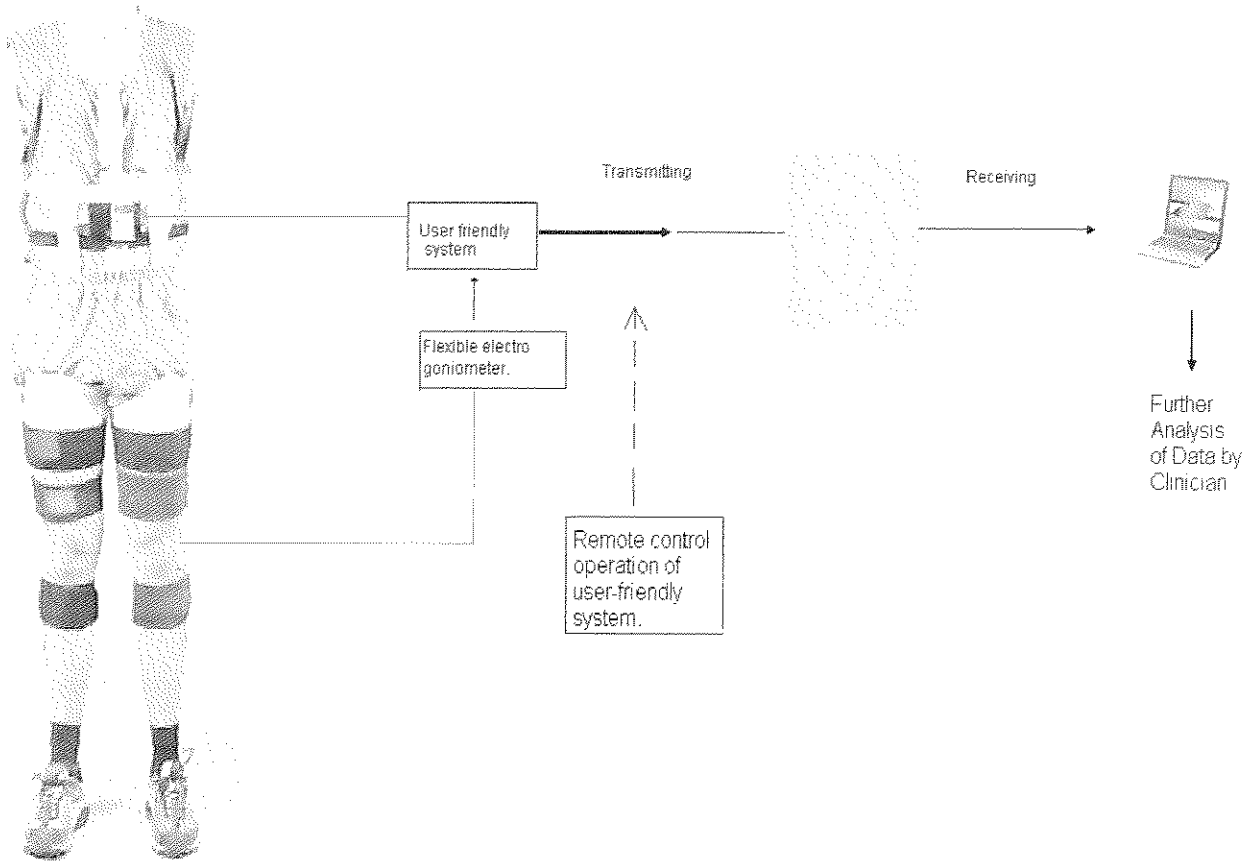
The volunteer will have the above attachments placed on him/her as shown in the diagram. Basically, each user will work in two sessions and each session will have 2 sets of data collection pertaining to test and re-test conditions. During session 1(morning) with these attachments, the volunteer would perform the various above mentioned ADL and during each of these activities, the information pertaining to the flexion-extension of the knee from flexible electrogoniometers would be collected using the commercial data collecting system by a research nurse or a physiotherapist. Similarly, in session2 (afternoon) the same user is expected to collect data from the same volunteer during these ADL using SUDALS. Prior to these sessions, complete training with a standard operating procedure would be given to the users and following these sessions, a short discussion for about 5 – 10 minutes would be conducted on a one to one basis, to know the user point of view regarding the usage of 2 different data collecting systems. In addition to this, the users would be asked to fill in a feedback questionnaire comprising of less than 10 questions. The protocol is a standard one and will be used by all the 5 users for testing the systems on the same volunteer on 5 different working days according to the convenience of both the parties involved with this study. The entire range of activities mentioned above would be carried out in the biomechanics movement analysis laboratory in the bioengineering unit. With a departmental ethical approval, a similar experiment has already been performed on 10 subjects under similar lab conditions within the bioengineering unit of University of Strathclyde by a post graduate research student. Hence, the possible hazards and the procedures to minimise the risk caused by such hazards have been taken into account.

