

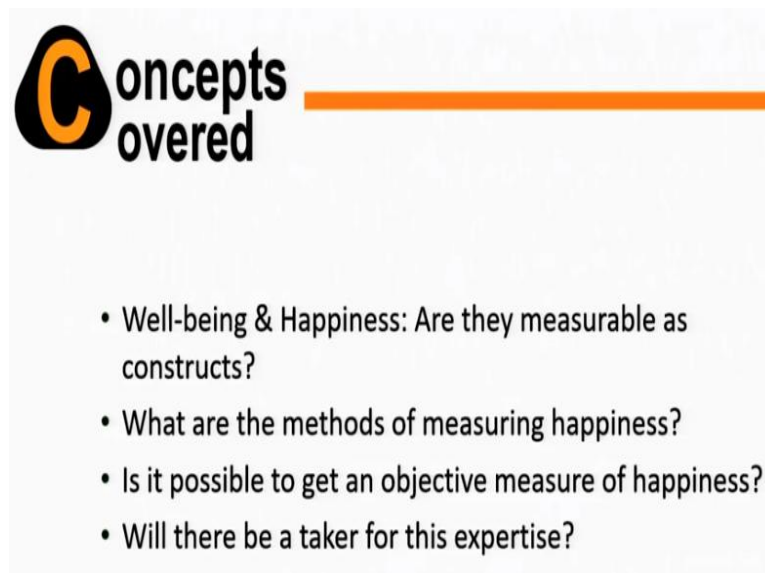
The Science of Happiness and Wellbeing
Prof: Manas Kumar Mandal
Rekhi Centre of Excellence for the Science of Happiness
India Institute of Technology - Kharagpur

Module No # 07
Lecture No # 36
Measurement of Happiness

Welcome again. Thus far we have get to know what are the different aspects of the science of happiness and well-being and why it has been considered different from the traditional view about happiness which primarily deals with the art of happiness. Here we have been trying to discuss whether happiness has a scientific backdrop or not has it got a biological vertical as it got a, psychological or behavioural verticals.

These issues have become very prominent therefore one of the major challenges is to understand whether happiness can be measured or not. Unlike any other cognitive capabilities of human being which involves perception, attention, memory, learning, problem-solving, intelligence, emotion is difficult to measure. Because other things, the cognitive faculties of our mind can easily be measured and there are tools available for that one of the major question is whether we can measure happiness as well or not happiness in particular emotion in general.

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Concepts covered

- Well-being & Happiness: Are they measurable as constructs?
- What are the methods of measuring happiness?
- Is it possible to get an objective measure of happiness?
- Will there be a taker for this expertise?

So our topic today will center around 4 questions and the questions involved: are they measurable constructs. We have already mentioned that anything which is called as a construct has a scientific basis in fact a scientific, concept is called construct. Now if it is a

construct there must be variables available in that construct and if it is a variable that which varies it should be measured as well.

Therefore if it is a construct we should be able to measure it the question is what are the methods for measuring happiness? So we will discuss about it and then the larger question is that since we are dealing with science of happiness and well-being the issue is that whether a third person can actually observe that form of happiness or not? Somebody who is happy can internally feel about it.

But somebody who is watching over whether he or she can actually notice that kind of happiness in their behaviour, in their psychological state, in their biological state and whether also computationally we can measure such kind of, happiness in people or not? So these are certain questions we will discuss about it and why we are studying all this because there are a lot of takers for this expertise.

So one of the major challenges in today's talk could also to let you know why it has become a major issue that is being considered very vital for many sectors including education, industry, marketing, business and other sectors. So with all these notes we will first try to tell you that what are the 2 major ways we can understand happiness? And we will talk about first person methodology and the third person methodology.

