Indian Institute of technology Kanpur

National Programme on Technology Enhanced Learning (NPTEL)

Course Title
Basic Cognitive Processes

Lecture – 11
Research Methods in Psychology

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Hello and welcome to the course basic cognitive process I am doctor Ark Verma from IIT Kanpur the topic of today's lecture is research in psychology.

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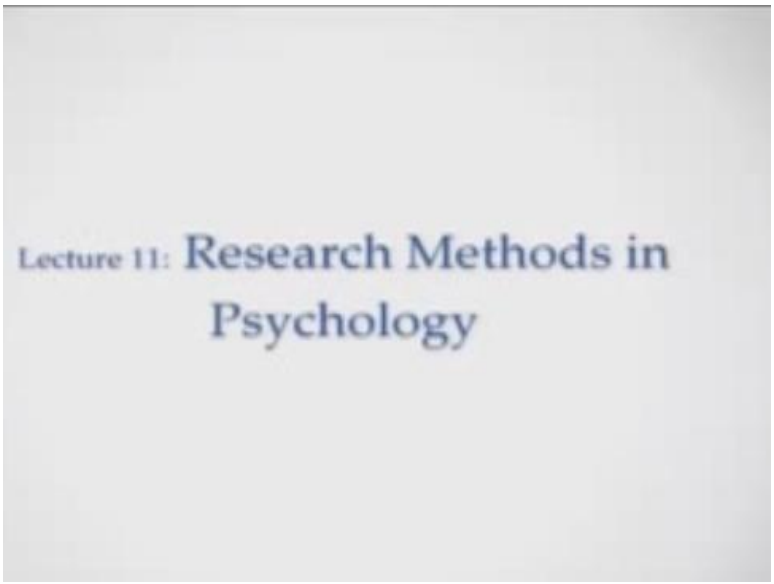

I am actually giving this lecture as part of this course because I am not really sure about the kind of backgrounds all of you watching this course and coming from so this particular lecture we need just a primer for how research is done in psychology I will touch some of the very basic

concepts of research in psychology which generally apply to go psychology which generally applied to congener to psychology as well.

So this should be at derivation for people who are already done some course in psychology and also say for example this will serve as a foundational lecture into a research method specifically know for cognitive psychology.

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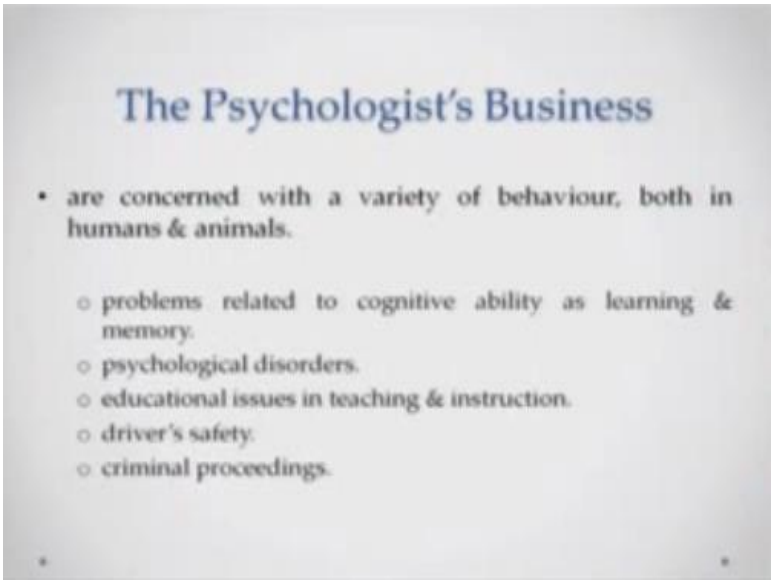

So let us talk about what do psychologist do, psychologist generally are concern with a variety of behavior both in humans and animals. They are sometimes concede with problems relating to cognitive ability such as learning memory intelligent they are also some time concerned with dealing with psychological disorders what are the causes how people suffering from those disorders can be helped also psychologies are always called up on to a tackle issues with related to education teaching instruction and so on.

Psychologist in reason in more reason times I have been finding use in developing driver safety manuals in deciding there optimal conditions for driving say for example for roads or train

driving or even training of pilots also psychology have been involved with judging with scenario while criminal proceedings are going in course of justice.

But how do psychologist actually deal with this what are the skills they use what are the methods they use actually which really you know are helpful for them in solving all of these kinds of concerns so let us talk a bit about the kind of research you the kind of research methods that actually the psychologist use.

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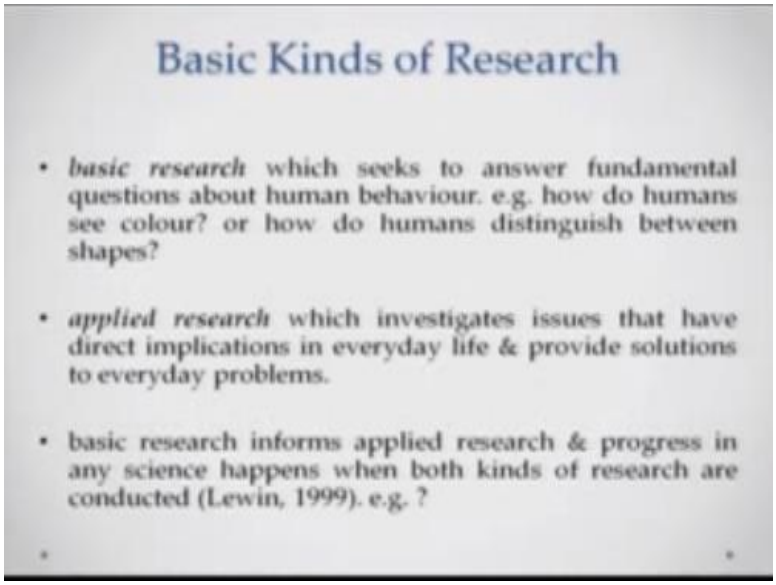

Primarily there are two kinds of research methods first is basic research basic research is one which actually seeks answer fundamental questions about human behavior, so something very specific something very simple say for example how do human seek color your something as basic as that or say for example how do humans distinguish between two kinds of shapes and those kinds of this things another variety of research is applied research which basically investigates the issues that have direct implications in everyday life and it actually borrows from the findings from basic research from whatever the theory says and trys in puts it to use in solving everyday problems like the once we were just talking about, so that is basic research

informs applied research and progress in any science actually happens only when both kinds of research are conducted so for our proposes we mostly be taking about concepts in basic research.

But we will also at some point about how these ideas from basic research can be carried forward to areas where they can be actually applied now what are the you know ground rules when psychologists actually you know takes to research what are the first things is that the straightness which psychologist make should be completely empirical you know they should be based on systematic collection of data and systematic analysis of data another characteristic.

That the psychologist aspire to is that the procedures use are completely objective and they are not really effected by the personal persist are emotional of the person or the scientist conducting their research finally the data in the methods of collecting the data are described in detail and they are but in the public domain so that others may draw up on their own conclusion or even replicate the reported the reported experiments.

And this kind of creation atmosphere of transparency in research and also sets out the data in the public so that everybody can derive their own kind of conclusions from the data that might available,

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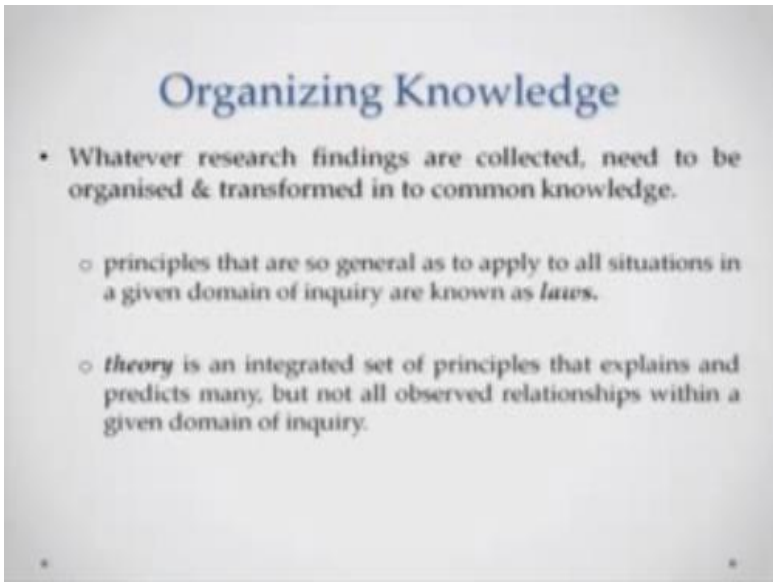

Now how does psychologist organized the research findings so wherever research findings are collected they need to be organized and transformed so that they can become part of common knowledge so whatever research findings are there some kind of principles are generated principles need to be so general so that they can apply to all situations in a given domain of inquiry such generated principles are generally know as laws now this could be something conman to others empirical sizes as well say for example the loss of gravity on the law of action and reaction and those kind of laws.

The theory on the other hand is an integrated set of principle that explains and predicts meaning but not all ossify relationships within a given domain of enquiry so for example if you are talking about a particular kind of behavior and you have certain principles to talk about one other things to do is that to integrate all those principles in a kind of theoretical frame work this theoretical frame work should I really describe the phenomena in question exhaustively though it might sometimes not be able to explain all the possible relationship are all the possible phenomena within that head but it should do a you no rather good job of this stricken whatever goes on with respect to particular phenomena.

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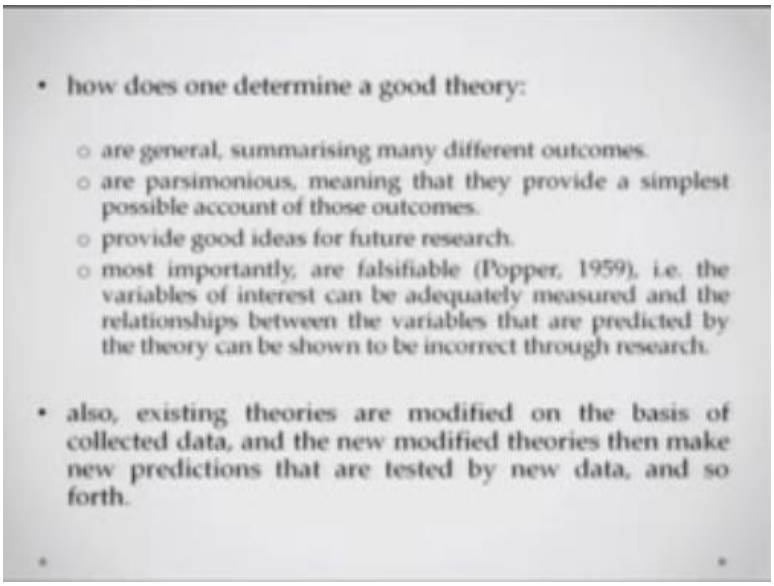

Now how does mean determine a good theory if you remember if talked about this any one of the earlier classes earliest go with this in a bit of high but let me remind of what we talked about when you have to really evaluate a good theory one of the first things is that the theory should be about many different outcomes the theory be board enough you know encamps many different outcomes related to particular phenomena at the same time the theory should be passive that it is it should have the simplest possible explanations about particular phenomena also a theory should be falls if am.