Note 1: During the test at least one person in addition to the subject and the researcher will be present to make sure that the test is as safe as possible.

Note 2: SUDALS is a battery operated device. This device has been checked for all possible electric hazards within the electronics laboratory of bioengineering unit of University of Strathclyde by an electronics technician and by a postgraduate research student and is certified to be an out of risk system.

Note 3: The wireless device used here in this study is a bluetooth RS232 serial to wireless communication transceiver whose frequency falls with in the ISM frequency range. Hence using this system within a hospital environment wouldn't be a problem.

Diagram



1. Chief Investigator (for the purposes of this application, this should always be the person responsible for the study at Strathclyde)

Name: Prof. Phil Rowe
Status (e.g. professor, senior lecturer): Professor of Rehabilitation Science
Department: Bioengineering
Contact details: Telephone: +44 (0) 141 548 3032
E-mail: philip.rowe@strath.ac.uk

2. Other Strathclyde Investigator(s)

Name(s): Mr. I.Vivek Padmanaabhan
Status (e.g. lecturer, post-/undergraduate): PhD Research Student.
Department(s): Bioengineering
If student(s), name of supervisor:
Contact details: Telephone: 07859816668
E-mail: vivek.indra-mohan@strath.ac.uk

Please provide details for all investigators involved in the study (*the text box below will expand to allow details to be entered*):
Julie Smith - PhD Research Student will be involved in assisting the female subjects during the trial..

3. Non-Strathclyde collaborating investigator(s)

Name(s):
Status:
Department/Institution:
If student(s), name of supervisor:
Contact details: Telephone:
E-mail:

Please provide details for all investigators involved in the study (*the text box below will expand to allow details to be entered*):

4. Title of the investigation:

Evaluation of the user friendly nature of Strathclyde University Data Logging System (SUDALS).

5. Where will the investigation be conducted? (Note that the Committee reserves the right to visit testing sites and facilities)

Biomechanics Movement analysis lab3, Bioengineering Unit.

6. **Duration of the investigation (years/months):**
(Expected) start date: 1.9.2008
(Expected) completion date: 10.10.2008

7. **Sponsor:**

University Of Strathclyde

8. **Funding body (if applicable):**

Not Applicable

Status of proposal – if seeking funding (Please cross as appropriate):

i) **in preparation** ☐
ii) **submitted** ☐
iii) **proposal accepted by funding body** ☐

Date of submission of proposal

Date of commencement of funding

9. **Objectives of investigation:**

Brief outline of the background, purpose and possible benefits of the investigation.

