The Brookbush Institute Publishes a NEW Glossary Term: 'Crossover Study'

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NEW YORK, NY, UNITED STATES, October 9, 2025 /EINPresswire.com/ -- -
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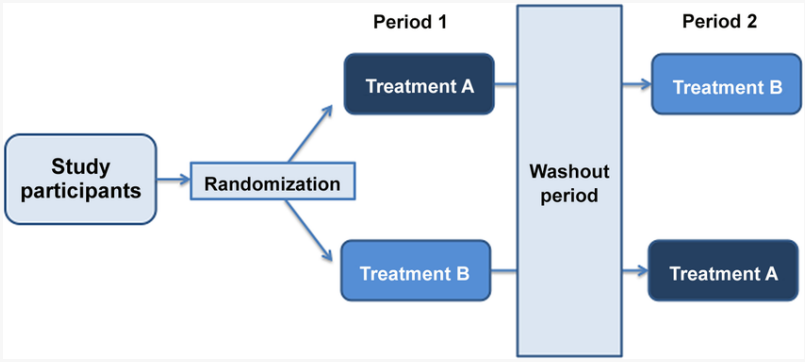

Crossover Design - https://brookbushinstitute.com/glossary/crossover-design

DEFINITION
A crossover study is an experimental research design in which the same participants complete each intervention in sequence. The order of interventions is randomized; generally, a washout period separates phases to limit carryover, and participants then switch ("cross-over") to the alternate intervention. Because every participant receives all conditions, each person serves as their own control.

> Crossover designs are especially valuable in exercise and rehabilitation research, where between-subject variability is high, and the effects of an intervention are not long-lasting or reversible."
>
> *Dr. Brent Brookbush, CEO of Brookbush Institute*

SEMANTIC CLARIFICATION
"Crossover": Each participant switches from one intervention to another within the same study.
"Randomized order": The starting intervention is assigned randomly to reduce sequence bias.
"Washout period": A break between interventions that minimizes lingering effects from the first condition.
"Within-subject control": Each participant acts as their own control, strengthening comparisons and reducing variability.

HISTORICAL PERSPECTIVE
The crossover design emerged from 19th- and early-20th-century agricultural and statistical work on "change-over" experiments (e.g., Lawes at Rothamsted, 1853) and later formal

treatments of carryover and period effects (e.g., Cochran, 1939/1941), establishing the logic of applying sequential treatments to the same experimental unit. A clear, peer-reviewed clinical exemplar arrived with Hogben & Sim (1953) in the British Journal of Preventive and Social Medicine, which used repeated treatment periods within the same patients and explicitly discussed wash-in/wash-out and carryover—core features that define contemporary crossover trials.

APPLIED EXAMPLE
- Included in the course: Acute Variables: Periodization Training

Oliveira et al. (2018) conducted a randomized cross-over study in 23 elite male wrestlers (24.5 ± 3.9 years; injury-free ≥6 months; no ergogenic supplements/drugs). Athletes completed two 3-month training protocols in sequence, separated by a 2-month transition:

Non-periodized (NP) protocol: 5 sessions/week; 4 sets/exercise; 8 reps/set; ~90% 1RM; 1 hour/session of wrestling drills to improve strength.
Block linear periodization (BLP) protocol: 5 sessions/week; aerobic + resistance training;
- Month 1: aerobic only (running) ~1 hour/session; no resistance training
- Month 2: 2 sets/exercise; 20 reps/set; 60% 1RM; running ~45 min/session (before resistance)
-Month 3: 3 sets/exercise; 10 reps/set; 80% 1RM; running ~30 min/session (before resistance)All participants continued wrestling-specific training and used a full-body resistance program (leg press, bench press, lat pulldown, seated row, shoulder press, crunches, hamstring curl).

Findings
- Isometric handgrip strength increased only during BLP.
- Peak strength (unspecified exercise) increased significantly and similarly after both protocols.
- Bench press, lat pulldown, and squat 1RM increased more after BLP.
- Serum creatine kinase (CK) rose significantly during both protocols; intra-intervention CK at 1 and 2 months was higher in NP.

Reference:Oliveira, A. L., Sposito-Araujo, C. A., Senna, G. W., Lopes, T. C., Godoy, E. S., Scudese, E., ... & Dantas, E. H. (2018). Comparison of the Matveev periodization model and the Verkhoshansky periodization model. Journal of Exercise Physiology Online, 21, 60–67.

STRENGTHS AND WEAKNESSES...

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