

Sensor and range-of-motion lab

Your goal: Collect EMG or range-of-motion data and record results in a data table.

One product: Raw data table with trial number, measured value (mV or degrees, with units), time, and fatigue-onset trial clearly marked.

Question: How can a raw record show a decline without proving why it happened?

Start the work

A proposed safety benefit needs evidence, and access should be justified by its purpose and limits.

1. Actual route only: follow the teacher-approved supervised protocol for device setup and its reference check. Without that protocol and authorization, use D1 on paper; do not set up or use a sensor.
2. Do not self-test or run physical fatigue trials without a teacher-approved supervised protocol. Actual route: follow its trial limits, rest and stopping rules. Paper route: read the supplied simulated D1 entries only.
3. Record force or angle and time for each trial in your data table.
4. Note the trial where performance clearly dropped.
5. Submit the chosen raw table with units and an evidence-supported onset annotation. For simulated D1, physiological fatigue onset is not established; its classroom decline marker is separate.

Do not self-test or run physical fatigue trials without a teacher-approved supervised protocol. Use the original paper record when that authorized route is unavailable. If access is blocked, save your work and ask the teacher for the assignment or missing input. After uploading, check that Schoology shows Submitted.

Words you will use

sensor

A device that detects a physical signal.

EMG

Electromyography, recording muscle electrical activity; it is not the same quantity as force or joint angle.

goniometer

An instrument used to measure angles, including joint angles.

joint

A place where bones meet.

joint angle

An angle defined by stated reference lines for the bones or segments at a joint.

range of motion

The extent of motion between defined positions at a joint; one angle is not a full range.

degree

A unit for plane angle, written °.

second

A unit of time, written s.

trial

One numbered entry in the stated record.

reference

A stated starting convention used to interpret a value.

baseline

A comparison value or condition defined by a protocol; it need not mean zero.

zeroing

Setting an instrument reference under its actual instructions; this paper activity does not zero a device.

timestamp

The time assigned to an entry relative to a stated time origin.

raw record

The original recorded values before averaging or other summaries.

precision of recording

The detail shown in the written values, such as whole degrees; this does not prove accuracy.

accuracy

How close a measurement is to an appropriate reference value.

uncertainty

Limits to how precisely a real measurement is known.

trend

A pattern across ordered values.

decline

A decrease under the stated comparison rule.

threshold

A specified value used as a cutoff for a rule.

operational rule

An exact method for deciding how to label a record.

physiological fatigue

A reduction in the ability to sustain a task; an angle pattern alone does not establish its cause.

qualitative observation

A description in words; only record what was supplied or actually observed.

quality note

A note about completeness, conditions or a possible limitation of a record.

simulated

Constructed for teaching; not measured from a person.

protocol

The assigned procedure, conditions, recording rules and safety requirements.

Submission check

After uploading, check that Schoology shows Submitted; ask for help if it does not.

H1: Choose one record, with no self-testing

Today's five steps name a supervised physical lab. They are not a complete procedure or permission to test yourself. Do not perform repeated movements, exertion, electrode placement or any test until fatigue from this page.

If the teacher supplies the actual protocol, equipment directions, supervision and authorization, use that assigned route and its real record. Otherwise use original D1 as paper preparation only. Follow the teacher's separate setup and safety directions before any actual measurement.

Opening facts: a goniometer measures angles; degrees are angle units. EMG records electrical activity. These are different quantities. Original opening: title your one record "D1 simulated joint-angle record; degrees." Actual opening: name the assigned quantity and unit, or ask for the missing input. Give one response, not both.

R1: Read the reference before making a table

D1 is a constructed elbow-angle record. No participant, device or real trial exists. Its quantity is flexion angle in degrees from a drawn straight-elbow reference called 0°. Larger positive numbers mean more bending in this drawing convention. This is not an instrument calibration instruction.

Text reference figure F1: straight reference = 0°; a right-angle bend = 90°; a drawn bend of 120° is 30° beyond that right-angle reference. These labels define the convention only. No body movement or comparison with your own joint is needed.