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Keywords

- Self-report
- Psychometry
- Behavior signature analysis
- Affect computing
- Pitfalls of measurement



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The first person methodology is the methodology where you actually report about yourself it's not really self-report it is about your subjective experience. And third person methodology is a

methodology where others can observe what kind of happiness you are actually experiencing. So towards that end we will primarily discuss about the third person methodology because we are dealing with the science of happiness rather than the subjective experience of happiness.

So towards that end once again we will discuss about self-report that if you are happy whether you would be able to jot it down or not in terms of a questionnaire or a self-report survey whether there are possibilities of utilizing a standardized psychometric tool or not? Is it possible to understand your emotion of happiness in your behaviour signature can such kind of effect may be computed and fed into artificial intelligence so that through computer vision we can automatically understand whether somebody is happy or not.

And if we are trying, to do all these things are these measures so sacrosanct that we can convincingly say that someone is happy not really so there are certain pitfalls of measurement as well we will try to discuss about that as well.

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First person vs Third person methodology

- 'Private' knowledge vs 'manifest' behavior
- Subjective experience vs Objective reality
- Exploratory vs Explanatory
- Experiential vs Empirical
- Holistic vs Analytical
- Qualitative vs Quantitative

So the first thing is as I said the first person versus third person methodology the first person methodology as I said is a methodology of subjective experience. And science and well-being studies generally do not dwell much upon that they also well upon it but they do not dwell much upon that. Science of happiness and well-being primarily are interested in the objective or verifiable or reliable measures of understanding happiness.

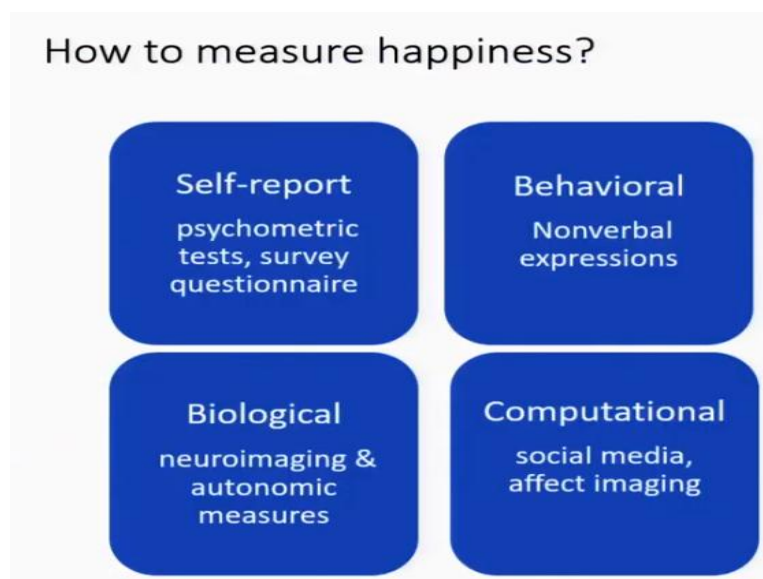
So the first person methodology deals with private knowledge, subjective experience it is generally very exploratory in nature because although, it is your own mind if you try to introspectively investigate yourself you need to explore a lot about yourself. And these are

more experiential in nature and they cannot be reduced to micro-momentary expressions. So they are more holistic in nature and the analyses of this data are generally qualitative in nature.

But when we talk about a third person methodology which actually measures the objective aspects of your happiness deal with manifest behaviour the way you are actually expressing it the objective reality of it can I verify it through a third person. They are more explanatory in nature rather than exploratory and obviously since there is a database coming from the person who is experiencing it is empirical in nature. It analyzes the data statistically therefore it is more, quantitative in nature.

So this is the fundamental difference between first person and third person methodology. In this module we will primarily dwell upon the third person methodology simply because we are dealing with science of happiness.

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Now there are four ways we can actually measure happiness one is through self-report. Self-report means the person who is experiencing emotion will he or she be, able to report it in a survey or in a psychometric test or in a questionnaire that's called self-report. There is a method called behavioral method that is behaviour signature analysis means if you are happy it must be expressed or manifest in certain forms of a behaviour.

