

Research Article

Comparative use of Tuskegee Syphilis Study Film *vs.* Text Triggers to Teach Bioethics: The Spheres of Ethics Teaching Using Film (SOETUF) College Study

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Key Points:
What is known:
1) Bioethics teaching is critical in medical education use of film engages students
2) Tuskegee Syphilis Study (1932-1972) was worst research abuse in U.S.
3) Qualitative studies show that use of film in education enhances study learning

What this paper adds:
1) Provides quantitative evidence of that use of film enhances student learning in bioethics
2) Provides evidence of a value of a new research instrument: the SOETUF P-T Questionnaire
3) Identifies specifically how film enhances learning in bioethics

ABSTRACT

The overall goal of this study was to determine whether one could demonstrate a measurable difference between the use of film *vs*. text exposure triggers-using documentary materials about the infamous Tuskegee Syphilis Study-in the teaching bioethics to college students using the 36-item 'Spheres of Ethics Teaching Using Film' Post-Trigger (SOETUF P-T) Questionnaire, as developed for this study. The results revealed statistically significant differences between the film *vs*. text groups for the overall Principles of Bioethics Domain-of-Interest (7.3±4.4 *vs*. 5.1±4.4, $p < 0.05$) with the film group scoring higher and for the 23-item 'Emotional Reaction Domain-of-Interest' (ER-DOI) with two of the five emotional components identified by a Principle Component Analysis (PCA), the components of being Content and Aroused, but not for the other three identified components of Unhappy, Afraid or Excited. Moreover, the SOETUF P-T Questionnaire items appeared to have reasonable face validity as revealed by the answer patterns to its range of items. In this study, the SOETUF P-T Questionnaire demonstrated that it could detect meaningful differences in student reaction to a film trigger versus a text trigger about the Tuskegee Syphilis Study in the teaching of bioethics to college students.

Keywords: Bioethics; Education; Biomedical; Teaching methods

Introduction

The medical education literature presents many articles and studies that discuss the value and the importance of using film in teaching bioethics to a variety of health care student groups from around the globe [1-15]. Angelo E Volandes, medical doctor from Massachusetts General Hospital points out that although written or verbal vignettes are useful as a pedagogic tool for teaching ethics and introducing students to real cases, they are limited, since students must imagine the clinical scenario…[while] Film vignettes fill in that imaginative leap. By providing vivid details with images, film vignettes offer rich and textured details of cases, including the patient's perspective and the clinical reality [14]. Moreover, according to Sabine Woehlke and Silke Schicktanz, "movies can be a wonderful starting point to teach bioethics (as)… Teachers can use these popular narratives for bioethical reflection: they provide useful, compelling, and even "cool" case studies for bioethical issues and give fleshed-out interpretations of bioethical claims" [15].

A study proving the same idea that film fills that visual gap missing from reading material is missing was conducted in Bulgaria, used 92 students in management of healthcare to see whether they find any benefit from watching movies when it comes to teaching ethics and concluded that "the introduction of movies in the courses of bioethics had the potential to provide

vivid illustrations of bioethical issues and to contribute to the exploration of specific theses and arguments" [2]. Following the same idea, Stanford Center for Biomedical Ethics has a whole program that uses films in order to teach biomedical ethics-"founded in 1998 by award-winning filmmaker and physician, Maren Grainger Monsen, the Program in Bioethics and Film creates films and education programs that touch people emotionally and intellectually to cause them to think deeply about important issues in healthcare and improve care" [14].

This project, the Spheres of Ethics Teaching Using Film (SOETUF), is the first study that approaches the question of what quantified differences, if any, result from use a of film trigger versus a text trigger in the teaching of bioethics. The study looks at how both the informational and emotional content of books and films, and the difference in the story/information-telling techniques of the two mediums, affect the way students perceive and digest the material presented to them. While teaching medicine, bioethics in particular, using film has been advocated by other people for over 40 years, and the term "cinemeducation" was invented to describe this concept, there has been no cinemeducation study that has directly measured-and quantified-the impact of exposure to film triggers versus text triggers on students' emotional reactions nor on the learning of bioethical principles [1,16,17].