D1 values show the angle at six sample entries, not the entire joint range or a clinical normal range. Whole degrees and whole seconds are the chosen writing precision. No measurement accuracy, error bound, participant effort or cause is known.

A study compared goniometer readings with radiographic readings and found differences between the methods. Thus recording more digits alone does not establish accuracy. The study does not supply D1 values or a fatigue cutoff. Source: ANGLE-STUDY. Degree is an angle unit; source: NIST-ANGLE.

The time origin is the first entry, $t = 0$ s. Later timestamps locate entries in this fictional timeline. Ten seconds between entries is not a rest, exertion or sampling instruction for a real lab. Keep original values unchanged; do not average, smooth or invent missing readings. Actual route: use the genuine assigned protocol, records and teacher rubric instead of D1 and its counts or rule. Do not complete both. Ask the teacher for missing assigned inputs; do not replace them with invented values.

D1: Complete simulated source record

Copy these six supplied entries into the one raw-data table during 20-50 minutes. All values, times and notes below are invented teaching inputs, not actual measurements or symptoms. Use columns: trial; flexion angle ($^{\circ}$); time since first entry (s); supplied quality note; classroom decline marker.

D1 trial 1 | 120° | 0 s | Entry supplied; reference row.

D1 trial 2 | 119° | 10 s | Entry supplied; no quality flag.

D1 trial 3 | 118° | 20 s | Entry supplied; no quality flag.

D1 trial 4 | 109° | 30 s | Entry supplied; no quality flag.

D1 trial 5 | 108° | 40 s | Entry supplied; no quality flag.

D1 trial 6 | 107° | 50 s | Entry supplied; no quality flag.

“No quality flag” means none was supplied; it is not proof of correct setup. No pain, tremor, effort, device drift or peer observation was recorded. Do not add any of those as facts. Actual route: preserve the genuine entries and quality notes; replace all D1 rows and counts with the assigned record. Missing entries stay missing, not zero.

R2: Mark a classroom decline, not a physiological onset

Original D1 rule: use trial 1 as the comparison baseline, 120° . Mark the first later entry at least 10° below that value only if the next entry also meets that cutoff. The cutoff is 110° because 120° minus 10° equals 110° . Values equal to 110° meet it.

Inspect entries in time order. A candidate at or below 110° needs the following entry at or below 110° too. If only the final entry meets the cutoff, note that the next entry cannot confirm it. If none qualify, state that there is no classroom marker. A missing next value also prevents confirmation.

This is an invented classroom labeling rule, not a biological threshold. Name the first classroom decline trial and its confirming trial in the marker field. Add this separate annotation: physiological fatigue onset not established by this simulated record.

Add one short table note explaining the two entries that meet the rule and the evidence limit. No graph, average, second experiment or diagnosis is required. Actual route: use the teacher's actual criteria instead. If the genuine record does not support onset, record that limit rather than inventing a trial.

Q1: Check the same table

Original check at 62-75 minutes: verify all six D1 entries against the source, with matching degree and second units. Check the reference, time origin and whole-unit precision. Apply R2 in time order, check the next entry, and retain the separate unknown physiological onset.

Use a real peer check if one occurs. Otherwise compare your table to D1 yourself and label it self-check. Name one correction, or state that no mismatch was found after checking. Do not invent another person's contribution. Actual route: use the genuine assigned protocol, records and teacher rubric instead of D1 and its counts or rule. Do not complete both. Ask the teacher for missing assigned inputs; do not replace them with invented values.

Recovery: return to the matching D1 line for a copied value. Return to R1 for the convention and R2 for the cutoff. Correct the same table; do not start a second report. Actual route: return to the supplied protocol or ask for the missing instruction; do not replace absent real data with D1 values.

S1: Checks and one submission

Keep ten separate checks and next actions. First check assigned protocol and stopping point, device and metric, setup/reference check, and teacher supervision and safety authorization. Then check genuine measurements, teacher rubric and onset criteria, and peer check if required. Finally open the assigned official activity, use evidence from that task and check Schoology after uploading. Note evidence from a check you performed or a specific next action. Reuse your existing check record if available.