Functional assessment of knee following Total knee Arthroplasty (TKA) is very useful for the health care professionals to know how much of the knee function is actually restored. Currently, there are two techniques available for this purpose. They are questionnaire based assessment and clinical assessment. Even though, the questionnaire based assessment is popular and easy to administer, research reveals that they are highly subjective and give a little information regarding the actual restoration of the knee function. On the other hand, clinical assessment involving the use of camera based complex motion analysis system such as the vicon systems are expensive and time consuming. Hence to bridge the gap, researchers have started using electrogoniometry to record the dynamic knee joint movement during a range of functional activities due to its simpler, cheaper and reproducible nature. (Rowe et al, 2005, Rowe et al, 2001). Flexible electrogoniometer is a device which when placed across the specific joint of interest, produces a signal proportional to the flexion / extension angle of that joint. It is as shown in figure1a and 1b. Mostly, such body mounted transducers are used in combination with information storage devices known as "Data Loggers". (Rowe et al, 2005). We have developed a battery operated remote control data collecting system(SUDALS), whereby pushing a single button would enable the user to record, delete and transmit the data obtained from two flexible electrogoniometers and four foot switches in a much simpler and more efficient way compared to existing systems.

However, research reveals that, when developing a prototype medical device, measuring and fulfilling the user requirements would help the designers to improve the effectiveness, safety and usability of the device (Martin.J.L. et al 2006). Further, it would also be useful in improving the patient satisfaction and user efficiency. Hence, we have decided to evaluate our system usability with a group of research nurses and physiotherapists, who we hope would be the end users of our system.

The aim of our study is to evaluate the user friendly nature of SUDALS on volunteer subjects during various activities of daily living (ADL) such as walking, deep squatting, in and out of a chair and obtain the user feedback following the data collection process and the objectives of our study are:

1.To develop standard operating procedures for the conventional electrogoniometry system and for the new system.

2.To give training to 5 health professionals in the use of both systems, allow them to collect data with the system and elicit their views on the strengths and weakness of both systems.

3.To determine Inter-rater and Intra rater reliability and

4.To improve the effectiveness, safety and usability of the device based on the user feedback.

Note: We had mentioned about the end users (research nurses and Physiotherapists) of the newly developed user friendly system in our previous ethics application for the investigation titled: "Testing the concurrent validity and reliability of the newly developed user friendly system of flexible Electrogoniometry during various activities of daily living".

10. <u>Nature of the participants</u>:

Number: 6
Age (range): 20 to 30
Gender of volunteers: male or female

Recruitment method(s)

The participants in this study would be 5 professionals comprising of 2 research nurses, 2 physiotherapists and 1 clinical researcher involved in collecting data from one normal healthy volunteer either male or female .

Method to recruit Professional volunteers, range from distribution of flyers to presentation of work and the method to recruit the normal healthy volunteer either from the bioengineering unit or from outside the unit would be by means of verbal explanation of the work prior to the investigation that is intended to be carried out.

Inclusion/exclusion criteria (if appropriate)

Exclusion criteria for the selection of normal volunteer from whom the data will be collected would be

1. Any active illness.
2. Previous history of Osteoarthritis or total Knee Arthroplasty or total hip replacement.
3. Diagnosed skin condition
4. Known allergy to sticking plasters

5. Taking any kind of medication that may affect alertness or balance

6. Subjects with visual or balance defects will be excluded from testing to reduce risk of falls.

Screening procedure (if appropriate)
As mentioned above.

Any special skills, attributes, medical conditions
No

Any vulnerable participants (see Code of Practice, section 5.1(ii) and annex 2)
No

Justifications for sample size (e.g. power calculations)
Sample of convenience similar in size to previous similar studies in Literature.

Will data be anonymised and destroyed after use? If not, please give reasons.
Yes. This is because of Standard Practice.

11. <u>What consents will be sought and how</u>?

(Consent forms and participator information sheets (and questionnaires where used) must be appended to this application
Subject Information sheet will be handed over to the individual and consent of both the participant groups concerned with this study will be soughted prior to the trial.

12. <u>Methodology</u>

Design: what kind of design is to be used in the investigation (e.g. interview, experimental, observation, randomised control trial, etc.)?
Interview of the professional group and collecting data experimentally from the volunteer will be involved in this study.