The overall goal of this study was to determine whether there is a measurable impact difference between the use of film *vs*. text-using documentary material about the Tuskegee Syphilis Study-in the teaching bioethics to college students. The specific research questions addressed to answer this overall goal were whether there were any differences in learning outcome between students exposed to a trigger film versus a trigger text on bioethical issues regarding either the impact on the students' emotional reactions or on the bioethical conclusions drawn by the students.

Methods

The research team developed the 'Spheres of Ethics Teaching Using Film' Post-Trigger (SOETUF P-T) Questionnaire for use in this SOETUF Pilot Study to be used after subjects were exposed to a 'bioethics trigger', i.e., either a text or a film that presented bioethical issues about the infamous Tuskegee Syphilis Study. This primary research instrument, the SOETUF P-T Questionnaire, was created to determine whether film versus text triggers that addressed bioethical issues evoked different emotional and/or cognitive responses in student subjects.

The final SOETUF P-T Questionnaire consisted of 36 items in total, including three domains-of-interest (DOI): 1) the 23-item 'Emotional Reaction Domain-of-Interest' (ER-DOI); 2) the 8-item 'Principles of Bioethics Domain-of-Interest (POB-DOI); 3) the 3-item 'Emotional Power, Morality Sense and Justice Sense Domain-of-Interest (EMJ-DOI); and, 4) two demographic items, i.e., age and sex (Appendix A for 36-item SOETUF P-T Questionnaire).

The primary specific aims of this proposed study were to determine whether there are measurable impact differences between the use of film versus text in the teaching of bioethics to college students using the 'Spheres of Ethics Teaching Using Film' Post-Trigger (SOETUF P-T) Questionnaire as measured in college students by the Emotional Reaction Domain of Interest (ER-DOI) Scale or the Principles of Bioethics Domain of Interest (POB-DOI) Scale. The secondary specific aim was to describe any differences in the primary specific aims by se.

The study consisted of New York University at Abu Dhabi (NYUAD) college student volunteers who took the SOETUF P-T Questionnaire after being exposed to one of the two trigger exposures about the USPHS Syphilis Study at Tuskegee (a.k.a., the Tuskegee Syphilis Study): 1) one group (n=41) having viewed the 1991, 52-minute documentary film 'Bad Blood' by Diverse Productions, Ltd. (Bad Blood by Diverse Productions Ltd, 1992), and the other group (n=42) having read (in ~ 45-50 minutes) a slightly edited 1978 printed article describing the USPHS Syphilis Study at Tuskegee by Allan Brandt as published in the Hasting Report Journal [17-20]. All the data were collected in two separate data collection days in the Spring of 2017 in the Social Science Experimental (SSEL) Lab at the NYU Abu Dhabi campus, a computer research facility where 24 computer stations which were loaded with the trigger films as well as the SOETUF P-T on each of the two data collection days. The SSEL Technical and Operational Manager used their SSEL Lab master list of NYUAD college student research volunteers to select a sex balanced set of research subjects for each invited study group. The subjects were each reimbursed at the rate of 150 AED (Emirati dirhams, ~$40.55 U.S.) for their 1.5 hours of participation which included viewing the trigger and completing the SOETUF P-T Questionnaire. For this first use of the SOETUF Questionnaire, a sample size of 85 total students was targeted, based upon the maximal use of the available research funds.

When viewing the trigger film 'Bad Blood' the student volunteers used high quality head-phones for the audio aspect and viewed the film on computer video display of 1500*844 pixels on high quality monitors with a maximum resolution quality of 1920*1200 pixels. The films were shown with a video aspect ratio of 16:9, as universally used for high definition television as well as for YouTube display of movies.