Actual physical work replaces this practice when the teacher provides it. The paper route establishes only that the simulated record was checked. It does not complete physical setup, measurements, cleanup or physiological assessment. Record no personal health details here.

The expected activities are 1.2.4 Mind Over Muscle and 1.2.5 Joints in Motion. Confirm which actual station and prompts are assigned. Ask which station to use; neither link requires both stations or establishes that you can open them.

Both sections use Wk7 Data table: Sensor and range-of-motion lab. Confirm directions and deadline. Submit the single raw table with its annotations through the confirmed route. If access is blocked, save locally and tell the teacher. Check Schoology after uploading. A saved file is not an upload.

Next class is Tuesday March 2, Kinesiology data analysis. Carry this same record and its limits. No graph or additional experiment is assigned now.

M1: Distinct worked simulated table

M1 is a separate fictional teaching model, not another task or a person's result. It uses R1's angle convention and whole-degree, whole-second writing precision. Its time origin is its own first entry. Use the same invented rule with M1 trial 1 as baseline.

M1 trial 1 | 90° | 0 s | Reference row | no marker.

M1 trial 2 | 86° | 12 s | Entry supplied | no marker.

M1 trial 3 | 79° | 24 s | Entry supplied | no confirmed marker: the next value rebounds.

M1 trial 4 | 84° | 36 s | Entry supplied | no marker.

M1 trial 5 | 78° | 48 s | Entry supplied | first confirmed classroom decline.

M1 trial 6 | 77° | 60 s | Entry supplied | confirms trial 5.

Worked note: 90° minus 10° gives an 80° cutoff. Trial 3 is below 80°, but trial 4 is not. Trials 5 and 6 both meet the cutoff, so mark trial 5. Physiological fatigue onset is not established. These timestamps are not instructions for testing. Actual route: use the genuine assigned protocol, records and teacher rubric instead of D1 and its counts or rule. Do not complete both. Ask the teacher for missing assigned inputs; do not replace them with invented values.

Try the decision

Original route: the R2 rule selects a classroom marker. What should the same table claim? Actual route: use the genuine assigned protocol, records and teacher rubric instead of D1 and its counts or rule. Do not complete both. Ask the teacher for missing assigned inputs; do not replace them with invented values.

- The stated rule marks a decline, while physiological fatigue onset is not established.
- Finding the first decrease proves the exact physiological onset of muscle fatigue.
- A declining angle in the classroom record proves a clinical problem.

Explain your choice using the reading. Discuss it or say it to yourself. This practice does not add another submission.

Your 80-minute flow

0–10 minutes	Read H1 and its opening definitions; identify one chosen record. No self-testing.
10–20 minutes	Read R1, the table terms and R2 rule. Set up the same paper table, reference and time origin. Actual route: use the genuine assigned protocol, records and teacher rubric instead of D1 and its counts or rule. Do not complete both. Ask the teacher for missing assigned inputs; do not replace them with invented values.
20–50 minutes	Transfer D1 entries, units and supplied notes to the same table. Recheck each line before annotation. Actual route: use the genuine assigned protocol, records and teacher rubric instead of D1 and its counts or rule. Do not complete both. Ask the teacher for missing assigned inputs; do not replace them with invented values.
50–62 minutes	Apply the original R2 rule; distinguish the classroom marker from unknown physiological onset. Actual route: use the genuine assigned protocol, records and teacher rubric instead of D1 and its counts or rule. Do not complete both. Ask the teacher for missing assigned inputs; do not replace them with invented values.
62–75 minutes	Check Q1 against the supplied record. Use genuine peer review or labeled self-check; update the same work. Actual route: use the genuine assigned protocol, records and teacher rubric instead of D1 and its counts or rule. Do not complete both. Ask the teacher for missing assigned inputs; do not replace them with invented values.
75–80 minutes	Save or submit through the confirmed route and update S1 checks and next actions. Actual cleanup follows only actual teacher instructions; no sensor was used in the paper route.