It may be in your face it may be in your gesture it may be on your eye contact it may be in your hand movement and so on and so forth. So we will analyze that behavioural measures there are certain biological measures as well which has primarily to find out certain objective measures of your happiness it can be electrophysiological like EEG it may be Neuro imaging

like functional magnetic resonance imaging all these measures are also possible to understand whether the person is happy or not.

And finally we can also, deal with computer vision or social media data because those data can computationally compute actually and give us some input through a holistic point of view whether some kind of emotion is transferred in this conversation or not. We call it sentiment analysis well systematically look into this one after another.

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The slide is titled "Self-report Measures" and is part of an NPTEL presentation. It lists two categories of self-report measures: Subjective and Projective. The Subjective category includes Survey, Psychometry, Experience sampling, and Situation Judgment Test. The Projective category includes Thought listing, Sentence completion, and Picture sorting. The slide features two icons: a green clipboard with a checklist and a blue clipboard with a checklist. A small photo of a man is visible in the bottom right corner. The NPTEL logo is in the top right corner.

Self-report Measures

Subjective

- Survey, Psychometry
- Experience sampling
- Situation Judgment Test

Projective

- Thought listing
- Sentence completion
- Picture sorting

Source: Getty Images

The first is of course self-report measure now there are varieties of method we are, going to talk about but all in nutshell just to give you a glimpse of what are the different ways it can be done. Each of this technique has its own set of variables priorities, criteria, parameters we are not going to deal everything about it but we will try to give you some idea what are all those.

So survey is a very common technique where in order to understand the happiness of a particular set of, people like class a community a range of population we can introduce surveys. But if you are interested in a more standardized measure of happiness then we use a psychometric test when it is a metric it is quantifiable in terms of their reliability and validity of the responses.

Reliability means if a subject is reporting happiness is it consistent over a period of time that is called reliability. And validity means if a subject is giving responses about happiness whether it is actually measuring happiness or some other mood state. So when a psychometric test is utilized we try to understand the reliability and validity of it.



The other measures of self-report are experience sampling you can be given a I mean pumped up computer and whenever you feel happy you can actually press a button and, at the end of the day we can get to know through a time sampling technique how many times you actually reported happiness? Likewise there are situation judgment test in which you are given a situation and under that situation you have got given certain response alternatives.

And based on those response alternatives we try to understand whether you are happy or not likewise there are projective techniques in those techniques actually it is away from subjective technique. In subjective technique you are aware that you are giving responses about your own happiness. But in projective technique we indirectly get to know about your state of happiness through thought listing that is you have been asked to narrate your experience and through that we can get to know.

By using sentence completion test where I give you a half sentence that I feel happy whenever then there is no nothing in that and you have to fill it. And when you fill it you fill it based on your experience although you do not really understand that you have been examined we understand that yes this is the mood state based on which you report your happiness. Picture sorting test in those tests also when a series of, pictures photographs are given expressing different kinds of emotion.

And if you are interested you can ask the candidate or the person that what kind of photographs do you like? And if you select all those photographs which are happy go like then we get to understand that well this is the kind of more state you are having at this point of time.


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Psychometric tests

- The questionnaire method in which a set of questions designed to generate statistical information from a specific population to test feelings, preferences, etc.
- The questionnaires may follow a response pattern which is structured, unstructured or semi-structured
- Self-report / survey with scaled response option is more often used in happiness research

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So these are different self-report measures out of, which psychometric measure is the most important measure where basically we as I said utilize a questionnaire method and the important part in the questionnaire method is that. There is a reliability of it there is a validity of it and there is statistical information we can generate out of it. Because each response can actually be appreciated under a normal probability distribution curve.

So the, questionnaire method is considered to be more scientific and these questionnaires are definitely are something which are psychometrically tested where a particular question is being asked and you are given certain response alternatives. It may be fully structured it may be unstructured it may be semi structured but based on that psychometric tests are developed. But more often we use actually self-report or survey for understanding your state of happiness as you often see everywhere to report your happiness.