So for example theory which is not falls is able is not really testable and in the sense if you remember what purpose said they are not good theories finally theory should provide us good idea so feature research say for example if you are conducting research on a particular topic it is hard to image that you will have answered all of the question that where raise about that particular topic you want to you know leave some questions open or say for example they will certainly be some questions which you have not converted in your research.

Which can be taken up by you know people in the further who might be looking at your research and taking up those questions for in query existing theories that is why are modified on the base

of collected data and the new modified theory is then make new perditions which are again testable so this in some kind of a cyclical arrangement whjkch basically drives the research if you remember this kind of set up is referred to as the hypothetical deductive model which we have talked about in the past.

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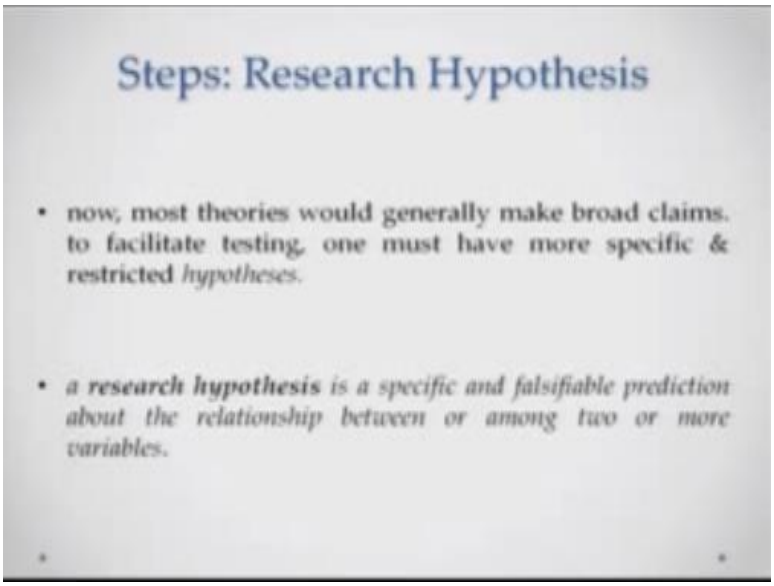

Now what are the main steps of staring to conduct a research first of the steps is basically two make you know rather you know let us say specific and you know restricted hypotheses what is a hypotheses is basically is a very specific falsifiable prediction about the relationship between two or more variable weather sleeping 6 hours a day has anything to do with your memory you will have to actually give a very you known testable predicting that okay if one sleeps for x amount of hours the memory improvement is by a number by and then you should go you should be able to go out and test this relationship this is a specific hypothesis should be generally.

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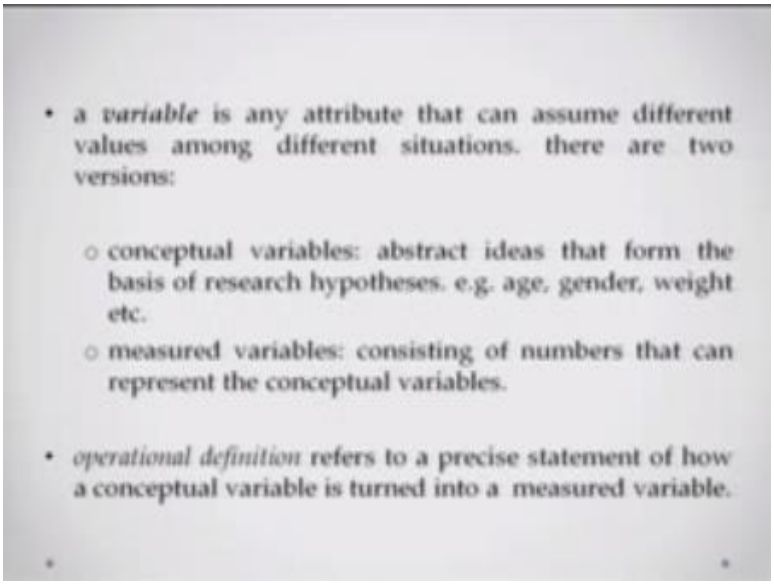

When you are talking about hypothesis we are actually talking about the relationship between 1 or 2 variables now what is minimal, minimal basically is any other active we would that can assume different value amount different situations for example then let us say I am talking about as example I just gave sleeping now sleeping actually for a particular amount of time can take different values you can sleep for 2 hours 4 hours 6 hours you can have a disturbed sleep.

You can have a completely unreserved sleep and those kind of things so sleeping in frame work of a particular study can be a variable one would like to study and what is the amount of sleeping actually this is one example of a way doing now one of the main problems when we you know which comes when you are actually talking about variables is that there are two kinds of variables probably first is conceptual variables, variables which basically stand from abstract ideas.

Say for example I want to talk about kindness and say for example if I talk about if I want to talk about guild and those kind of things these basically from the basis of research which is going to idea is if you want to talk about kindness or guild those kinds of things as physiologically variables you would want to able to quantify them so that they can be actually made it so just

now I said sleep can be you know measured into 4 6 hours that is the way I am quantifying sleep so for example kindness.

There should be a way for me to able to quantify kinds I should you know have test or have a measure which can actually help me test amount of kindness inserting so that part basically the conversion from a conception variable to something that can be quantified that quantified variable is called the measured variable, now how do you convert take the conceptual variable and convert into a measured variable this process of converting a conception variable to a measured variable is called operational definition.

So in operational definition is per size statement of how a particular conception variable has been turn into a measured variable let me take n example here, say for example somebody says to you that.

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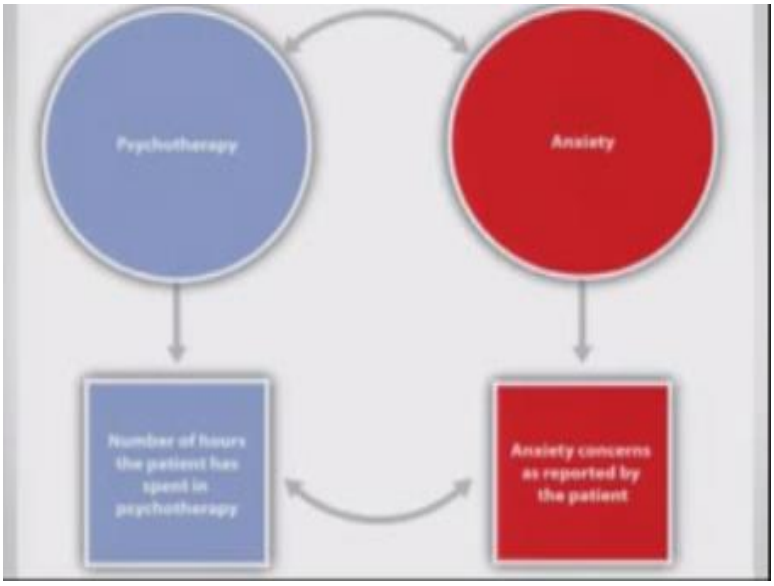

That physiotherapy reduces anxiety so how do you quantify physiotherapy, physiotherapy is a rather brought drop it so what you can do is you can take an example saying number of hours the patient has went in physiotherapy actually reduces the anxiety concerns as reported by the patient

so in that sense what you have done is actually you know convert it both of these conception variables, in physiotherapy and anxiety into measure those okay.

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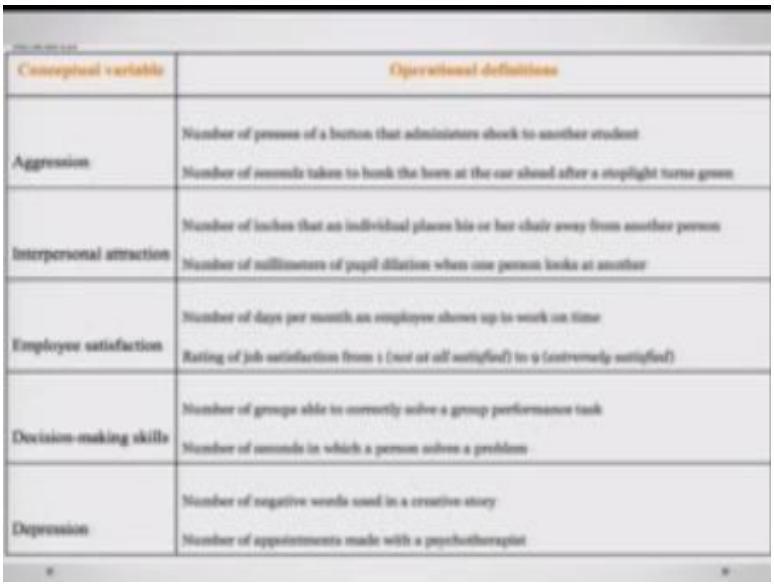

Now there could be other ways and there are some, some of the examples are require in which you can actually see that you converting you know these conception variables into measure variables see for example of you want to measure aggregations so one other things could be say for example you say number of this second number of seconds taken by a person to you know start honking the car zone when he stuck in about regular traffic jam or say for example of you want to measure depression.

You want to you know have a matrix for example the number of negative words a question uses while writing a creative story so these are the ways in which you can actually now start to tangibly talk about these varies and that is one of the more basic things which drives any research enterprise now there also different kinds of.

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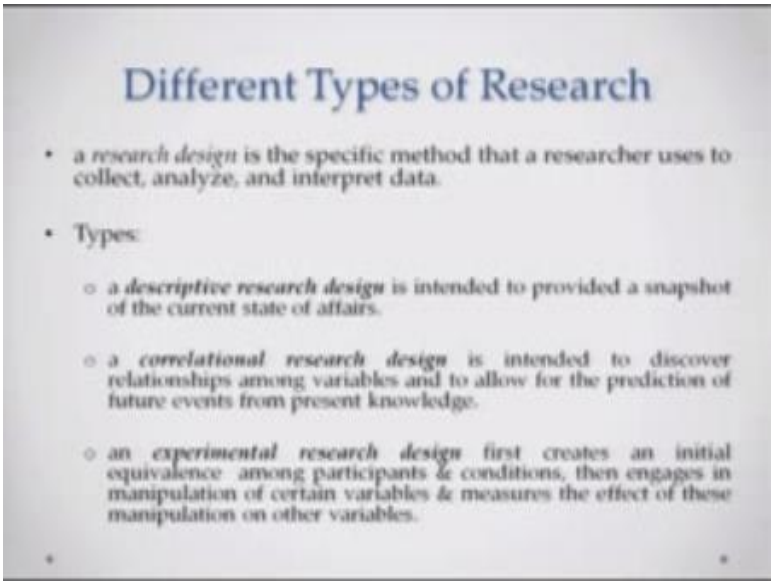

Now there also different kinds of different types of research that can be done other than basic in applied research both of those kind of research can actually we done through a variety of designs let us talk about what is the research designers, now a research design is basically a very specific method that a research is uses to collect analyze and interpret data's you could have a question and then you can actually you know ask just which kind of research design I am going to use to answer this question.

Now there are three types of research design mainly first is descriptive research design which is intended provide you a snap shot of the current state for example if you want just check that how many you know let us say how many people who like color red are living your locations so you can just go ask them that okay whether like color red or not and then you can actually have a distribution that okay these many people like red and while others like some other colors the correlation research design.