Techniques: what methods will be employed and what exactly is required of participants?

As mentioned above, the end users of this system would be research nurses and physiotherapists. Hence, we would like to carry out this study with a group of 5 users involving 2 research nurses, 2 physiotherapists from clinical background and 1 clinical researcher.

The individuals from the clinical environment would be blinded to this study. However, prior to the trial, explanation of the data acquisition system with a standard operating procedure (prepared with the assistance of a research nurse) would be given. In addition to this, if the users wish to have a rehearsal prior to the actual data collection, a practice session can also be arranged. For the purpose of the intra-rater reliability, we would like to carry out

2 sessions of data collection from the same subject, one in the morning and the other in the evening. Following the data collection in the morning, the raters / users need to attend a short interview and fill in a short questionnaire so as to obtain their feedback on the usage of the system. Though the actual time involved in collecting data from the subjects is only 40 minutes, due to the training, interview and different data collecting sessions; it would be greatly appreciated if the participants are able to spend about 6-7 hours for this experiment. However, sufficient breaks and refreshments would be provided to the participants on request.Two Flexible electrogoniometer will be attached to the lateral side of the right and left knee of the volunteer through attachment strips which in turn are fixed to the skin using hypo allergenic adhesive tape. Further, four force sensing resistors, two on each foot betweent the foot and the shoe interior, will be used to determine the foot contact with the floor. These transducers will be interfaced with the battery powered user friendly system placed in a pouch and hung on the back or front of the subject depending upon his/her convenience. During session 1(morning) with these attachments, the volunteer would perform the various above mentioned ADL and during each of these activities, the information pertaining to the flexion-extension of the knee from flexible electrogoniometers would be collected using the commercial data collecting system by a research nurse or a physiotherapist. Similarly, in session2 (afternoon) the same user is expected to collect data from the same volunteer during these ADL using SUDALS. Prior to these sessions, complete training with a standard operating procedure would be given to the users and following these sessions, a short discussion for about 5 – 10 minutes would be conducted on a one to one basis, to know the user point of view regarding the usage of 2 different data collecting systems. In addition to this, the users would be asked to fill in a feedback questionnaire comprising of less than 10 questions. The protocol is a standard one and will be used by all the 5 users for testing the systems on the same volunteer on 5 different working days according to the convenience of both the parties involved with this study. The entire range of activities mentioned above would be carried out in the biomechanics movement analysis laboratory in the bioengineering unit.

Note: Shorts will be provided to the subject during the experiment. However, the volunteer is expected to bring his/her own comfortable shoes.

Reference should be made to any of the following to be used in the investigation (see Code of Practice, section 5.1):

Invasive techniques ☐
DNA testing ☐
Administration of drugs, foods, liquids, additives, other substances ☐
Any deception ☐
Physical exertion/exercise ☐
Manipulation of cognitive or affective human responses, possibly causing stress/anxiety ☐
Highly personal, intimate and/or confidential information being sought ☐
Acquisition of bodily fluids or tissue ☐
Access to confidential data (e.g. medical reports) ☒

Description of the use of any of the above:
Prior to testing a check list including the various exclusion criteria would be tested with the subject volunteering for this study.

The duration of the study for participants and frequency of testing (if repeat testing is necessary)
Duration :5 days of each 6-7 hours.
Frequency: Each trial would be tested 2 times for test, re-test studies with suffcient comfort breaks as and when requested by the subjects.

13. Potential risks or hazards:

Full details should be given of any potential risks or discomfort for participants, any burdens imposed and any preparatory requirements (e.g. special diet, exercise), as well as any steps/procedures taken to minimize these risks and/or discomforts. Details should also be given of any potential risks to investigators.

1.Slips,Trips or Falls: The volunteer will be performing activities of daily living and therefore the risk is no higher than being at home. However, the volunteer participating is young and hence falls on stairs or during any other activity are unlikely.

