The Scientific Basis of the Lack of replicability in Psychological Research

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The lack of issue of replicability of psychological research recently has attracted immense scrutiny. This presentation argues that the pervasive role of context (e.g., design, specificity) in behavioral performance and learning poses a formidable human factors challenge to rigorous replicability in psychological research. Because of this role, it is hard to re-create the exact conditions of the original research. That is, many variables and conclusions in psychology cannot be fully understood apart from the design contexts that define their meanings and implications.

Key Conclusions: Experimental findings reviewed in this presentation support the following conclusions: (1) results of early research indicate that cognitive performance is task specialized in relation to transfer effects between different tasks, as well as in relation to the predictive significance of initial performance in forecasting final performance; (2) results of subsequent research confirm and extend these conclusions by demonstrating that for most tasks, variability observed in cognitive performance is more prominently linked to task-specific factors than to general attributes of intelligence or ability; and (3) these findings pose a formidable scientific challenge to the replicability of psychological research, unless experimental analysis is conducted and/or validated in real world contexts.

1. Background - 1
   - The sciences of learning are facing a crisis [11]
   - Many sciences — including psychology — have many highly cited studies — do not replicate
   - The failure to replicate research has raised important questions about the scientific process in general and, in particular, in psychology
   - People have the right to know if they can trust the research they read
   - Psychologists also have a vested interest in ensuring that their methods and findings are as trustworthy as possible.

2. Extent of Non-Replicability of Psychological Findings
   - Perspectives on Psychological Science, 7(1), 5-25 (2012)
   - Several High Prestige Journals (275 authors)

3. Potential reasons for lack of replicability of psychological research
   - Over 70 years ago, Lewin [9] noted that behavior is influenced by both the person (P) and the environment (E); P*E = O
   - Leading experts, including Bavel [6-8], have been unable to determine the core factors that contribute to replicability
   - Several studies reviewed were found to confirm the work of Lewin.

4. Other contextual factors not addressed by Van Bevel et al. [5] that may also influence replicability
   - Race or gender of subjects or experimentalists
   - Temperature
   - Time of day

5. Why should replicability in psychological research be compromised by design specificity in behavior and performance?
   - Recent Perspectives on This Question:
     - Findings may only be true for some people (sampling design), and/or in some circumstances (study context)
     - Van Bevel et al. [5] analyzed 100 behavioral studies to develop an index called contextual sensitivity, based on the degree to which the following study design factors may have influenced replicability: 1) time (month or years); 2) subject; 3) location; 4) sample population
     - Contextual sensitivity was negatively correlated with the success of the replication attempt, (r = -0.23, p < 0.01), such that when a contextual sensitivity score was high, the less likely was the replication attempt to be successful
     - In two other variables (below) also significantly predicted replicability (positive or negative correlation)

6. Magnitude of Variables Predicting Replicability
   - Predicting replicability
     - Contextual sensitivity
     - Sample population
     - Time of day

7. Other remaining non-replicated variables
   - Design factors in learning environments have the potential to create the exact environments necessary for results to be replicated
   - Very few variables explain the variance in real-world learning.

8. EVIDENCE FOR CONTEXT SPECIFICITY IN BEHAVIOR AND PERFORMANCE
   - Evidences for Context Specificity in Performance and Learning
     - From the standpoint of the child, the great waste in school is not from his inability to utilize the environment he gets outside…while on the other hand, he is unable to apply it in daily life what he is learning in school. That is the isolation of the school from daily life.
   - Context outside the classroom has more influence on student behavior and learning than classroom learning.

   - Specific variance refers to the influence of task structure or makeup (versus individual differences or learning) on cognitive performance
   - There is no general mental factor or process which accounts for improvement in cognitive learning.
   - The variance of the practiced tasks increases with practice, and this increase is a function of the nature (design) of the task.

10. Extension of Woodworth’s Work by the Task Taxonomy Research of Fleishman [16]
   - Studies of a great variety of practices are capable of producing different degrees of improvement in performance
   - The particular combination of abilities contributing to performance changes as practices continue
   - These changes are progressive and systematic and eventually become stabilized.
   - As practice continues, there is an increase in a factor specific to the task itself (called task-specific variance).

11. Refined Fleishman’s Work by Ackerman [17]
   - Task-specific variance, before and after practices, compared for consistent (stimulus and response compatible) versus inconsistent (stimulus and response incompatible) environments.
   - Summary of Findings
     - For three consistent tasks, task-specific variance increased from the range 64 to 90 percent before practice, to the range 84 to 95 percent after practice
     - For four inconsistent tasks, task-specific variance decreased from the range 44 to 87 percent before practice to the range 35 to 58 percent after practice
   - Conclusions
     - For consistent tasks, task-specific variance increases as practice progresses
     - For inconsistent tasks, task-specific variance decreases as practice progresses.

   - Educational replicability is defined as that branch of replicability that relates to the interaction of educational performance and educational design.
   - The analysis of Smith has focused on identifying design factors and outcomes influenced by the interaction of educational performance and educational design.
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   - A summary of these factors is provided below.

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