Only the other hand is intended to discover the relationship between two or more variables it is basically use to you know allow for a prediction of future say for example if you want to know that you know amount of humidity and then violent you know can be link to the amount of

rainfall that will be experience later, so you can measure them also humidity and then you can you know the measure the amounts of rainfall that have happen in try and find the correlation between that.

It is other second rather mathematical method another kind of research design is the experimental research type which is what we are actually concerned with when we are talking about permit your physiology now in experiment will research design one first needs to create and initial equivalent so for example which ever variable you really want to talk about and whichever groups you really want to you know look in with respect to variable you would like to create an initial equivalence.

And then from there when you think all factors that are considered equal then you try and manipulate one of the variables which we considered independent variable and then you actually you know measured the effect of this manipulation of the independent variable on the another variable which is your dependent variable I will talk about this concepts in more detail in this while.

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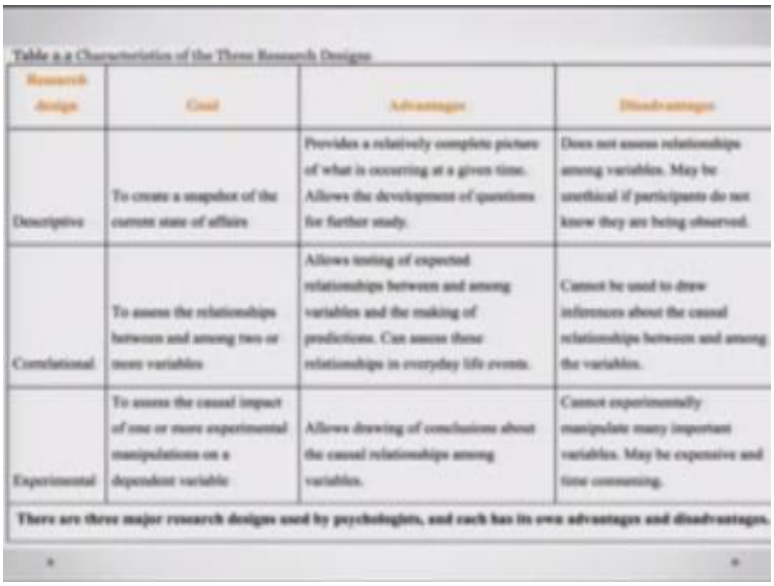

Now this is basically a snap shot of how these different kinds of research designs are and what are that advantages and disadvantages let us talk about them assuming it.

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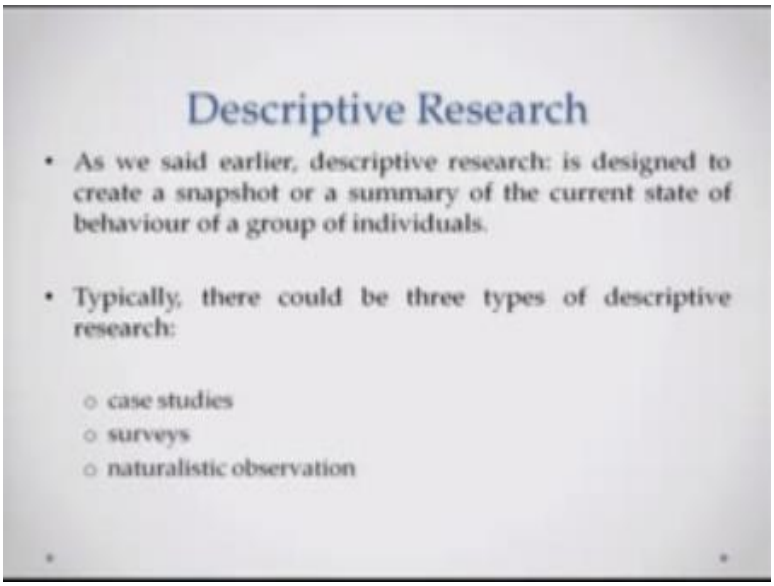

Descriptive research basically can be conducted in three ways you could either have a studies varying your actually taking signal cases and describing them in detail what does the behavioral patterns say for example of a person who is suffering from you know schemes of or let us say depress this order something like that, the another way of doing descriptive research is conducting service you could have a question here which has you know let say 20 or 40 questions and those question basically tell you something about the population.

You can actually take these questions to the entire population or to a sample from the population and in that sense you actually get an idea about what the you know whatever variables you are looking up another kind of descriptive researches naturalistic observation, so for example if you want to you know see the variables in plane in real settings so if you want to say you know want to check people say helping behavior while they are improves, so you want to relief you know go and observe.

Multiple groups and see how a particular you know scenario helping really you know takes course and then this side at you know whether people help because of x or y variables.

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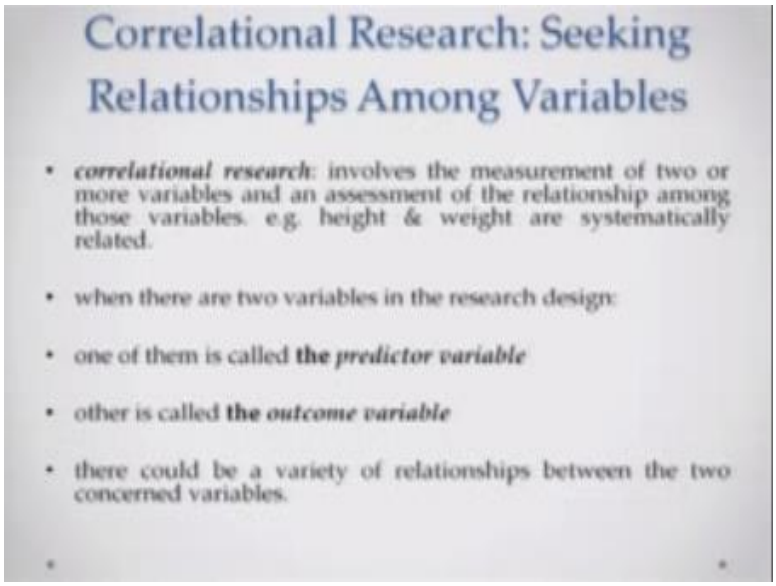

Correlational research basically inverse the measurement of to or more variables as I already said and in assessment of the relationship among these variables so for example height and weight may be systematically now people who are taller generally are considered to be heavier, those things like this one of these variables which you looking you know which will looking for in the correlational design becomes predictor variable the other one becomes you are outcome variable so basically what you want to do is.

Test the effects of the predictor variable on the outcome variable now there could be a variety of relationship.

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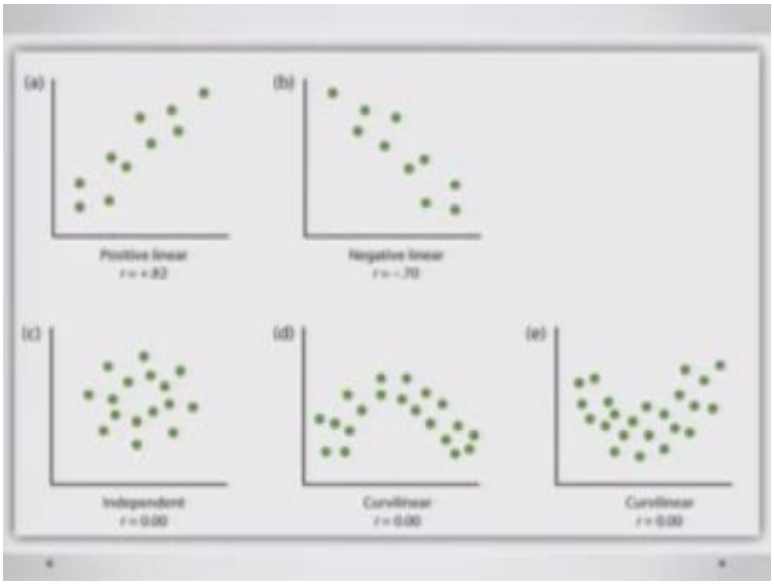

Among these variables okay and those relationships are depicted in this figure here so you could have a positively linear relationship and negative linear relationship or those variables could be independent of each other, also you can see or they could be curving linear kind of relationship is.

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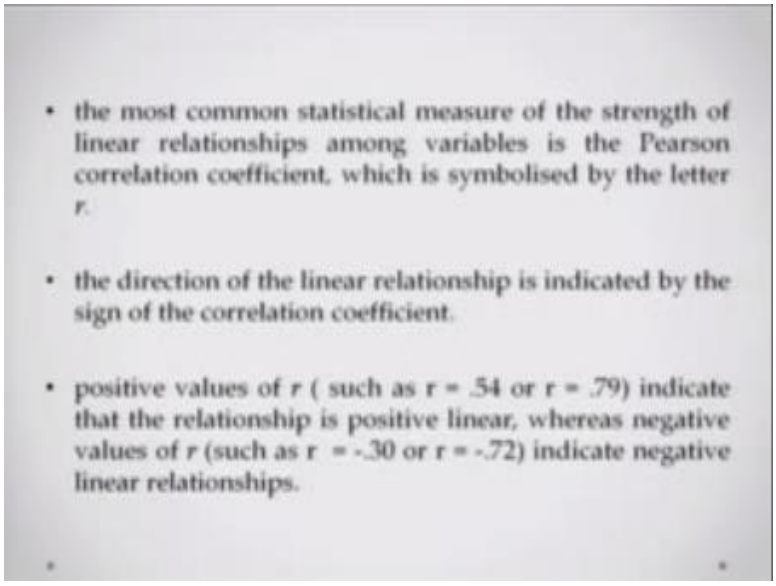

Now the most common statistical measure of the strength of linear relationships is the Pearson and Pearson's correlation coefficient which is symbolized by the letter r. You might have seen this in a you know somewhere in papers or in particular books which you read. Now basically the directional of the linear relationship is indicated by the sign of the correlation coefficient that is r, so if r is + is there is a +sign then it is a positively linear relationship if it is negative sign it is a negative linear relationship.

The magnitude or say for example numbers such as r is 0.5 4 or r is 0.79 it tells you how strong that relationship is, not about the direction but about the strength of the relationship. So if some, so if you want to you know measure the correlation between two variables and r coefficient comes up to be you know +0.80 you are actually talking about a very strong positively linear relationship. In the other hand if the value is let us say, -r -.20 then you are actually if you going very weak but negative relationship.

