JMP SPORTS

The JMP Youth Loading Standard

A method for prescribing physical training to athletes who are still growing.

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STATUS	Draft for review
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> This version contains values that have not been verified against the implementation. See Appendix A. Not for distribution.

The JMP Youth Loading Standard

1. Scope and status

1.1 What this standard covers

This standard sets out a method for deciding how much physical load to prescribe to a young athlete, based on where that athlete sits in their growth trajectory rather than on their chronological age or their competitive age group.

It covers four things:

1. How to establish an athlete's maturity status without medical imaging.
2. How to assign that athlete to a maturation band.
3. What each band implies for prescribed load, exercise selection, and progression.
4. When to reassess, and what findings require referral rather than programming.

1.2 What this standard does not cover

It is not a strength and conditioning qualification and does not substitute for one. It does not address technical or tactical coaching, nutrition, psychological preparation, or the management of diagnosed injury.

It is not a clinical instrument. Nothing in it diagnoses or treats any condition. Athletes presenting with pain, a suspected injury, or the referral indicators in Section 7 are directed to a physician or physiotherapist, and any subsequent training is carried out in coordination with that clinician.

1.3 Who it is for

Coaches and technical staff working with athletes between approximately nine and eighteen years of age, in sports where physical preparation forms part of the training week. It was developed in soccer and is written primarily from that setting, but the maturational reasoning is sport-independent.

1.4 The problem it addresses

Youth sport is organised by birth year. Physical development is not. Within a single under-14 squad it is ordinary to find athletes separated by four or more years of biological maturity — one who has not begun their growth spurt alongside one who has substantially completed it. Prescribing the same session to both is prescribing two different sessions in effect: for one it is inadequate, for the other it may exceed what their tissues currently tolerate.

The premise of this standard is that maturity status, not age group, is the correct unit for load decisions.

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2. Definitions

Peak height velocity (PHV). The point of fastest growth in stature during adolescence. Occurs on average near 12 years of age in girls and 14 years in boys, with individual variation of roughly two years either side.[ref]

Maturity offset. An athlete's estimated distance from PHV, expressed in years. Negative values indicate the athlete has not yet reached PHV; positive values indicate they have passed it.

Percentage of predicted adult stature (%PAS). Current standing height expressed as a percentage of the athlete's predicted adult height. The primary banding input under this standard.

Maturation band. The category an athlete is assigned to under Section 4, which governs prescription.

Growth velocity. Change in standing height over time, expressed in centimetres per month. Used as a running check between formal assessments.

Apophysis. A growth plate at a site of tendon attachment. Apophyses are the weakest point in the muscle–tendon–bone unit during adolescence and are the site of several growth-related complaints listed in Section 7.

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3. Establishing maturity status

3.1 Principle

The gold-standard measure of biological maturity is skeletal age determined by hand–wrist radiograph. This standard does not use it. Radiography is not appropriate for routine screening in a training setting, and requiring it would place the method out of reach of the clubs it is intended for.

Instead, maturity is estimated from anthropometric measures a coach can take in a gymnasium in under five minutes per athlete. These estimates are less precise than skeletal age. The standard accommodates that imprecision by banding conservatively and reassessing frequently, rather than by treating an estimate as a fact.

3.2 Required measures

Taken at intake and at each formal reassessment.

MEASURE	METHOD	PRECISION
Standing height	Stadiometer or wall-mounted tape. Shoes off, heels together, head in the Frankfort plane, measured at the end of a gentle inhalation	0.1 cm
Sitting height	Seated on a box of known height, back against the wall, same head position. Subtract box height	0.1 cm
Body mass	Calibrated scale, light clothing, shoes off	0.1 kg
Date of birth	From the registration record	—
Date of measurement	—	—
Biological parents' heights	Reported by the guardian. Recorded as reported rather than measured	1 cm

Leg length is derived as standing height minus sitting height and is not measured separately.

3.3 Measurement conditions

All measures are taken at a consistent time of day where possible, because stature varies by up to a centimetre across a day. Measurements are taken by the same person within a club wherever practical, since between-assessor variation is the largest source of error in this protocol.

3.4 Estimation methods

Primary — percentage of predicted adult stature. Predicted adult height is estimated from current height, body mass, chronological age, and mid-parent height using the Khamis–Roche method.[ref] Current height is then expressed as a percentage of that prediction.

This is the primary method because it is comparatively stable across the adolescent period, and because its output — how much growing is left — maps directly onto the decisions this standard governs.