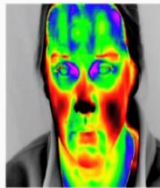
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Behaviometry: Behavior signature analysis


'Do happiness affect skin color?'

- Subtle shifts in blood flow color around the face provide key insights into a person's emotions that fellow humans can interpret
- People can identify others' feelings from changes in facial blood flow alone up to 75% of the time

Source: Science - H. Siddique (2018)
<https://www.theguardian.com/science/2018/mar/19/happy-or-sad-the-colour-of-your-face-reveals-how-you-feel>



Source: see list



We will now discuss about behaviour signature analysis behaviour signature analysis we try to understand what kind of behaviour you actually emit when you are happy? So for example we can understand if you are happy what kind of I mean blood flow goes on around your face? If you are angry the, the blood flow would be different if you are unhappy the blood flow would be different in different parts of the face and if you are happy it would be different.

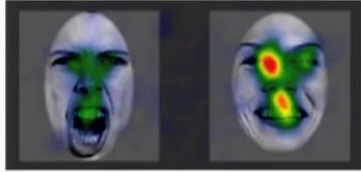
So one can easily measure it through a thermal camera and we understand that in majority of the time using a thermal camera we can understand whether you are happy or not I can show you a photograph for that. Now this is what is a thermal camera drawn pictures where we get to understand in which area of the face your blood circulation is going on the vascularity is taking place in the face.

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Behaviometry: Eye-tracking

'What part of the face show happiness or anger'

Average durations of all eye fixations in milliseconds for participants looking at natural faces expressing anger or happiness



<https://www.techexplorist.com/age-8-spontaneously-link-vocal-facial-emotion/33424/>

Likewise we can use which part we can try to understand which part of the face shows more happiness or anger. Now we can use this particular technique by someone who is actually looking at your happy face. We use eye tracking instruments or gaze tracking instruments in order to see that if someone is happy which part of the face actually will look into. So average duration of all eye fixations through a eye tracking instrument in milliseconds we understand that these are the areas in the face through which the happiness is more often expressed.

And these are the area of the face through which anger is expressed so eye tracking is also an excellent device to measure happiness in your face.

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Behaviometry: Kinesics

'How can I understand happiness based on body language'?

- Tight hug [intimacy, belongingness]
- Relaxed posture [full of confidence]
- Forced smile [diminished happiness]
- Interlaced finger [negative thoughts]



Source: see list

We can use other kind of measures which are not really instrument based even observation based or visually based if you can capture certain moments of the person when they are happy

we can also understand whether he is or she is happy or not. So the question is how can I understand happiness based on body language? Like in our day to day observation, we have found that a tight hug for example is a the photograph that you see is actually a mark of intimacy is a mark of belongingness.

So a person who is holding the baby I mean the mother who is holding the baby we understand she is extremely happy. Posture also gives a relaxed posture you may not be happy but you are showing a relaxed posture it means you are in full confidence So we understand, true body language your state of mood through forced to smile if you are in a social situation where you are somewhat embarrassed.

And if you are embarrassed you will actually be forced to smile and that forced smile means you may be happy but that happiness must have diminished in a big way. Interlaced finger for example when there are negative thoughts going in your mind you actually interlace, your finger and try to express yourself whatever verbally you want to. Other day we have understood that nonverbal expressions are the great way to understand somebody's emotion.

These are languages which are written nowhere known by none understood by all therefore when people express their happiness somehow this happiness would be expressed in their overt behaviour as well.

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Mood Induction

'How does induced mood affect our feeling'?

