



Recognizing Reader's Affect Using EEG Data

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INTRODUCTION



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Affective Computing

- Relates to, arises from, or influences emotions (Picard, 1997).
- Imbue the computer with emotional intelligence*

*subset of social intelligence that involves the ability to monitor one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions (Salovey & Mayer, 1990)



INTRODUCTION

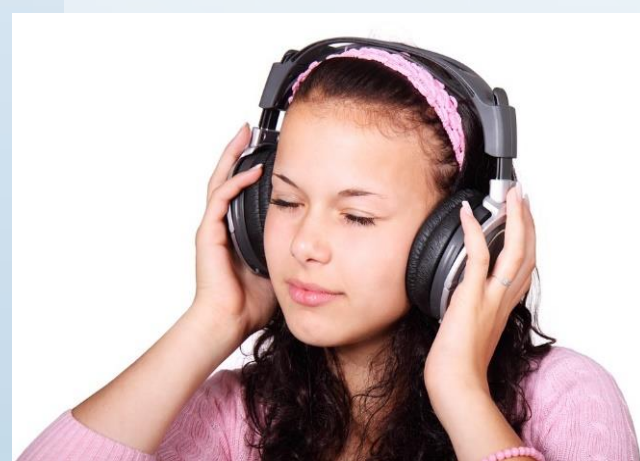
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COMP	Cannot Express Affect	Can Express Affect
Cannot Perceive Affect	[1] Most computers	[2] Synthesis
Can Perceive Affect	[3] Analysis	[4] A true “personal” and “user-friendly” computer

INTRODUCTION

- Apart from facial and vocal expressions, humans naturally read many physiological signals of emotions (Picard, 2000).
- Emotion recognition involves pattern recognition of physiological data, one of which is brainwaves or EEG.



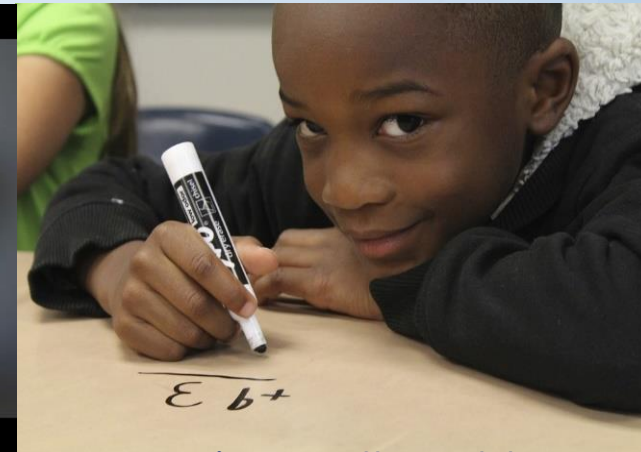
Listening to Music
Lin et al. (2010)



Watching Movies
Nie et al. (2011)



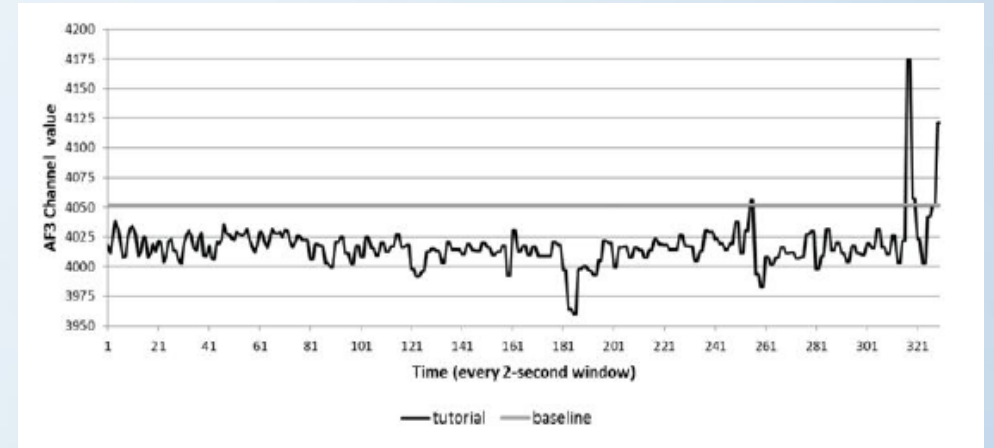
Watching Music Videos
Yazdani et al. (2012)



