

# From Deadly Sins to Effective Habits: Lessons for Medical Education Researchers

(AAIM 2026 Spring Meeting: On behalf of the Medical Education Research Committee [MERC]:

Monday - April 20, 2026)

## A) 7 Deadly Sins in Educational Research (J Grad Med Edu 2016 8[4]:483-7)

### 1) Before Research

a. The Curse of the Handicapped Literature Review

b. Inadequate Power

### 2) During Research

- a. Ignoring the Importance of Measurement
- b. Using the Wrong Statistical Tool
- c. Merciless Torturing of the Data

### 3) After Research

- c. Slavery to the  $p$ -value
- d. Lack of Transparency in Reporting Results



#### BOX Checklist of Recommendations for Responsible Research Conduct

- Conduct a thorough literature review
- Specify hypotheses a priori based on literature review
- Enlist the help of a statistician prior to study design
- Select research designs appropriate to the research questions
- Conduct a power analysis based on research design and literature
- Select measures with evidence of reliability and validity for the intended purpose
- Avoid using single-item measures of complex constructs (eg, motivation, confidence, satisfaction, resilience)
- Before analysis, check to make sure statistical assumptions for the analytic technique have been met
- If assumptions are violated, take steps to remedy those violations and report these steps in the manuscript
- If outliers are removed, report this practice and provide a rationale for removal
- Conduct statistical analyses appropriate to the research questions
- Avoid testing hypotheses that were not specified a priori
- Report descriptive statistics, including means and standard deviations
- Report effect sizes and confidence intervals around effect sizes
- Report nonsignificant results along with statistically significant findings

**B1) The Curse of the Handicapped Literature Review: The Literature Review: A Foundation for High Quality Medical Education Research. (J Grad Med Educ 2016;8[3]:297-303).**

**TABLE 2**  
Common Problem Areas for Reporting Literature Reviews in the Context of Scholarly Articles

Problem	Potential Negative Impact(s)	Potential Solution(s)
Citations are too old (ie, more than 10 years)	<ul style="list-style-type: none"> <li>Study results are not discussed in the context of current literature, theory, and evidence thus limiting generalizability and impact</li> <li>May propagate outdated ideas, potentially falsely inflating study outcomes</li> </ul>	<ul style="list-style-type: none"> <li>Cite old references only for classic, paradigm-shifting studies, or in the rare case that relevant contemporary studies are unavailable</li> <li>State the reference age and indicate the reason for citing</li> <li>Cite contemporary work and discuss how older and newer studies together inform current research</li> </ul>
Too few or too many citations are provided <sup>a</sup> (ie, Goldilocks principle)	<p><i>Too few studies cited:</i></p> <ul style="list-style-type: none"> <li>Inadequate context to understand the study</li> <li>Authors of relevant work are not provided with opportunities for their work to be cited and disseminated</li> </ul> <p><i>Too many studies cited:</i></p> <ul style="list-style-type: none"> <li>Lends the study a false sense of authoritativeness</li> <li>Readers will not know which prior studies are most relevant</li> </ul>	<ul style="list-style-type: none"> <li>Map out information that readers need to understand in your paper, and select the highest-yield references</li> <li>Include the following types of references: those that illustrate core, background, theoretical, and methodological concepts (ie, groundbreaking, paradigm-shifting papers); recent relevant studies; and society position/policy statements</li> <li>Read articles of a similar type for the journal to which you are submitting to get a sense for the usual number of references</li> </ul>
The most extreme or hyperbolic studies are the only studies cited	<ul style="list-style-type: none"> <li>Synthesis of available literature is biased toward extreme examples, which can cause inaccurate understanding of results and impact</li> </ul>	<ul style="list-style-type: none"> <li>Cite studies across the spectrum of findings when available and discuss them in relation to one another and the current study</li> <li>If only extreme examples are available, articulate and discuss implications in the discussion section</li> </ul>
Studies conflicting with the authors' findings are intentionally not cited	<ul style="list-style-type: none"> <li>Causes extreme bias and is unethical</li> <li>Contributes to harm if erroneously interpreted results are applied in future studies/practice</li> <li>Eliminates productive discussion that arises from comparing studies with divergent results</li> </ul>	<ul style="list-style-type: none"> <li>Identify and discuss the studies with results that conflict with your study</li> <li>Compare and contrast those studies with yours in the discussion section</li> </ul>
Ideas are inappropriately attributed	<ul style="list-style-type: none"> <li>Attributes an idea, concept, or claim falsely, giving the illusion of authenticity or credibility</li> <li>Is a disservice to the authors to whom ideas are inappropriately attributed</li> </ul>	<ul style="list-style-type: none"> <li>Confirm that an idea, claim, or concept is clearly articulated in the reference</li> <li>Contact the author of the cited study to ask whether you accurately understand their study's claims</li> <li>If you cannot find a reference for an idea or concept, discuss it without a citation, and state that the literature is lacking</li> </ul>
Secondary literature (eg, reviews, commentaries, editorials, other studies citing primary literature) are overcited	<ul style="list-style-type: none"> <li>Author conclusions of secondary literature are taken at face value; these may be incorrect or even biased, potentially propagating ideas or concepts lacking evidence</li> <li>Failure to consider nuances and details of primary literature reduces the sophistication of interpreting results and conclusions drawn</li> </ul>	<ul style="list-style-type: none"> <li>Cite secondary literature only when it explains a general concept</li> <li>Supplement secondary literature cited with primary literature</li> <li>Identify the primary source for an idea or concept and cite that source</li> </ul>