The SSEL staff developed and maintained computer screen formatted questionnaires for the SOETUF P-T Questionnaire and delivered the data in Excel files from each of the completed data collection sessions within a 2-week period by a secure means. These data were then de-identified and converted into SPSS (v24) files. The study required written informed consent and was approved by the NYUAD IRB as an Expedited Review category study.

The primary statistical analysis for each of the two primary specific aims used ANOVA on the mean scores of the respective two Domains of Interest (the ER-DOI and the POB-DOI) between the group exposed to the film trigger *vs.* the group exposed to the text trigger. For all 8 items in POB-DOI that were retained for the final analysis, scores were reversed, as needed, to ensure that on the 5-point 0-4 scale for each time, a score of 4 meant 'highest fulfillment' of that bioethical principle and a score of 0 meant 'lowest fulfillment' of that bioethical principle. ANOVA analysis was also used to study the effect of sex on the two primary specific aims. In addition, a Principal Component Analysis (PCA) was used to identify the principal

components within the 23-items of the 'Emotional Reaction Domain-of-Interest' (ER-DOI). All analyses were conducted using SPSS v24.

Results

The age and sex distribution of the 83 volunteer college students from the NYU Abu Dhabi baccalaureate program who participated as subjects were similar for each trigger exposure group, with the film trigger group (n=41) having a mean age of 20.8 (± 1.6) years with 46.3% being female and the text trigger group (n=42) having a mean age of 21.0 (± 1.7) years with 50.0% being female.

The mean POB-DOI scores for the film exposure trigger group *vs*. the text exposure trigger group for the overall POD-DOI and for each its eight component items grouped within the four principles of bioethics, i.e., autonomy, beneficence, non-maleficence, and justice (Table 1). As can be seen, the film exposure trigger group scored higher than the text exposure trigger group on the overall POB-DOI (7.3 ± 4.4 *vs.* 5.1 ± 4.4, $p<0.05$) on a scale of 0-32. As can also be seen, this statistically significance difference was largely due to the observed difference on the two beneficence subset items (where the differences observed achieved statistical significance or borderline statistical significance), although-for each of the other six subset items on autonomy, non-maleficence and justice-the universal pattern showed a higher (albeit non-statistically significant) POB-DOI score for the film exposure trigger group.

The data reveal that while exposure to either the film trigger or the text trigger resulted in equally high overall EMJ-DOI scores (10.0 ± 2.3 *vs*. 9.9 ± 2.0) on a scale of 0-12, there were also no differences detected between the film exposure trigger group and the text exposure trigger group for any of the component parts of the EJM-DOI, i.e., neither the emotional power of the story on them, nor the arousing of a sense of injustice, nor a violation of their sense of morality (Table 2).

The comparison of the 23-items in the Emotional Reaction Domain of Interest (ER-DOI) component of the SOETUF P-T Questionnaire for the film exposure trigger *vs*. the text exposure trigger groups (Table 3). One major observation on the data from these twenty-three emotion items is that, on the 5-point scale used, the nine emotions of frustrated, sadness, disturbed, anger, irritated, worried, uncomfortable, pessimistic and hopeless scored high (i.e., a mean score between 2.4-4), while another set of seven emotions (such as pleasure, joy, happiness, optimistic, energetic, aroused, and satisfied) scored very low, i.e., a mean score 0.1-0.6. The remaining seven emotions of anxious, intimidated, scared, fearful, terrified, frightened and threatened had mean scores between 1.3 and 1.9.

