

## **PUBLIC USE DATASET FOR NORMAL JOINT RANGE OF MOTION**

### **Methods and Materials**

#### ***Sample Selection***

The objective of this project was to obtain age- and gender-specific estimates of the ranges of motion of ten joints among persons with no known history of a bleeding disorder selected from the general population. The following lists of inclusion and exclusion criteria were used during participant selection.

#### **Inclusion criteria:**

- Non-institutionalized men and women between the ages of 2 years and 69 years.
- Must be ambulatory without assistance devices such as walkers, crutches or canes.
- Must pass a simple joint screening exam.

#### **Exclusion criteria:**

- Diagnosed with a bleeding disorder by a physician or related to a person with a diagnosed bleeding disorder.
- Diagnosed with any connective tissue disorder (e.g., rheumatoid arthritis, lupus, Ehler-Danlos or hypermobility syndromes, osteogenesis imperfecta) by a physician or who take prescription medications on a regular basis for joint pain.
- History of any type of joint surgery including ligament repair or joint replacement.
- Neurological diseases that may affect ROM (e.g., cerebral palsy, spina bifida, Parkinson's Disease, stroke, multiple sclerosis).
- Amputation of any part of any limb.
- Acute joint injury including fracture, torn ligament, significant trauma, cast.
- Recent injury including a bone fracture within the past 6 months or a joint sprain or dislocation within the past 3 months.
- Pregnancy.
- Diabetes Mellitus diagnosed by a physician.

A convenience sample of healthy volunteers was recruited by staff at CDC, staff at hemophilia treatment centers and the physical therapists who performed the measurements for the study. Participants were recruited from among the general public and among people at well clinics or health fairs. Only one member of an immediate family group was selected for participation. People who were hospitalized or seeking care for current illnesses in health care settings were not recruited.

The estimated sample size for the study was 700 persons and was based on 100 persons in each of the following 7 age categories: 2-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69 years. Equal numbers of men and women were to be recruited so that gender- and age-specific measures could be calculated. Sample size estimates used measurements of the joint with the greatest amount of measurement variability (as assessed by the coefficient of variation) in data on males reported by

Boone and Azen (1979). Based on these data, a sample size of 50 persons in each gender group was predicted to have 90% power to provide estimates of “normal” range of motion with a precision of  $\pm 5\%$  or better depending upon the joint. The estimate was based on measurement of ankle plantarflexion. The precision for ankle dorsiflexion will be somewhat less and that for measures of most other joints will be better than  $\pm 5\%$  due to differences in the variability of these measures.

### ***Data Collection***

Eligible participants were examined by physical therapists in a suitable room equipped with a scale to measure body weight, a tape measure or other device to measure body height and an examination table. Participant height and weight was measured in light clothing without shoes and any participant whose BMI exceeded 35 was excluded from participation in the study.

ROM measurements on ten joints (ankles, knees, hips, shoulders, and elbows) were obtained by the physical therapist according to detailed guidelines provided in a reference manual and training video supplied by CDC. Subject position was specified for each joint measurement as follows: sitting for ankle dorsiflexion and plantarflexion; supine for knee flexion, extension, and hyperextension; sidelying for hip extension and supine for hip flexion; supine for shoulder flexion; supine for elbow flexion, extension, hyperextension and sitting for elbow pronation and supination. Each joint was moved passively to its full extent and end-point measurements were made to the nearest degree using a standard goniometer. The ROM measures were recorded on a standardized form provided by CDC. More details on the methods used to measure the joints and conventions used to record the measurements are provided in the document entitled “Normal ROM Data Description and Sample Tables.”

Completed data collection forms were mailed to CDC. Trained personnel entered data from the forms into CDC-provided computer software. The software was designed to perform reliability checks on the entered data and reduce the likelihood of data entry errors by using a double entry system.

### **Informed Consent and Patient Confidentiality**

Informed consent was obtained from all participants by physical therapists prior to collection of any data. Parental consent was obtained for all children. All data sent to CDC were identified with a unique code. No personal identifiers were sent to CDC. All participants were assured that data analyses would report group data and care will be taken to assure that individual patients cannot be identified. Information obtained from this study may be published in the medical literature. However, no information will be disclosed that might result in identification of any individual participant.

### **Public Use Data Files**

All investigators who use the public use data files agree to abide by the confidentiality agreement and will not attempt to identify any study participant. The data are provided in a spreadsheet format and sample data tables will be provided. It is recommended that all investigators who use these data compare results of their analyses with the sample data tables provided to ensure that

the data have been accurately downloaded and/or imported.