Confounding Factors

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This module covers the WWC standards related to confounding factors.

By the end of this module you will be able to:

- Define a confounding factor
- Identify examples that do and do not qualify as confounding factors
- Describe how confounding and non-confounding factors affect a study’s WWC Group Design Standards rating
- Explain how the WWC considers studies that test combined interventions
What Is a Confounding Factor?

- Confounding factors are components of a study that make it difficult or impossible to isolate the effect of the intervention.

- According to the WWC, a confounding factor is a study component that:
  1. Is observed,
  2. Aligns completely with only one of the study conditions, and
  3. Is not part of the intervention the study is testing.

- Studies with a confounding factor receive the Does Not Meet WWC Group Design Standards rating.
Example of a Confounding Factor

- A study examined the effects on math test scores of a pullout intervention that instructed students in solving math problems with a number line. Students in the intervention group met with a math specialist who delivered the intervention once a week for 12 weeks. The comparison group did not spend time with the math specialist.

- In this example, the presence of the single math specialist is a confounding factor.

- It is impossible to determine how much of the observed effect was due to the intervention and how much was due to the specialist.

- The study would receive the Does Not Meet WWC Group Design Standards rating.
Types of Confounding Factors

The intervention or comparison group contains a single study unit (known as an n = 1 confounding factor)

Examples

• School: A study randomly assigns two schools, one to each condition.
• Instructor: A study’s intervention group includes only one instructor and has no contact with the comparison group.
Types of Confounding Factors

Characteristics that plausibly affect outcomes differ systematically with no overlap between groups

Examples

• Qualifications: All teachers in the intervention group—and none in the comparison group—have a Ph.D.
• Time: The comparison group is 4th graders in 2010–2011 and the intervention group is 4th graders in 2011–2012.
Which Factors Are Not Confounding Factors?

- Factors that are part of the intervention do not qualify as confounding factors

*Examples*
- Qualifications: All intervention group teachers—and no comparison group teachers—have a Ph.D., but teachers must have a Ph.D. to implement the intervention.
- School: Students in the intervention group—but not in the comparison group—attend one type of school (such as a charter school), but the study is examining the effect of attending that type of school.
Non-Confounding Factor: Single Unit in Both Conditions

- A single study unit that appears in both conditions is *not* a confounding factor.

- Example of a non-confounding factor: One teacher with three intervention classes and three comparison classes.

- Example of a confounding factor: One teacher with one intervention class and one comparison class.

<table>
<thead>
<tr>
<th>Ms. Smith’s Math Classes</th>
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</thead>
<tbody>
<tr>
<td><strong>Intervention</strong></td>
</tr>
<tr>
<td>Period 1</td>
</tr>
<tr>
<td>Period 3</td>
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<tr>
<td>Period 4</td>
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</tbody>
</table>
Non-Confounding Factor: Incomplete Alignment

- There are observed differences between conditions, but the observed factor does not completely align with one condition.

- There is no confounding factor in this situation.
Non-Confounding Factor: Volunteering

Researchers may recruit volunteers for a study.

- In *randomized controlled trials* (RCTs), volunteering is not a confounding factor if the study randomly assigns volunteers to both conditions.

- In *quasi-experimental design* (QED) studies, volunteering is not a confounding factor. Rather, it is a special case of the concern in QEDs that the groups differ on some unobservable baseline measure, such as motivation.
Special Case: Combined Interventions

- Example: The intervention group receives both Intervention A and Intervention B. The comparison group receives neither Intervention A nor Intervention B.
  - Study examines combination of interventions A and B, not just intervention A.

- Although technically this can be a confounding factor in some circumstances, the WWC usually considers these situations to affect the eligibility of the study for review.

- If the study is eligible, the review focuses on the combined intervention, so the WWC would not consider the combination to be a confounding factor.
Knowledge Check 1

A study assigns four schools to intervention and comparison conditions. Schools A and C implement a new reading curriculum. Schools B and D continue to use the same reading curriculum they had been using. Then, during the study, a new principal hired at School C refuses to allow the researchers to collect posttest data. The analytic sample includes Schools A, B, and D.

