

# **CHILD & ADOLESCENT SPINAL HEALTH STUDY (1999-2003)**

## **PROTOCOL MANUAL FOR PHYSIOTHERAPY RESEARCH PROJECT U *(formerly Project 400)***

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# **2003**

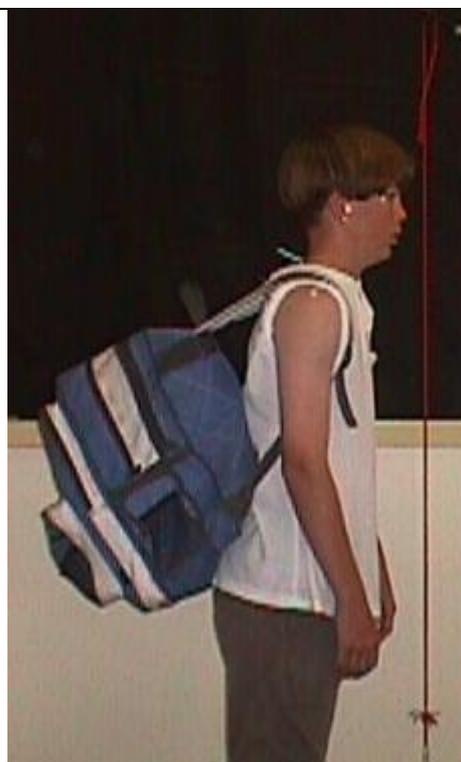
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## ABOUT THE SPINAL HEALTH STUDY

Adolescent spinal health is one of the key interests of the Centre for Allied Health Research (University of South Australia). Research into this area commenced in 1997 with preliminary investigations into whether carrying loads in backpacks by high school students warranted research attention. It certainly did, and as a result a sustained research campaign has resulted, which has involved over 500 undergraduate physiotherapy students, 8 higher degree students and approximately 22 School of Physiotherapy and Centre for Allied Health Research staff. A number of studies have been undertaken, including laboratory studies to test the effect on posture of different weights and positions of backpacks and correlating posture change with EMG activity, observational and attitudinal studies of load carrying behaviors, ergonomic evaluation of school environments, and epidemiological studies of student physical and recreational characteristics. This year's study is the 5<sup>th</sup> year of a longitudinal study which commenced in 1999 on 452 students entering Year 8 in four Adelaide high schools. This year approximately 200 of them will be enrolled into Year 12, and will complete participation in this study. The rest have left school, changed schools or decided that they don't want to participate (there haven't been too many of these!!!) How quickly five years have gone!!! Moreover, in 2001, some 700 students in one primary school joined the study (reflecting children from Reception to Year 7). 2003 will be the third year of their participation. There will be a smaller group to test this year, as the little Reception children in 2000 are now in Year 2, and we have 'lost' two years' of Grade 7 students who have since graduated from primary school).



**An all too common sight!! Backpack too big, too heavy, wrongly adjusted straps, and putting enormous strain on the low back and shoulders!!!**

The findings from the spinal health studies have been widely published to date, and have resulted in approximately 75 known media episodes (print, radio and television) nationally and internationally. The list of publications and conference presentations to date is listed. You will note that one of these publications came from a fourth year student in 1998 (Sam Steele) who was so interested in the study that he went ahead to write up his particular findings. You too could do this, and there are plenty of staff members to help you do it!!

Grimmer K, Williams M and Gill T (199): The relationship between adolescent head-on-neck posture, backpack weight and anthropometric features. *Spine* 24 (21): 2262-2267.

Gill T, Grimmer K, Williams M (1999):. High School Students and Lockers. *Australian Council of Health, Physical Education and Recreation Journal*. 46 (2-3): 5-9.

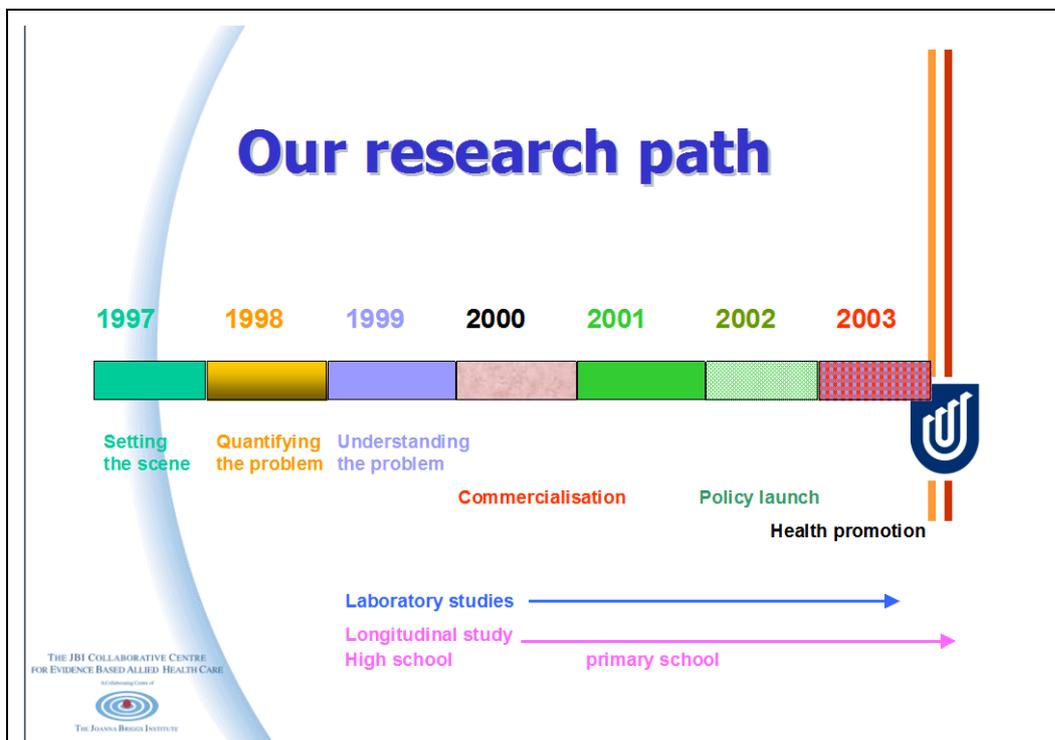
Grimmer K and Williams M (2000): Gender-age environmental contributions to adolescent low back pain. *Applied Ergonomics* 31: 343-360.

Steele S, Grimmer K, Williams M and Gill T (2001): Vertical anthropometric measures and low back pain in high school aged children. *Physiotherapy Research International* 6: 94-105.

Chansirinukor W, Wilson D, Grimmer K, Dansie B (2001). The Effects of Backpacks on Students: Measurement of cervical and shoulder posture *Australian Journal of Physiotherapy*.47: 110-116

Grimmer K, Dansie B, Milanese S, Pirunsan U and Trott P (2002): Adolescent postural response to experimental backpack loads. *BMC Musculoskeletal Disorders* 3:10.

Grimmer K and Milanese S (2002): Adolescent spinal health: an under-rated area of public health concern. *Australasian Epidemiologist* July 9(21): 18-21.



This is an overview of the enquiries by researchers in the Centre for Allied Health Research:

- Pilot studies in 1997 to establish the problems and work out measuring techniques
- A cross-sectional observational study in 1998 to quantify the problems
- A longitudinal study which commenced in 1999 to better understand the problem (ongoing), now including primary and high school children
- Laboratory studies to assess specific aspects of load carriage and posture
- Development of products (ergonomically designed backpack and policy document for schools)
- Health promotion study which is about to commence, to introduce specific spinal health curriculum into schools to address spinal health problems

We have provided you with the policy document (which was launched at the end of last year by the Minister for Education) as an appendix to this manual so that you can see what our research has produced and you can use it for reference when you go out into physiotherapy practice.

The area of adolescent spinal health is generally under-rated in research and clinical. Our work is unique in that it has provided the first rigorous information on adolescent spinal health in Australia. You should all be very proud that you are participating in research that has already made a difference, and may well underpin school furniture and curriculum design in the future. What is so surprising is that the prevalence of adult spinal pain is high, and the research literature generally considers that this starts at 18 years when young people enter the workforce and are legally called adults. What we have found is that spinal pain is significant in teenagers, and that reports of it have increased each year of our longitudinal study. Our findings to date are that there are strong links between adolescent spinal pain and poor standing posture for both boys and girls, long leg relative to trunk height (particularly in boys), imbalance in trunk muscle performance (boys and girls), poor fit between child and furniture dimensions (desks/chairs) (girls and boys), early and high rates of participation in competitive sports (girls and boys), regular carriage of heavy backpacks (particularly for boys) and prolonged sitting in any type of chair (girls in particular). After data collection this year we will know a whole heap more!!!

**This manual outlines what you need to know about the measurement stations so that you can participate as a trained, competent and insightful researcher.**

## MEASUREMENT STATIONS

Six measurement stations are used to collect data in all of the schools (Figure 1), each of which is identified by a colour. The prefix for saving the data files for each of these stations in the high schools and primary school is listed so that there can be no mistake (Table 1).

Station name and identifying colour	High School file names	Primary school file names
1. Questionnaire (GREEN) (see later)	Hsqa-f	Psqa-f
2. Posture (BLUE)	Hspo	Pspo
3. Bag weigh (YELLOW)	Hsbg	Psbg
4. Brace tests (BROWN)	Hsbc	Psbc
5. Muscle performance (ORANGE)	Hsms	Psms
6. Anthropometric (RED)	Hsan	Psan

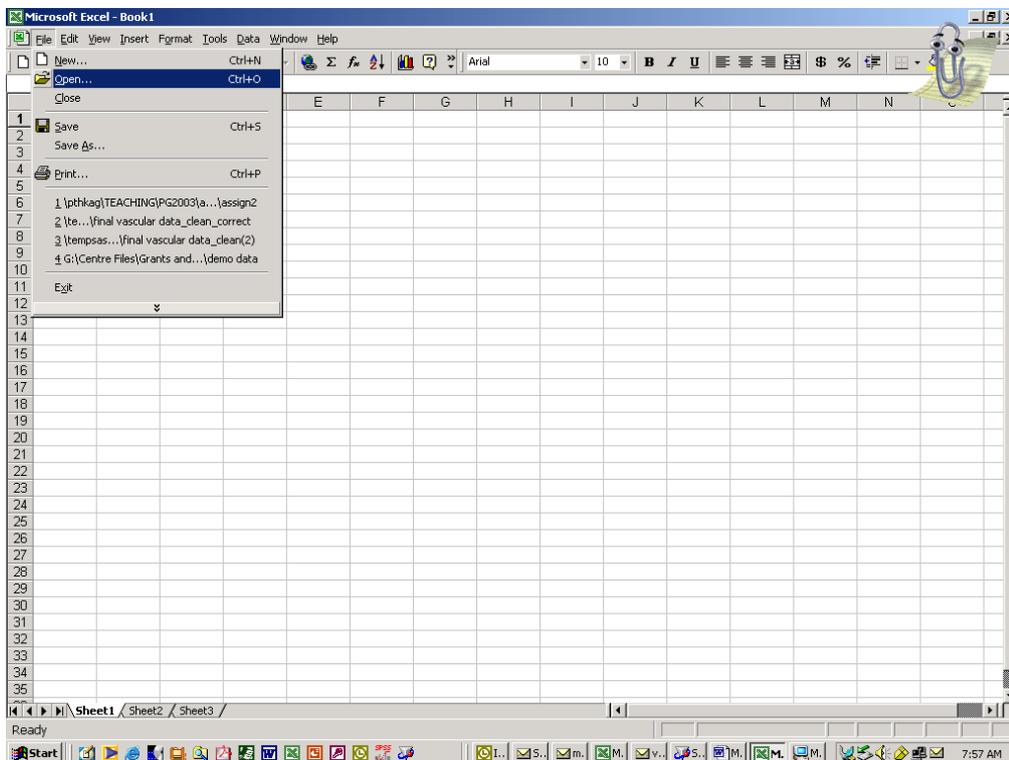
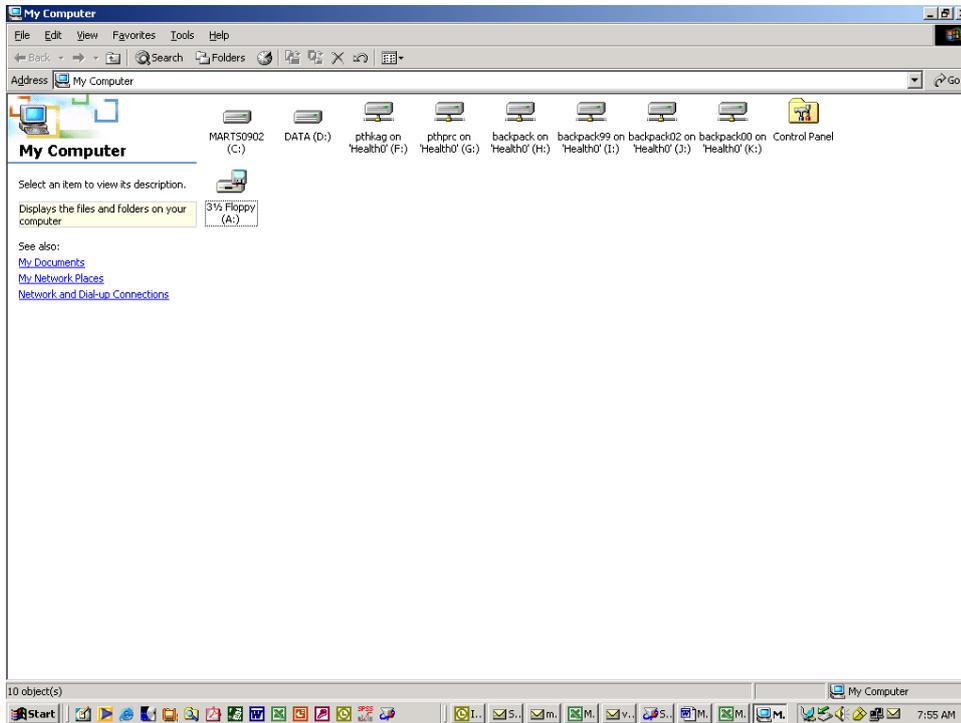
**Figure 1** Measurement stations and their corresponding colours