Secondary — maturity offset. Estimated years from PHV, calculated from age, standing height, sitting height, and leg length using the Mirwald equations.[ref]

Used as a cross-check and as the input to reassessment intervals. It is secondary because its accuracy degrades for athletes who are early- or late-maturing,[ref] which is precisely the population this standard exists to identify. Where the two methods disagree about band assignment, the more conservative band is assigned.

Running check — growth velocity. Between formal assessments, standing height is recorded monthly. A sustained rate above the threshold in Section 6.3 triggers reassessment regardless of when the next one was scheduled.

3.5 What is not used

Secondary sexual characteristic staging is not used under this standard. It is a valid maturity indicator in clinical and research settings, but self-assessment is unreliable and assessment by a coach is inappropriate. Any method requiring a coach to evaluate a child's body is outside the scope of this standard and outside the conduct rules in Section 9.

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4. Band assignment

4.1 The bands

This standard uses three named bands.

BAND	%PAS	MATURITY OFFSET	DESCRIPTION
Pre-PHV	below 88‡%	earlier than -1.0 yr‡ yr	Growth spurt not yet begun. Physically stable.
Circa-PHV	88‡% to 95‡%	-1.0 yr‡ to +1.0 yr‡ yr	Rapid growth in progress. The period of highest caution.
Post-PHV	above 95‡%	later than +1.0 yr‡ yr	Growth substantially complete. Approaching the adult response to training.

4.2 Assignment rules

1. Both estimation methods in Section 3.4 are calculated for every athlete.
2. Where they agree, that band is assigned.
3. Where they disagree, the **less mature** band is assigned. An athlete assigned Circa-PHV who is in fact Post-PHV is under-loaded for a period. The reverse error loads an athlete through their growth spurt at a ceiling their tissues may not tolerate. The two errors are not equivalent and this standard does not treat them as such.
4. Where any required measure is missing, **no band is assigned and the athlete is prescribed at the Pre-PHV ceiling** until the assessment is completed. The system fails closed. An absent record is not evidence of maturity.
5. Every assignment is recorded with the date, the measures it was derived from, and the assessor.

4.3 What band assignment is not

A band is not a talent judgement, a selection criterion, or a statement about an athlete's future. Early maturation confers a temporary physical advantage that disappears; late maturation confers a temporary disadvantage that does the same. Neither predicts adult performance.[ref]

Bands are not communicated to athletes as rankings and are not used to group athletes competitively. Their sole function is to govern prescription.

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5. Loading by band

5.1 How ceilings are expressed

Ceilings are expressed as a **multiple of body mass** for Pre-PHV and Circa-PHV athletes. A percentage of one-repetition maximum is permitted only for Post-PHV athletes with an established, recently tested maximum.

The reasoning: a percentage of 1RM is only meaningful if a 1RM exists. For most pre- and circa-PHV athletes it does not, and estimating one from a multi-repetition set in an athlete whose coordination is still developing produces a number carrying false precision. Body mass is measured, current, and available for every athlete. It also scales correctly as the athlete grows, which a percentage of a historical maximum does not.

Where both units appear for the same athlete, body mass governs.

5.2 Ceiling table

	PRE-PHV	CIRCA-PHV	POST-PHV
Bilateral lower body	0.5 x body mass‡	1.0 x body mass‡	1.5 x body mass‡, or 85‡% 1RM where tested
Unilateral lower body	0.25 x body mass‡	0.5 x body mass‡	0.75 x body mass‡
Upper body	body mass only‡	0.5 x body mass‡	0.75 x body mass‡, or 85‡% 1RM where tested
Repetition range	8 to 15‡	6 to 12‡	3 to 12‡
RPE ceiling	7‡	8‡	9‡
Sessions per week	2 per week‡	2 per week‡	2 to 3 per week‡
Weekly progression cap	5‡%	5‡%	10‡%
Maximal testing	Not performed	Not performed	Permitted when technically competent
Impact and plyometric volume	Low, skill-focused	Reduced during rapid growth (§6.3)	Full, progressed normally

Multiples are of body mass unless stated otherwise. RPE anchors follow a scale where 1 is *very easy* and 10 is *maximum effort*. The anchor wording is fixed and is not paraphrased when the scale is explained to an athlete, because the consistency of the anchor is what makes the rating comparable over time.