- Displaying material for emotional impact (photographs, movie, music)
- Imagination techniques (recall or reactivate past experience)
- Posing happiness via face or vocal expressions
- Virtual reality, augmented reality

Now when we try to, understand such over behaviour I mean we can also try to induce mood and see whether the person can be made happy or not. I mean if the person is not spontaneously happy we can also see whether the person can be made happy or not and that

can also be measured. For example we can display a movie for example a comedy movie and we can show their impact through after showing photographs, music, movies, and so on and so forth.

So when they see it you can actually capture their expressions and then understand whether the person is happy or not you can also ask a subject person to imagine certain very happy moments in their life and you can contrast it, contradict it with some very embarrassing or angry moment in their life. So if you take these 2 photographs separately side by side of the same, person of 2 different imagination techniques you will understand that in 2 situations where although the person is only experiencing.

They are actually manifested in certain forms of their behaviour either through their moving leg syndrome or through their hand movement or through their face or through their eye contact because this keeps on changing in imagination techniques. We can also ask people to pose happiness and we can see how well the person can pose happiness. For example if a person is depressed and if we motivate them to actually express emotion the person would not be able to express it fully either facially or vocally.

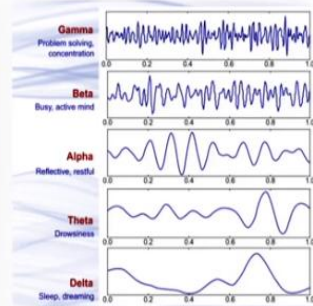
So we can also examine, measure emotion by asking them requesting them to pose certain forms of emotion. And if a person is really happy go like a very, extrovert type a very confident assertive person if you ask them to posit they instantly do it and their expression is full blown we can easily understand. One of the instrumental ways to actually induce mood is virtual reality you can augment reality and through virtual reality you can actually show them something which is in 3D images.

And through that augmentation also you will find the person, expressions like in telephone if we are talk someone very near and dear we keep on smiling although the person is not present at that moment of time. Because they are so correlated that if; you imagine a state of happiness your other expressions in the body will keep on happening. So virtual reality through augmented reality it is also possible to measure happiness in somebody's body or mind.

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Mindful meditation

'Does meditation impact our brain (CNS) & body (ANS)'?



Likewise, we can also see whether suppose in order to become happy we prescribe mindful meditation we prescribe lot of exercises will we be able to actually understand when the person is in meditative state or in the following meditative state are they really getting more confidence, more energy more happiness merge of reality more joy we can do that by 2 techniques one is called neuroimaging technique. In, such technique it's a MRI machine is being used and the person is after the meditative state is inserted into that machine and what the machine does?

Because the moment you have a happy state the pattern of neural fire that takes place in your brain changes and when it fires actually it the area get demagnetized because the oxygen is depleted. The demagnetized area of the blood and the magnetized, blood is contrasted in that magnet and then we get an image in the computer in order to understand whether the person is happy or unhappy.

Likewise we can use electrophysiological techniques as well EEG which is a non-invasive technique also there also we can understand through your brain activation pattern what kind of wavelengths are going in your brain when you are in a very happy state. As you, can see the alpha state is a state it is not a state of happiness we say but it is a state of relaxed mood and in a in a mood when you have got no conflict or anxiety in your mind. So we can use a lot of biological methods as well also to understand your state of happiness.

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Computational: Affect computing

- Combining AI techniques & human psychology
- Emotion recognition systems make it possible to automatically detect the meaning contained in signals such as facial expressions, speech patterns, etc.
- Machines may interpret and react in a prescribed manner to detected emotions but do not have feelings



There are computational techniques available as well the AI technique has also come up in order to understand the emotion. Because, emotion when we try to understand by a third party that is a decoder. The decoder own emotion actually biases the understanding of emotion because if I am seeing somebody happy but I myself who is decoding or trying to understand somebody's happiness I have got a different kind of mental state then probably our perception also gets changed.