**Table 1:** File names per day of testing

	<b>Quest</b>	<b>Bag weigh</b>	<b>Anthro</b>	<b>Brace</b>	<b>Muscle</b>	<b>Posture</b>
3 <sup>rd</sup> March Pembroke	hsqa030303 hsqb030303 hsqc030303 hsqd030303 hsqe030303 hsqf030303	hsbg030303	hsan030303	hsbc030303	hsms030303	hspo030303
5 <sup>th</sup> March Freemont Elizabeth High School	hsqa050303 hsqb050303 hsqc050303 hsqd050303 hsqe050303 hsqf050303	hsbg050303	hsan050303	hsbc050303	hsms050303	hspo050303
6 <sup>th</sup> March Henley High School	hsqa060303 hsqb060303 hsqc060303 hsqd060303 hsqe060303 hsqf060303	hsbg060303	hsan060303	hsbc060303	hsms060303	hspo060303
7 <sup>th</sup> March Henley High School	hsqa070303 hsqb070303 hsqc070303 hsqd070303 hsqe070303 hsqf070303	hsbg070303	hsan070303	hsbc070303	hsms070303	hspo070303
10 <sup>th</sup> March Magill Primary School	psqa100303 psqb100303 psqc100303 psqd100303 psqe100303 psqf100303	psbg100303	psan100303	psbc100303	psms100303	pspo100303
11 <sup>th</sup> March Magill Primary School	psqa110303 psqb110303 psqc110303 psqd110303 psqe110303 psqf110303	psbg110303	psan110303	psbc110303	psms110303	pspo110303
12 <sup>th</sup> March Magill Primary School	psqa120303 psqb120303 psqc120303 psqd120303 psqe120303 psqf120303	psbg120303	psan120303	psbc120303	psms120303	pspo120303
13 March Adelaide High School	hsqa130303 hsqb130303 hsqc130303 hsqd130303 hsqe130303 hsqf130303	hsbg130303	hsan130303	hsbc130303	hsms130303	hspo130303

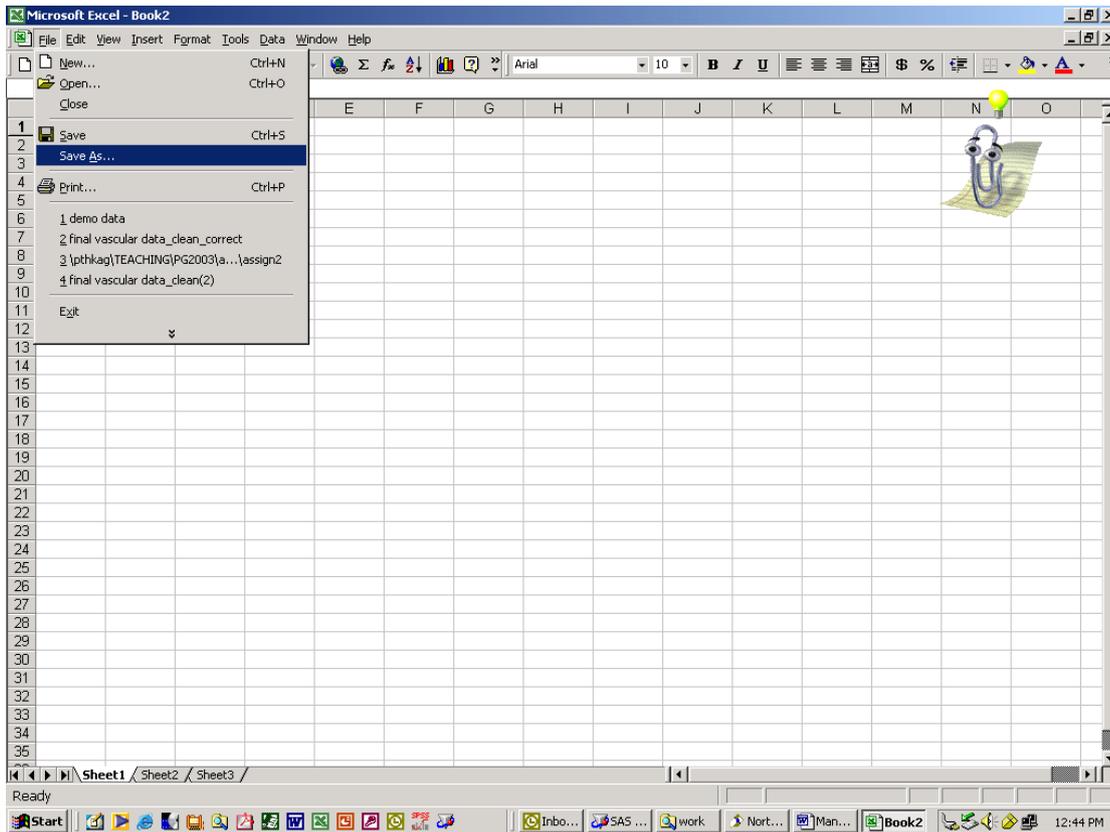
## Opening and saving files

**Opening files:** For students unfamiliar with opening and saving files in MS Excel, practice doing this before the data collection starts!! To enter data, open the template files on the floppy discs by double clicking on the floppy disk icon ('A') in 'My Computer' (see below). Alternatively, open the file once you are in the MS Excel program by going to FILE, Open, and then pointing the computer to the floppy disc drive.



## Saving files

It is essential that all files are saved appropriately (as listed in Table 1). Immediately you have opened up the template for your station, save the file under the file name that you will use for data collection for that day. Always use the SAVE AS option (see below) to do this because that way you can double check not only the file name (the unique one that you will be using for station and day of testing (Table 1), but also its location before you save it (by pressing the Enter button). Then start entering your data, saving the file (SAVE AS) every few minutes. It is **very wise** to save the data to the floppy disc as well as to your hard drive each time you save. It might mean a little more time in saving but it means that you have 2 copies, just in case!!



The questionnaire group will enter their data onto 6 excel spreadsheets, for which templates are provided on 6 discs. Refer to the data entry section of the questionnaire in this manual for details. For all other measurement stations, one disc will be provided to each group which contains the Excel template for data entry for that station. Make a copy of the template as backup!!! Keep it somewhere safe (the hard drive of your home computer?) Data should be entered onto the template each day, and each day's work SAVED AS the file names as outlined in Table 1 (this lists the measurement station identifier, day, month, year so that each day's file for each measurement station is unique). For example, if data for the anthropometric station was collected on the 8<sup>th</sup> of March 2003, the corresponding excel file would be labelled; an080303.

The floppy disc with the week's files should be brought to Associate Professor Karen Grimmer on the data validation day (each Friday during the project). Failure to enter data according to the above protocol or incorrect data entry will incur a 10% penalty to the whole group.

**MAKE SURE THAT YOU KEEP A BACKUP OF ALL OF YOUR FILES, YOU NEVER KNOW WHEN YOU WILL NEED IT!!!!**

## FAMILIARISATION AND RELIABILITY SESSIONS

All groups need to attend the practice sessions for Project U in the week of 24<sup>th</sup> – 28<sup>th</sup> February 2003. The dates and times for these sessions are outlined in the 2003 Block Lecture Program. The aim of the first practice sessions is to become familiar with the equipment, procedure, instructions and data entry. The manual is your best guide, and researchers are on call to assist you with understanding and interpreting the protocols. The remaining sessions are required for reliability testing, to ensure that you collect the data in a consistent manner, in accordance with the procedures outlined in this manual. In general, two types of reliability will be assessed.

- Intra-rater reliability (within person) assesses the consistency of results, by the same tester, over two occasions of testing.
- Inter-rater reliability (within the whole group) assesses the consistency of results when two or more testers assess the same subject, or take the same measurement.

Reliability testing for each measurement station varies, depending on the type of measurements taken, how the data is collected and the requirements of the station. Even though you will be working in smaller groups in the schools, the within- group reliability (inter-rater) should be tested on all people who are working on that measurement station over the three weeks of testing (remember, you need to be clones of each other for the whole testing period). Refer to the relevant measurement station section in this manual, for specific reliability testing protocols. Individuals or groups who do not achieve high levels of reliability will have to practice their measurements and repeat reliability testing to the satisfaction of the supervisor, prior to data collection.

## PROTOCOLS

The protocols for each measurement station have been fixed since 1999, thus ensuring that the longitudinal study data collection occurs in a standardised manner each year. It is everyone's responsibility to ensure that there are no deviations from the set protocols. In addition, students should familiarise themselves with all measurement stations, to ensure efficient measurement of subjects (with minimum disruption to the school timetable). This knowledge also assists students to be familiar with all the data items being collected in the study, in case they want to use data from another station for their analysis and reporting.

## PROFESSIONAL BEHAVIOUR

The Centre for Allied Health Research and the School of Physiotherapy, Uni SA have trusting relationships with the test schools. It is essential that student privacy and decisions are respected, and that testing is efficient (subjects are missing class time). This is particularly important in 2003 when our high school subjects are in Year 12. Therefore, streamlined test procedures and excellent organisation is paramount from the very first minute of testing. The session supervisor has the responsibility of liaising with school staff regarding access to subjects and testing venue, however it is important that each student in the measuring group recognises their professional responsibility in ensuring efficient and accurate data collection.

When attending schools for data collection all students are representing the School of Physiotherapy in the University of South Australia. As such all students are expected to dress and behave in a professional manner. This includes wearing clinic uniform and name badges, as outlined by University policy, being punctual to all testing locations and attending to tasks in a professional manner. Activities such as playing games (i.e. football or cricket during testing), lounging around or "gossiping" during gaps in testing are inappropriate. If a measurement group finishes testing, students should ask the project supervisor where they are able to assist other stations. If a student wishes to leave the testing area permission must be gained from the supervisor. At the end of the day, permission to leave will only be granted, by the supervisor, when all data collection has finished and all equipment is checked and packed away. Any questions in relation to the professional requirements of data collection should be directed to the subject coordinator or supervisor.