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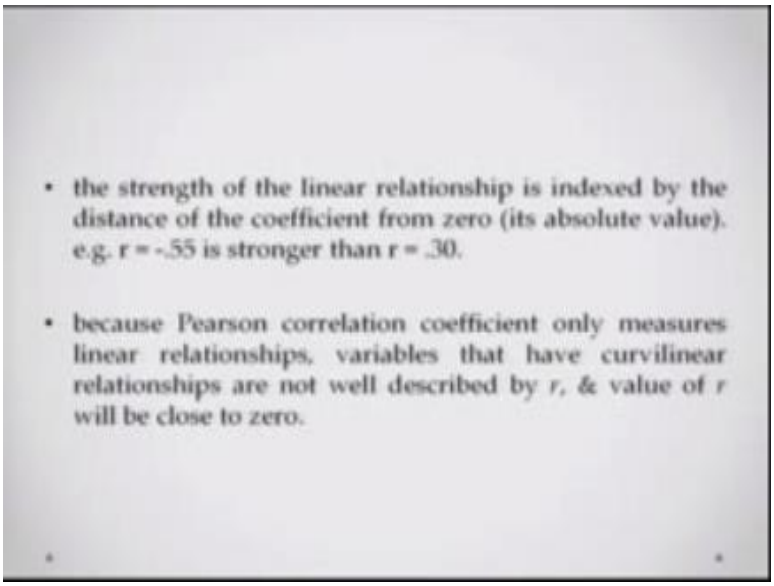

Now the strength of this linear relationship is indexed basically by the distance of, as I already said distance of the coefficient from 0. Now because of the Pearson you know correlation coefficient this r only measure linear relationships whenever you have a curvilinear relationship between two variables you will find that the value of r is 0.

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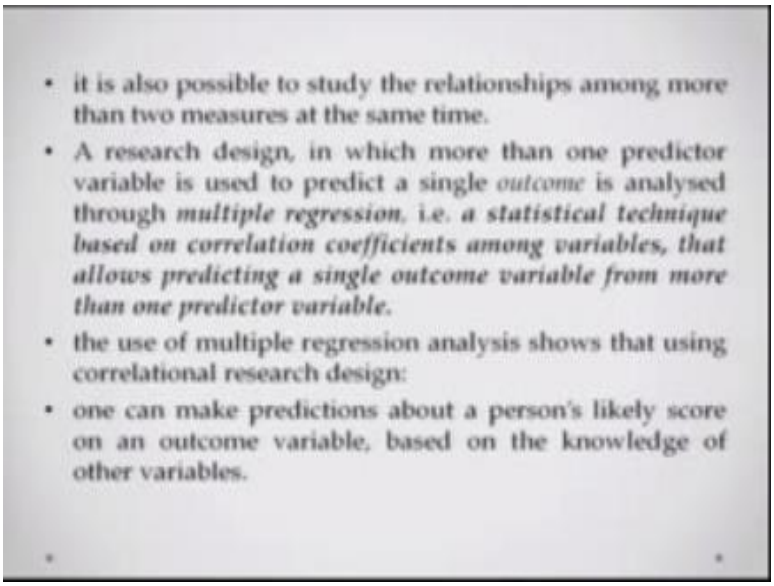

It is also possible you know to study the relationships of more than two variables, we have been talking in our examples about generally two variables but it is also possible to test the relationship among more than two variables during a correlation coefficient sign, that kind of design is called a multiple regression set when it a statistical technique based on correlation coefficients among variables is used to you know is used to allow predicting of a single outcome variable on the basis of variety of other predictive variables. Let us take an example of that.

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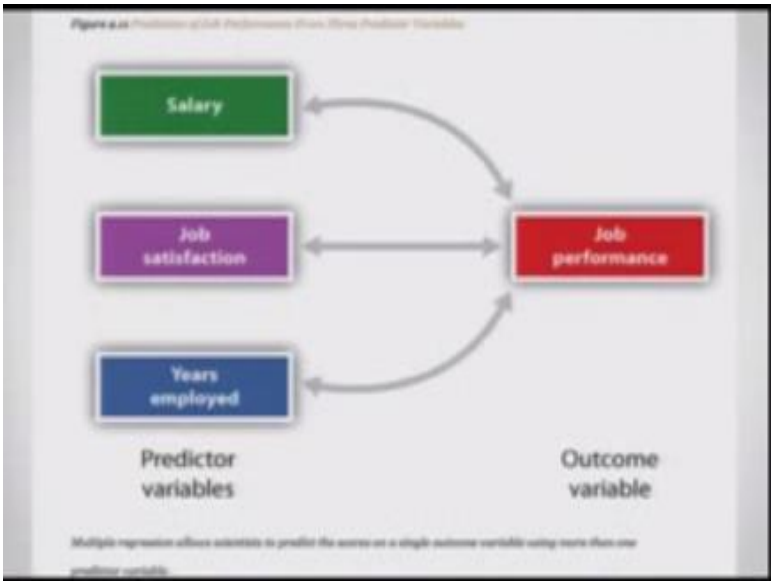

Say for example if you want to you know predict someone's job performance you can actually talk about more than two variables you can talk about salary how the salary fixed their performance, how the job satisfaction fixes job performance or also the number of years that a person has been employed him. So can actually you know on the basis of regression coefficient tell that how much a particular variable impacts the main outcome variable that is job performance.

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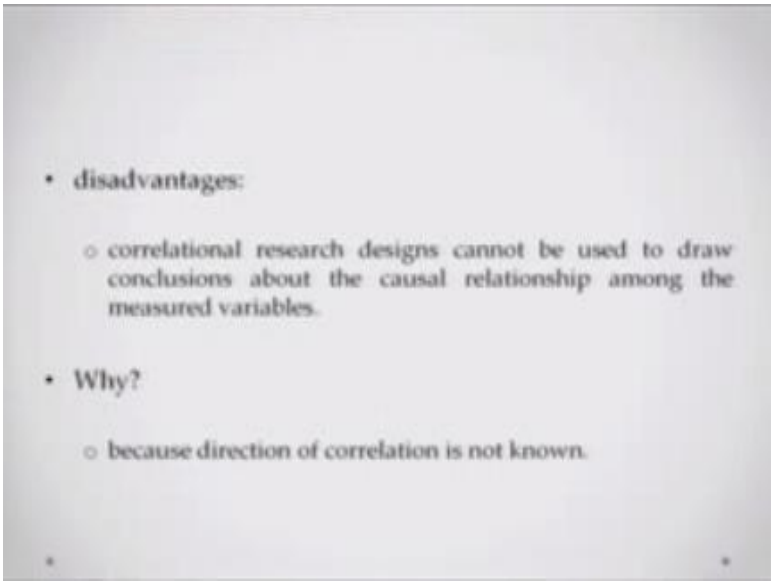

Now there are certain you know, there is a certain disadvantage to correlation research one of the disadvantage is that correlation research designs cannot be used to draw conclusions about the causal relationship you cannot really say confidentially that there is a casual relationship between the two variables which we were studying on the basis of a correlation design and okay.

One of the reasons is that direction of correlation is not really known during this kind of a method.

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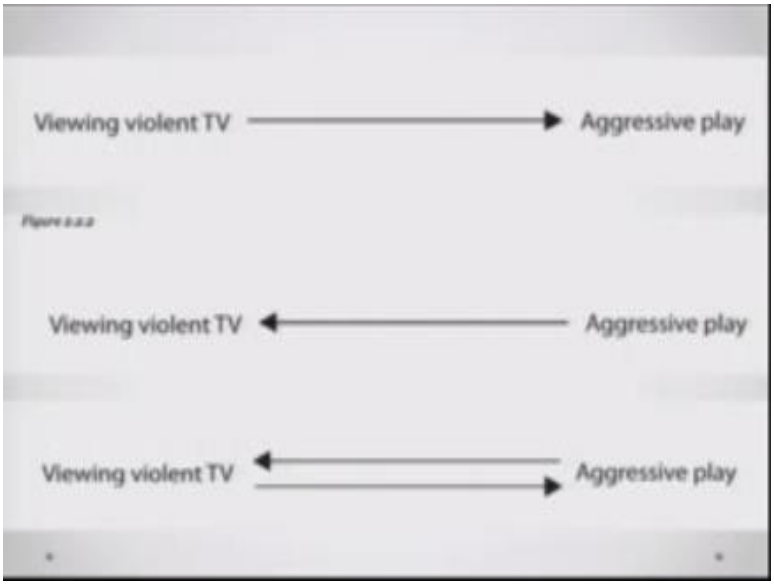

So you might basically have let us say an example that if you want to study whether violent you know watching violent TV leads to aggressive play you will never know actually whether v viewing violent TV is leading to aggressive play or a aggressive play is actually leading to more violent you know watching violent TV or say for example there is a bi-directional relationship. This kind of information is not given to us by the co relational research designs.

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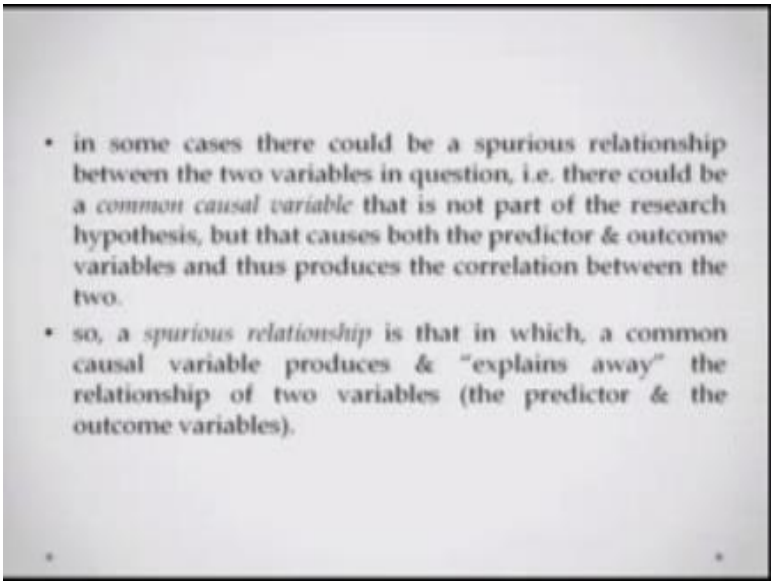

See for example in some cases it could also be, that there could be third common casual variable which is actually effecting both viewing violent TV and you know aggression, say you could actually have some like this.

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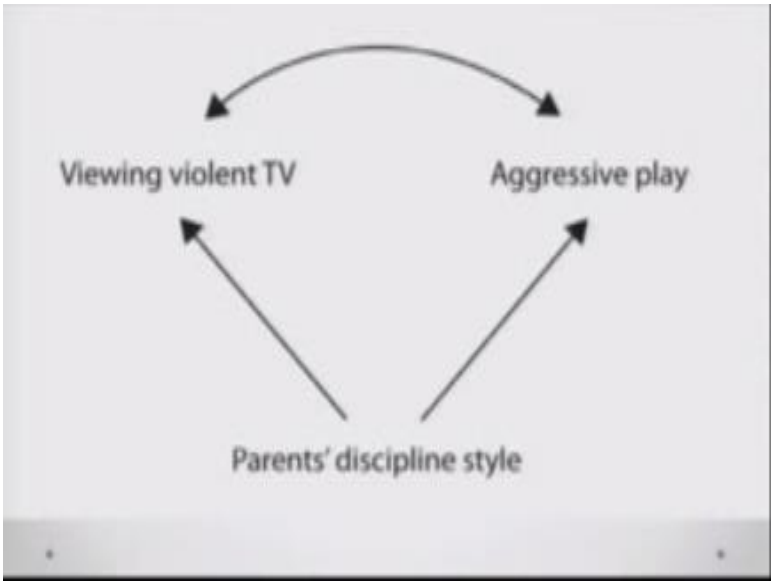

That parents discipline style kind of effects you know the children such a way that they, that there they view violent television and they are also engage aggressive kinds of play. So that kind of you know resolution is not there.