The Literature Review: A Foundation for High Quality Medical Education Research.  
(J Grad Med Educ 2016;8[3]:297-303) – *continued*:

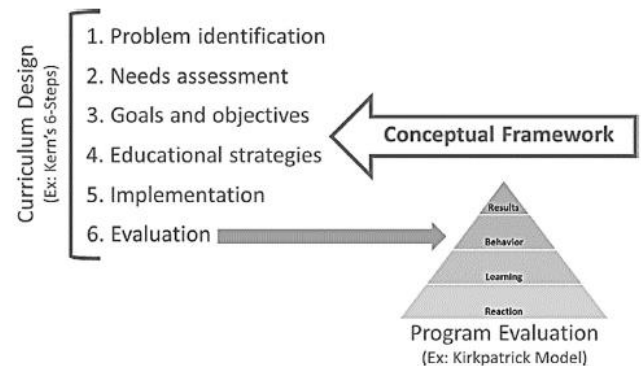
**TABLE 2**  
Common Problem Areas for Reporting Literature Reviews in the Context of Scholarly Articles (continued)

Problem	Potential Negative Impact(s)	Potential Solution(s)
Authors' own work is overcited	<ul style="list-style-type: none"> <li>Provides a biased view of the current literature and context for study</li> <li>Reduces the external generalizability of the work</li> <li>May falsely inflate the impact of authors' prior work</li> </ul>	<ul style="list-style-type: none"> <li>Cite your own work as long as the work is clearly relevant</li> <li>Limit citations of your own work to references relevant to rationale, methodology, and interpretation of results</li> <li>Avoid citing your own work if it relates only to general context or background</li> <li>Clearly indicate when citing your own work</li> <li>Discuss studies that conflict with your prior work</li> </ul>
A laundry list of studies is provided without adequate synthesis	<ul style="list-style-type: none"> <li>Readers will not understand the context or rationale for your study</li> <li>May lend false authoritativeness to your paper</li> </ul>	<ul style="list-style-type: none"> <li>Prior to writing, outline the results of your literature search along with key points to be discussed in the introduction and discussion sections</li> <li>Ask colleagues to review your outline and manuscript</li> </ul>
Discussion of literature review is overly long	<ul style="list-style-type: none"> <li>Readers may become overwhelmed</li> <li>In the introduction section, the context and rationale for the study will be lost</li> <li>In the discussion section, the impact and meaning of results will be lost</li> </ul>	<ul style="list-style-type: none"> <li>Review journal guidelines</li> <li>Read articles of a similar topic within the journal to which you are submitting to get a sense for typical style and length</li> <li>Outline the literature you want to discuss, including the main points for cited articles, and hold to that outline</li> <li>Critically read your discussion of the literature and revise or delete any repetitive or superfluous sections</li> <li>Include only studies specifically that inform the study context and rationale or that support and/or conflict with study results</li> </ul>
Literature review lacks structure or organization	<ul style="list-style-type: none"> <li>The reader will not understand the points you are trying to make</li> <li>Findings will be weakened, which reduces the likelihood of publication and the impact if published</li> </ul>	<ul style="list-style-type: none"> <li>Carefully outline the literature that you want to discuss, including main points for cited articles, and stick to that outline</li> <li>Ask colleagues within and outside your authorship group to critique your literature review for clarity and impact</li> </ul>

