

Week 3 — From theory to research questions

How clearly does the field frame its questions — descriptive versus inferential, and confirmatory versus exploratory — and pre-specify them before collecting data?

Objective evidence review · companion to Week 3 · prepared July 2026

Scope & method. Rapid narrative review, not a systematic review. Structured search of the sport-science and meta-research literature (PubMed, Google Scholar, BMJ Open, SportRxiv) for evidence on question framing, pre-specification, and the exploratory–confirmatory distinction. Findings reported as the cited studies state them; adjacent-field sources (causal-language evaluation in health research) are flagged.

The principle under review

WEEK 3 · FRAMING AN ANSWERABLE QUESTION

Week 3 argues that a study should fix who is studied, what is compared, which outcome counts, and what kind of question is being asked — descriptive or inferential, confirmatory or exploratory — and that this should be settled before data are collected. The empirical questions are whether the field pre-specifies its questions, labels exploratory work honestly, and keeps descriptive findings distinct from causal claims.

1 · How well is it currently applied?

THE EVIDENCE

20% of sports-medicine/orthopaedic trials were prospectively preregistered — Schulz et al. 2022	82% of studies without a stated hypothesis still used significance testing — Twomey et al. 2021	44.5% of observational studies made action recommendations implying causality — Haber et al. 2022
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Questions are rarely pre-specified or clearly typed

Pre-specification is the exception rather than the rule. In a meta-research study of 163 sports-medicine and orthopaedic clinical trials, Schulz and colleagues (2022) found only 20% were prospectively registered (58% were registered retrospectively) and only 32% justified their expected effect size — indicating that the question and its parameters are frequently not committed to in advance. Twomey and colleagues (2021), examining 300 kinesiology articles, found that although only about 64% stated a hypothesis, roughly 82% of studies without a stated hypothesis nonetheless used significance testing — treating exploratory analyses with the machinery of confirmatory ones.

Exploratory research is common but not labelled as such

Ditroilo, Mesquida, Abt and Lakens (2025) argue that a substantial proportion of sport and exercise science is exploratory in nature, yet exploratory work is frequently not reported as exploratory. The problem is not exploration itself — which is essential for generating hypotheses — but presenting it with the confidence of a pre-planned confirmatory test, which invalidates the error control the statistics assume (Weeks 4, 6, 8). The paper provides recommendations for conducting and transparently reporting exploratory studies.

Descriptive findings are often stated in causal terms

The descriptive–inferential boundary is frequently crossed in language if not in design. In a systematic evaluation of observational health research, Haber and colleagues (2022) found that action recommendations implied causality in about 44.5% of articles — often more strongly than the results themselves warranted — and that even ostensibly non-causal words such as “associate” were judged by most reviewers to carry some causal implication. Although this evaluation spans health research broadly, the same descriptive-to-causal slippage is a recognised issue in sport and exercise science (see Week 11).

Source	Finding	Implication
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Schulz, Langen, Prill, Cassel & Weissgerber (2022) <i>BMJ Open</i>	163 sports-med/ortho trials: 20% prospectively registered; 32% justified effect size	Questions and parameters seldom pre-specified
Twomey et al. (2021) <i>Comms. in Kinesiology</i>	~64% stated a hypothesis; ~82% of those without one still used significance testing	Exploratory analyses treated as confirmatory
Ditroilo, Mesquida, Abt & Lakens (2025) <i>J. Sports Sciences</i>	Much sport-science research is exploratory but not reported as such	Mislabelling inflates apparent confidence
Haber et al. (2022) <i>Am. J. Epidemiology</i> (adjacent)	~44.5% of observational studies made causal action recommendations	Descriptive findings framed as inferential/causal
Caldwell et al. (2020) <i>Sports Medicine</i>	Preregistration recommended to separate confirmatory from exploratory work	A mechanism exists but is under-used
Chalmers & Glasziou (2009) <i>The Lancet</i>	~85% of research investment wasted, including via poor questions	Unclear questions are a major source of waste

2 · Is there cause for concern?

OBJECTIVE ASSESSMENT

ASSESSMENT **Moderate-to-substantial concern**

Three patterns converge: questions are seldom pre-specified (low prospective registration), exploratory work is often not labelled as such, and descriptive findings are frequently expressed in causal terms. Each undermines the reader's ability to know what kind of claim is being made and how much confidence it warrants, and each amplifies the statistical problems addressed in later weeks.

The concern is tempered by direction of travel. Preregistration and Registered Reports are being adopted (if slowly), and the field now has explicit, sport-specific guidance for conducting and reporting exploratory research (Ditroilo et al., 2025). The issue is largely one of practice and reporting norms rather than missing knowledge, which makes it correctable through editorial standards and individual discipline.

3 · Immediate steps to improve

ACTIONABLE

1. **State the question type explicitly:** descriptive or inferential, and confirmatory (pre-specified, tested once) or exploratory (a search reported as such).
2. **Structure the question** with a scaffold such as PICOT so population, comparison, outcome and timeframe are all fixed before data collection.
3. **Pre-specify and register** the primary question and analysis prospectively; label any additional analyses exploratory (Week 6).
4. **Match the language to the design:** reserve causal verbs for randomised designs and use associational language for observational findings (Week 11).
5. **Report exploratory studies transparently** using available sport-specific guidance, rather than reframing them as confirmatory.

References

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Improving Research Practices in Sport & Exercise Science — a free short course for the Sports Science Replication Centre. Current State Review, Week 3. Figures are reported as stated in the cited sources; adjacent-field sources flagged. For education.