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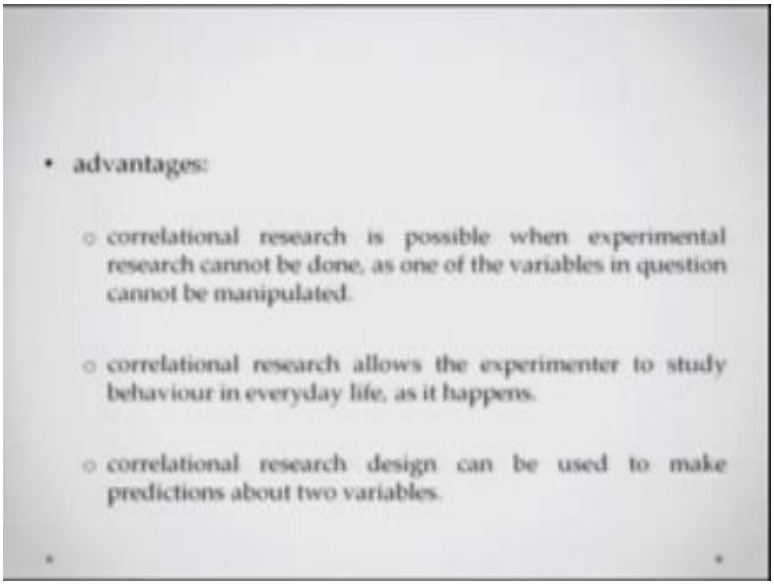

But there said an advantages also to correlation research design it is generally possible when experimental research cannot be done. Say for example, if you cannot actually go out and manipulate the variables then it is one of the good ways to actually conduct a research. Also correlation research allows the experimenter to study behavior in everyday life you know you can actually just go take some measurements you do not really need to you know get inside that behavior and manipulated and okay. Also correlation research design can be used to make predictions about two variables.

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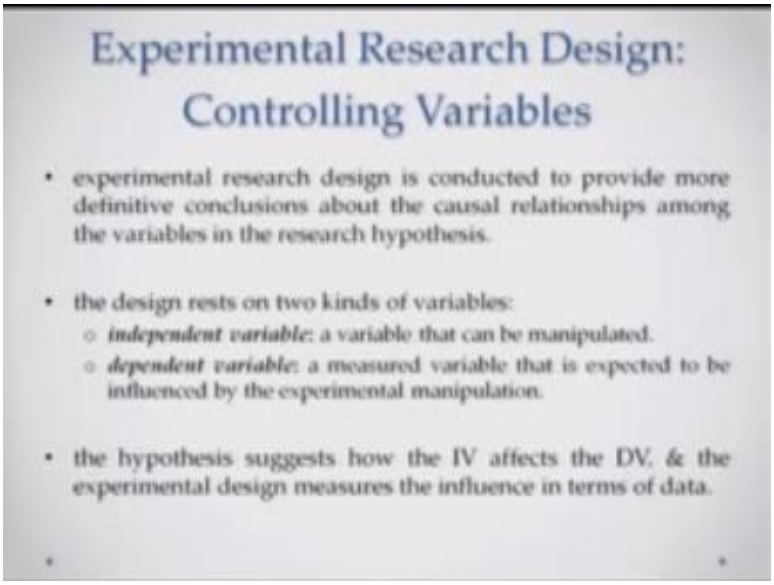

Now coming to experimental research design, let us talk about a scenario when even actually control variables another basis of that control in manipulation actually tells something about what is casually related to what, so as I mentioned earlier we are talking about two kinds of variables here, we are talking about an independent variable that is one which can be manipulated and we are talking about a dependent variable.

We will get manipulated or say for example on which we are going to measure the effects of the manipulation we did on the independent variable. Now we actually in an experimental research design we actually have these two kinds of variables and we generally create a testable hypothesis about how these two variables will be related. So hypothesis basically then suggest how the IV suppose to effect the DV which is how the independent variable is going to effect the dependent variable. And the experimental design is such that it measures the influence in terms of quantifiable data.

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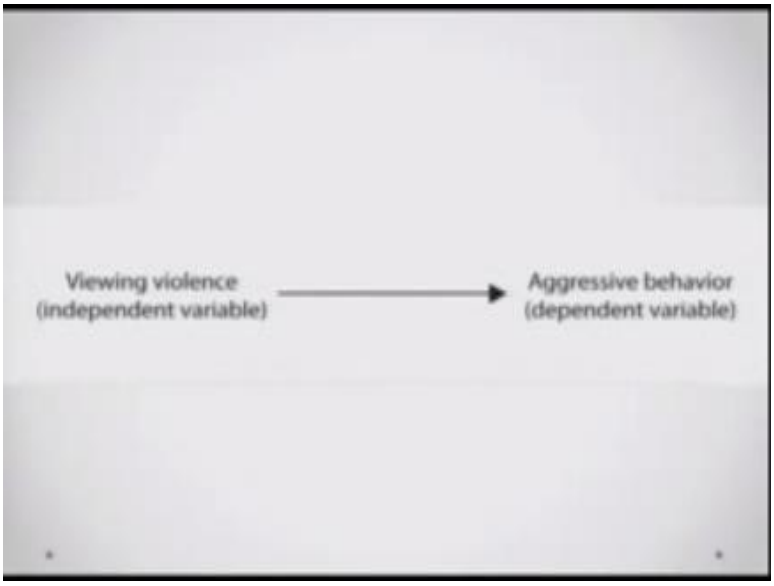

Say for example, you want to really check whether viewing violence leads to aggressive behavior taking the same examples.

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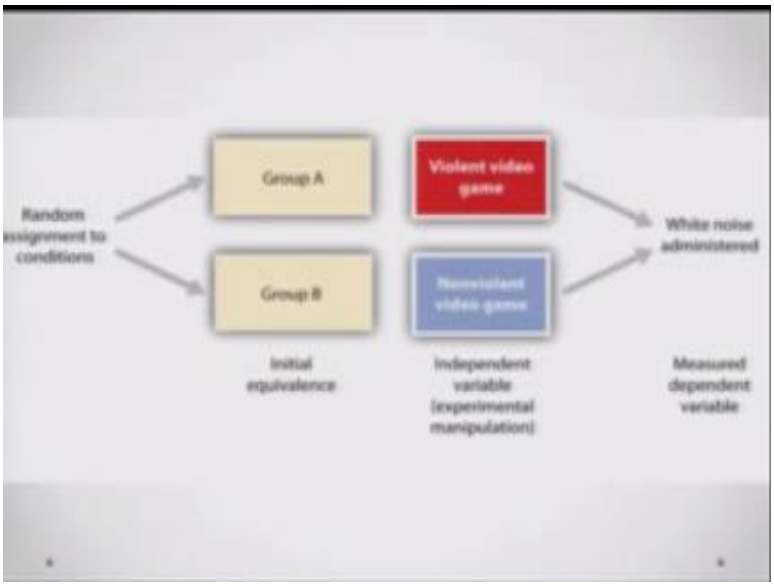

Say for example what you will do is then you will actually have two groups I will say group A and group B you will create a some kind of you know initial equivalence that they could be matched in A matched in other variables like pertaining style matched in you know the explore to kind of TV they have matched in general education of their parents social, now they could be many things you try and you know said how that okay, these are the parameters on which I will create kind of equivalence among these groups, then what you can do is then you actually give them a particular kind of a treatment wherein you are manipulating the experimental variable or manipulating the independent variable.

So one of these groups actually watches violent video game another of these group watch as an non-violent video game what you have manipulated here is the presence or absence of violent or non-violent video game. Then you actually you know take them to a scenario where they are allow to expressed their aggression. So for example you administer can particular kind of a white noise and you actually see how the children are going to react with, whether they react aggressively or whether they react non-aggressively.

That is your way of actually measuring what is the dependent variable, what is the outcome of this experimental manipulation.

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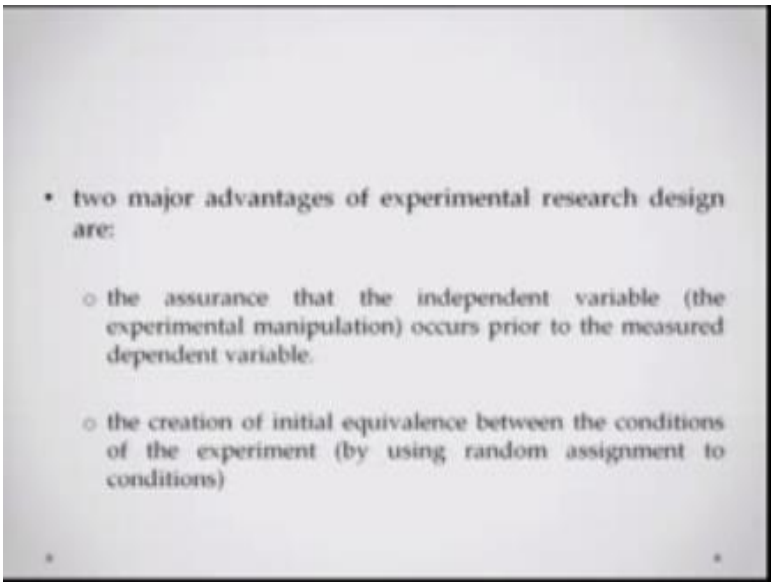

Now two major advantages of experimental design are first that it assures you that the independent variable actually occurs prior to the measured variable because you created a kind of an initial equivalence. Second is this creation of initial equivalence between the conditions tells you that this effect is not arising because of any other factors, how is this done?

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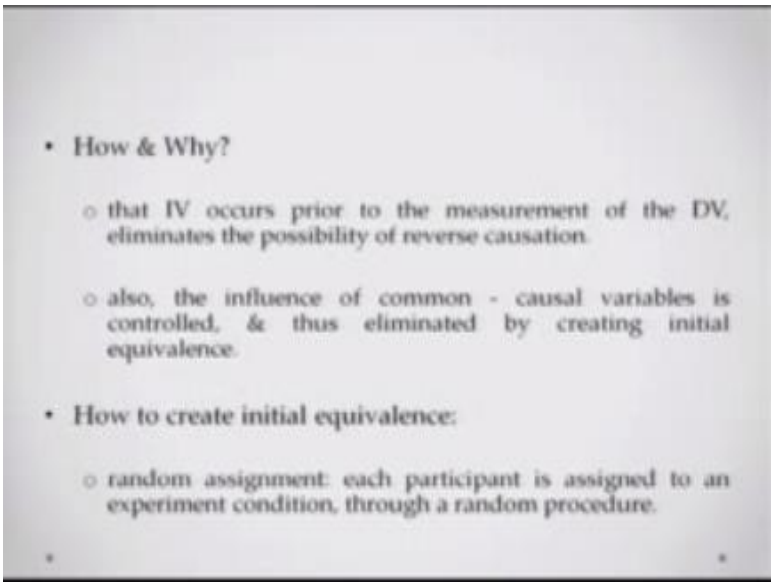

Because the IV generally occurs prior to the measurement of the DV that eliminates the possibility of reverse causation. Secondly the influence of common casual variables is controlled by creating initial equivalence. How do you create initial equivalence generally random sampling or random assignment of participant to conditions are both ways in which you can actually create initial equivalence.