2. Allergic reaction to tapes: This is low risk as hypoallergenic tape is used.

3. Electrocution: This is low risk as the transducers require only 5V D.C supply and they are all battery operated and hence mains isolation is not required. Further, there is no mains connection during data transmission as Bluetooth is used for this application.

14. Ethical issues
What do you consider to be the main ethical issues which may arise during the investigation, and how do you propose to address them (please refer in particular to Code of Practice, section 5.1)
Minimal ethical issues involved with the study. Only issue is to maintain health and safety.

15. Any payment to be made:

Include reference to reimbursements for time or expenses incurred, plus any additional fee/incentive for participation.
As the same subject is going to participate for all the 5 working days, a national minimum wage for the calculated amount of time that was being spent for this study would be paid to the subject.

16. What debriefing, if any, will be given to volunteers?
No Debriefing is required. However, feedback regarding their general performance of the trials would be given to the subjects if requested.

17. What are the expected outcomes of the investigation? How will these be disseminated? Will you seek to publish the results?

Data on the user feedback and test, retest reliability of the developed system would be published in the PhD thesis and suitable journal. Data on usability of the system will be used to inform continuous PhD Progress and subsequent dissemination. However, the information will not be used in teaching courses.

How long will data (incl. e.g. photographs) be kept, and how will it be stored?
10 Years as anonymised text or data files and then the data would be deleted.

18. **Nominated person (and contact details) to whom participants' concerns/questions should be directed before, during or after the investigation (in the case of student projects, both the supervisor (Ord 16 staff member) and the student should be named); in all cases a member of University staff should be named.**
1.Prof. Phil Rowe .
2. I.Vivek Padmanaabhan.

19. **Previous experience of the investigator(s) with the procedures involved.**
Prof. Phil Rowe has an experience of 20 years in working with Flexible electrogoniometers, including supervision of 4 PhD's to completion.
I.Vivek Padmanaabhan used, practiced and has taken proper training before application.

20. **Generic approval:** if approval is sought for several separate investigations, or a series of investigations, all employing the same basic methodology and serving the same overall objective, then generic approval can be sought for a 3-year period. Give, on a separate sheet, further details about additional studies to be covered by this approval application, using the relevant headings (1-17 above), and drawing attention to any variations in methodology, participants, risks, etc. Student projects can also be submitted via Generic approval – see Code of Practice on Investigations on Human Beings, Section 6.3.

21. **Sponsorship**
This application requires the University to sponsor the investigation. I am aware of the implications of University sponsorship of the investigation and have assessed this investigation with respect to sponsorship and management risk. As this particular investigation is within the remit of the DEC and has no external funding and no NHS involvement, I agree on behalf of the University that the University is the appropriate sponsor of the investigation and there are no management risks posed by the investigation.

If not applicable, cross here X

Signature of Head of Department Please also print name below

.....

Date:

22. **Declaration**
I have read the University's Code of Practice on Investigations on Human Beings and have completed this application accordingly.

Signature of Chief Investigator Please also print name below

.....

Signature of Head of Department Please also print name below

.....

Date:

* *

Notes

1. If there is any variation to any aspect of the investigation (location, investigators, methodology, risks, etc.) then the Secretary to the Ethics Committee should be notified in writing immediately.

2. Should anything occur during the project which may prompt ethical questions for any similar projects the Chief Investigator should notify the Ethics Committee.

3. Insurance and other approval requirements from appropriate external bodies must also be in place **before** the project can commence.

* *

For applications to the University Ethics Committee this completed form should be sent (electronically, with signed hard copy to follow) to Research and Innovation in the first instance.

You may append further documents by expanding the text box below:

University of Strathclyde

Subject Information Sheet

Investigation Title

To evaluate the user friendly nature of SUDALS on volunteer subjects during various activities of daily living (ADL) such as walking, deep squatting, in and out of a chair and obtain the user feedback following the data collection process.