The analysis of the 23 emotions comprising the ER-DOI for the film exposure trigger group *vs.* the text exposure trigger group revealed that for five emotions, the film exposure trigger group had higher mean scores, with two of them-the emotions of hopeless (2.1 *vs.* 1.8, respectively) and of satisfied (0.3 ± 0.6 *vs.* 0.1 ± 0.3, respectively)-being statistically significant at $p>0.05$, while three emotions (frustrated, sadness and worried) achieved borderline significance (a p-value between 0.06-0.10) with scores of 3.2 ± 0.9 *vs.* 2.8 ± 1.3, 3.1 ± 1.0 *vs*. 2.7±1.2 and 2.8 ± 1.0 *vs*. 2.3 ± 1.3 for the film vs text triggers, respectively) (Table 3). Conversely, two emotions-aroused and energetic-had statistically significant higher mean scores for the text exposure trigger *vs*. the film exposure trigger (0.7 ± 1.0 *vs.* 0.2 ± 0.5 and 0.7 ± 0.9 *vs*. 0.4 ± 0.7, respectively). For the other 16 emotions,

Table 1: Comparison of the POB (Principles of Bioethics)-DOI mean scores1,2 between the college students exposed to the film trigger vs. exposed to the text trigger for the total POB Scale and each its eight component items.

Bioethics Principles	Trigger Group	Mean score (± s.d.)	Eta
Autonomy #1 (*range 0-4*)[1]	Film Exposure Text Exposure	1.4 (± 1.4) 0.9 (± 1.3)	0.19
Autonomy #2 (*range 0-4*)	Film Exposure Text Exposure	0.9 (± 1.2) 0.7 (± 1.1)	0.10
Beneficence #2 (*range 0-4)*	Film Exposure Text Exposure	0.7 (± 1.2)* 0.2 (± 0.6)*	0.29
Beneficence #2 (*range 0-4*)	Film Exposure Text Exposure	1.2 (± 1.3)** 0.7 (± 1.0)**	0.21
Non-maleficence #1 (*range 0-4*)	Film Exposure Text Exposure	0.4 (± 0.7) 0.3 (± 0.7)	0.08
Non-maleficence #2 (*range 0-4*)	Film Exposure Text Exposure	1.3 (± 1.3) 1.2 (± 1.3)	0.02
Justice #1 (*range 0-4)*	Film Exposure Text Exposure	0.2 (± 0.6) 0.1 (± 0.5)	0.05
Justice #2 (*range 0-4)*	Film Exposure Text Exposure	1.1 (± 1.5) 0.9 (± 1.4)	0.07
TOTAL POB-DOI Scale Scores (Range: 0 – 32)[2]	Film Exposure Text Exposure	7.3 (± 4.4)*** 5.1 (± 4.4)***	0 .24

1scoring scale 0-4: 4=highest Bioethics Principles with 0=lowest Bioethics Principles
2scoring scale 0-32: 32=highest Bioethics Principles with 0=lowest Bioethics Principles
*statistically significant at p=0.01
**borderline statistically significant at p=0.055
***statistically significant at p=0.03

the data show virtually no numerical (much less statistically significant) differences reported by the film *vs.* text exposure trigger groups.

Overall, for all 83 subjects (i.e., combining all subjects for both trigger exposures) only 3 of 23 emotions showed a statistically significant difference (at p>0.05) by sex. Males indicated a stronger emotional score for 'satisfied' (0.3 ± 0.6 *vs*. 0.1 ± 0.3) and 'happiness' (0.2 0.5 *vs.* 0.1 ± 02) although both sexes were at the extreme low end of the 0-4 scale on these two emotions. For the third emotion with a statistically significant gender difference, females indicated a stronger emotional score on 'worried' (2.9 ± 1.2 *vs.* 2.2 ± 1.1).

The final statistical analysis of these 23 emotions consisted of a Principal Component Analysis (PCA) for the mean scores for the combined film + text exposure trigger groups (n=83) to identify clustered subsets of these 23 emotion terms (Tables 4 and 5). As the Kaiser-Meyer-Olkin (KMO) Test for Sampling Accuracy rated the sample at .83 (i.e., a good rating level), and the data set passed the Bartlett's Test, the PCA analysis proved to be robust. The PCA identified 5 components using the Varimax with Kaiser Normalization Rotation Method with the rotation converged in 6 iterations with a cut-off point set at 0.50 for component loadings (Table 4). Component 1 consisted of eight emotions (in descending order: frustrated, sadness, anger, disturbed, worried, irritated, uncomfortable and pessimistic) and was labeled Unhappy. Component 2 also consisted of eight emotions (fearful, scared, terrified, frightened, threatened, intimidated, anxious and hopeless) and was labeled Afraid. Component 3 consisted of 4 emotions (pleasure, optimistic, energetic and happiness) and was labeled Excited, while Component 4 had only two emotions (satisfied and joy) and was labeled Content. Component 5 had but a single emotion (aroused) and was labeled Aroused.