Answering Math Problems
Azcarraga & Suarez (2012)

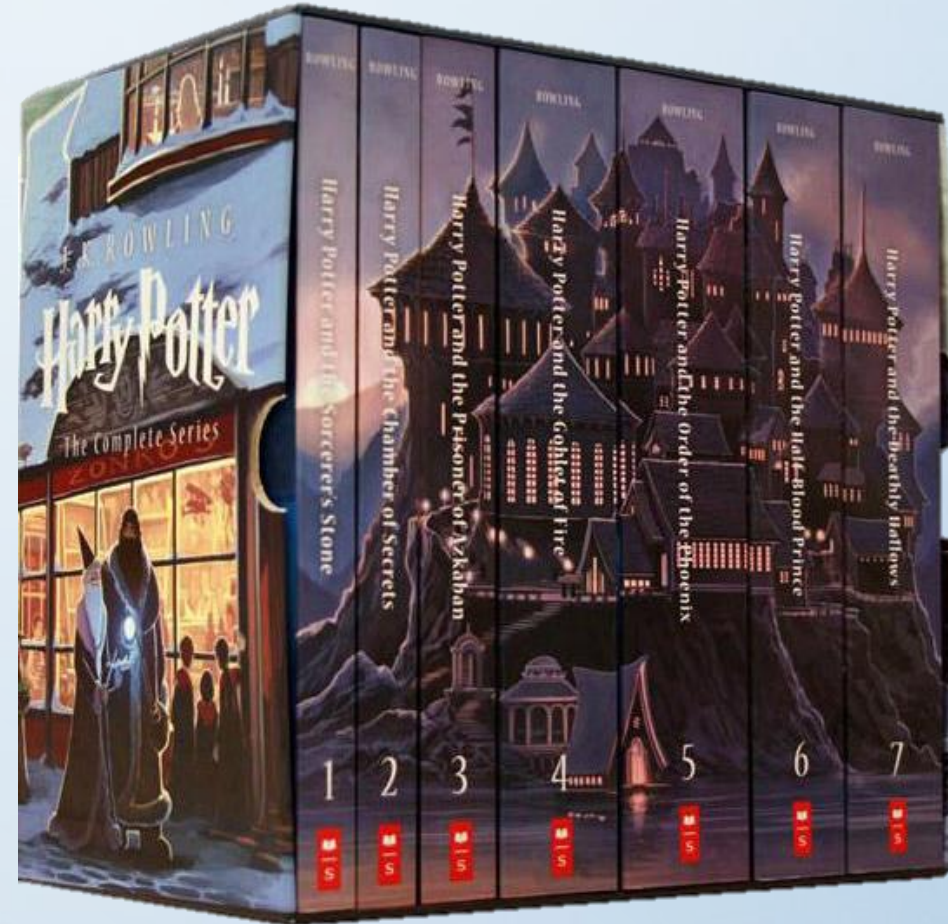
INTRODUCTION

- **Electroencephalography (EEG)**
 - It is the recorded electrical activity generated by the brain (Rossetti & Laureys, 2015).
 - It is an effective means of neuro-imaging because it is a noninvasive and safe procedure which can record in milliseconds.
- **Emotiv Insight**
 - It is a 5-channel, wireless EEG headset that records brainwaves.
 - It is a commercial product marketed worldwide and is **designed for everyday use**.
 - It uses a polymer sensor that is safe to use and offers great electrical conductivity with the convenience of a **dry sensor**.