## GENERAL MEASUREMENT PROCEDURE

Generally, subjects will arrive at the data collection area in classes of up to thirty students. Members of the questionnaire group will introduce themselves to the class and outline briefly the nature of the study. In the high school in particular, many of the subjects will remember this procedure well and so this task is not onerous. The questionnaire group will use a role-call to assign identification numbers to subjects. It is essential that the right ID numbers are assigned to the right students – errors at this level will completely undermine the integrity of data collection!!! **NO NEW NUMBERS ARE TO BE ASSIGNED.** The questionnaire station group will collect completed questionnaires from students (these will have been

distributed to students several days prior to testing) (more about this later!!). Very few questionnaires should be completed on the day of testing.

Students on the questionnaire station will ask subjects to attach the identification badge to their shirt, and to remove their shoes and socks prior to testing. The identification badge contains coloured stickers as well as the student's identification number. Each sticker corresponds to a measurement station as shown in Figure One. This acts as a double check for the Uni SA students to ensure that students have been to every station before they leave. The questionnaire group will then direct subjects to the bag weigh station, where subject's bags and shoes will be placed in numbered stalls. Once bags are placed in the appropriate areas, the bag weigh group members will direct subjects to measurement stations so that there is approximately the same number of subjects being tested at each station.

Once each subject has completed testing at one measurement station, a member of that group will remove the coloured sticker relevant to that station from the ID badge. They will then direct the student to the next station at which there is least activity. Members of the questionnaire group are also responsible for the coordination of subjects between measurement stations. It is very useful for someone from the questionnaire station to regularly walk around the test venue to ensure that there are no problems at the stations (i.e. too many students waiting, not enough etc). Subjects will continue to rotate around the measurement stations until testing is completed, as identified by the absence of coloured dots on their identification badge. Completion of data collection may occur at different times, depending on the order with which subjects attend the measurement stations. It is the responsibility of all groups to ensure that the project supervisor and class teacher know when subjects have completed data collection and are leaving the area.

## DATA HANDLING

At the end of each day of data collection, all groups except posture need to decide whether they wish to enter their data that day or leave it until one specific day. It doesn't matter what is decided as long as the data is entered by the end of each week of testing. The group also needs to decide who is responsible for data entry and data checking. It is a good idea if people work in pairs so that there are two sets of eyes ensuring data entry integrity.

All data sheets, including posture photo discs, will be taken back to the Centre for Allied Health Research each day after testing by the supervisor. Groups need to arrange with the supervisor to pick up the data sheets and discs for data entry. These need to be signed out, and signed back in when returned, by the supervisor. Failure to do this will incur a penalty of 10% for the entire group.

### **For the questionnaire, posture, bag weigh, brace test, muscle performance and anthropometric groups**

- Data must be entered, and submitted to Associate Professor Karen Grimmer in person on the Friday of each data collection week, between 1 and 3pm in C7-58. She will then check the data. If there are any inconsistencies, the data will need to be corrected and resubmitted that day. Failure to do this will incur a penalty of 10% per group.

### **For the posture group**

- There may be some delay with film processing and scanning (approximately one week from the completion of data collection)
- Obtain computer discs containing photographs from the Centre for Allied Health Research (a nominated student from each week's posture group will be contacted when the discs are available)
- Data entry must be completed and submitted to Associate Professor Karen Grimmer in person on the Friday of the week after data collection week, between 1 and 3 pm in C7-58. She will then check the data. If there are any inconsistencies, the data will need to be corrected and resubmitted that day. Failure to do this will incur a penalty of 10% per group.

## QUESTIONNAIRE STATION

The questionnaire group has a number of responsibilities which are essential to ensure the efficient running of data collection. These responsibilities include:

1. Preparation of identification number badges, including ensuring coloured stickers are stuck onto clean badges
2. Assigning the correct identification numbers to each student (matching name and then assigning an existing ID number)
3. Collection of questionnaire data
4. Coordination of the transfer of subjects between measurement stations
5. Checking students who are leaving the testing area have completed all stations
6. Data entry

### Preparation of identification badges

The questionnaire group must ensure that all identification badges are prepared prior to testing, according to the following procedure:

1. Prior to testing, obtain from the supervisor, a master list that details each subject's name and corresponding identification number
2. Separate identification numbers into classes, according to the class lists provided by the supervisor
3. Attach the coloured stickers onto each of the identification number badge. Figure 1 listed the colour of the sticker that corresponds to each measurement station

**Note:** Questionnaire stickers are not required because questionnaires should be pre-completed (we hope!!!).

### Allocation of identification numbers

Members of the questionnaire group are required to introduce themselves to arriving subjects and to give a brief outline of the measurement procedure. Based on a role-call, identification numbers will be given to each subject. The identification numbers will be identical to the number that was used to identify the subject in previous years of testing. Once the identification number has been allocated, the subject's name should be ticked off the master list. The subject must be instructed to attach their identification badge to their top and to remove their shoes and socks. Members of the questionnaire group will then direct subjects to the bag weigh station for processing of the subject's bag and shoes.

### Completion / collection of questionnaires

In 2003, questionnaires will be distributed to all students (high school and primary school) several days prior to data collection. This will be done via the school. For the high school students, this is in an attempt to reduce the amount of time spent in the data collection area (we are mindful that this is a very busy year for most of our older subjects). For the primary school students, this has always happened as many of the younger students do not have the reading and writing skills to complete the questionnaire, and their parents are the best reporters.

The students' name and ID number will be printed onto the questionnaire when it is distributed. All students will be asked to bring their completed questionnaire on the day of testing. A reply paid envelope will be attached to each questionnaire for the primary students in case the questionnaire return is delayed. A reminder to bring the questionnaires to school will be made by the class teacher on the day before testing.

It is **ESSENTIAL** that the questionnaire group collect all questionnaires that are available on the day of testing (ask each student for their questionnaire), and mark off on the student list those who have returned them. These questionnaires should be placed in number order for ease of data entry. For those high school students who do not return their questionnaire, the questionnaire station group will ask them to complete a second questionnaire in front of them, and ensure that it is completed before the student leaves the data collection area. This will ensure that all high school questionnaires are completed and compiled on the day of testing.

For the primary school students who do not bring back their questionnaire, the questionnaire group must give them a reminder note for their parents, asking that the questionnaire is returned in the reply paid envelope the next day. A stack of these will be provided to the questionnaire group by the research leaders, in the hope that we will use very few!!

High school subjects will hand in two completed questionnaires (study questionnaire and the Offer Questionnaire). It is the responsibility of members of the questionnaire group to **ensure that the subject**

**has completed every question on both questionnaires.** If the subject has not done this, they must do so before leaving the testing area. Once all of the items (on both questionnaires) have been checked, stamp the questionnaire 'COMPLETED'. Direct the subject onto the next measurement station.

The ID numbers of all students (primary and secondary (we hope none of these!!)) who have not returned completed questionnaires by the end of the test day must be given to the supervisor so that these students can be followed up.

## **Coordination of subjects**

The questionnaire group is responsible for ensuring the efficient transfer of subjects between measurement stations. Therefore each member of the questionnaire group must be familiar with each measurement station's colour code, each of the measurement stations' testing procedures and the approximate time required for completion of each station. Effective communication with members of each measurement station is thus essential during testing.

## Data entry

Students do not have to enter data from the Offer questionnaire (completed by the High School students). Data from all other questionnaires must be entered into the relevant Excel spread sheets, which will be provided on six disks (one disc for each template) by the supervisor. The format in which data is to be entered into the spreadsheet is outlined on the questionnaire (in italics next to each question), and also on the spreadsheets themselves. Cutting the data up into six individual spreadsheets in this way is necessary to ensure the integrity of the data because of the large number of data items collected.

Note that the girls and boys high school questionnaire data will be entered into the same excel spreadsheets. Enter the data from the questionnaires in the correct columns, ensure that each file is saved appropriately refer to the filename checklist on page 5 (it is a good idea to save your file after every student entry), and back up your data elsewhere to ensure that a second copy of the data is available.

## Familiarisation session

Included in this manual are:

- An equipment list for the questionnaire station; and
- The questionnaires that will be used in this study. You will notice that the questionnaires are divided into 6 sections (a-f). The data in each of these sections is saved as the relevant file name (Section a saved as hs (or ps) qa[date] and so on as outlined in Table 1). The templates for each of these 6 sections are provided on 6 separate discs so that the data for each section from each day of testing can be saved onto the appropriate disc, and handed to Associate Professor Grimmer at the end of the week.

The questionnaire group must:

1. Ensure that all equipment listed for the station is present in the questionnaire box
2. Make decisions regarding each member's individual responsibilities on each day of testing. For example, who is responsible for:
  - Setting up and packing away the questionnaire station
  - Allocating identification numbers
  - Coordinating the transfer of subjects between stations
  - Communicating with each of the measurement groups
  - Data entry
  - Administrating and/ or collecting questionnaires
  - Walking around the testing venue to ensure that all is flowing smoothly
3. Become familiar with each questionnaire. This involves identifying the:
  - Reason behind each of the questions
  - Type of data provided
  - Type of questions that may be asked by the subjects during testing
4. Become familiar with data entry procedures
5. Organise identification badges and coordinating lists of students who have, and have not returned the questionnaires

## Equipment list

- |  | Checked ✓ |
|--|-----------|
| ▪ Self adhesive coloured dots boxes (red, blue, orange, green, brown, yellow)* | _____     |
| ▪ 3 x checked self inking stamp  | _____     |
| ▪ Box 46 bic pens – blue   | _____     |
| ▪ 3 x perspex clipboards   | _____     |
| ▪ Identification badges*(clear plastic pockets and ID cards)                   | _____     |
| ▪ Questionnaires*  | _____     |
| ▪ 3 x overheads of body chart  | _____     |

\* Means that this equipment may/ will need restocking at some stage in the data collection period.

## Reliability sessions

Students should first identify the type of data being collected in each question on the questionnaires (both the project questionnaires and the Offer questionnaire) and become familiar with the data entry codes for the project questionnaire. You may need to discuss classification of the question items within the group if there are differing opinions.

Then each student is required to organise completion of one high school and one primary school questionnaire, so that everyone is familiar with the wording of the questions and the way the data is collected. This may mean asking family or friends of Year 12 age, and a parent of a primary school child, to complete the questionnaires. It is important to check that all items in the questionnaire are answered, especially for the High School questionnaires as they will be collected or completed on the day of testing. For these questionnaires, check that:

- Any unilateral pain recorded on the body charts is recorded on the correct side
- Make sure that only one response is recorded for Questions 8b i,ii,iii, and Question 15
- Make sure that a single number (no decimal points) is specified for Question 21.

The students should then swap completed questionnaires and using the questionnaire data entry templates, should enter someone else's high school and primary school questionnaire responses, and then practice saving the file as indicated. This is so they can become familiar with each of the characteristics of the questions, and the way in which the data is going to be collected in 2003. Students should then work through each question within the group and discuss potential difficulties with data entry, so that a consistent approach can be taken by each member of the group when collecting, interpreting and recording each item.

It is vital that you practice saving your data using the appropriate file names: for example, if data for the high school questionnaire station is entered on the 8<sup>th</sup> of March 2003, the corresponding excel files would be labelled hsqua080303 for Section a, hsqub080303 for Section b, hsquc080303 for Section c, hsqud080303 for Section d, hsque080303 for Section e, hsquf080303 for Section f. Please make sure that each of these files have the student's ID number in the first column (so that the files can all be linked later). The reason that we are collecting the data in this way (multiple files) is that there are too many data items to fit comfortably into one sheet.