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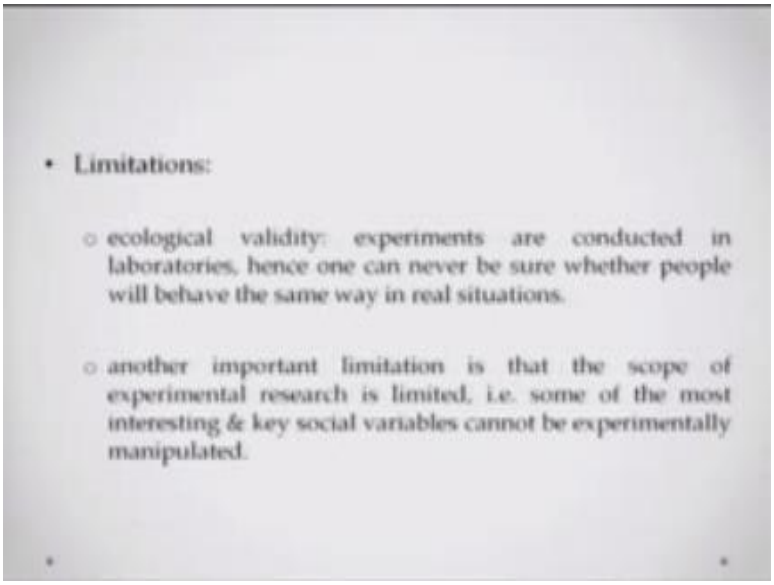

Now there are also limitations so the experimental research design as well, first is ecological validity now if you are actually getting into the you know in the play of the variables or actually controlling something this is not something you will actually do you know more often and not, so in one of the you know one of the concerns that are always raised about experimental reset design is that they are these experiments are conducted under controlled laboratories settings and in that sense they cannot be predictive of how the relationship between the wavelength spans out once the inter play is happening in you know in the outside world whether there is not so much control.

Another important limitation is the scope of experimental research is rather limited. It is very difficult to know, you know to be able to manipulate all kinds of variables. So you know a lot of interesting key and social variables say for example, you know the effects of the religion or effects of you know rays extra are things that you cannot experimentally vary. You cannot have you know manipulate the rays versus religion of that person and then measure something okay. So those are kind of you know difficulties with experimental decision design.

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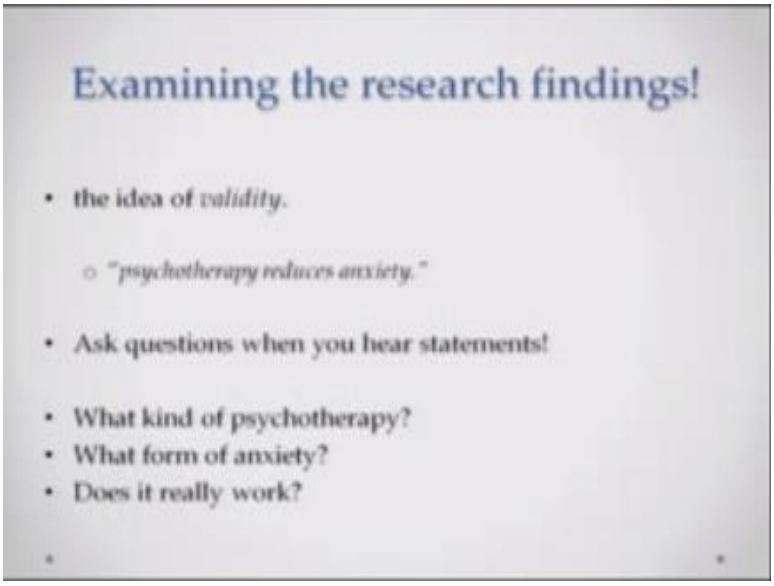

Now I talk to you about the 3 kinds of research design and how research typically conducted there in but say is for example you have a set of finding and you want to be really be sure of whether the findings are correct or not. So let us talk about ways where you can actually test it and be sure of it. Now there comes the idea of validity, so if you remember we talking about the experimental scenario, where somebody said that the psychotherapy reduces anxiety.

Now you should ask questions for example what kind of psychotherapy we are talking about, what form of anxiety we are talking about and does these really work. Now the idea is asking this question will help you constrain your statements and that sense it will help you to get a very specific answer to your questions.

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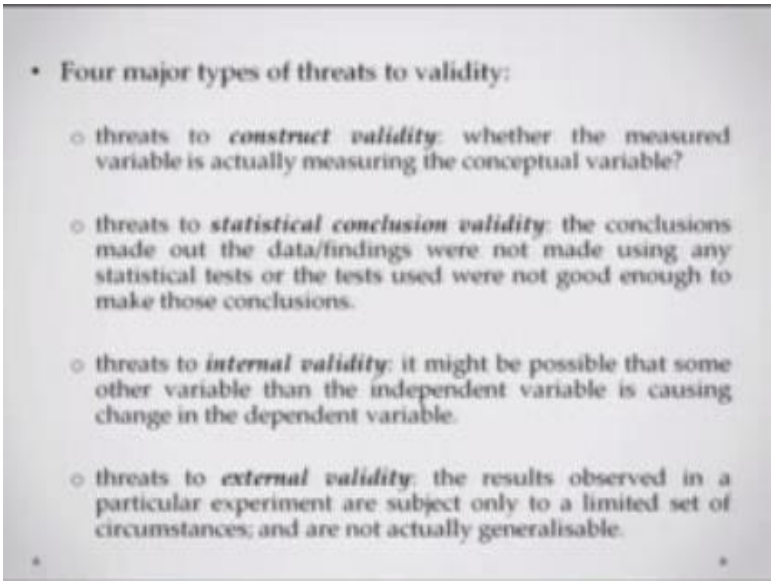

Those kind of answers are generally covered under validity, now therefore kinds of threats to validity. One of the threats is construct validity, simply about whether the measured variable is actually measuring the conceptual variable. So see for example, if you remember one of the earlier examples that I told, whether the number of you know, sad words or depressive words person used in particular story do really tell us about, whether the person is depressed or not. It might be that the person just likes that kind of thing and he is just using those words because let us say easily available words in the mind.

So does the number of these words really measured that the person if depressed or not, that kind of question is asked when you are talking about construct validity. Statistical conclusion validity is you know the concern about whether the correct statistics has been used, whether the correct methods have been used you know to actually defused any kind of conclusion from the collected and analyzed data. Internal validity is basically is about that is it possible that some of the variables have not been controlled and those variables are actually you know causing these effects other than the independent variable.

So that is internal validity finally, there is also concept of external validity whether the results observed in the particular experiment are subjected only to a limited set of condition or in my lab only or whether the same kind of results will occur if they test it in their own lab let us say in this same city, same country or somewhere else. So that is also, so that is the concept of external validity.

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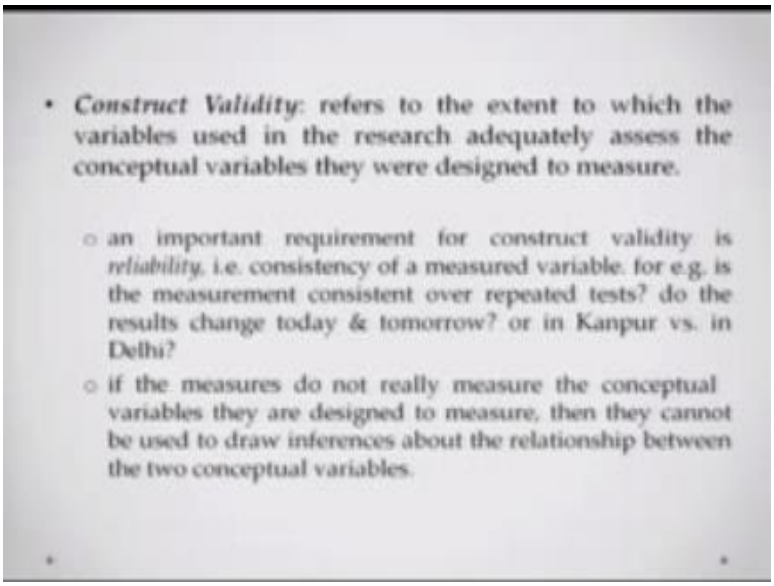

Let us talk about this issue in bit more detail, construct validity basically refers to the extent to which that variables using research adequately access the conceptual variables that they would design to measure. Say for example if you are using a thermometer whether the thermometer is actually measuring temperature or not, you know it is such a basic question. Now an important requirement you know for a variable to have construct validity, is the reliability whether the variable is consistently measured, whether the measures change in a matter of hours.

If the measures do not measure the conception variables, they are designed to measure than they cannot draw you know incidences about the relationship of variables in the question. So in that construct validity is rather important aspects.

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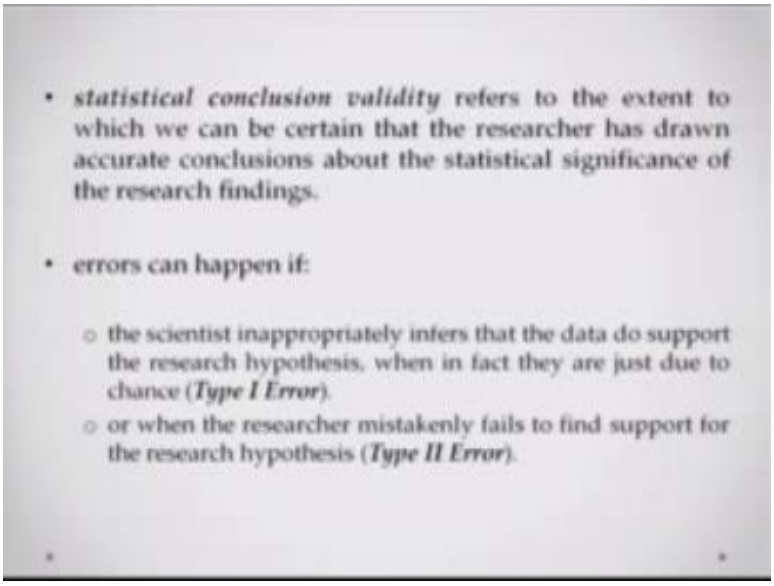

Statistical conclusion validity refers to the extent to which we can draw, we can be certain the researcher has drawn accurate conclusion so the statically significance of research finding, whether two things are statistical different or statistical significantly different from each other or not. There are two possibilities errors happening here.