5.3 Emphasis by band

Pre-PHV. The objective is movement competence and a broad motor skill base. This is the most productive window for acquiring technical quality in fundamental patterns, because the athlete's proportions are stable and what is learned is retained rather than invalidated by subsequent growth. External load is a means of practising a pattern under resistance, not a training stimulus in its own right. Sessions are skill-dense and load-light.

Resistance training in this band is appropriate and, when supervised and correctly prescribed, carries a lower injury rate than the sports the athletes are training for.[ref] The persistent belief that it impairs growth is not supported.[ref]

Circa-PHV. The period of highest caution, and the reason this standard exists.

Three things change at once: the athlete is heavier, their limb segments have lengthened, and the apophyses are at their most vulnerable. Growth-related complaints cluster here. [ref] Coordination may be transiently disrupted as segment lengths change faster than motor control adapts to them; the evidence for this is mixed, and it is offered here as a common coaching and clinical observation rather than an established finding. [ref]

Prescription responds by holding load conservative, protecting movement quality over load progression, reducing high-impact volume during periods of rapid growth, and reassessing on a short interval. Technical correction has a lower yield in this band than on either side of it, because the target is moving.

Post-PHV. The athlete's response to training approaches the adult pattern and progression follows conventional principles. Maximal expression, tested maxima, and full plyometric progression become appropriate for athletes who are technically competent. This is the band in which the qualities built earlier are converted into sport-specific output.

5.4 Override

A coach may prescribe **below** a band's ceiling at any time, for any reason, without justification.

A coach may not prescribe **above** it. Where an athlete appears to require more than the ceiling permits, the response is to reassess the band, not to exceed the ceiling. If reassessment confirms the band, the ceiling stands.

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6. Reassessment

6.1 Intervals

BAND	INTERVAL
Pre-PHV	Every 6 months‡ months
Circa-PHV	Every 3 months‡ months
Post-PHV	Every 6 months‡ months, or annually once growth velocity has been below the Section 6.3 threshold for twelve months

6.2 Why the Circa-PHV interval is shorter

An athlete near PHV can change band within a single competitive season. A six-month interval means prescribing against a stale assessment for up to six months during the exact period in which the assessment matters most.

6.3 Trigger for early reassessment

Standing height is recorded monthly. A sustained growth rate above **0.6 cm per month**[‡] **cm per month** triggers full reassessment within two weeks, regardless of the scheduled date. [ref]

During any period of growth above this threshold, high-impact and plyometric volume is reduced and the athlete is monitored for the referral indicators in Section 7.

6.4 Other triggers

Full reassessment is also triggered by return from any absence exceeding 4 weeks weeks, by a change of primary sport, and by the closing of any referral made under Section 7.

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7. Referral indicators

The following are stop-and-refer findings. Training is modified or paused and the athlete is directed to a physician or physiotherapist. A coach operating under this standard does not attempt to identify which condition is present. The function of the list is to recognise that one may be, and to hand over.

- Pain localised to a growth plate or tendon attachment, particularly at the knee, heel, hip, or elbow, and particularly where it is reproducible on loading that site
- Pain that persists after a session rather than resolving within it
- Any limp, or any unwillingness to bear weight
- Pain reported at the hip or groin, or referred to the knee, in an adolescent. This presentation is treated as urgent and is not managed by training modification
- Any new pain in an athlete currently in a rapid growth period
- Swelling, locking, or giving way at any joint
- A reported change in appetite, sleep, mood, or menstrual pattern alongside declining performance
- Any finding the coach is uncertain about

The final entry is deliberate. A coach's uncertainty is itself a sufficient indication for referral, and no coach should be placed in the position of deciding whether their own uncertainty is warranted.

7.1 Return

An athlete returning from a referral is reassessed under Section 3 before prescription resumes, and is programmed in coordination with the treating clinician rather than in parallel with them.

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8. Records and consent

8.1 What is recorded

For each athlete: the measures in Section 3.2, the derived estimates, the assigned band, the assessment date, the assessor, the prescribed load, and any referral made.

8.2 Consent

Height, mass, maturity estimates, and injury history collected on a minor are personal information about a child's body and development. Before any measurement is taken:

1. Written guardian consent is obtained, specific to this assessment rather than bundled into a general club registration.
2. The guardian is told what is measured, why, who will see it, where it is stored, how long it is retained, and how to withdraw.
3. Where the data is held in software, **the guardian is told who owns that software.** Where the practitioner has a financial interest in the platform, that interest is disclosed in writing at the point of consent and not placed in a policy document elsewhere.
4. The athlete is told, in terms appropriate to their age, what is being measured and why, and may decline any individual measure without consequence to their participation.

