In choosing a research design, the researcher wants to be free of bias from any threats to the validity-accuracy of the outcome of the research study. What are some risks that can affect the outcome of the study?

When conducting quantitative research, the researcher is testing whether the independent variable is truly what is making the difference in the dependent variable, and that the results are generalizable to the population selected and replicated in other populations or environments.

To establish **internal validity**, knowing the dependent variable was impacted by the independent variable the researcher considers possible threats that could have influenced the outcome of the study. These threats are **history, maturation, mortality, testing, instrumentation, and selection bias**.

**History** - During the time that the research study is taking place, another event can impact the outcome of the study. This event is the influence that results in the change of the dependent variable and not the independent variable. For instance, a study is being conducted on eating a low fat, healthy diet in reducing heart disease for patients 20-25 years old with elevated cholesterol. The intervention is an educational video program, that is the independent variable and lower cholesterol levels is the dependent variable. During the time this study was taking place, the most famous Rock Singer has a heart attack, and it is on the news and in the newspapers that he had a very high fat, unhealthy diet. It may be that event influenced the study participants to change their diet and not the educational video.

**Maturation** - Participants of the study change over time during the course of the study. It can be physical (growth, healing, fatigue), cognitive (learning new information or skills), or developmental. These changes can be the influences on the dependent variable.

**Mortality** - Participants leave the study before its completion. If this leaves the groups being studied not equal, this may impact the outcome of the study.

**Testing** - Participants that are tested prior to the study are sensitized to the information or attitudes that are being studied. They may have altered scores or changed attitudes due to this rather than the independent variable.

**Instrumentation** - The actual instrument can change during the course of the study. If the instrument is a scale, it needs to be tested and calibrated. The instrument can also be individuals scoring or rating an activity. Such as the judges at the Olympics scoring a triple toe loop jump in ice-skating. Judges can go through training at the beginning of the study and and either become more proficient than other judges during the course of the study or less proficient as the time from the training elapses. The change in the instrumentation can impact the outcome of the study.
**Selection Bias** - This occurs most often when participants in the study are not randomly selected. There can be different characteristics in those who are hand selected or volunteer to participate in the study than those in the population that were not included. The differences in the groups can impact the dependent variable and it may not be due to the independent variable.

**Threats to External Validity**

Research designs are selected to help minimize these threats to internal validity. An example is the Solomon four group. There are two experimental groups and two control groups. One of each group takes the pretest and the other does not. All groups take the posttest. The results are analyzed to see if knowledge from the pretest impacted the outcome in the groups.

The ability to generalize the outcomes of the study is **external validity**. There are three threats to external validity, **reactivity effects, selection effects, and measurement effects**.

- **Reactivity** - is also known as the Hawthorne effect. Participants respond because they are being studied and not due to the independent variable.

- **Selection** - the sample from the population was selected may not be representative of the population being studied. Therefore, it is not generalizable to the population.

- **Measurement** - the participants of the study are sensitized by taking a pretest to what is being measured in the study. This may impact the participants’ outcome limiting the researchers’ ability to generalize the outcomes of the study to the population being studied.

In selecting the research design, the researcher attempts to minimize the possibility of threats to external validity.

**Resources**