For integrity of data entry, you will probably need to see the header rows whenever you are putting data in to make sure that the right data is going into the right columns. This will mean turning on the Freeze Panes option under WINDOWS in the Menu Bar (see below). Place your cursor into the first row of column A, under all of the header rows. Turn on the Freeze Panes option by clicking on it, and then what will happen is that the header rows stay in place, and the data entry rows roll up underneath it, which means that you can always see all the instructions in the header rows. So you could theoretically be entering data into Row 3000, whilst still viewing what is in Row 9. If you have never done this before, practice turning the Freeze Panes option off and on until you can see what is happening. It is probably a good idea to turn it off when you have finished data entry each day, just so that you can 'eyeball' the entire dataset that you have put in. **Make sure you know how to Freeze Panes in each of the data entry templates.**

Microsoft Excel - hsqa03

File Edit View Insert Format Tools Data Window Help

Hide  
Unhide...  
Split  
Freeze Panes  
1 hsqa03

1	MAIN HEADING	ID number	Today's Date	Date of Birth	Country of Birth	Mother's Country of Birth	Father's Country of Birth	Bag type	Bag brand	Age of bag	do you use them						
2	SUB HEADING										Waist belt	Chest strap	Side compression straps	Other	Oth		
3	ANSWER D										Question 1	Question 2	Question 3	Question 4a	Question 4b	Question 4c	Question 4d
4																	
5		4 digits	11 digits	11 digits	R_L	8 characters	8 characters	8 characters	max	10 characters							
6	QUESTION CODE	date03	dob03	hand03	born03	p1brn03	p2brn03	bagr03	brand03	bgage03	0_1_2_3_4	n_s_a_d	n_s_a_d	n_s_a_d	n_s_a_d	che	
7	EXAMPLE	1001	04-Mar-02	27-Jun-86	R	australia	australia	england	1	hot chilli	1	d	d	d	d	S	
8		1003	04-Mar-02	16-Nov-85	R	australia	australia	england	1	blackwolf	1	n	d	a	n	inu	
9		1004	05-Mar-02	25-Nov-85	R	australia	australia	australia	1	go pak	4	s	n	n	a		
10																	
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Sheet1 / Sheet2 / Sheet3

Ready

Start SAS work Nort... Man... hsqa... 2:10 PM

## POSTURE STATION

The posture group has a number of responsibilities, which include:

1. Collection of posture data
2. Collection of Q angle data
3. Digitising the posture data
4. Data entry (posture data only)

### Collection of posture data

Posture data is collected by taking photographs of students standing in two positions ('usual' and tall) with a Canon SLR camera. This equipment is expensive (Please treat it carefully) and is set at standardised focal lengths and exposures which **MUST NOT** be altered.

The protocol for the collection of posture data is as follows:

1. Set up the SLR camera, as per the protocol outlined below
2. Place anatomical markers, on the subjects skin at:
  - Lateral canthus of right eye
  - Tragus of right ear
  - Lateral part of shoulder (mid point between greater tuberosity of humerus and posterior of acromion process)
  - Lateral superior border of iliac crest
  - Right greater trochanter
  - Note: subjects wearing loosely fitted clothing require a wet suit body wrap with Velcro edges applied over both the superior border of the iliac crest and the greater trochanter to ensure accurate marker placement.
  - Lateral epicondyle of femur
  - Lateral malleolus
  - Spinous process of C7

Markers are also required for the measurement of Q angle. These should be placed on the subject at the same time as the posture markers. The position of the these markers include:

- Left and right anterior superior iliac spine
  - Inferior poles of the left and right patellae
  - Superior poles of the left and right patellae
3. Line the subject up with the camera, according to the protocol outlined below. It is essential that all subjects are facing the same direction, with their **R side** pointing towards the camera.
  4. Write the subject's identification number on an A4 piece of paper and attach it to the number board on the tripod. Ensure that the identification number is visible through the view-finder of the camera
  5. Ensure that the subject is standing correctly and that all markers are attached to the appropriate areas and are visible through the view-finder of the camera
  6. Take a photograph of 'normal' standing posture
  7. Request the subject to stand as straight as possible ('tall' posture)
  8. Write 'T' next to the subject's identification number which is attached to the perspex board
  9. Take a photograph of 'tall' posture
  10. Direct the subject to the Q angle photographic station

### Protocol for camera setup

#### Subject

Refer to Figure 2 for a diagram of the camera set-up. Mark a 'T' on the ground with masking tape. The top of the T must be at 90 degrees to the camera. Check, using the set square, that the two pieces of masking tape which form the 'T' are at right angles to each other. Position the subject so that their right side is closest to the camera. The outer border of their right foot should be lined up with the inner edge of the stem of the T, and the toes on the inner edge of the top of the T. Attach the piece of string (which is four metres in length) to the masking tape, aligning it with the inner edge of the top of the 'T'. The string should be attached, fully extended, to the ground so it points towards the position of the camera. Place the tripod (with the set square and number board attached) in a fully extended position. Attach the plumb line to the number board and position the set square above the inner edge of the stem of the 'T'. Use the spirit level attached to the number board to ensure that the tripod is horizontal. Position the two feet of the tripod at a distance 5 centimetres from the inner edge of the top of the 'T'. Place a piece of masking tape 5 centimetres parallel from the

vertical masking tape line to facilitate tripod positioning. Fix the tripod to the ground to ensure that it does not move.

### Camera

Measure, from the inner edge of the stem of the 'T', 3.10 metres along the piece of string and mark this position with a piece of masking tape measuring 8.5 centimetres. Use a set square to ensure that the masking tape is at right angles to the string. Position the mid-point of the front foot of the tripod (legs extended) at the end of this piece of tape. Adjust the tripod top so the handle is facing right when facing away from subject end. Place camera, facing the subject end, on a tripod. Tilt the tripod handle up until it stops so that the camera is rotated 90° anti-clockwise. Check that it is horizontal by using a spirit level at the front of the lens. Ensure that the adjustable arm on the tripod is fully retracted and that the camera is centred over the string (using a plumb line). Fix the tripod to the ground to ensure that it does not move.

### Camera settings

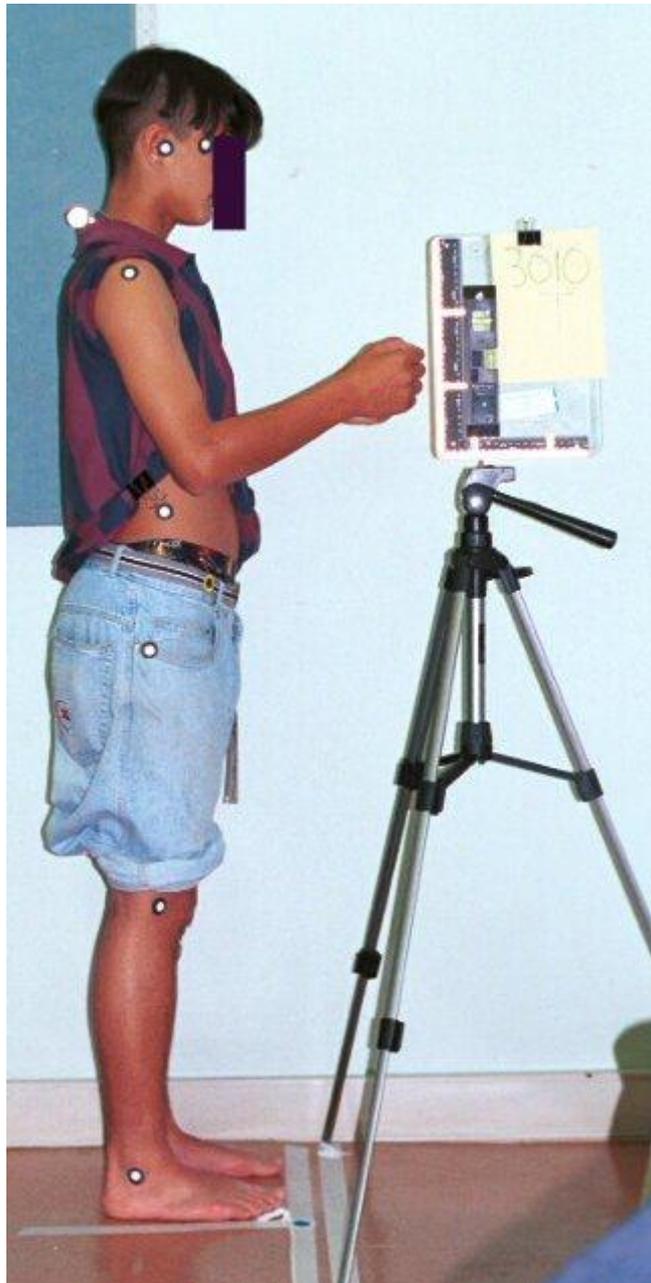
- The camera will be switched off after each session ('L' on the dial)
- Each day set dial to 'P' position. This is the camera's automatic set up; thus it will automatically select the appropriate shutter speed and aperture
- Pop up flash
- Attach shutter extension cable
- Fix camera to tripod
- When pushing shutter button **DO NOT PUSH UP**, as the shutter locks and continuous photographs will be taken
- Ensure the subject is looking straight ahead at all times
- Ensure all markers and the identification number are visible in view-finder
- First photograph is take with the subject in 'normal' standing posture
- Second photograph is taken with the subject standing 'tall'

### Before the photograph is taken ensure that:

- The subject's **R Side** is facing the camera (failure to do this will ensure that the entire group is penalised 10% of the total marks – **this is one of the most important aspects to ensure valid reporting of posture**)
- All anatomical markers are visible
- Loose clothing is tucked out of the way
- Hair is tucked out of the way and the C7 marker is clearly visible
- All markers are still attached
- Collars are completely out of the way
- Feet are flat on the floor and toes are not raised
- Subjects are looking straight ahead and their head is not tilted
- Arms are in the correct position, so that the hip markers are visible

### Recording

- After taking the first photograph ('normal' posture), write the identification number and the number of the photograph on the recording sheet. A copy of the posture recording sheet is included in this manual. Note, the film winds through to the end when loaded. When developed, the last photograph taken is the first negative. Therefore, use the frame counter on the camera to record the photograph number.
- Direct the subject to the Q angle posture recording station



**Figure 2** Camera set-ups - subject's position

Note that all anatomical markers are clearly visible. However, identification number is not clearly visible, which reinforces the importance of writing this number clearly in **BLACK** text.



## Protocol for positioning the subject

1. Align the subject's lateral border of right foot with inside of the stem of the 'T', with the tip of their right toes lined up with top of the 'T', as illustrated in Figure 3.
2. Place ID Number on board. Write in large numbers in **BLACK MARKER ONLY**. For the second photograph add a 'T'

Below is a list of standardised instructions that are to be used to position the subject:

### Normal posture - photograph 1

- Demonstrate correct standing position:
  - “Put your right foot here, like this, with toes behind edge of tape
  - Take your weight through both feet
  - Stand comfortably in your normal standing position, like if you are waiting for a bus or at the canteen, and look straight ahead at the vertical line
  - I need you to bend your elbows so we can see the dots on your hip”. (The subject moves their elbows just enough to clear the greater trochanter marker with minimal shoulder movement keeping elbows touching body)
  - “Hold arms still in this position.” (Elbows are approximately in 90 degrees with thumbs up)
- Ensure that posture is as ‘normal’ as possible and all anatomical markers are visible.

### Tall- photograph 2

- Demonstrate stance to subjects
  - “Stand with feet together
  - Keep taking your weight through both feet
  - Stand up straight and tall as you can
  - Look straight ahead at the vertical line.”

## Collection of Q angle data

Anatomical markers are placed on the anterior superior iliac spine, the centre of the patella, inferior and superior poles of patella and the tibial tuberosity of both lower limbs, as illustrated in Figure 3.



**Figure 3** Anatomical markers for the measurement of Q angle  
Note: The position of the subject and all anatomical markers are clearly visible

### Procedure

1. Align the subject's toes with the back of the masking tape line
2. Ensure that the subject is standing in a 'normal' posture
3. Request the subject to hold an A4 piece of paper with their identification number clearly written on it in black texter
4. Ensure that the subject's feet are flat, the subject is looking straight ahead, all anatomical markers and the identification number are visible, through the view finder

5. Take photograph
6. On completion of Q angle data collection, remove all of the anatomical markers.
7. Remove the blue dot from the subject's identification badge. Thank the subject and direct them onto the next measuring station, as indicated by the colour of the remaining dots on their identification badge.