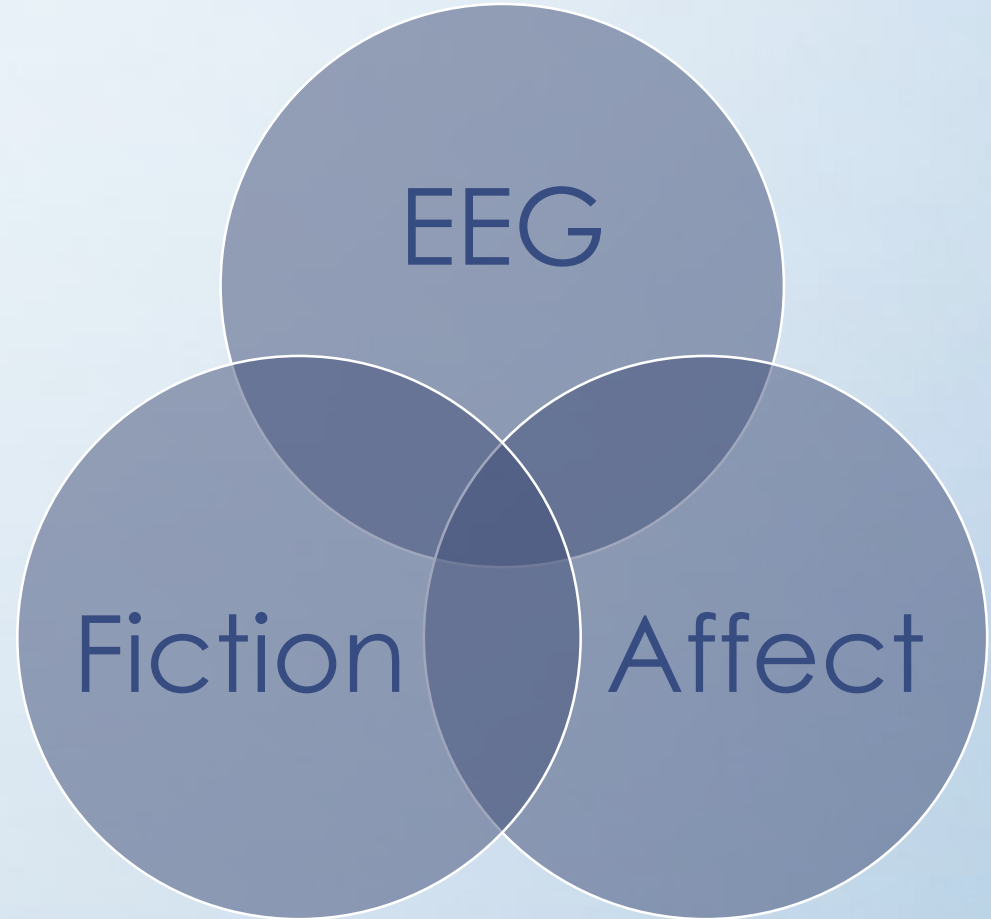
INTRODUCTION

- Reading literary texts or fiction is not simply an activity but rather an experience that is never the same from one reading to the next (Tompkins, 1980).
- Usually, when one reads non-fiction such as academic texts or news articles, the goal is to be informed. Whereas when one reads fiction such as novels, short stories, or poems, the goal is to be entertained and moved (**experience a variety of emotions**) (Mar et al., 2011).



