Second order interaction or a three-way interaction?

*A three-way interaction means that the two-way interactions differ as a function of the level of the third variable. The usual way to portray a three-way interaction is to plot the two-way interactions separately.*

I am not referring to the statistical idea of hierarchy as you put it.

There is also a theoretical idea of hierarchy as a necessity in the process-way. First this has to happen and than that. Or first this has to be established and in relation to that another thing. Building a house starts with the foundation and not with the roof.

And the problem is whether this theoretical hierarchical relation is proven to be present in a observer by means of research and the data that this research delivers.

The question becomes then how can we establish by means of statistics a confirmation of this theoretical problem by means of the produced data?

I will try to explain the problem:

Let we start with an observer who watches a screen and on that screen pictures are projected. And we vary the presentation time.

All pictures are of well known people.

The question for the observer becomes: Who did you see?

We expect the following. When presentation time increases the observer will identify more and more people up to perfection.

Its almost a logical thing, but we have to establish this by means of research and confirm our expectation.

But lets suppose its true.

Then we add something to the presentation of the pictures: before every well known person, we present a randomly chosen person not known to the observer.

And we vary the presentation times of the first and second picture.

The question for the observer becomes: who did you see on the second picture?

As we analyze the results we expect the same outcome as before: the less presentation time for the second picture the worse the identification result will be.

Lets say this is also true.

Now we look at the data and see 4 combinations in time:

1. An unknown man followed by a known man
2. An unknown man followed by a known woman
3. An unknown woman followed by a known woman
4. An unknown woman followed by a known man

We define combinations a and c as the Gender+ condition

And we define b and d as the Gender- condition.

Gender in this way is related to a relation in time and is not a classification within a group of people, as usually is the case.

What do we expect when we compare both research conditions Gender+ and Gender-?

Is there a difference in the data?

Perhaps not or is there a difference in the sense that the Gender+ condition delivers a better score than the Gender- condition?

From a theoretical view we can argue that when an observer uses a kind of Gender concept to establish the identity of a person, we can expect a difference in the research defined Gender condition: between Gender+ and Gender-. Because when the first picture is a man and the second picture is a man than the observer can profit from this knowledge when confronted with the second picture that of a man. The observer does not profit from his first established knowledge a man when the second picture is a woman.

The differentiation will become bigger as the presentation time for the second picture decreases!

It could also be that the observer does not have such a gender concept available, so there will be no differentiation between Gender+ and Gender-.

The analysis will in my opinion make both conclusions clear in whether or not a first order interaction is presented.

When there is a first order interaction establised between presentation time and the research Gender condition, the observer uses a Gender concept in the perception process. In reaching the identity of that person, s/he first establishes whether or not it was a male or a female person.

When there is no interaction, we can e.g. train the observer to make a difference between males and females and then repeat the research, to see whether the training was effective.

The next step will be to present an approach for a second order interaction or do I have to say a three-way interaction? Is it the same and just a matter of different expression? Its confusing. In our time we spoke of Main effect, first order interaction and second order interaction.