## Camera position

### Subject

Create a straight line, approximately 500mm long, on the ground with masking tape. Position the subjects facing the line, with their toes touching the line. Attach the string (which is two meters in length) in the middle of the tape line. Extend the string from the masking tape line at right angles (use a set square to ensure the correct angles) and taped the end of the string down. Position the tripod (with the set square and number board attached), which is in a half extended position (i.e. only lower section of the legs extended), so that the axis of the number board is parallel to the axis of the masking tape line and in the same plane. Use a spirit level, which is attached to the number board to ensure that the tripod is horizontal. Fix the tripod to the ground to ensure that it does not move.

### Camera

Measure, from the masking tape line, at 1.80 metres along the piece of the string and mark this position with a piece of masking tape measuring 8.5 centimetres. Use a set square to ensure that the masking tape is at right angles to the string. Position the mid-point of the front foot of the tripod (legs extended) at the end of this piece of tape. Adjust the tripod top so the handle is facing right when facing away from subject end. Place camera, facing the subject's end, on a tripod. Tilt the tripod handle up until it stops so that the camera is rotated 90° anti-clockwise. Check that it is horizontal by using a spirit level positioned at the front of the lens. Ensure that the adjustable arm on the tripod is fully retracted and that the camera is centred over the string (using a plumb line). Fix the tripod to the ground to ensure that it does not move.

### Camera settings

- Open the side of the digital camera and insert a 3.5 inch floppy disc. Label the disc with the date, school and the identification number of the subject's whose images appear on the disc
- Turn the camera on at the power switch
- Ensure that the subject is looking straight ahead
- Ensure all markers are visible in viewfinder
- Before the photograph is taken ensure that:
  - All anatomical markers still attached and clearly visible
  - The subject's feet are flat on the floor and toes are not raised
  - Subjects are looking straight ahead
- The photograph is taken of 'normal' standing posture
- When pushing shutter button **DO NOT MOVE THE CAMERA**

### Recording

Record, on the Q-angle recording sheet record, the subject's identification number and the sequential number of the photograph. Ensure that photographs are taken in order and any mistakes are noted.

## Digitising photographs and data entry

At the end of each week of data collection, the supervisor will take the SLR films to be processed at a laboratory and all photographs will be scanned onto a CD. The images on these discs then require digitising. The program used for digitising photographs is called Image Tool and is loaded on the pool computer in P-3-19. The protocol for digitising the images is as follows:

1. Start Image Tool from the start programs menu
2. Start Microsoft Excel from the start programs menu. Use a new work sheet to work with, instead of using the template
3. Open a JPEG file from your floppy disc
4. Rotate the photo (if necessary) so that it is in portrait view (if you don't know what this is, please ask!), with the subject's head at the top of the image. The data collection sheet specifies the direction that the subject was facing at the time of data collection
5. Copy the photo, contained in the JPEG file, into Image Tool
6. Switch to Image Tool. Click on the 'points' button on the tool bar; this is the button in the middle of the toolbar with dots on it (next to the 123 button). This will cause the cursor to change to a pencil when placed over the image.
7. Using the very tip of the pencil cursor, click once in the centre of the white dot at the canthus of the eye.
8. Next move cursor to click once on white markers at the tragus of the ear, C7, the shoulder, iliac crest, trochanter, knee and then ankle.
9. Close the image and the background data sheet will become visible and should have numbers on it.
10. 'CUT' the data sheet and 'PASTE' into the your new work sheet of your Excel file.
11. The new work sheet now has the mean and standard deviations and the pixel values for the subject. Ignore the mean and standard deviations. The pixel values run vertically with the x value in the first column and the y value in the second.
12. 'CUT' the values from the scrap sheet and 'PASTE' them horizontally (using paste special into the template.
13. Repeat this process from step 5 until all images have been digitised.
14. Make sure that you save your excel file regularly, using the file saving protocols outlined previously. Sometimes Image Tool has been known to crash and so saving after each subject as you put the data into Excel will ensure that there is no lost work.

## Familiarisation session

Included in this manual are:

- Equipment lists for the collection of posture and Q angle data
- The posture recording sheet

The posture group must:

1. Ensure that all equipment listed for the station is present, in the posture box
2. Make decisions regarding each member's responsibilities. For example, who is responsible for:
  - Setting up and packing away the posture station
  - Placing the anatomical markers on the subjects / taking photographs, removing the anatomical markers
  - Notifying the supervisor regarding low supplies of anatomical markers, film and batteries
  - Checking, collating and handling over the posture recording sheets and floppy discs; and
  - Scanning and digitising
3. Practice setting up the posture and Q angle stations
4. Become familiar with the operation of the SLR and digital cameras
5. Practice positioning the subjects
6. Prepare anatomical markers

## Equipment list – posture data

\* Means that this equipment may/ will need restocking at some stage in the data collection period.

- |  |           |
|--|-----------|
|  | Checked ✓ |
| ▪ Posture recording sheets*  | _____     |
| ▪ 1 x Cannon SLR camera  | _____     |
| ▪ 1 x Remote shutter control   | _____     |
| ▪ Attachment for bottom of camera to connect with tripod   | _____     |
| ▪ Camera box   | _____     |
| ▪ 1 x perspex board with set square and spirit level attached and bulldog clip and tripod mount  | _____     |
| ▪ 1 x normal tripod  | _____     |
| ▪ 1x sinker plumb and bob  | _____     |
| ▪ Set square   | _____     |
| ▪ 3 x roll masking tape*   | _____     |
| ▪ 5 x roll double sided marking foam tape*   | _____     |
| ▪ 3 x white board markers  | _____     |
| ▪ Scissors   | _____     |
| ▪ Yellow tape measure  | _____     |
| ▪ 5 x bulldog clips  | _____     |
| ▪ Spirit level   | _____     |
| ▪ 3 x reflection C7 globes   | _____     |
| ▪ Stacks of yellow paper* (to write subjects' ID number on)                                      | _____     |
| ▪ 10 pack of batteries (must be good quality alkaline batteries)*                                | _____     |
| ▪ Boxes self adhesive label spots (big black spots with small white spots stuck on top of them)* | _____     |
| ▪ Film*  | _____     |
| ▪ Wet suit wraps with velcro edges   | _____     |
| ▪ Box rubber bands (tie back subjects' hair)*  | _____     |
| ▪ 1 x 4 metre piece of string  | _____     |

## Equipment list – Q angle data

- |  |           |
|--|-----------|
|  | Checked ✓ |
| ▪ Q angle recording sheets*  | _____     |
| ▪ 2 x Digital cameras and battery rechargers   | _____     |
| ▪ 20 x 3.5" floppy discs*  | _____     |
| ▪ Attachment for bottom of camera to connect with tripod   | _____     |
| ▪ Tripod for digital camera  | _____     |
| ▪ Boxes self adhesive label spots (big black spots with small white spots stuck on top of them)* | _____     |
| ▪ Masking tape*  | _____     |
| ▪ Tape measure   | _____     |
| ▪ 1 x 2 metre piece of string  | _____     |

## Reliability sessions

- Reliability testing will only be undertaken on the posture data
- Five people will be required to act as subjects. Each group will be required to:
  - Set up the equipment
  - Place the anatomical markers on each subject
  - Obtain opinion from project supervisor regarding accuracy of the anatomical markers (**this constitutes reliability of procedure**)
  - Practice positioning the subject
  - Each member of the group, who is responsible for taking photographs, must take a photograph of three subjects in the required positions (i.e. 'normal' posture and tall), and mark these as indicated on the posture recording sheet
  - Remove the anatomical markers, ask the subject to walk around and relax, then repeat the steps above.

This procedure will produce two sets of images for each subject. Thus, a comparison could be made by any group of its consistency of method of measuring posture. Make sure that **every** person in your group is familiar with the procedure (even the people who are subjects).

Due to time constraints in the testing week however, your films will not be able to be processed on time. Instead the posture group will be given a disc containing 10 photographs from previous years which will be used to practise the digitising process. Digitising should be undertaken during this session on these photographs to provide the coordinates of all anatomical landmarks. You can use these measurements later in the study to calculate displacement angles. All the anatomical points on each photograph should be digitised twice by all group members at different sessions (so that you do not remember what you did previously). Each student should digitise the anatomical points watched by the other members in the group, to ensure that they all agree with cursor placement. They should add their data in sequence to the same file, and data at the one measurement session should be recorded in the one Excel file in the following manner:

ID	date of test	Tester	canthus X	tragus x	C7 x	should x	iliac x	gr troch x	etc
1001	40302	1	1377	1364	1283	1222	911	781	459
1002	40302	1	1364	1355	1281	1216	911	780	452
1003	40302	1	1347	1343	1250	1232	957	802	430
1004	40302	1	1329	1326	1252	1203	922	769	422
1005	40302	1	1435	1422	1325	1324	1003	858	483
1006	40302	1	1428	1418	1328	1298	1007	867	494
1007	70302	1	1507	1487	1403	1385	1052	859	519
1008	70302	1	1479	1471	1378	1352	1029	854	522
1009	40302	1	1476	1460	1365	1330	1000	865	492
1010	40302	1	1479	1468	1375	1334	1006	873	500
1001	40302	2	1397	1291	1200	1170	886	767	412
1002	40302	2	1302	1296	1206	1196	912	793	421

etc

Practice saving your files using the appropriate file names as outlined in Table 1. For example, if data for high school posture is digitised on the 8<sup>th</sup> of March 2003, the corresponding excel files would be labelled hspost080303. The comparison file (Test 2) should be done on another day so that you can save it as (for instance) hspost090303.

### To test for reliability

You will have two files (as described above). Open up both files and copy the columns for the Test 1 and Test 2 values for the x and y values for each anatomical point into a third (new) file and paste the corresponding values side by side (see below). Give this third file a name, like reliability220203.

ID	date of testing	tester	canthus X1	canthus X1
1001	40302	1	1377	1373
1002	40302	1	1364	1361
1003	40302	1	1347	1349
1004	40302	1	1329	1331
1005	40302	1	1435	1432
1006	40302	1	1428	1428
1007	70302	1	1507	1505
1008	70302	1	1479	1481
1009	40302	1	1476	1474
1010	40302	1	1479	1480
1001	40302	2	1379	1375
1002	40302	2	1363	1362
1003	40302	2	1345	1346
1004	40302	2	1330	1329
1005	40302	2	1431	1432
1006	40302	2	1424	1423
1007	40302	2	1510	1509
1008	40302	2	1477	1475
1009	40302	2	1475	1473
1010	40302	2	1480	1479

It is a good idea to rename the columns for each variable in this file as 1 or 2, so that you can inspect them visually for differences, knowing what data you are comparing. You can see from the example above that there are some discrepancies in the data – so there are going to be differences that may be statistically significant.

Using the instructions on MS Excel provided in Appendix 2 of this Manual, calculate means, standard deviations and % differences per repeated x and y measures for each anatomical point for each of the photographs digitised. Apply paired t tests and Pearson’s r statistics to the data for each person in your group (identified by the tester variable) to test intra-tester reliability. You will need to use the filter to extract all this information out. If you want to assess the overall effects of the testers you can again use Pearson’s r statistics and ANOVA 2 factor with replication to get an idea of whether there are differences within members of the group (you will find this from the Menu Bar, under TOOLS, Data Analysis). You are looking for p values of greater than 0.05 in all instances to show no significant differences within subject, within one tester or within a group of testers.

It is important that you test the reliability of digitising all anatomical points twice, using both horizontal and vertical measures. This will give you all the confidence that you can digitise as well as each other irrespective of the anatomical point that is being tested.

## BAG WEIGH STATION

The bag weigh group has the following responsibilities:

1. Preparation of the numbered stalls for placement of bags and shoes
2. Collection of bag weigh data
3. Data entry

### Preparation of numbered stalls

Numbered stalls are required for the storage of each subject's bag(s) and shoes during testing. Stalls are marked by placing masking tape on the floor.

### Collection of bag weigh data

After identification numbers are assigned at the questionnaire station, all subjects will be directed to the bag weigh station, where their bags and shoes are placed in the numbered stalls. At this time, the identification number of each subject will be recorded on the bag weigh data collection form which will be kept with each subject's bag. This procedure avoids duplication of data and allows bag dimension measurements to be made while the subject attends other stations.