The only statistically significant findings among these five labeled PCA components between the film exposure trigger group and the text exposed trigger group were for the Content and the Aroused components (Table 5). For the Content component (which had a scale range of 0-8 as it was comprised of two emotions), while both groups scored it on the lower end of the scale, the text trigger group reported less more content, at a statistically significant level of 0.03. Conversely, for the Aroused component (which had a scale range of only 0-4 as it was comprised of only one emotion) the text trigger group reported being more aroused at a statistically significant level of 0.01. These observed statistical differences for the PCA components of Content and Aroused remained after adjusting for sex with females having lower scores on the Content component (0.08 ± 0.27 *vs*. 0.40 ± 0.88) and higher scores on the Aroused component (0.48 ± 0.91 *vs*. 0.40 ± 0.88) [21].

Discussion

This study confirmed that the SOETUF P-T Questionnaire could detect differences in bioethical judgments and emotions after exposure to film *vs*. text triggers in college students and identified a subset of five emotions within the 23 emotion reactions items that can be used to construct hypotheses for testing in future studies.

The SOETUF P-T Questionnaire did detect differences in both of the primary specific aims. In the Emotions Reaction Domain of Interest (ER-DOI), seven of the 23 listed emotions were identified at different levels of intensity between the film *vs*. text trigger groups (Table 3). In addition, the overall range of level of intensity for the 23 emotions were spread well over the 5-point scale ranging from mean scores of 0.1 to 3.2. Moreover, this spread over the emotion intensity scale appeared, on face content validity, to be both reasonable and appropriate given the horrific nature of the bioethical story that was the focus of both the film and the text triggers. Specifically, the seven emotions rated at very low intensity (i.e., a mean score of <0.7 for both film and text) were pleasure, joy, happiness, satisfied, optimistic, aroused and energetic, while the nine emotions rated at the other end of the intensity scale (with a mean score of >2.4) were disturbed, frustrated, sadness, anger, irritated, worried, uncomfortable, pessimistic, and hopeless.

For the other primary specific aim that addressed the Principles of Bioethics Domain of Interest 'POB-DOI', the text exposure trigger group reported a statistically significant lower score on the overall 'POB-DOI' (mean score of 5.1 *vs*. 7.3 for the film exposed group) indicating that the text exposed student group identified more serious breaches of bioethical principles than did the film exposed student group (Table 1). This overall difference detected in the 'POB-DOI' was due to two mathematical factors: 1) the result of a statistically significant 3.5-fold difference in the subset of two 'POB-DOI' questions on the principle of beneficence (mean scores of 0.7 and 1.2 for the film exposed group *vs*. respective scores of 0.2 and 0.7 for the text exposed group); and, 2) the overall consistent trend in which the text group had lower, albeit not statistically significant, scores for each of the six items on the three remaining principles of bioethics: autonomy, non-maleficence and justice.

Additionally, it is worthwhile to note that the overall mean 'POB-DOI' scores for both the text and film group (5.1 and 7.3, respectively, on a scale that scored from 0- 32) indicated the students' judgment-regardless of trigger exposure-that the story

Table 2: Comparison of mean EMJ-DOI scores1 for emotional power of the story, sense of injustice and sense of morality between the college students exposed to the film trigger vs. exposed to the text trigger.