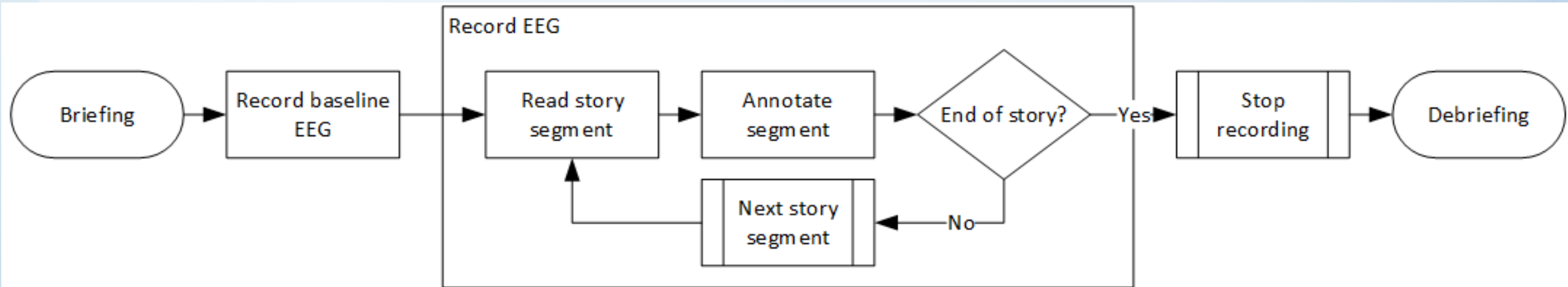
INTRODUCTION

There is no current work that has studied **brainwave patterns** and their association to **affect** while a person is **reading literary fiction**.



DATA COLLECTION (Jan 11-Feb 3 @ G409)

**EXTENDED
UNTIL
FEB 10 😊**




https://tinyurl.com/ReaderAffectModel-Schedule

De La Salle University

Google Calendar

https://calendar.google.com/calendar/selfsched?sstoken=UUJiWTI2b3NBU0ZkfGRlZmF1bHR8Yzg3ZWU1NDc0YmQ4ZTQ5ZDkxMGYzMzdmM2Y3MDM3OTQ

 **DLSU**

Click on an open appointment slot to sign up. If no slots are available, please try a different time range. To cancel an appointment slot you've already booked, leave this sign-up page and delete the event from your own calendar.

Today

Jan 15 – 21, 2017

[Refresh](#)

Day

Week

	Sun 1/15	Mon 1/16	Tue 1/17	Wed 1/18	Thu 1/19	Fri 1/20	Sat 1/21
9am		Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	
10am		Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	
11am		Reader Affect Model Data	11 – 12p Class	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	
12pm		Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	
1pm		12:30p – 1:30p Class	Reader Affect Model Data	12:30p – 1:30p Class	Reader Affect Model Data	Reader Affect Model Data	
2pm		Reader Affect	Reader Affect Model Data	Reader Affect	Reader Affect Model Data	Reader Affect Model Data	
3pm		Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	
4pm		Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	
5pm		Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	
6pm							

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De La Salle University - Google Calendar

https://calendar.google.com/calendar/selfsched?sstoken=UUJiWTI2b3NBU0ZkfGRlZmF1bHR8Yzg3ZWU1NDc0YmQ4ZTQ5ZDkxMGYzMzdmM2Y3MDM3OTQ

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4pm							
5pm		Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	Reader Affect Model Data	
6pm							

Book an appointment

What Reader Affect Model Data Collection

When Mon, January 16, 9:15am – 10:45am

Who

Where G409

Description name@email.com
09xxxxxxxxx

Tip: You can customize the details of the event after you save it.

Save **Cancel**

Challenges in Affective Computing



Rosalind Picard, Sc. D., FIEEE



- Founder and director of the **Affective Computer Research Group** at the **Massachusetts Institute of Technology**
- Notable works in the field of digital signal processing, computer vision, pattern recognition, machine learning, human-computer interaction
- Took a risk and published the book **Affective Computing**, which became so instrumental that it started a new field
- Also helped launch the field of **Wearable Computing**

Affective Computing (1995/1997)

- This is where the term “affective computing” was coined.
- This presented a set of ideas of what Picard’s take is on the significance of having affective computers in assisting humans as well as in decision making.
- Also presented the notion of “affective wearables” which can also be a new source of gathering data.

M.I.T Media Laboratory Perceptual Computing Section Technical Report No. 321

Affective Computing

R. W. Picard

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Abstract

Computers are beginning to acquire the ability to express and recognize affect, and may soon be given the ability to “have emotions.” The essential role of emotion in both human cognition and perception, as demonstrated by recent neurological studies, indicates that affective computers should not only provide better performance in assisting humans, but also might enhance computers’ abilities to make decisions. This paper presents and discusses key issues in “affective computing,” computing that relates to, arises from, or influences emotions. Models are suggested for computer recognition of human emotion, and new applications are presented for computer-assisted learning, perceptual information retrieval, arts and entertainment, and human health and interaction. Affective computing, coupled with new wearable computers, will also provide the ability to gather new data necessary for advances in emotion and cognition theory.