**It is a priority to direct subjects to the muscle endurance and brace test stations after they have lodged their bags with the bag weigh group.**

#### Weighing protocol

1. Ask subject to collect their bag and check that the identification number on the data collection corresponds to their identification badge
2. Measure the thickness of the shoulder strap padding
3. Weigh subject, who is carrying/wearing bag. Record total weight (if any fluctuations in readings – round up)
4. Bag is removed and the subject's weight recorded
5. Weigh any extra items such as sporting equipment in a second bag and musical instruments.
6. Subject steps off the scales, collects bag(s)
7. Subjects are questioned about bag use
8. Subjects place their bag(s) into their stall

**Note:** Many subjects, regardless of their age, feel anxious about their weight becoming known by their peers. Students at this station must be sensitive to this and ensure that subjects waiting to be weighed are kept approximately 1-2 metres directly behind the person currently being weighed. Ensure that there is one person assigned to recording weight directly from the scales onto the data sheet, and that the weight value is not said aloud.

**Please note:** We have had several girls refuse to participate further in earlier years of testing, because they feared that their weight would become known to their peers. Please respect these anxieties. In addition, **never disclose data from the data recording sheet to any student (irrespective of whether it is actually their own data)**. Because you do not know the name of the student, it is impossible to know whether the number on the ID sheet actually belongs to any one student. Our ethics approval specifically precludes release of information on any participant to anyone.

#### Measurement protocol

Bags can be measured at any time during testing. Measurements are taken at the numbered stalls to minimise congestion at the scales.

By definition, the **front of the bag** is the area resting against the subject's body when correctly worn. The back of bag is the area projecting away from the subject when the bag is correctly worn. The width of the front of bag seam to seam is equal to the distance between shoulder straps at the bottom of or place of attachment to the bag.

## Record

1. Bag type, tick as appropriate
2. Shoulder strap: record width in mm and record number of straps
3. Distance between shoulder straps – measure distance between the inner edges of the straps where they join the bag at the top and at the bottom
4. Measure the length of front of bag from seam to seam (ensure that zip is not being measured).  
Measure the width of front of bag seam to seam (ensure that zip is not being measured)  
Measure the length of back of bag seam to seam (ensure that zip is not being measured)  
Measure the width of back of bag seam to seam (ensure that zip is not being measured)  
Measure the distance between front seam and back seam (if the bag has them)
5. Length of strap: relevant only for satchels and “other” bags
6. Record whether the straps on the backpack are curved or straight
7. Record safety features as appropriate, for compression straps record number, all other measures record Yes or No
8. Record whether reinforcing or padding is present or not
9. Record the presence and position of pocket
10. Record the nature of any other items brought with them today other than a school bag, and how often this item is brought to school with them

## Data entry

All data, recorded on the data collection sheet, will be entered into a standardised MS EXCEL spread sheet, a template of which will be provided by the supervisor. This spread sheet must not be altered in any way.

## Familiarisation session

Included in this manual are:

- An equipment list for the collection of bag weigh data
- The bag weigh measurement sheet.

The bag weigh group must:

1. Ensure that all equipment listed for the station is present
2. Make decisions regarding each member’s responsibilities. For example, who is responsible for:
  - Marking out stalls
  - Setting up and packing away the equipment
  - Calibration of the scales (Also need to decide how often this will be done)
  - Collating and submitting the data collection sheets to the supervisor
  - Who will initially direct the subjects to place their bags in the stalls, measure the bags, weigh the subjects
3. Practice setting up the bag weigh station, including scale calibration
4. Become familiar with the weighing and measurement protocols and data collection sheet
5. Practice weighing subjects and measuring bags
6. Become familiar with data entry procedures

## Equipment list

- |                                  | Checked ✓ |
|----------------------------------|-----------|
| • Bag weigh recording sheets*    | _____     |
| • Electronic scales              | _____     |
| • 20kg weight for calibration    | _____     |
| • Thin metal tape measure        | _____     |
| • 2 x small calipers             | _____     |
| • 2 x dress makers tape measures | _____     |

\* Means that this equipment may/ will need restocking at some stage in the data collection period.

## Reliability session

Work out the type of data that you are collecting on your station (equal interval or categorical).

**Familiarity with weighing students:** Every member of the bag weigh group should be weighed twice, with and without their backpack. Calculate within-person differences and within group differences, to ensure that you have the measurements accurate. The way that you could collect this information is listed below.

person	person+ bag		person without bag	
	test 1	test 2	test 1	test 2
1	60.5	60.3	55.2	55.4
2	73.7	73.6	70.1	69.8
3	95.6	95.8	80.2	80.4
4	102.6	102.4	97.4	97.7
5	55.3	55.3	51.4	51.4
6	76.9	77.1	67.3	67.4

Use t-tests (paired) and Pearson r statistics to assess the significance of differences between tests 1 and 2 for the measures of person + bag, and person without bag. Remember you are looking for p values from the t-test of  $> 0.05$ , and Pearson statistics of close to 1. If you do not have these statistical outputs, it is because your protocols were wrong (because it is highly unlikely that the student or bag weight changed!!!)

**Measures taken from backpacks:** Choose 5 backpacks owned by the members of the group for testing. Choose two measures reflecting equal interval scaled data, and two measures of categories. All students in the station will measure the chosen elements on the five backpacks on two occasions of testing. Data will be recorded on separate recording sheets, using the procedures as described. Enter the data into Excel (as below) (this outlines the way you might enter category data, the above example for student weight outlines the approach for continuous data). Use appropriate t-tests, percent agreement or chi square statistics to calculate reliability.

	tester	Test 1	Test 2
Bag 1		1a	a
Bag 1		2a	b
Bag 1		3b	b
Bag 1		4a	b
Bag 1		5b	c
Bag 2		1b	b
Bag 2		2a	b
Bag 2		3b	b
Bag 2		4b	b
Bag 2		5a	a
etc			



## BRACE TEST STATION

The brace test group have the following responsibilities:

1. Collection of the brace test data
2. Ensuring student safety whilst completing the tests
3. Data entry

### Collection of brace test data

The brace tests, designed by Brace in 1927, consist of 20 skills to test child and adolescent motor abilities.

#### Protocol

For each brace tests, give a preamble:

“We’ve got some exercises for you to try, some of them are easy, and some are a bit difficult, but we’d like you to try them all anyway. We will demonstrate and explain each exercise as we do them. Wait until we ask you to do them.”

- Make sure that all subjects have removed their shoes and socks
- For each test give verbal instructions and demonstration
- Request each subject to perform the test

#### Do not allow:

- Subjects to practice or repeat the test
- Do not disclose whether the subject scored ‘yes’ or ‘no’

#### Procedure

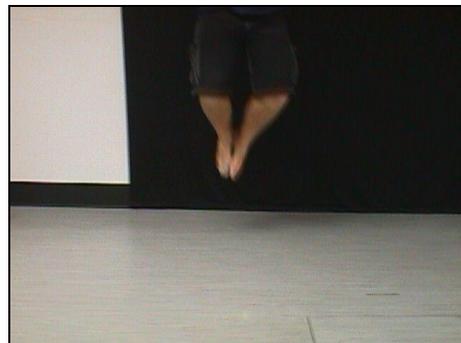
- Write the subject’s identification number on the data collection form
- Collect brace test data
- Ensure that each subject completes all the tests in the brace tests station
- Remove the BEOWN sticker from the subject’s identification badge and thank them for participating
- Direct the subject onto the next measurement station, as indicated by the colour of the remaining dots on their identification badge

#### TEST 1<sup>1</sup>

- Walk heel to toe for 10 steps (along a line)
- Demonstrate, after verbal instruction
  - No = stepping off the line, can’t heel/toe
  - Yes = staying on the line

#### TEST 2

- **Instruction:** Jump and clap both feet together once while in air
  - No = a step on landing; doesn’t clap feet together, hand to floor / fall



<sup>1</sup> These tests are demonstrated by Sam Dixon, who worked as an assistant on this project in 2000.

### TEST 3

- **Instruction:** Sit up from lying on your back without raising feet from floor, keeping your arms across your chest.
  - No = feet leave floor; and doesn't get up



### TEST 4

- **Instruction:** Fold arms behind back; kneel onto both knees; get up, and knees going down and up in time
  - No = knees not up and down together, stepping



### TEST 5

- **Instruction:** Perform 3 consecutive push-ups, with back and knees straight (arm and shoulder girdle strength) and bending elbows to 90 degrees
  - No = elbows < 90 degrees of flexion
  - Yes = elbows > 90 degrees of flexion



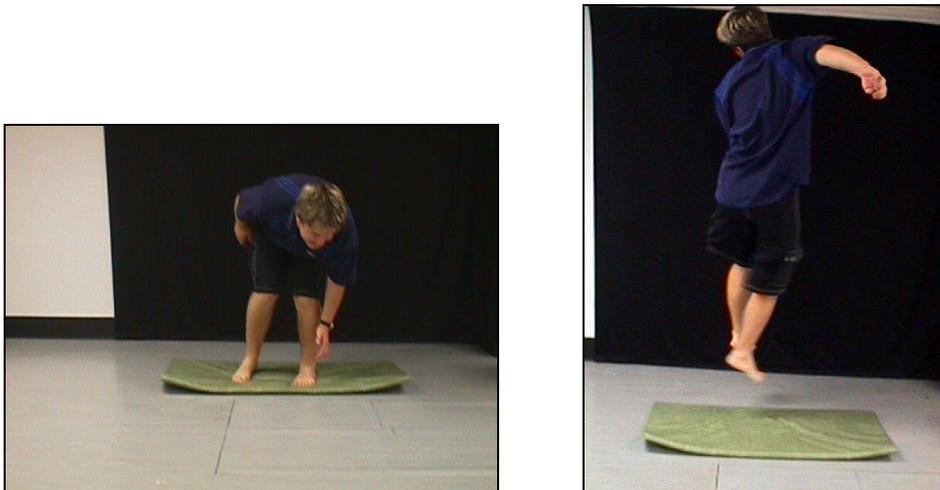
## TEST 6

- **Instruction:** Squat with feet together and hands between knees, and do a star jump, taking knees apart. Do three times in a row.
  - No = cannot do 3 in a row (at a constant speed), or if steps or loses balance



## TEST 7

- **Instruction:** Jump into air, do a full turn to left and hold position at end (balance)
  - No = stepping, cannot do a full turn



## TEST 8

- **Instruction:** Jump and clap both feet together twice in air
  - No = a step on landing; don't clap feet together 2x, or hand to floor/fall



## TEST 9

- **Instruction:** Stand on right foot, grasping left foot behind right knee; touch left knee to floor, then stand up again
  - No = not getting left knee to floor, letting go of their left foot, stepping; hand to floor / fall



### TEST 10

- **Instruction:** Hold toes of either foot with opposite hand; jump over held foot with free foot
  - No = letting go of foot, touching hand on ground or falling



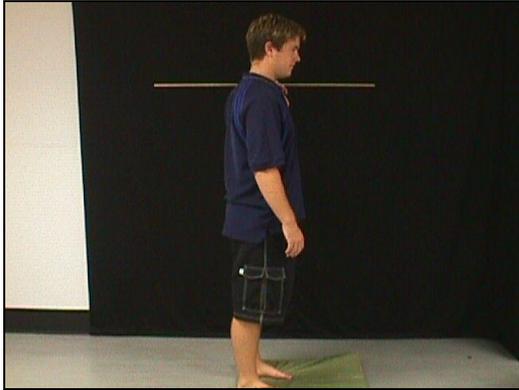
### TEST 11

- **Instruction:** jump and slap both heels with hands behind back
  - No = hands not behind back, not touching both feet to hands, stepping



### TEST 12

- **Instruction:** Kick right foot up from standing position to at least shoulder level
  - No = foot not reaching shoulder level (toes to shoulder level)