But computer vision has got that ability. Computer vision, can actually detect certain parameters without contaminating with their own personal biases or subjective mood stack. So emotion recognition system by using AI make it possible to automatically detect the meaning content in the signal of the facial expression or speech pattern. Well face can be actually understood anatomically there are techniques available for that called facial action coding, system there are computationally based system and there are behavioural system as well.

So when it is a computational system it is the machine which interprets and reacts in a particular manner to detect the presence or absence of emotion. Now face has got different muscles more than 80 muscles are there in the face their configuration and the musculoskeletal skeletal features they are actually, reflective of certain mood state. And through a database the computer can the machine can actually tell what kind of mood state you are having at the moment.

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Computational: Social media

'What do social media reveal about our emotions'?




Social media data

Connections I [friends, followers]

Connections II [links, URLs]

Connections III [likes, comments, downloads]



Research Methods


Surveys

Interviews

Experiments

Content analysis

Network analysis



So the computational method is not only used in computer vision through social media data also called sentiment analysis it is possible to understand the level of happiness in a particular kind of conversation. The kind of image you have posted the kind of connectivities you have through friends and followers the kind of links you use the kind of domain comments and downloads you have made.

Everything can be compiled and actually meta analyzed through surveys, through interviews experiments, content analysis network analysis in order to do something called sentiment analysis. To understand that over the past 3 months whatever, exchanges you have done through emails your Whatsapp messages through twitter through I mean Instagram. The kind of connectivity you have maintained over a period of time will also give us a fair idea of the kind of sentiment or the kind of mood states that you had in the past 3 months.

So that is also a very effective way of understanding a person mood state or three persons apparent mood state at a particular moment or a particular period of time.

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Difficulties in Experimental Research

- Selection of appropriate base line
- Event-related study [data during positive emotional reaction]
- Monitoring emotions: Too frequent or less frequent sampling of subjects' self-rated mood
- Slow & variable onset and its inability to be quickly reversed
- Synchronizing multiple-level-data
- Avoiding reductionism pitfalls

But there are problems as well as I said now in immersion research is very difficult to find a baseline. That is one can find baseline for all kinds of measuring devices if I am trying to understand our span of attention I can create a baseline for myself that I can attend up to 7 digits. But is there a baseline for emotion research if I am happy if I, and if I try to find out my happiness in order to give you an objective report of it probably the happiness will go by that time when I report about it.

So getting a particular baseline for happiness is also a difficult task then the difficulty comes in terms of whether I mean the event-related study. My true happiness come in a particular moment but can I capture that moment, experimentally. Because whenever I do something experimentally I have to fabricate or simulate that situation. Now if I try to simulate it I cannot spontaneously elicit as well it needs to be posed.

So the event-related studies are not very I mean plausible method of doing happiness research. Likewise monitoring happiness I mean you need to sample happiness over a period of time. Your subjective mood state if you do it too frequently then also you will find that happiness is not apparently visible. If you do it too infrequently then also you will not find happiness. It is quite possible that when I am having that emotion of happiness at that moment I am not actually monitoring it, I am monitoring something which is related to a negative mood state.

Because as I said happiness is just one kind of mood, state which is primary emotion the other kind of moods are generally negative that is sad fear anger surprise discussed they are all negatively tuned therefore it is very difficult to monitor it as well. Also happiness cannot just

be elicited the slow and variable onset and its inability to quickly reverse is very difficult. So if I do a functional MRI research I cannot elicit it just like that, because happiness just does not come you can be angry in a spur of a moment but you cannot just be happy in a switch on switch off mode.

So that is also very difficult to actually measure happiness in either a biomarker like a electrophysiological studies or a functional MRI studies or even in self-report studies or even in behaviour signature analysis. So it is very important that instead of trying to, do micro level understanding of happiness its important that we synchronize all data from all sources. It may be from self-report it may be from behaviour signature analysis it should also be from biological point of view, through computational point of view as well if we can synchronize it then only pass we would be able to measure happiness appropriately.