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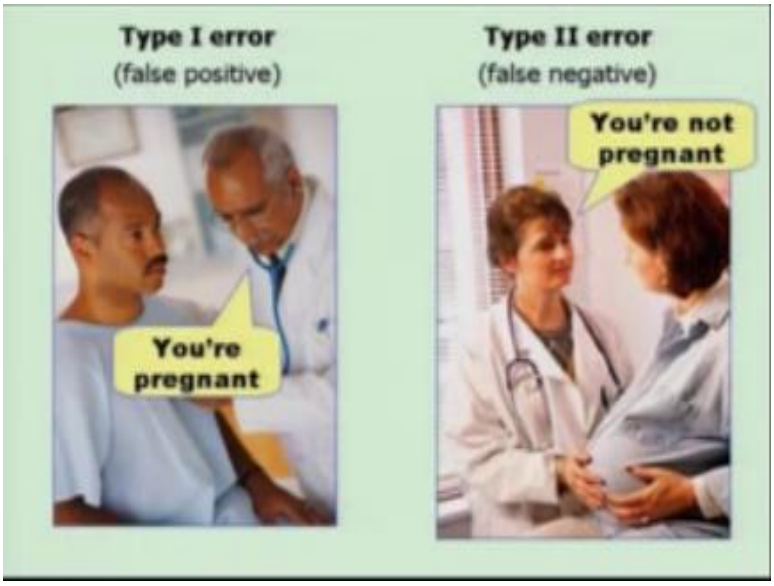

Say for example you can actually sometimes say that there is an effect if there is not, you know you can have something which is called a false positive, so figure on the left also you can say for the resembles figure on the left, also again you can some example find dismiss their effect when there is actually an effect that is called the false negative or the type two error. These are two one of the common ways.

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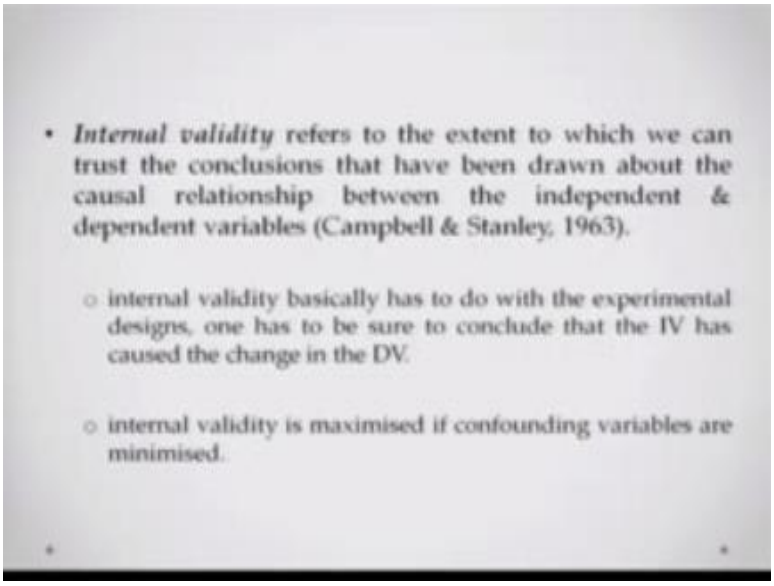

Now coming to internal validity, internal validity refers to a extent which we can trust our conclusion and you know that had been drawn on the basis of our study whether the same variable, is actually the variable that has cause the effect on the dependent variable. Internal validity basically as to do with experimental designs, generally we try experimental designs such that we have control all the possible variables you know that could have the effects and we make sure it is the only the independent variable whose manipulation will lead to effects happen with the dependent variable.

Internal validity therefore is maximizing if the confounding variables are minimized. No wi used this term confounding variables, what are confounding variables?

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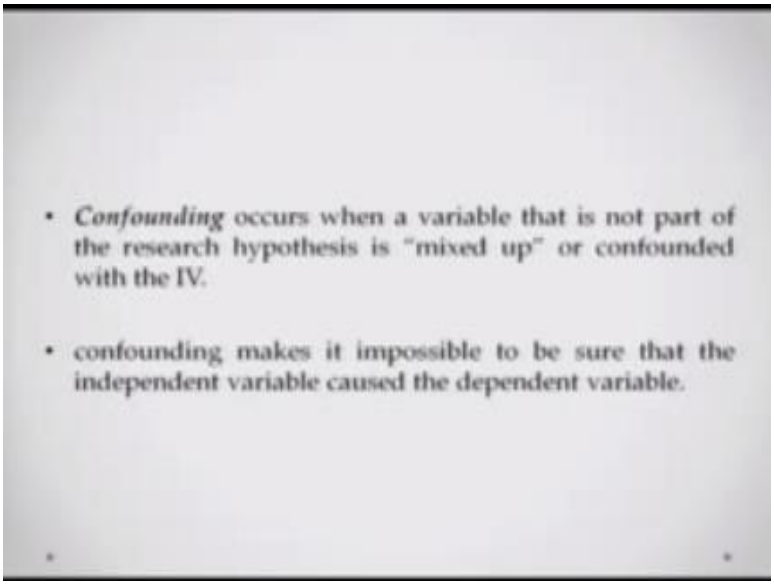

Confounding variables is generally a variable which is not part of the research hypothesis or it is mixed up or confounded with the independent variable, confounding makes it possible for us to be sure that it is the independent variable that has cause the effect on the dependent variable.

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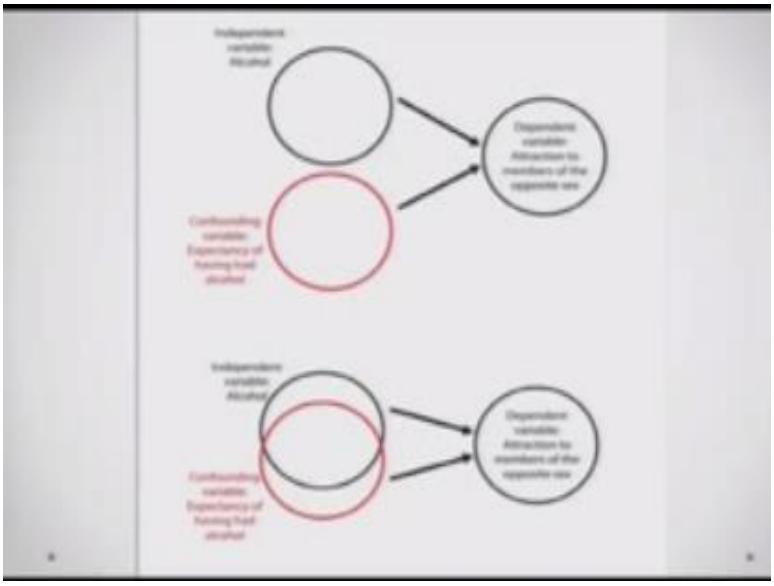

Let us take an example so there could be research where you want to test whether intake of alcohol increases person attractiveness to opposite sex. So independent variable is alcohol and the confounding variable is expectancy attraction to opposite sex. Now for example the group which is actually taken to be part of this experiment, if for example they know that they have taken alcohol and then the basis of that they start rating their attractiveness. The point is because they know some times thou might come up with incorrect conclusions.

You will never be sure whether the attractiveness towards the opposite sex, was only because of taking alcohol. To control these kind of setup what we could do is, we can actually have a double mind setup where in we do not tell which members have been given alcohol, which members have not been given alcohol and then we measure the attractiveness towards the opposite sex in both of these groups. Then what we can do is we can compare the attractiveness in both of these groups, the one who have taken alcohol and other who have not taken alcohol.

In that sense that will give us the best estimate of whether taking alcohol had any effect on attractiveness on opposite sex. This is one of the ways.

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I remembered one of the studies which I was involved in, where in I wanted to see whether the reaction times for a happy faces or sad faces are equivalent or higher or lower something like that. You can see the know faces I have used here, basically you can see the happy faces have a kind of confound. What is confounded? If you think for yourself and really look at theses faces more, you know accurately you will find, that the happy faces both have teeth been shown, while the sad faces do not.

In that sense whatever the result I would have drawn from this, might be because of the fact that teeth are been invisible so what I try to do is I try to change the conform what I done it was I tried to you know from pair the idea wearing the happy faces are compared with other kind of emotion say discussed.

Then wearing also the teeth are alone now I can compare the reaction times to happy faces and discussed the faces both of it which shows the teeth and in that sense the comparison is actually give me only the effect of people perception of the facial expressions whether it happiness or sadness not because of teeth were visible one of the has set of stimulate more, more easier to respond.

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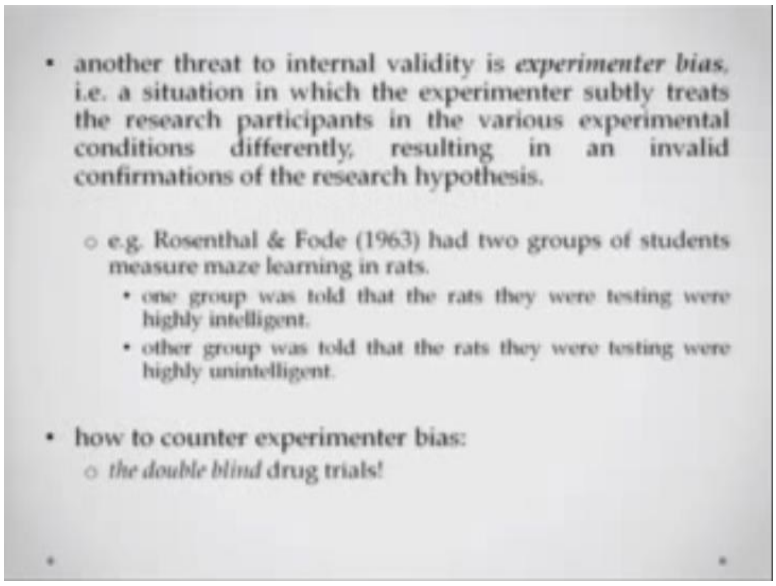

These are one of the ways you could control internal value another way of controlling internal validity is to control experimental bias sometimes it could be that the experimental or the research himself or herself has a particular angle of an idea about what the result should be sometimes you know knowingly or unknowingly that could lead to the experimental effecting himself.

There is an interesting experiment we can talk about in this regard Rosenthal & Fode basically had two groups of students measure maze learning in rats so they basically you know give this bunch of rats and they were actually asked to measure how well or how poorly these rats would learn to navigate a certain kinds of maze.

Now the point is one of these books wart will happen in this experiment one of this books were told that rats may testing your highly intelligent the other groups they was told that rats were testing a highly and unintelligent now what happen was irrespective of you know what the rats would have ideally done or done in an another scenario.

Both of these choose got results which are very consistent with the information they were given earlier so the first group actually you know found that, that the rats learned the mazes very well and the second would found that the rats could not learn the mazes as well and they kind of agreed with finalize because they know that these rats are un-internal.

Now this is one of the ways were the expectations of next experimental kind of can you know get confounded with this how do you, you know control these experimental bias again as I said earlier the double blind drug trials so something like in the formal industry people who are actually given medicinal dose they do not know you know and the maze of those drugs.