Is there a confounding factor?

☐ A. Yes
☐ B. No
Answer to Knowledge Check 1

- **A** is the correct answer. There is an n = 1 confounding factor because there is only one intervention school in the analytic sample.

- **B** is an incorrect answer. There is a confounding factor because it is impossible to separate the effects of the new reading curriculum from the effect of School A.
Knowledge Check 2

Half of the math teachers in a school implement a new supplemental math curriculum. Four of the five teachers implementing the new curriculum have master’s degrees. One of the five teachers in the comparison group has a master’s degree; the other teachers in this group have only bachelor’s degrees.

Is there a confounding factor?

☐ A. Yes
☐ B. No
□ A is an incorrect answer. There is no confounding factor; the conditions do not completely align with the teachers’ education.

■ B is the correct answer. There is no confounding factor related to teacher education because the teachers’ education does not completely align with only one group. For example, there is at least one teacher in each group with a master’s degree, and there is at least one teacher in each group without a master’s degree.
Knowledge Check 3

Miss Johnson’s 4th-period math class receives a new intervention, and her 5th-period math class receives the regular district curriculum.

3.1. Is there a confounding factor?

☐ A. Yes
☐ B. No

3.2. What is the highest rating the study can receive?

☐ A. Meets WWC Group Design Standards Without Reservations
☐ B. Meets WWC Group Design Standards With Reservations
☐ C. Does Not Meet WWC Group Design Standards
Answer to Knowledge Check 3.1

- **A is the correct answer.** This is an example of an $n = 1$ confounding factor because each condition includes only a single class.

- **B is an incorrect answer.** A confounding factor is present; there is only one class in each condition.
Answer to Knowledge Check 3.2

☐ A and B are incorrect answers. A single class in either condition is an \( n = 1 \) confounding factor, so the study would receive the *Does Not Meet WWC Group Design Standards* rating. Any other design features that might affect the study rating, such as randomization or attrition, are irrelevant when a confounding factor is present.

■ C is the correct answer. When a study includes a confounding factor, the highest rating it can receive is *Does Not Meet WWC Group Design Standards*. 
A study examined the effects of a pullout intervention on reading scores. Students in the intervention group met with the reading specialist, who delivered the intervention for 30 minutes each day for six weeks. The comparison group students continued with their regular reading activities.

Is there a confounding factor in this study?

- A. Yes
- B. No
Answer to Knowledge Check 4

- A is the correct answer. There is a confounding factor in this study. One reading specialist taught all the intervention students, so any differences between the outcomes of students who used the intervention and those who did not may be due to the intervention, the reading specialist, or both.

- B is an incorrect answer. A single instructor in the intervention group who does not interact with the comparison group in a similar manner is a confounding factor.
Knowledge Check 5

Five teachers in an elementary school volunteered to participate in a study that examined the effectiveness of a new math curriculum. At the beginning of the school year, three of the teachers implemented the new math curriculum. The teachers had different backgrounds and levels of education. Two of the teachers implementing the intervention had master’s degrees, and the rest of the teachers had only undergraduate degrees.

Is there a confounding factor in this study?

☐ A. Yes
☐ B. No
Answer to Knowledge Check 5

- A is an incorrect answer. There is no confounding factor in this study. The WWC does not consider volunteering a confounding factor. The teachers’ education is not a confounding factor either, since it does not align completely with condition.

- B is the correct answer. There is no confounding factor. The WWC does not consider volunteering a confounding factor and the teachers’ education does not align completely with condition.
Confounding Factors

Conclusion
You can access all the resources mentioned in this module through the WWC website, whatworks.ed.gov.

The full slide deck for this module, including detailed responses to the knowledge check questions, is available on the WWC website.

To receive a certificate of completion for viewing these training modules, you must view the videos on the WWC website.

Thank you!