Purpose of the Study

The purpose of this study is to:

To evaluate the user friendly nature of SUDALS on volunteer subjects during various above mentioned ADL by giving training to 5 health professionals in the use of conventional electrogoniometry system and the new system, allow them to collect data with the system and elicit their views on the strengths and weakness of both systems . This would help us to improve the effectiveness, safety and usability of the device based on the user feedback.

Who Should Volunteer?

This study requires one Volunteer, either male or female in age group of 20 to 30. A national minimum wage for the calculated amount of time that was being spent for this study would be paid to the subject.The exclusion criteria would be:

1. Any active illness.
2. Previous history of Osteoarthritis or Total Knee Arthroplasty
3. Diagnosed skin condition
4. Known allergy to sticking plasters or tape
5. Taking any kind of medication that may affect alertness or balance

6. Subjects with visual or balance defects will be excluded from testing to reduce risk of falls.

Procedure

A Flexible electrogoniometer is a device or an instrument used for measuring the range of movement of a joint. Here in this study, two Flexible electrogoniometer will be attached to the lateral side of the right and left knee through attachment strips which in turn are fixed to the skin using hypo allergenic adhesive tape. Further, four force sensing resistors, two on each foot between the foot and the shoe interior, will be used to determine the foot contact with the floor. These transducers will be interfaced with the battery powered user friendly system placed in a pouch and hung on the back or front of the subject depending upon their convenience.Each subject has the above attachment placed on them. With these attachments, the subject has to perform the various activities of daily living in two different sessions. During session 1(morning) the information pertaining to the flexion-extension of the knee from flexible electrogoniometers would be collected using the commercial data collecting system by a research nurse or a physiotherapist. Similarly, in session2 (afternoon) the same user is expected to collect data from the same volunteer during these ADL using SUDALS. The entire range of activities mentioned above will be carried out in the biomechanics movement analysis laboratory 3 in the bioengineering unit. The duration of the experiment will be 6-7 hours and the trials would be carried out in the lab mentioned above with sufficient breaks as and when required by the volunteer. Due to test – retest reliability condition, the systems will be tested on the same subject by all the users on 5 different working days. The days on which the experiment would be taking place will be intimated in advance to the volunteer according to the convenience of both the parties.

Note: Shorts will be provided to each and every subject during the experiment. However, the subjects are expected to bring their own comfortable shoes.

Possible Hazards:

1. Trips or Falls: Subjects will be performing activities of daily living and therefore the risk is no higher than being in your own home.

2. Allergic reaction to tapes: This is low risk as hypoallergenic tape is used.

3. Electrocution: This is low risk as the transducers require only 5V D.C supply and they are all battery operated. Further, there is no mains connection during data transmission as Bluetooth is used for this application. *However, since three 9V rechargeable batteries are used to provide a regulated 5V supply, it is advisable to remove these batteries and recharge them before re-using them*

Procedures to minimise the risk caused by hazards:

1. To reduce the risk of slipping or tripping on the stairs a contrast edge is painted around each step to aid visual input. Handrails are present, if in case the subject loses balance.

2. All the areas will be cleared of obstruction and the surfaces would be kept dry.

3. All the objects will be marked so that their edges are clearly visible. Subjects with visual or balance defects will be excluded from testing to reduce risk of falls.

4. To reduce the risk of reaction to adhesive tape, subject will be asked if they have any allergies to tape and will be excluded if this is the case. Skin checks will be performed through out the tests to ensure there is no irritation.

All information would be considered confidential and will be used anonymously for research purposes only. If you have any queries regarding the project, please feel free to contact me at the address given below:

Principal Investigator:

I.Vivek Padmanaabhan,
Postgraduate Researcher,
Department of Bioengineering,
University Of Strathclyde,
106, Rottenrow,
Wolfson Centre,
Glasgow – G4 0NW.
Email: vivek.indra-mohan@strath.ac.uk