

Guide to Writing Research Questions and Hypotheses

Quantitative and Qualitative

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Research Questions and Hypotheses

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Purpose: Define the **main goal** of a study.

Driven by current trends and advances in the field.

Research Questions (RQs) start as:

- Descriptive inquiries
- Later refined into **inferential questions**

They must be **specific** and **concise** to support hypothesis development.

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Hypotheses propose **predicted outcomes**.

They define *expected relationships* between variables or groups.

Key Traits

- Formal and testable
- Based on specific research questions
- **Guide data collection and analysis**

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Quantitative vs Qualitative RQs and Hypotheses

Quantitative Research:

- RQs framed at the start
- Inquire about **variable relationships**
- Hypotheses predict:
 - Simple (1 DV & 1 IV)
 - Complex (multiple DVs/IVs)

Qualitative Research:

- RQs evolve during the study
- Emphasis on *central and sub-questions*
- Hypotheses may:
 - Be stated as *generalizations*
 - Lead to both testing and generating new hypotheses

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Crafting the RQ and Hypotheses

Frameworks for Developing RQs and Hypotheses

Plan ahead: RQs and hypotheses must be set **before** the study begins.

Use the **FINER** criteria:

- Feasible
- Interesting
- Novel
- Ethical
- Relevant

A structured foundation leads to focused and meaningful research.

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Constructing RQs and Hypotheses (1)

1. **Clarify** the background of the study.
2. **Identify** the research problem *early and clearly*.
3. **Review** existing literature and conduct preliminary research:
 - Explore related *theories*
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These steps build the **knowledge base** for formulating your RQs.

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Constructing RQs and Hypotheses (2)

4. **Formulate** research questions to investigate the problem.

5. **Identify** variables and define them *operationally*.

- Variables should be accessible and measurable
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6. **Develop** hypotheses from your RQs:

- Deductive: from general theory to specific prediction
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Research questions are built from the study background.

Hypotheses follow and are based directly on those questions.

Why This Matters

- Strong RQs lead to **strong hypotheses**
- Clear hypotheses define **objectives, design, and outcomes**

Good questions drive good science.

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Research Question: Can modifying the Dirac equation to allow asymmetric dispersion relations for particles and antiparticles lead to a consistent quantum field theory?

Hypothesis: Introducing asymmetry in the Dirac equation will result in a Lorentz-covariant, renormalizable quantum electrodynamics that is empirically equivalent to the standard model, while offering insights into matter-antimatter asymmetry.

Source: Rigolin, G. (2023). Asymmetric particle-antiparticle Dirac equation: second quantization. *J. Phys. G: Nucl. Part. Phys.*, 50(12), 125005.
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Conclusions

Conclusion: Questions Drive Research

RQs and hypotheses are **crucial** for all research types.

They must be developed **at the start** of the study.

Excellent RQs lead to superior hypotheses.

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- Guide research direction like a **compass**
- Determine study design, goals, and outcomes
- Prevent ethical and methodological issues

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- [3] Edward Barroga and Glafera Janet Matanguihan. **“A Practical Guide to Writing Quantitative and Qualitative Research Questions and Hypotheses in Scholarly Articles”**. In: *Journal of Korean Medical Science* 37:16 (2022). ISSN: 1598-6357. DOI: 10.3346/jkms.2022.37.e121.

Thank you!

Questions or comments?