

**TABLE 9.2** Summary of the Threats to Internal Validity That Are Controlled by the Strong Experimental Designs

Designs	Ambiguous Temporal Precedence	History	Maturation	Testing	Instrumentation	Regression Artifact	Differential Selection	Differential Attrition	Additive and Interactive Effects	Sequencing
Pretest-posttest control-group design 	+	+	+	+	+	+	+	?	+	NA
Posttest-only control-group design 	+	+	+	+	+	+	+	?	+	NA
Factorial design 	+	+	+	+	+	+	+	?	+	NA
Repeated-measures design* $ X_{T_1} \ O_2 X_{T_2} \ O_2 X_{T_3} \ O_2 $ Same participants take every level of the treatment condition	+	?	?	?	?	?	NA	?	NA	?
Factorial design based on a mixed model  All participants receive all levels of the X treatment variable, but different participants are randomly assigned to the two levels of the Z treatment variable	+	+	+	+	+	+	+	?	+	?

\*With counterbalancing, this design controls for all applicable threats except possibly differential attrition.

A positive sign (+) indicates that the threat is controlled, a question mark (?) indicates that the threat may or may not be controlled depending on the characteristics and control techniques included in the study, and NA indicates that the threat does not apply to that design.  $X_T$  designates a treatment condition,  $X_C$  designates a control or standard treatment condition,  $O_1$  designates a pretest,  $O_2$  designates a posttest,  $X_{T_1-T_3}$  designate three levels of one independent variable,  $Z_{T_1-T_2}$  designate two levels of a second independent variable, and R designates random assignment to groups.