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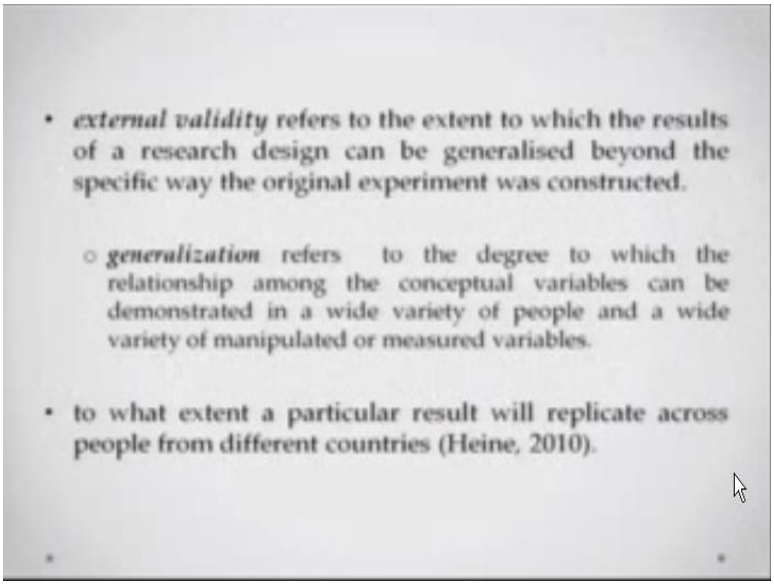

The doctors were giving this medicines also not know which patients are got the double bind have got the +co and which patients have got the medicine this is one of the ways you can actually controlled the experimental bias external validity coming to external validity basically refers to you know extend which the results of a research design can be generalized say for example whether the results can experiment conducted in my lab can be you know replicated in another lab or you know at another culture.

You have the place something like that generalization basically refers to the degree to which the relationship among to conceptual variables can be demonstrated in a wide variety of people and a wide variety of situations why do you need to talk about generalization so just to take a percent talk about this generalization basically is very important for any kind of research methods.

Because you do not conduct the research to actually alone not only out of sample of people you generally want to know about you know generally want to diffuse impedances about the large you know larger number of population on the basics of research you do induce so all sample of people so the idea is that you research should be you know actually be generalisable it should have in result that it can be generalize for the large group of people.

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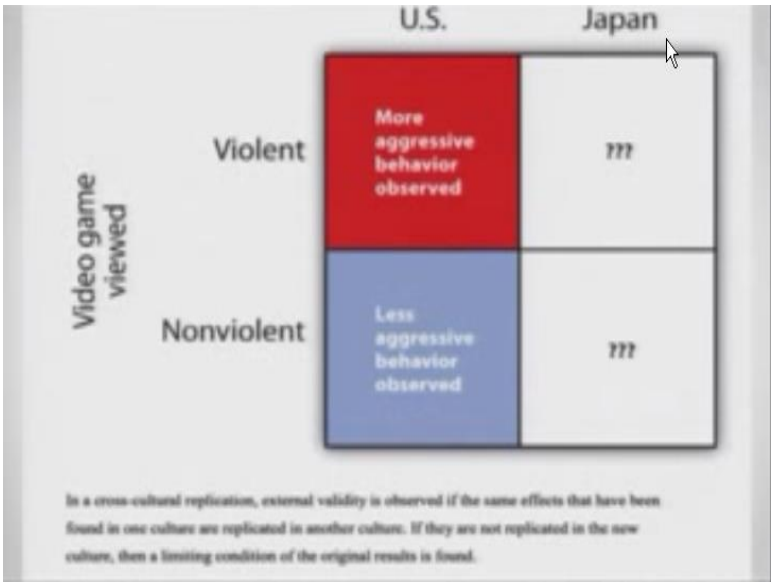

Only then your research will have any value or any replicate value so toward extent let us say a particular result will replicate about people from different countries you can have an example here they was an experimental in which people wanted to easy that you know what kind of video game you know viewed can lead to what kind of behaviouring.

So the same study was repeatedly done induces and it was found that you know more aggressive behavior also observed in people who washed violently video games and less aggressive people who are less aggressive behavior was also induced people who watch less who played less violent videos.

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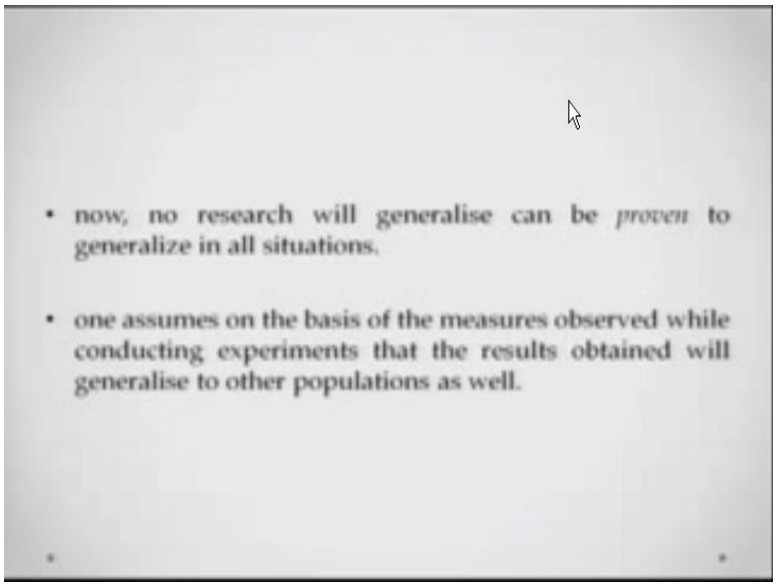

On the point is we really want to test this in India or in Japan or in China it would actually want to do this same study in these places and see whether this kind of relationship will hold or not now just to you know give you a small tip is that none of these research design so no research design can possibly you know proven to generalize in all situations.

You have to make that inference on the basis of how well you control all the other you know variables and all the other important factors in this time so one basically assume so on the basis of these kinds of measures that while conducting experiments the results obtain will be generalize the two other populations.

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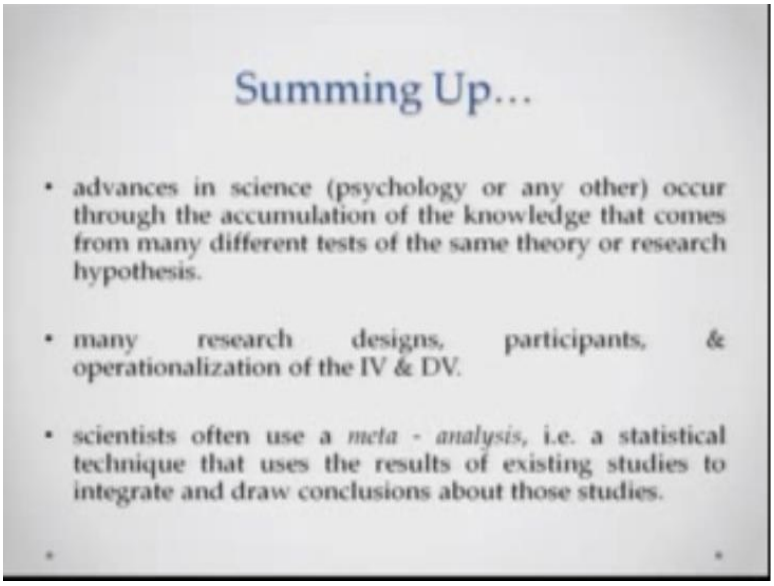

As to sum up we can know that advances in science occur through the accumulation of the knowledge that comes from many different tests of the same theory okay so you can have a correlation design you can have variety of research designs and you can ask this same question now many research designs there are different kinds of participants.

And another most important factors the operation how you operationalization in the independent and dependent variables scientist you know to actually you know ensured that the research been unavailing or to actual take stop of what kind of research exist in particular field take two something called meta analysis, meta analysis basically is a statistical technique that uses the results of all the existing studies or many existing studies in a particular field.

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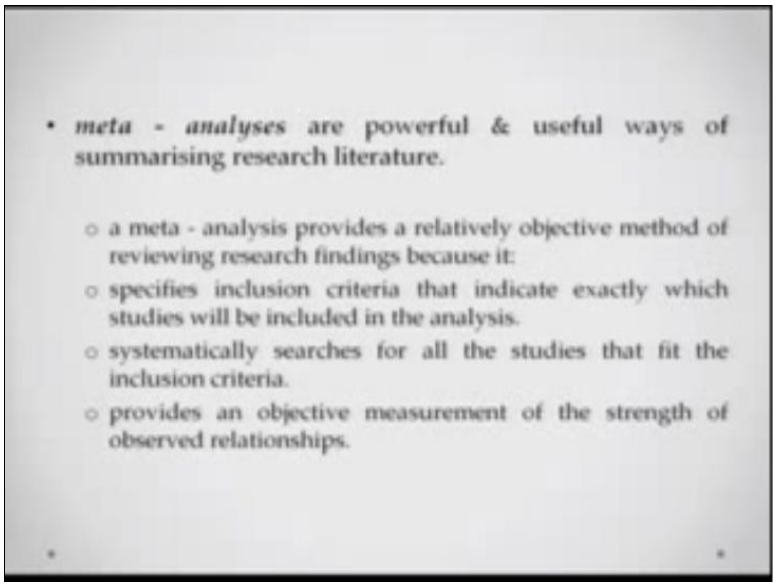

To integrate them and to draw a conclusion on the overall topic Meta analysis is actually or rather powerful and very useful way of summarizing the entire research literature related to specific term it will provide you relatively objective way of reviewing research findings because you actually compare these different research findings.

And particular scenario it also specifies the inclusion criteria so you know exactly what kind of research that is over what kind of participants in what kind of conditions you are actually comparing that will be giving you very good hold on what can be really induced on this also meta analysis is systematically researches for all the studies that pretend particular illusion criteria.

And say for example you want to study to tell you about intelligence and memory announce you know people of age characteristics 8 to 10 and 12 so you can actually prefer all the studies which have use and study the same questions it also provides you in objective measurement of the strength of the observation.

If we actually find that you know particular kind of result happens in only 20% results studies and 40% studies says something else then you can actually compare the strength of the mind you can actually take up all that whether it was strong conclusion to take or not.

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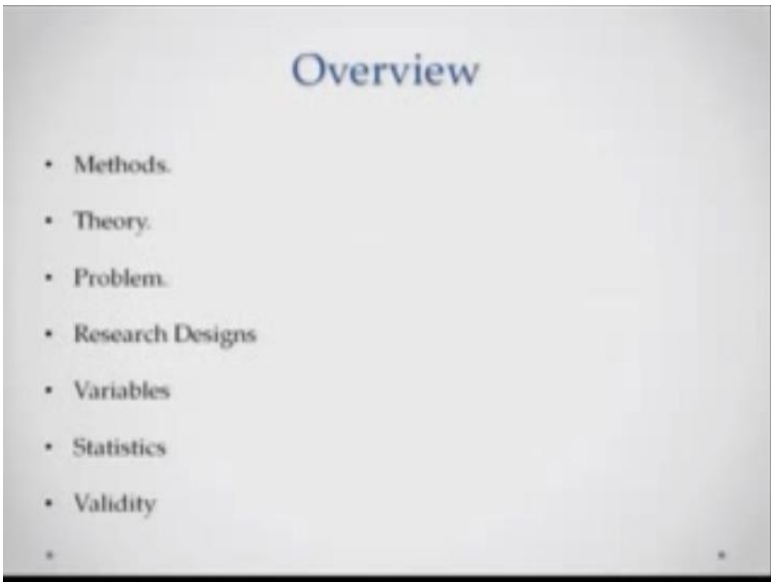

So you sum up today 's lecture we talked about variety of research methods and we talked about theory and problems we said we talked about kinds of research designs we also talked about what kind of variables we ask questions about and we talked about statistics and validity thank you.

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