8.3 Access

Assessment data is available to the athlete, their guardian, and the staff directly involved in their prescription. It is not shared with selection panels, scouts, or third parties, and is not used as an input to team selection.

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9. Conduct

Three rules govern how this standard is applied. They are not optional components of it.

9.1 No comment on the body. Measurement produces numbers about a child's body. Those numbers are used to prescribe training and for nothing else. Staff operating under this standard do not comment on an athlete's body, weight, shape, or composition — not as encouragement, not as concern, not as a joke, and not in an athlete's presence about someone else.

9.2 Numbers are not shown comparatively. An athlete's measures are shown to that athlete and their guardian. They are not displayed alongside teammates' measures, ranked, or posted.

9.3 The band is explained, not concealed. An athlete old enough to ask why their programme differs from a teammate's is told, in terms they can hold: that people grow at different times, that this is normal and temporary, and that the programme is matched to where they are now. Concealment invites the interpretation that something is wrong with them.

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10. Evidence basis and limitations

10.1 What this standard is built on

The maturation framework draws on established work in non-invasive biological maturity assessment, the Youth Physical Development model, and consensus guidance on youth resistance training. [ref]

10.2 Stated limitations

- **The maturity estimates are estimates.** Non-invasive prediction of maturity status carries meaningful error, and that error is largest in early- and late-maturing athletes. This standard manages that through conservative assignment and short reassessment intervals. It does not eliminate it.
- **The ceilings are conservative rather than optimal.** They are set to be safe across a population, which means some individual athletes are capable of more than their band permits. This is an accepted cost.
- **The evidence for transient coordination disruption around PHV is mixed.** It is included as a common observation, not as an established finding.
- **This standard has not been validated prospectively.** It is a structured expression of practice, not a tested intervention. It is evidence-informed rather than evidence-based, and the distinction is real.

- **It does not remove the need for judgement.** It constrains the range within which judgement operates.

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11. Adoption

A club adopting this standard commits to:

1. Assessing every athlete in the relevant age range under Section 3, rather than a selected subset.
2. Recording assignments and prescriptions in a form that can be reviewed.
3. Reassessing at the intervals in Section 6.
4. Referring on the indicators in Section 7.
5. Obtaining consent under Section 8.
6. Applying the conduct rules in Section 9 across all staff, including those not involved in physical preparation.

A club that assesses but does not act on the assignment has not adopted this standard.

The JMP Youth Loading Standard is published openly and may be read, applied, and cited without charge or licence. Coach certification in its application, and software for its operation, are separate.

Appendix A — Verification status

2 of 34 values confirmed (6%). 5 blocking item(s) outstanding.

This document is not ready for publication. Values marked ‡ in the text have been drafted but not verified against the BioBand implementation. A published standard that disagrees with the software operating it is worse than no standard.

A.1 Values requiring verification

VALUE	DRAFTED AS	WHERE TO VERIFY
`bands.offset_post_min`	+1.0 yr	as above
`bands.offset_pre_max`	-1.0 yr	maturity offset thresholds, if stored separately from %PAS
`bands.pas_circa_max`	95 %	as above
`bands.pas_circa_min`	88 %	as above
`bands.pas_post_min`	95 %	as above
`bands.pas_pre_max`	88 %	maturation band assignment logic; resolveGuardrailBand or the migration that defines band boundaries
`ceilings.circa_bilateral`	1.0 x body mass	band_load_ceiling, Circa-PHV row
`ceilings.circa_progression`	5 %	progression rules, if encoded
`ceilings.circa_reps`	6 to 12	programme templates for Circa-PHV band
`ceilings.circa_rpe`	8	youth cap clamp
`ceilings.circa_sessions`	2 per week	programme templates
`ceilings.circa_unilateral`	0.5 x body mass	band_load_ceiling, Circa-PHV row
`ceilings.circa_upper`	0.5 x body mass	band_load_ceiling, Circa-PHV row
`ceilings.post_1rm`	85 %	band_load_ceiling, Post-PHV row
`ceilings.post_bilateral`	1.5 x body mass	band_load_ceiling, Post-PHV row
`ceilings.post_progression`	10 %	progression rules, if encoded
`ceilings.post_reps`	3 to 12	programme templates for Post-PHV band
`ceilings.post_rpe`	9	youth cap clamp
`ceilings.post_sessions`	2 to 3 per week	programme templates
`ceilings.post_unilateral`	0.75 x body mass	band_load_ceiling, Post-PHV row
`ceilings.post_upper`		band_load_ceiling, Post-PHV row