1 Fear, Emotion, and Science

Nothing in life is to be feared. It is only to be understood. – Marie Curie

Emotions have a stigma in science; they are believed to be inherently non-scientific. Scientific principles are derived from

Nor will I propose answers to the difficult and intriguing questions, “what are emotions?” “what causes them?” and “why do we have them?”²

Instead, by a variety of short scenarios, I will define important issues in affective computing. I will suggest models for affect recognition, and present my ideas for new applications of affective computing to computer-assisted learning, perceptual information retrieval, arts and entertainment, and human health and interaction. I also describe how advances in affective computing, especially combined with wearable computers, can help advance emotion and cognition theory. First, let us begin with a brief scenario.

1.1 Songs vs. laws

Let me write the songs of a nation; I don’t care who writes its laws. – Andrew Fletcher

Imagine that your colleague keeps you waiting for a highly important engagement to which you thought you were both committed. You wait with reason, and with increasing puzzlement by his unusual tardiness. You think of promises this delay is causing you to break, except for the promise you made to wait for him. Perhaps you swear off future promises like these. He is completely unreachable; you think what you will say to him about his irresponsibility. But you still wait, because you gave him your word. You wait with growing impatience and frustration. Maybe you waver between wondering “is he ok?” and feeling so irritated that you think “I’ll kill him when he gets here.” When he finally shows, after you have nearly given

“A computer that can express itself emotionally will some day act emotionally, and the consequences will be tragic.”

- Rosalind Picard, 1995

(Dabbles a bit in the realm of science fiction...)

Affective Wearables

- Affective wearables offer possibilities of new health and medical research opportunities and applications.
- A jacket that senses your posture might gently remind you to correct a bad habit after back surgery.
- Wearables that measure other physiological responses can help you identify causes of stress and anxiety, and how well your body is responding to these.
- Wearables that detect your lack of interest during an important lecture might take careful notes for you.