### TEST 13

- **Instruction:** Stand on one foot, bend forward and place both hands on floor, stretch right leg back in air, touch head to floor; regain standing position (leg strength, balance)
  - No = if don't touch head to floor, can't get up from floor to standing, if "walk" their hands during test, step with standing leg, hop



### TEST 14

- **Instruction:** Squat, reach both arms between knees, behind the ankles, and hold fingers together in front of ankles; hold 5 seconds. **Count out aloud**
  - No = not holding hands, cannot hold for 5 seconds; stepping



### TEST 15

- **Instruction:** Jump into air, turn full turn to right and hold position at end
  - No = stepping, or unable to do a full turn



### TEST 16

- **Instruction:** Kneel with feet and toes pointed behind you, swing arms and jump to feet
  - No = step, feet do not land simultaneously, cannot jump up



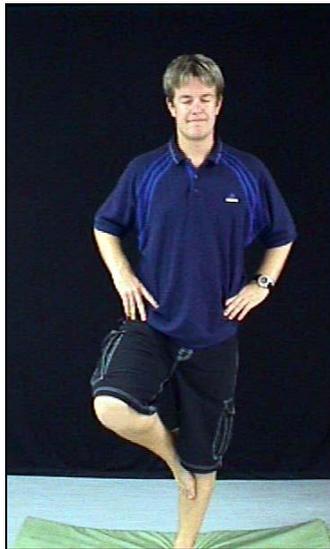
### TEST 17

- **Instruction:** Fold arms across chest and cross feet; sit down cross-legged, then get up
  - No = rocking, unable to get up again, stepping, uncrossing arms during test, uncrossing legs, feet off ground after lean back in sitting



### TEST 18

- **Instruction:** Stand on left foot with right foot inside left knee, hands on hips, and eyes closed. Hold for 10 seconds. **Count seconds out aloud**
  - No = hands off hips, hop/step, opening eyes, foot off inside knee, cannot hold for 10 seconds



### TEST 19

- **Instruction:** Balance 5 seconds on hands, knees over elbows
  - No = not lasting 5 seconds, falling over, not keeping knees over elbows



### TEST 20

- **Instruction:** Stand on left foot with right leg extended forward off the floor; sit down on heel of left foot, then stand up
  - No = stepping/hopping, touching ground with other leg or hands, not sitting on heel.



## Brace test recording sheet

ID	
----	--

Test	Performance	
<i>Test 1</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 2</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 3</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 4</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 5</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 6</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 7</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 8</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 9</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 10</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 11</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 12</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 13</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 14</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 15</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 16</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 17</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 18</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 19</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Test 20</i>	Y <input type="checkbox"/>	N <input type="checkbox"/>

## Data entry

All data, recorded on the data collection sheet, will be entered into a standardised MS EXCEL spread sheet, that will be provided by the supervisor. This spread sheet must not be altered in any way.

## Familiarisation session

The brace test group must:

1. Make decisions regarding who is responsible for:
  - Collating and handing over the data collection sheets at the end of a testing session
  - Liaising with other group members in order to assemble a group of subjects for testing
2. Become familiar with all tests
3. Ensure that all group members are familiar with the standardised instructions
4. Ensure that all group members are clear as to when a second test is allowed

## Reliability sessions

Last year a video was made of several group members performing the 20 Brace tests. All group members will watch the video, on two occasions, and will score each subject on each test. Results from the two assessments will be compared within tester and across the whole groups, to ensure consistency of scoring. Moreover, for the tests where there was disagreement within the group for whether the test was completed successfully or not, there must be a discussion about why there was a difference of opinion. Descriptive analysis and chi square tests need to be conducted on the categorical data in the following manner.

**For the individual tester** for one subject doing all 20 Brace tests.

	First view of the video	Second view of the video
Subject 1	Yes = 1, No = 0	Yes = 1, No = 0
Test 1		
Test 2		
etc		

Calculate differences in scores using % differences.

For the group, for each test, a 2x2 table is required, and the distribution of scores for each of the 2 viewings of the video to assess % agreement and chi square statistics. The chi squared test is made in this instance on the assumption that the distribution of scores of Test 1 will be the same as the distribution of scores for Test 2 (therefore Test 1 is the actual and Test 2 is the expected).

For a group of 10 measurers, firstly an Excel tables needs to constructed like so.....(data is fictitious)

1. Overall data sheet (totals will be 10 x 20 tests x 2)

	First view of the video (Attempt 1)		Second view of the video (Attempt 2)	
	Yes = 1	No = 0	Yes	No
Subject 1				
Test 1	5	5	4	6
Test 2	9	1	9	1
etc				

2. From this 2 x 2 table for each test (where the total will be repeated scores for all the members of the group) (for instance for 10 members), calculate percent agreement (the sum of the numbers in the Yes\_Yes and the No\_No cells). If this is less than 100%, go back and discuss where the differences lie, and then reassess. Your group cannot commence testing until you can provide evidence of total agreement.

Attempt 2	Attempt 1	
	Yes	No
Yes	6	1
No	1	2

## MUSCLE PERFORMANCE STATION

This measurement station involves testing muscle endurance and flexibility. The muscle performance group has the following responsibilities:

1. Collect muscle performance data
2. Data entry

### Collection of muscle performance data

#### Protocol

For all muscle performance tests:

- Give preamble:  
“We’ve got some exercises for you to try, some of them are easy, and some are a bit difficult, but we’d like you to try them all anyway. We will demonstrate and explain each exercise as we do them. Wait until we ask you to do them.”
- Make sure that all subjects have removed their shoes and socks
- For each test give verbal instructions and demonstration

#### Do not allow:

- Subjects to practice or repeat the test
- Do not disclose the test score

#### Procedure

- Write the subject’s identification number on the data collection form
- Collect muscle performance data
- Ensure that each subject completes all the tests in the muscle performance station
- Remove the ORANGE sticker from the subject’s identification badge and thank them for participating
- Direct the subject onto the next measurement station, as indicated by the colour of the remaining dots on their identification badge

## ABDOMINALS TEST

#### Equipment

Tape recorder, cadence tape, pencil, ruler, mats (if required)

#### Starting position

- Crook lying, with ruler balanced on subject's knees
- Subject holds a pencil in their hands

#### Procedure

- Play cadence tape (rate = 20 beats per minute)
- Instruct the subject to do a sit up so that they slide the pencil up to touch the ruler, at the rate of the cadence tape. Instruct the subject, that their head must touch the ground in between sit up repetitions
- Practice the sit ups in order to get the correct cadence
- Rest for 15 seconds then commence the test
- Count / record the number of correctly performed sit ups achieved at the desired cadence

#### End test when two consecutive sit ups are

- Not in time with the cadence tape
- The pencil is released
- The whole of one foot leaves the floor
- One or both fists do not touch the ruler
- The head does not contact the ground

## **BACK EXTENSORS TEST**

### **Equipment**

Micro-switch which is attached to the retort stand, ruler, mat, foam pads, wet suit bands, stop watch

### **Starting position**

- Prone, on the floor with the subject's hands behind their head
- The subject's feet are supported over the foam pad and strapped to a board using the wet suit bands
- The micro-switch is positioned at a point 5 centimetres above the T7 spinous process

### **Procedure**

- Instruct the subject to lift their head and trunk so that the micro-switch is activated and the subject can view the indicator light, when looking forwards
- Instruct the subject to hold this position and measure, with the stopwatch, the amount of time that this position can be maintained
- Record the time that the position is held prior to the 5 second loss of grip or micro-switch contact

### **End test when**

- The subject releases the hand grip for 5 seconds
- The micro-switch is de-activated for 5 seconds

**NB** For recording, the 5 seconds would then need to be deducted from the final time on the stopwatch

## **NECK FLEXORS TEST**

### **Equipment**

Ruler clamped to a retort stand, stop watch

### **Starting position**

- Supine of floor

### **Procedure**

- Instruct the subject to tuck their chin in and lift their head 2 centimetres off the ground (as measured by the ruler, from the lowest part of the ear)
- Student gently places their fingers on the subject's chin
- Record the amount of time that this position can be maintained

### **End test when**

- Chin position is lost

## **MIDDLE TRAPS TEST**

### **Equipment**

Ruler, stop watch, micro-switch that is attached to the retort stand, spirit level

### **Starting position**

- Prone on floor, with head rotated away from the tested side and non-tested arm by the side
- Test arm in 90 degrees of abduction, so that it is horizontal to the floor. Check this position with a spirit level which is positioned over the elbow
- The test hand has a pistol grip so that the thumb points up towards the ceiling
- Position the micro-switch so that it is just over the tip of the thumb

### **Procedure**

- Instruct the subject to squeeze their shoulder blades together and lift their test arm to active the micro-switch by contact with the thumb
- Position the indicator light so that it can be seen by the subject
- Record the amount of time that the position can be held prior to the 5 second loss of contact with the micro-switch
- Repeat this procedure for left and right middle traps

### **End test when**

- When contact is lost with the micro-switch for 5 seconds

**NB** For recording, the 5 seconds would then need to be deducted from the final time on the stopwatch

## **LOWER TRAPS TEST**

### **Equipment**

Ruler, stop watch, micro-switch that is attached to the retort stand, spirit level

### **Starting position / Procedure / End test**

- As for middle traps but with shoulder abducted to 120 degrees

## **SHOULDER FLEXIBILITY**

### **Equipment**

None

### **Starting position**

- Standing

### **Procedure**

- To test for right shoulder flexibility, instruct the subject to reach over their right shoulder with their right hand and behind their back with their left hand
- To test for left shoulder flexibility, instruct the subject to reach over their left shoulder with their left hand and behind their back with their right hand

### **Recording**

- If the fingers of the right and left hands touch, record yes
- If the fingers of the right and left hands do not touch, record no

## **HYPERMOBILITY TESTS**

### **1. MCP little finger**

#### **Equipment**

Small plastic goniometer fixed at 70 degrees

#### **Starting position**

- Position hand on a flat, stable surface, eg: table, chair

#### **Procedure**

- Align goniometer along the length of the fifth metacarpal bone and the first phalanx of the little finger, with the axis at the MCP joint
- Passively extend the subject's MCP joint, at the little finger
- Repeat for both hands

#### **Recording**

- If range of movement is greater than 70 degrees, record yes
- If range of movement is less than 70 degrees, record no

### **2. Elbow**

#### **Equipment**

Small plastic goniometer fixed at 10 degrees

#### **Starting position**

- Long sitting, leaning back on externally rotated arms with elbows and wrists extended

#### **Procedure**

- Align goniometer along the lateral aspect of the radius and humerus with the axis at the elbow joint
- Repeat for both hands

#### **Recording**

- If range of movement is greater than 10 degrees, record yes
- If range of movement is less than 10 degrees, record no

### 3. Knee

#### Equipment

Small plastic goniometer fixed at 10 degrees

#### Starting position

- Standing , with one foot slightly forward, with the knee to be measured locked in extension

#### Procedure

- Align goniometer with the greater trochanter and lateral tibia, with the axis at the knee joint
- Repeat for both legs

#### Recording

- If range of movement is greater than 10 degrees, record yes
- If range of movement is less than 10 degrees, record no

### 4. ANKLE

#### Equipment

Angled rulers fixed at 45 degrees

#### Starting position

- Stride standing, with the foot to be measured behind

#### Procedure

- Instruct the subject to flex their knee, on the side to be measured, and achieve maximum dorsiflexion whilst maintaining forefoot supination and heel contact with the floor
- Align the ruler along the floor parallel to the bottom of the foot and with the lateral malleolus, in line with the head of fibula
- Repeat for both ankles

#### Recording

- If range of movement is greater than 45 degrees, record yes
- If range of movement is less than 45 degrees, record no

### CALF STRENGTH

#### Starting position

- Standing on one leg

#### Procedure

- Instruct the subject to heel raise six times; ensure that the subject raises and lowers completely between attempts
- Repeat on each leg (**Note:** Minimal support for balance may be required for primary school children)

#### Recording

- If six repetitions can be achieved, record yes
- If less than six repetitions is achieved, record no

### QUADS STRENGTH

#### Starting position

- Standing on one leg

#### Procedure

- Instruct the subject to bend their knee (on the leg that they are standing on) six times, as if to do a quarter squat (**Note:** Minimal support for balance may be required for primary school children)