Trigger Exposure	Emotional power of the story (± s.d.)	Sense of injustice (± s.d.)	Sense of morality (± s.d.)
Film Exposure (n=41)	3.2(± 0.9)	3.4(± 0.8)	3.4(± 0.9)
Text Exposure (n=42)	3.1(± 0.8)	3.4(± 0.8)	3.5(± 0.7)
p value	*p=0.53*	*p = 0.85*	*p=0.83*

[1]scoring scale of 0-4:0=weakest feeling/sense, and 4=strongest feeling/sense

Table 3: Comparison of mean scores1 for the 23 emotions between subjects exposed to the film trigger vs. exposed to the text trigger on the SOETUF P-T Questionnaire.

Emotion	Film Trigger (± s.d.)	Text Trigger (±s.d.)	Statistical Significance
Stronger for FILM trigger:			
Hopeless	2.4(±1.1)	1.8(±1.3)	p<0.05
satisfied	0.3(±0.6)	0.1(±0.3)	p<0.05
frustrated	3.2(±0.9)	2.8(±1.3)	borderline*
sadness	3.1(±1.0)	2.7(±1,2)	borderline*
worried	2.8(±1.0)	2.3(±1.3)	borderline*
Stronger for TEXT trigger:			
aroused	0.2(±0.5)	0.7(±1.0)	p<0.01
energetic	0.4(±0.7)	0.7(±0.9)	p <0.05
No statistically significant difference between FILM vs TEXT triggers: (ranked by strength felt)			
disturbed	3.1(±1.0)	3.1(± 0.8)	n.s.
anger	3.0(±1.1)	2.7(± 1.3)	n.s.
irritated	2.9(±1.1)	2.7(± 1.3)	n.s.
uncomfortable	2.6(±1.1)	2.4(± 1.1)	n.s.
pessimistic	2.6(±1.2)	2.5(± 1.2)	n.s.
anxious	1.9(±1.2)	1.9(± 1.4)	n.s.
intimidated	1.8(±1.4)	1.3(± 1.3)	n.s.
scared	1.7(±1.3)	1.5(± 1.3)	n.s.
fearful	1.6(±1.3)	1.6(±1.3)	n.s.
terrified	1.4(±1.3)	1.4(±1.3)	n.s.
frightened	1.3(±1.3)	1.7(±1.4)	n.s.
threatened	1.3(±1.3)	1.4(±1.4)	n.s.
optimistic	0.6(±0.9)	0.5(±0.8)	n.s.
happiness	0.2(±0.5)	0.1(±0.4)	n.s.
joy	0.1(±0.2)	0.0(±0.2)	n.s.
pleasure	0.1(±0.3)	0.0(±0.2)	n.s.

1 scoring scale: 4=very strong
3=strong
2=moderate
1=weak
0=not at all

violated bioethical principles, i.e., had 'POB-DOI' scores toward the lower end of the score range. Further it should be noted that while the SOETUF P-T Questionnaire did not detect any difference between the film trigger and the text trigger regarding the emotional power of the story, the sense of injustice aroused or in the sense of their morality having been violated, the mean scores for each of these three measures of impact were uniformly high, achieving mean scores ranging from 3.1-3.5 on a 4-point scale for both the film and text trigger groups (Table 2).

The Principal Component Analysis (PCA), conducted on the 23 items of the listed emotion reactions to achieve pattern recognition and data reduction in that set of 23 items for the overall SOETUF P-T Questionnaire for the combined film and text trigger groups, identified 5 components, or groupings, among those 23 emotions based on eigenvalues of less than one and inspection of the scree plot. The first grouping, which by PCA definition explains the most variance in the overall 23 emotion set of variables, was labeled as Unhappy consisted of eight emotions (in descending order: frustrated, sadness, anger, disturbed, worried, irritated, uncomfortable, and pessimistic). The second grouping, which then explained most of the remaining variance among the emotions, was labeled as Afraid also consisted of eight emotions (fearful, scared, terrified, frightened, threatened, intimidated, anxious and hopeless). The remaining three groupings, or components, labeled as Excited, Content and Aroused as described above in the results, then in descending order explained the remaining variance in the emotions data set (Table 4).