VALUE	DRAFTED AS	WHERE TO VERIFY
	0.75 x body mass	
`ceilings.pre_bilateral`	0.5 x body mass	band_load_ceiling, Pre-PHV row
`ceilings.pre_progression`	5 %	progression rules, if encoded
`ceilings.pre_reps`	8 to 15	programme templates for Pre-PHV band
`ceilings.pre_rpe`	7	youth cap clamp; RPE ceiling in session logic
`ceilings.pre_sessions`	2 per week	programme templates
`ceilings.pre_unilateral`	0.25 x body mass	band_load_ceiling, Pre-PHV row
`ceilings.pre_upper`	body mass only	band_load_ceiling, Pre-PHV row
`monitoring.growth_trigger`	0.6 cm per month	growth velocity monitoring, if implemented; may not exist yet
`monitoring.reassess_circa`	3 months	reassessment scheduling logic
`monitoring.reassess_post`	6 months	reassessment scheduling logic
`monitoring.reassess_pre`	6 months	reassessment scheduling logic

Source hints are leads recalled from earlier work, not verified addresses. Confirm the table and column names before trusting them.

Notes on specific values

- **`bands.offset_pre_max`** — Some implementations use plus or minus 0.5 rather than 1.0 for the circa window. Confirm which BioBand uses.
- **`bands.pas_pre_max`** — Percentage of predicted adult stature. 88 / 95 is the common convention in academy settings.
- **`ceilings.post_1rm`** — Only band where a percentage of 1RM is permitted, and only with a tested max.
- **`ceilings.pre_bilateral`** — This is the value carrying the known unit conflict: 60% 1RM in one place, 0.5x bodyweight in another.
- **`ceilings.pre_progression`** — May not exist in BioBand. If not, this is a policy decision.
- **`ceilings.pre_rpe`** — BioBand RPE anchors run 1 (very easy) to 10 (max effort).
- **`ceilings.pre_upper`** — Drafted as no external load. Confirm whether BioBand permits any.

- `monitoring.growth_trigger` — Common threshold for flagging a rapid growth period. If BioBand has no equivalent, this is a policy decision and the feature is a gap.
- `monitoring.reassess_circa` — Shorter because an athlete can change band within one season.

A.2 Open questions

U-1 — Band count

Blocking. band_load_ceiling carries four or five rows; the interface presents three. The published standard cannot disagree with the software.

Recommendation: Publish three. Keep any finer split as an internal sub-stage of Circa-PHV, never surfaced to a coach as a peer category.

U-2 — Pre-PHV load unit

Blocking. The Pre-PHV ceiling is expressed as 60% of 1RM in one place and 0.5x bodyweight in another. These are not interchangeable.

Recommendation: Body mass governs for Pre-PHV and Circa-PHV. Permit %1RM only for Post-PHV athletes with a tested, recent maximum. A percentage of a maximum that was never measured is a false number.

U-3 — Growth velocity monitoring

Blocking. The standard requires monthly stature recording and an early-reassessment trigger. It is not clear that BioBand implements this.

Recommendation: Confirm. If absent, either build it or remove the requirement from the standard. Do not publish a requirement the software cannot support.

U-4 — PIPA and consent position

Blocking. Section 8 states obligations under Alberta's Personal Information Protection Act, including disclosure of the practitioner's ownership interest in the platform holding the data.

Recommendation: Legal review before publication. Do not adopt the drafted wording without it.

U-5 — Citations

Blocking. Every claim marked as requiring a source in the text needs a full reference.

Recommendation: Complete before any club sees the document. An uncited standard is an opinion.

U-6 — Coordination disruption around PHV

Non-blocking. The evidence for transient motor coordination disruption at PHV is mixed. The standard describes it as a common observation rather than an established finding.

Recommendation: Keep the hedge. Also soften the corresponding note on the website, which currently asserts it more strongly than the evidence supports.

A.3 How to close this appendix

Open `values.json`. For each entry above, set `value` to what the implementation actually contains and change `status` from `proposed` to `confirmed`. For an entry with no implementation equivalent, decide it and set `status` to `decided`. Then run `python3 build_standard.py`. The daggers, this appendix, and the draft watermark all clear automatically once nothing is outstanding.