<sup>a</sup> There is no right number of references—this depends on the topic, the complexity with which that topic is addressed, the authors' style, and usual practices for the journal to which you are submitting your work.

**B2) The Curse of the Handicapped Literature Review:** Enhancing Educational Scholarship Through Conceptual Frameworks: A Challenge and Roadmap for Medical Educators. Acad Pediatr. 2019 Mar;19(2):135-141.

Description, Justification and Clarification: a framework for classifying the purpose of research in medical education. Med Educ 2008;42:128-133



**Table.** Examples of Conceptual Frameworks Applicable to Medical Education Scholarship

Conceptual Framework	Attributed to	Theory Source	Brief Description	Hypothetical Example of Application for Scholarly Work in Medical Education Research
Deliberate practice <sup>10</sup>	Erickson	Kinesiology	Teacher/coach plans learning and provides immediate feedback, allowing the learner to incorporate this feedback as she or he continues to refine an approach to achieve a goal.	Simulation-based curriculum Skill acquisition over time
Automaticity and skill expertise <sup>11</sup>	Fitts and Posner	Kinesiology	Skills acquisition occurs in 3 phases: 1) <i>cognitive phase</i> , when learners use explicit cognitive processes to understand a skill in a step-by-step fashion; 2) a <i>associative phase</i> , when learners perform a skill and, based on feedback, modify how the skill is performed; 3) <i>autonomous phase</i> , when a skill can be performed automatically without need for conscious attentional control.	Procedural skills curriculum Skill acquisition over time Ability to perform a skill with competing distractions
Cognitive load theory <sup>12</sup>	Sweller, Van Merriënboer, and Paas	Cognitive psychology	Careful attention to instructional design can be used to reduce the cognitive load in learners; heavy cognitive load can have a negative impact on task completion.	Use of low-fidelity simulation to focus on mastery of a specific task prior to practice in the clinical environment
Self-directed learning <sup>13</sup>	Knowles	Cognitive psychology	This process allows learners to take the initiative in diagnosing their learning needs, formulating goals, identifying human and material resources, and evaluating learning outcomes.	Individualized learning plans Tracking of self-directed learning goals and attainment
Social cognitive theory <sup>14</sup>	Bandura	Cognitive psychology	People learn from one another by observing and imitating others' behavior. Pay attention. Retain what you observed. Reproduce the modeled behavior. Remain motivated to continue to imitate the behavior.	Shadowing program Tracking observed behaviors, incorporating them into practice, planning their use in the future
Self-regulated learning <sup>15</sup>	Zimmerman and Schunk	Cognitive psychology	Learners plan, monitor, and evaluate their own learning to achieve a goal.	Individualized learning plan Tracking self-directed learning goals and attainment
Reflective practice <sup>16</sup>	Schon	Cognitive psychology	<i>Reflection in action</i> : Experience and reflect on an experience during an event. Decide how to act. <i>Act</i> . <i>Reflection on action</i> : Reflect after an event. Think about what you might do differently. Use new perspectives to process feelings and actions.	Debriefings, reflective writing activities Assess for implementation of identified changes following debriefings
Self-determination theory <sup>17</sup>	Deci and Ryan	Cognitive psychology	People have 3 basic needs, which, if met, lead to enhanced self-motivation, performance, personal growth, and vitality. These needs are <i>competence</i> , <i>autonomy</i> , and <i>relatedness</i> .	Problem-based learning, small group learning activities Impact of hypothetical clinical scenario vs anchoring in shared experience
Experiential learning cycle <sup>18</sup>	Kolb	Cognitive psychology	Learning happens through a transforming experience via a 4-stage learning cycle: <i>concrete experience</i> , <i>reflective observation</i> , <i>abstract conceptualization</i> , and <i>active experimentation</i> .	Simulation-based curriculum Impact of a structured debrief followed by time for practice prior to further simulation
Situated learning—guided participation <sup>19</sup>	Vygotsky	Sociology	Instructors develop activities to promote more independent learning over time.	Workshops Learning following didactic vs interactive session