#### Recording

- If six repetitions can be achieved, record yes
- If less than six repetitions is achieved, record no

## Muscle Measurement recording sheet

ID	
----	--

Test	Performance
Abdominals - Curl ups	Number
Back extensors	Number
Neck flexors	Time
Middle trapezius	Time      R <input type="checkbox"/> L <input type="checkbox"/>
Lower trapezius	Time      R <input type="checkbox"/> L <input type="checkbox"/>
Shoulder flexibility	<b>R</b> Y <input type="checkbox"/> N <input type="checkbox"/> <b>L</b> Y <input type="checkbox"/> N <input type="checkbox"/>
MCP joint of little finger	<b>R</b> Y <input type="checkbox"/> N <input type="checkbox"/> <b>L</b> Y <input type="checkbox"/> N <input type="checkbox"/>
Elbow	<b>R</b> Y <input type="checkbox"/> N <input type="checkbox"/> <b>L</b> Y <input type="checkbox"/> N <input type="checkbox"/>
Knee	<b>R</b> Y <input type="checkbox"/> N <input type="checkbox"/> <b>L</b> Y <input type="checkbox"/> N <input type="checkbox"/>
Ankle	<b>R</b> Y <input type="checkbox"/> N <input type="checkbox"/> <b>L</b> Y <input type="checkbox"/> N <input type="checkbox"/>
Calf strength	<b>R</b> Y <input type="checkbox"/> N <input type="checkbox"/> <b>L</b> Y <input type="checkbox"/> N <input type="checkbox"/>
Quadriceps strength	<b>R</b> Y <input type="checkbox"/> N <input type="checkbox"/> <b>L</b> Y <input type="checkbox"/> N <input type="checkbox"/>

## Data entry

All data, recorded on the data collection sheet, will be entered into a standardised MS EXCEL spread sheet, that will be provided by the supervisor. This spread sheet must not be altered in any way.

## Familiarisation session

Included in this manual are:

- The equipment list for the collection of muscle performance data
- The muscle performance data recording sheet

The muscle performance group must:

1. Ensure that all equipment listed for the station is present, in the muscle performance box
2. Make decisions regarding each member's responsibilities. For example. Who is responsible for:
  - Each test (ensure that the work is divided equally amongst all group members)
  - Setting up and packing away the posture muscle performance station
  - Checking, collating and handling the data collection sheets
3. Become familiar with all equipment
4. Practice setting up the whole muscle endurance station, in an area with limited space
5. Practice giving clear, standard instructions for each test
6. Ensure that everyone is clear regarding what constitutes the end of a test

## Equipment list

	Checked ✓
• Black and grey foot stool/step	_____
• 2 x foam sleeping roll	_____
• 6 x stands	_____
• 6 x clamps	_____
• 3 x cross bars	_____
• Tape deck	_____
• Angle measuring devices	_____
• 50 cm ruler	_____
• 30 cm ruler	_____
• 100 cm ruler	_____
• 30cm free standing ruler	_____
• Box with 21 pencils	_____
• 2 x stop watch	_____
• 4 x 6 inch goniometres	_____
• 1 x cadence tape	_____

## Reliability sessions

All individuals in the muscle performance stations must go through the protocols and agree on each aspect of the test. They need to determine the type of data being measured on their station. They should assess their reliability for categorical data by measuring shoulder flexibility, all hypermobility tests, calf and quads strength tests. This involves assessing five individuals on two occasions, and comparing the results per individual tester, and for the whole group, as outlined in the MS Excel aspect of this manual. Depending on the tests chosen, the type of analysis will differ because of the different types of data used. See below for instructions on calculating reliability / agreement between the categorical data.

To test reliability for the remainder of the tests (abdominals, back extensors, neck flexors, middle and lower traps), a video tape of five individuals should be made performing the tests, and each member of the group should score their performance on two occasions. Results will be compared within individuals and between the group, by calculation of t tests and Pearson's r statistics. Refer to the Excel manual in Appendix 2 for assistance in setting up and conducting these tests.

For each of the categorical tests, do the following:

1. create a 2x2 table of agreements / disagreements of the entire group scores using the following set up

	Measurement 1	
Measurement 2	Hypermobile Yes = 1	Hypermobile = No = 0
Hypermobile Yes = 1		
Hypermobile No = 0		

2. From this 2 x 2 table for each test (where the total will be repeated scores for all the members of the group) (for instance for 10 members), calculate percent agreement (the sum of the numbers in the Yes\_Yes and the No\_No cells). If this is less than 100%, go back and discuss where the differences lie, and then reassess. Your group cannot commence testing until you can provide evidence of total agreement.

	Attempt 1	
Attempt 2	Yes	No
Yes	6	1
No	1	2

# ANTHROPOMETRIC STATION

The anthropometric group has the following responsibilities:

1. Collection of anthropometric data
2. Data entry

## Collection of anthropometric data

### Protocol

For all anthropometric tests:

- Give an explanation of the procedure
- Ensure that subjects have removed their shoes and socks
- Ensure that the subject is still, during the test
- Do not disclose whether the subject's score

### Procedure

- Write the subject's identification number on the data collection form
- Collect anthropometric data
- Ensure that each subject completes all the tests in the anthropometric station
- Remove the RED sticker from the subject's identification badge and thank them for participating
- Direct the subject onto the next measurement station, as indicated by the colour of the remaining dots on their identification badge

### 1. Height and Shoulder Width

#### Equipment

- Hard tape measure which is easy to read
- T-square
- T-bar marked on the floor with top of T 5 cm from the wall and parallel to the wall
- Step for measurer to stand on
- Spirit level
- Micrometer
- 5 cm wide wooden block – placed against wall behind T-bar
- texta

#### 1. Height

##### Equipment set up

- Fix tape measure to wall with bluetak / masking tape with the zero level with the floor and in line with the middle of the T bar
- Use a spirit level to ensure that the tape measure is perpendicular to the floor

##### Starting position

- Instruct the subject to stand on either side of the perpendicular line, with the heels resting against the 5 centimeter block
- The subject must be standing up straight, with their shoulders back, chin tucked in and looking straight ahead. The subject's arms should be hanging comfortably by their side
- Ensure that accurate measurements can be taken, ie: no hats, high hair styles, etc
- Shoes and socks must be removed for all measurements

##### Procedure

- Make sure that the subject is as upright as possible, prior to taking the measurement
- Align the T square, with one side resting against the wall and the other firmly positioned on the top of the subject's head
- Read the measurement from the base of the T square which is adjacent to the tape measure. Ensure that you are at eye level to take the height measurement to eliminate parallax
- Record height in centimetres to one decimal place

## **2. Shoulder Width**

### **Equipment set up and starting position**

- As for height

### **Procedure**

- Reassess standing posture in particular shoulder position
- Roll up subject's sleeve and put texta dot on most anterior part of the left and right acromion
- Measure the distance across between the marks with the micrometer
- Record in centimetres to one decimal place

## **Waist and Hip Measurement**

### **Equipment**

- Measuring tape
- Block (wooden) 8.5cm wide

### **1. Waist Measurement**

#### **Starting position**

- Subject stands, facing a wall, with the wooded block between their feet

#### **Procedure**

- Request subject to lift their shirt and find their waist & belly button
- Instruct the subject to breath in, then out, then relax and measure around waist for females and at the naval level for males
- Hold tape firm so that a tidal breath does not affect measurement. (Tape must be in contact with the skin)

### **2. Hip Measurement**

#### **Starting position**

- Subject stands, facing a wall, with the wooded block between their feet

#### **Procedure**

- Request subject to find lift their shirt and find "the point at which the bones stick out at the top of the thigh", (ie level of greater trochanters)
- Request permission from the subject the position of these landmarks
- Measure around the hips at the level of the greater trochanter

## **Sitting and Shoulder Height**

### **Equipment**

- Wooden stool
- Steel rulers x 3
- T-square
- 4 wooden 2cm high boards (40cm x 16cm)
- Spirit level

### **1. Sitting Height**

#### **Equipment set up**

- Place stool against wall
- Fasten measuring tapes to wall (zero at top of stool): one in the centre of the stool, and the other two tapes in line with the lateral edges of the stool

#### **Starting position**

- Request the subject to sit on the stool, with their bottom resting against the wall

#### **Procedure**

- Adjust the foot blocks so that the subject's hips are flexed at 90°, the femurs are horizontal and feet shoulder width, hands resting on thighs and looking straight ahead
- Align T square with one side resting against the wall and the other firmly positioned on top of the student's head.
- Read measurement from the base of the T square to the adjacent tape measure
- Record measurement in centimetres to one decimal place.

## **2. Shoulder Height Procedure**

### **Equipment set up and starting position**

- As for sitting height

### **Procedure**

- Request the subject to roll up their sleeve and expose the AC joint
- Measure the height from the top of the stool to the left and right AC joints (using the T square)
- Record measurements in centimetres to one decimal place

### **Leg Length Measurement**

#### **Equipment**

- Measuring tape
- Mat
- Wooden Block, 8.5 cm in width

#### **Starting position**

- Request the subject to lie supine on mat
- Place block between ankles to ensure standard distance between feet
- Ensure that the student's body is symmetrical, with their legs in line with their trunk, knees extended and feet level
- Request the subject to hold their feet in the above position

#### **Procedure**

- Request the subject to locate their hip bones
- Obtain permission to palpate for ASIS (hip bone)
- Measure left leg length from most anterior tip of ASIS to most prominent part of medial malleolus of same leg in centimetres to one decimal place.
- Hold the tape measure firmly and measure the shortest path to the malleolus. The tape does not need to be in contact with the skin
- Repeat measurement procedure on right leg

## Anthropometric Measurement Sheet

ID	
----	--

Height cm (shoes off)	Sh width <i>cm</i>	Sitting Height <i>cm</i>	Elbow height <i>in sitting cm</i>	Shoulder height L <i>cm</i>	Shoulder height R <i>cm</i>	Waist <i>cm</i>	Hip <i>cm</i>	Leg length L	Leg length R

### Data entry

All data, recorded on the data collection sheet, will be entered into a standardised MS EXCEL spread sheet, that will be provided by the supervisor. This spread sheet must not be altered in any way.

### Familiarisation session

Included in this manual are:

- An equipment list for the collection of anthropometric data
- The anthropometric data recording sheet

The anthropometric group must:

1. Ensure that all equipment listed for the station is present, in the anthropometric box
2. Make decisions regarding who is responsible for
  - Each test (ensure that the work is divided equally amongst all group members)
  - Setting up and packing away the equipment
  - Collating and handing over the data collection sheets at the end of a testing session
  - Liaising with other group members in order to assemble a group of subjects for testing
3. Become familiar with all set ups and measurement procedures

### Equipment list

	Checked ✓
• Anthropometer (large caliper)	_____
• 2 x Foam sleeping rolls	_____
• 2 x Thin metal tape measures	_____
• 2 x 120cm metal ruler	_____
• 2 x white board markers	_____
• 2 x rolls masking tape	_____
• 3 x orange tape measures	_____
• 2 x dress makers tapes	_____
• 3 x opened metal tape measures – no casing	_____
• 3 x 2.5 x ? blocks of wood	_____
• 4 x 16 x 40 x 2 cm blocks of wood	_____
• Non descript block of wood 90 x 190 x 27cm	_____
• 2 x metal set squares	_____
• Yellow spirit level	_____
• 2 x big square blocks of wood	_____
• Wooden step from Gait Lab No 5	_____
• Wooden step from Gait Lab No 4	_____
• Wooden stool from Gait lab	_____

## Reliability sessions

Reliability testing involves taking two sets of measurements, for each test, on five students. The results of the tests will be recorded on separate measurement sheets to avoid recall bias. The results for subject and tester will be analysed using intra-rater and inter-rater reliability tests as outlined in the Excel section of this manual. It is essential that for each subject in this reliability study, each measurer demonstrates excellent reliability within them selves, and with every other member of the group (p values of  $> 0.05$ . and Pearson r statistics close to 1).