So but when we try to amalgamate them we do, not get it holistically what happiness is all about because reductionism does not allow you to give a very holistic picture of it. That's why the qualitative measures as I said in the beginning the qualitative measures in the first person methodology the experiential methodology the investigative introspective methodologies are often considered as a good way to understand somebody's state of, happiness.

So these are the difficulties in doing experimental research with happiness but of course since we are dealing with science of happiness we will talk more about experimental research only. The other methods the qualitative methods are also been used but we have not captured much about that.

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Pitfalls

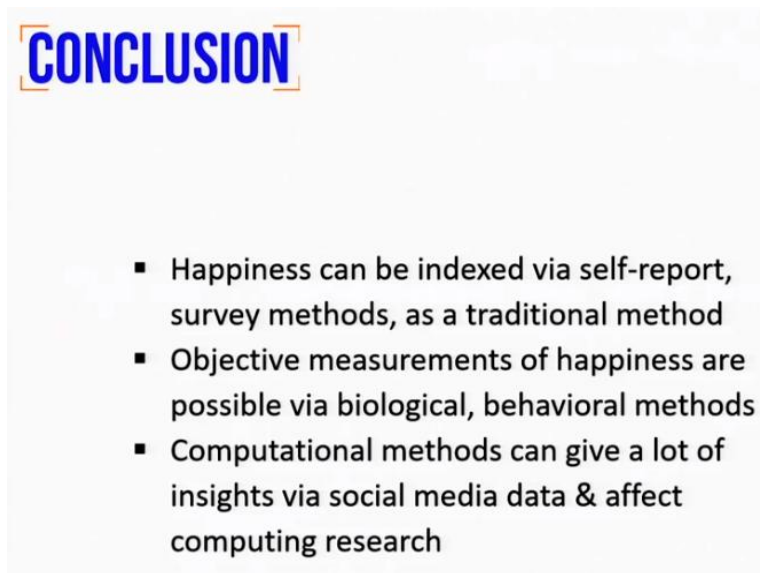
- The prediction urge
- The simplification urge
- Illusory expertise
- Sloppy execution
- Overselling
- Error & bias

Finally there are certain pitfalls of happiness research, the moment we do it we have a prediction urge, to tell that whether the person is becoming happy or not. We have a simplification urge we believe that it is not a rocket science I can easily elicit happiness and I can actually predict about it. Some people without having an expertise in the research methodology start trying to examine it and develop an illusory expertise that is not the real expertise we call its illusory expertise.

Like any other research it also requires lot of experimental control both statistical control and experimental subject and situation control if we fail to do that it would be a sloppy execution. And then happiness researcher more often are interested in overselling that well I understand the customer, I understand the people who are happy, I understand who is the happy child in the classroom.

So I know whether, the patient is improving becoming I mean happier from a depressed state so all these things will come in the form of overselling. So error and bias are more frequent in happiness research remember error is acceptable but bias is not because error is reversible bias is irreversible error. If we are biased towards happiness research then we will never probably get to know the insight about it.

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CONCLUSION

- Happiness can be indexed via self-report, survey methods, as a traditional method
- Objective measurements of happiness are possible via biological, behavioral methods
- Computational methods can give a lot of insights via social media data & affect computing research

Finally, our conclusion is that happiness can be indexed by self-report survey methods as a traditional method. Because these methods are being used for several decades but these days recently we have started using the objective measures of happiness we whether they are through behaviour signature analysis which is called behaviour metric, biological method.

And also the computational methods also have come, into picture where social media data through sentiment analysis and also computer vision research has come into play in a big way to understand how people are experiencing happiness.

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Emotion Measurement
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Understanding Facial Expressions in Communication
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So with all this we would like to give you 2 specific books which will actually give you some idea about what happiness is all about? How it can be measured and I have also referred about my own personal book where we, have referred about how computer vision as well as other techniques can be utilized to understand that what is being intended to be communicated especially happiness thank you so much.