Your response record

Use these labels on paper or in your document. The space below also works when this page is printed.

T1: Name the chosen record

Original route: use H1 to title the record as simulated and name its quantity and unit. Actual route: name the genuine quantity and unit or missing input.

One note on the same table. Actual route: use the genuine assigned protocol, records and teacher rubric instead of D1 and its counts or rule. Do not complete both. Ask the teacher for missing assigned inputs; do not replace them with invented values.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.

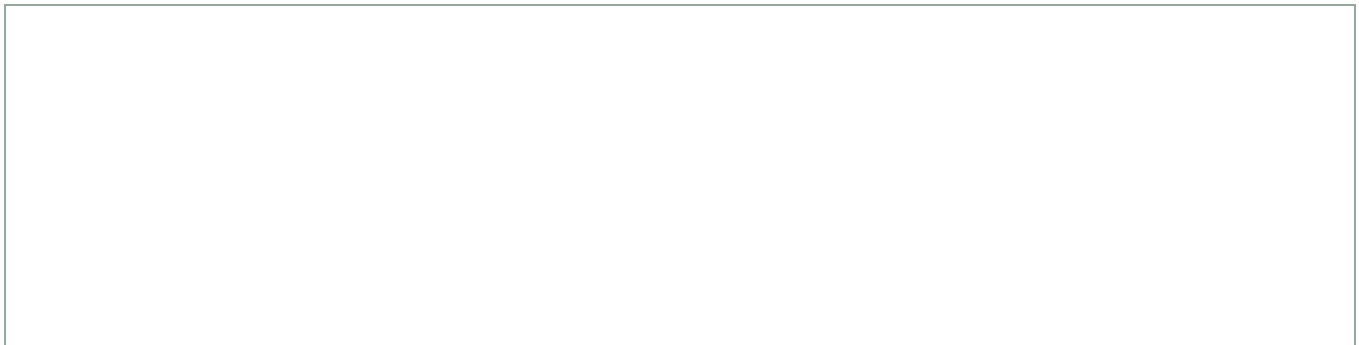


T2: Prepare the raw table

Original route: add R1 reference, time origin and writing precision, then copy all six D1 rows into the five stated columns. Leave the marker column until R2.

Record the original values and notes exactly. No physical trial is required. Actual route: use the genuine assigned protocol, records and teacher rubric instead of D1 and its counts or rule. Do not complete both. Ask the teacher for missing assigned inputs; do not replace them with invented values.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.

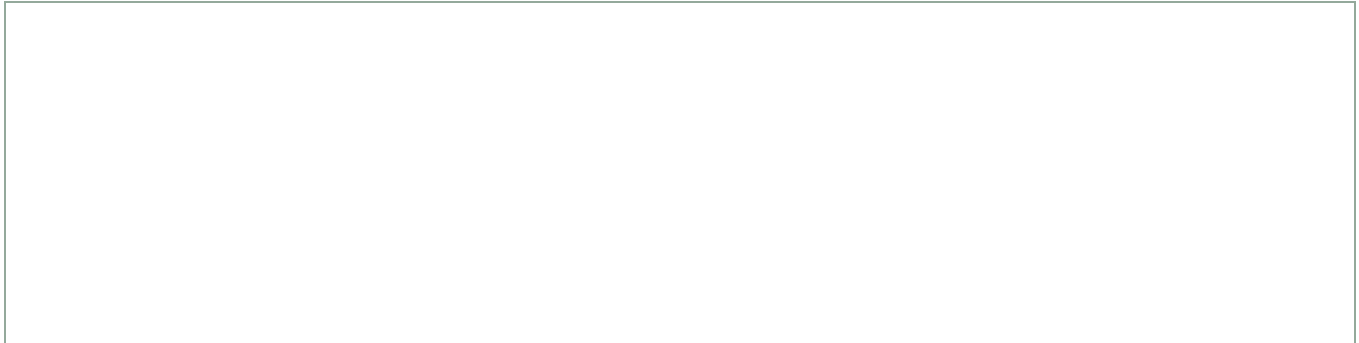


T3: Annotate decline and unknown onset

Original route: apply R2, mark the first confirmed classroom decline, identify its confirming row, and add the separate unknown physiological-onset annotation.