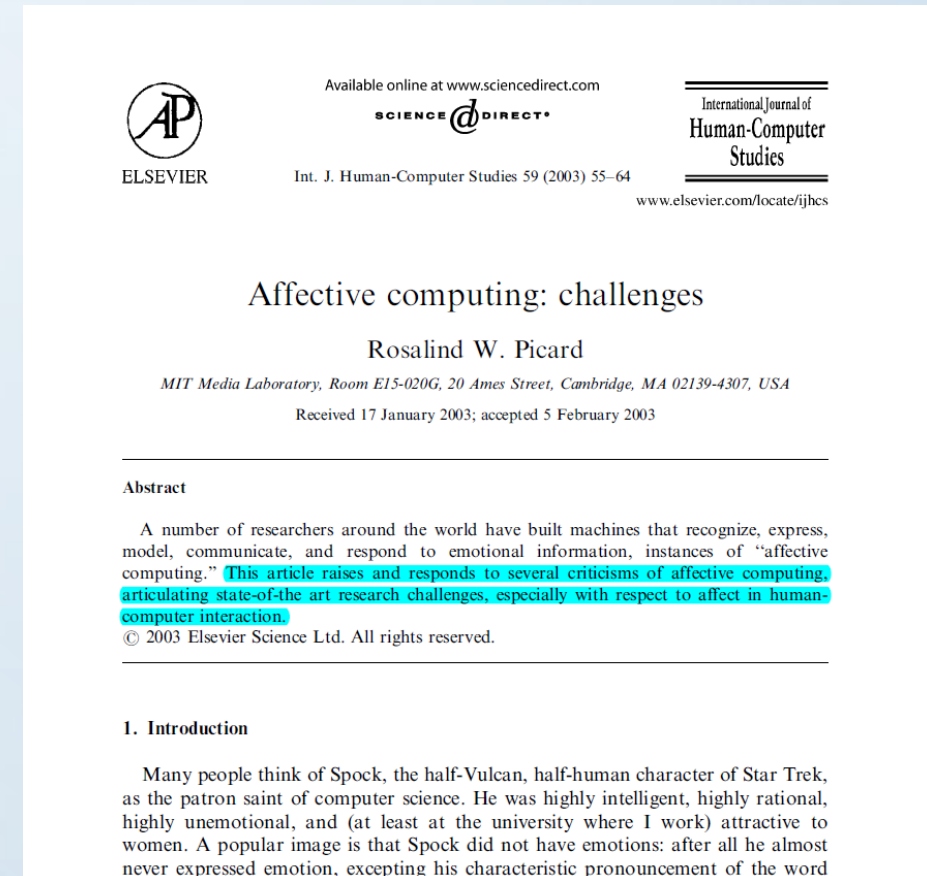
Challenges in Affective Computing

“For an affect recognition system to be accurate, it needs to combine multiple kinds of physiological signals from the user as well as information about the user's context, situation, goals, and preferences.”

- Rosalind Picard, 1997

Affective Computing: Challenges (Picard, 2003)

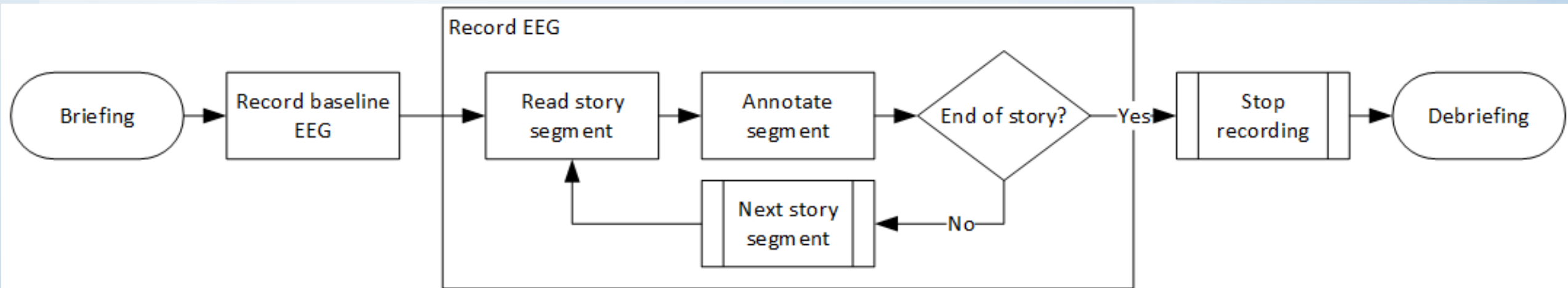
- **Sensors** are expensive, invasive, and/or obtrusive
- Difficulty in gathering **accurate** physiological data due to technical factors such as location where the sensors are applied, how much gel is used for the electrode, has the subject washed hands
- How to “**quantify**” emotions
- Obtaining the **ground truth**
- **Ethical** and **privacy** issues



Factors to consider on gathering **good** affect data

Subject-elicited vs. <u>event-elicited</u>	Does subject purposefully elicit emotion or is it elicited by a stimulus or situation outside the subject's efforts?
Lab setting vs. <u>real-world</u>	Is subject in a lab or in a special room that is not their usual environment?
Expression vs. <u>feeling</u>	Is the emphasis on external expression or on internal feeling?
Open-recording vs. <u>hidden-recording</u>	Does subject know that anything is being recorded?
Emotion-purpose vs. <u>other-purpose</u>	Does subject know that the experiment is about emotion?

The experimental set-up is event-elicited, conducted in a lab setting, concerned with feeling, is open-recorded, and is emotion-purpose.



Yazdani et al. (2012)



<https://tinyurl.com/ReaderAffectModel-Schedule>

<https://tinyurl.com/ReaderAffectModel-ConsentForm>

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Thank you for
listening! 😊