### C) Inadequate Power: Importance of Calculating Sample Size for Educational Studies

#### 1) Key Components of a Power Analysis or Sample Size Calculation:

- a) **alpha**: chance of rejecting the null hypothesis (Type 1 error); usually  $\leq 0.05$  (by convention); lower alpha (e.g. 0.01) will require larger sample sizes.
- b) **beta**: chance of rejecting a true hypothesis (Type II error); usually  $\leq 0.20$  (by convention), Power =  $1 - \text{beta}$  (by convention 80% or higher); lower beta (e.g. 0.10) yields higher power but also require larger sample sizes
- c) **delta**: size difference in outcomes between the experimental and control group that is clinically important to detect
  - i) determined by the investigator
  - ii) based on prior research and knowledge:
    - e.g, Is your goal to test an intervention that leads to an increase in NBME or ITE scores? How much of different do you want to see?
    - e.g. Is your goal to test learner perception of an intervention? What change in perception are you tracking?
  - iii) smaller differences will require larger sample sizes
- d) **variation**: measure of spread (e.g. standard deviation); the greater the spread the larger the sample size will be needed

#### 2) Interpreting Study Conclusions: Type 1 and Type II Errors – The most common reason for a Type II (beta) error is an insufficient sample size.

		<b>REALITY</b>		
<b>STUDY CONCLUSIONS</b>		<b>Difference Exists</b>	<b>No Difference</b>	<b>ROW</b> →
Statistical Difference ( $p \leq 0.05$ )	<b>Correct Conclusion</b> (TP = True Positive)	<b>Error - Type I or alpha</b> (FP = False Positive)	All “Positive” Studies	
No Statistical Difference ( $p > 0.05$ )	<b>Error - Type II or beta</b> (FN = False Negative)	<b>Correct Conclusion</b> (TN = True Negative)	All “Negative” Studies	
<b>COLUMN</b> ↓	All of Reality with a Difference	All of Reality with no difference	All Results ← ↑	



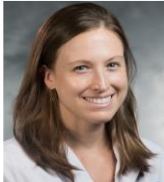


- 3) Free, online, sample size calculator from MedCalc:  
<https://www.medcalc.org/en/calc/sample-size.php>



**D) Other Suggested Resources:**

- 1) Yarris LM, Artino AR Jr, Simpson D, Deiorio NM, Sullivan GM. **Translate Your Education Work Into Scholarship: A 5-Step Approach.** J Grad Med Educ. 2025 Oct;17(5):545-550. PMID: 41104001.
- 2) Cook DA, Hatala R. **Got power? A systematic review of sample size adequacy in health professions education research.** Adv Health Sci Educ Theory Pract. 2015 Mar;20(1):73-83. PMID: 24819405.
- 3) Peterson SJ, Foley S. **Clinician's Guide to Understanding Effect Size, Alpha Level, Power, and Sample Size.** Nutr Clin Pract. 2021 Jun;36(3):598-605. doi: 10.1002/ncp.10674. Epub 2021 May 6. PMID: 33956359.
- 4) Artino AR (editor): **Conducting Research in Health Professions Education: From Idea to Publication. AM Last Pages 2010 – 2016.**  
(Free ebook from AAMC. Found @ [https://hsrc.himmelfarb.gwu.edu/smhs\\_hs\\_facpubs/278/](https://hsrc.himmelfarb.gwu.edu/smhs_hs_facpubs/278/) )



				
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***! Thank You for Attending Our Workshop !***