Add one short explanation in the same table. Actual route: use genuine assigned criteria and evidence; keep onset unknown when unsupported. Skip the invented D1 rule.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.

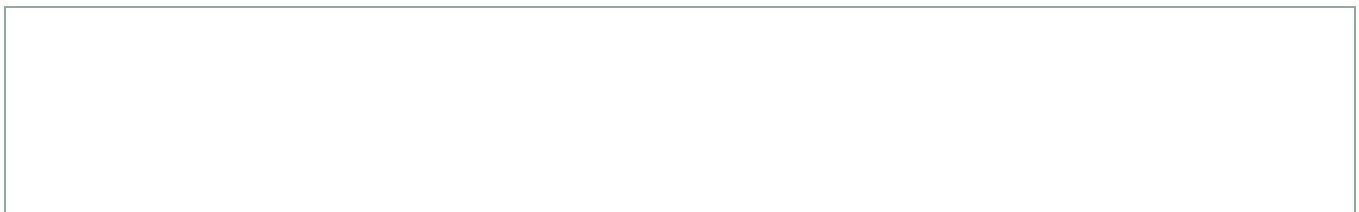


T4: Check and save the one record

Use Q1 to check the chosen record. Note a correction or explain that your check found no mismatch. Use S1 to identify your next actions.

Actual route: use the genuine rubric and required scope instead of D1 counts. Label real peer work or solo checking truthfully. After uploading, check that Schoology shows Submitted.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.



Check your product

- Original route: one simulated raw table contains six D1 entries, degree and second units, reference, time origin and stated writing precision.
- Original route: the classroom marker follows R2 and cites the confirming entry; physiological onset remains not established.
- Actual route: genuine protocol, data and rubric replace the original rows, counts and rule; do not do both.
- Both routes: source values and true quality notes are preserved, with no invented measurements, causes, symptoms or peer input.
- Both routes: follow the required safety and physical-work directions, use only evidence from work you actually do, and check Schoology after uploading.

Keep the limit: A simulated angle table supports a classroom data check. It cannot establish physiological fatigue, health, actual sensor use, teacher clearance, official completion or an actual upload to Schoology.

Turn in your work

Submit one raw table with its annotations. Section 1292 uses assignment 8544572153; section 6792 uses assignment 8544572181. Confirm the actual rubric, directions and deadline. Actual route: use the genuine assigned protocol, records and teacher rubric instead of D1 and its counts or rule. Do not complete both. Ask the teacher for missing assigned inputs; do not replace them with invented values.

Do not self-test or run physical fatigue trials without a teacher-approved supervised protocol. Use the original paper record when that authorized route is unavailable. If access is blocked, save your work and ask the teacher for the assignment or missing input. After uploading, check that Schoology shows Submitted.

[Section 1292: Wk7 Data table: Sensor and range-of-motion lab](#)

[Section 6792: Wk7 Data table: Sensor and range-of-motion lab](#)

Carry forward

Keep the units, reference and original values; a classroom decline marker does not establish physiological fatigue.

On March 2, use this record and its limits for Kinesiology data analysis. What pattern can the motion record show, and what cause would remain unproven?

Sources and resources

[Open today's page](#)

NIST-ANGLE · SI Brochure, section 5: Writing unit symbols and names

National Institute of Standards and Technology

<https://www.nist.gov/pml/special-publication-330/sp-330-section-5>

ANGLE-STUDY · Validity of Goniometric Elbow Measurements: Comparative Study with a Radiographic Method

Chapleau and colleagues, Clinical Orthopaedics and Related Research (2011), original research; DOI 10.1007/s11999-011-1986-8

<https://pmc.ncbi.nlm.nih.gov/articles/PMC3183177/>