These five identified PCA components best fit the model of emotion groupings proposed by James A. Russell, a renowned

Table 4: Principal Component Analysis1 (PCA) of the 23 emotions on the SOETUF Post-Trigger (P-T) Questionnaire for the combined subjects (n=83) in the both the film and text trigger groups of college students.

	Component				
	1	2	3	4	5
	Unhappy	**Afraid**	**Excited**	**Content**	**Aroused**
uncomfortable	0.654	0.230	-0.036	-0.091	0.306
disturbed	0.704	0.140	-0.088	-0.101	0.217
worried	0.689	0.397	-0.044	-0.102	-0.014
satisfied	-0.226	-0.047	0.235	0.798	-0.131
energetic	-0.015	0.107	0.655	-0.068	0.455
happiness	-0.259	0.043	0.633	0.331	-0.030
aroused	0.088	0.008	-0.072	0.051	0.854
joy	-0.100	0.024	0.331	0.776	0.213
pleasure	-0.080	-0.020	0.848	0.086	0.095
optimistic	0.003	0.000	0.758	0.324	-0.129
pessimistic	0.530	0.321	-0.023	-0.201	0.025
sadness	0.852	0.244	-0.148	-0.026	0.017
frustrated	0.872	0.204	-0.018	-0.028	-0.054
hopeless	0.473	0.527	-0.210	0.153	-0.194
intimidated	0.289	0.702	0.118	-0.059	-0.119
anger	0.815	0.218	-0.026	-0.002	0.010
scared	0.223	0.858	0.026	-0.072	-0.143
anxious	0.456	0.597	-0.132	0.155	0.137
fearful	0.224	0.866	-0.074	0.065	-0.005
threatened	0.133	0.798	0.183	-0.251	0.031
frightened	0.300	0.805	-0.018	0.035	0.258
terrified	0.223	0.844	0.028	0.060	0.172
irritated	0.681	0.160	-0.057	-0.171	-0.111

[1]Using the Varimax with Kaiser Normalization Rotation Method with the rotation converged in 6 iterations with a cut-off point set at 0.50 for component loadings.

Table 5: Comparison of mean scores for the 5 identified PCA component groupings of the 23 emotions in the Emotional Reactions Domain of Interest (ER-DOI) between the film exposure (n=41) versus text exposure (n=42) trigger groups.

PCA component groupings label	Trigger Group	Mean scores(±s.d.)	Statistical Significance	Statistical Significance adjusted for sex
Unhappy	Film	23.2(±6.2)	0.20	0.17
	Text	21.3(±7.7)		
Afraid	Film	13.2(±8.2)	0.75	0.75
	Text	12.6(±8.7)		
Excited	Film	1.2(±1.9)	0.69	0.64
	Text	1.4(±1.8)		
Content	Film	0.4(±0.8)	0.03**	0.03**
	Text	0.1(±0.4)		
Aroused	Film	0.2(±0.5)	0.01**	0.01**
	Text	0.7(±1.1)		

** statistically significant

research psychologist, who mapped emotion on a two-dimensional plane, with positive-negative valence on one axis (pleasure versus displeasure) and high-low energy on the other (activation versus deactivation). Using the Russell mapping model, the unhappy component represents displeasure with lower activation, and the afraid component represents displeasure with higher activation. For the two positive components, Excited represents pleasure with higher activation, and Content represents pleasure with lower activation. While the remaining Aroused component is usually interpreted in the Russell Model as representing sexual energy, given that the subject matter that both the film and text trigger groups were exposed to was the horrific bioethical abuse story of the USPHS Syphilis Study at Tuskegee, aroused in this case might more likely be interpreted as being 'aroused to action'.

Only the Content component and the Aroused component of these five PCA components were detected to be statistically different between the film versus text exposure trigger groups.

The mean scores for Content reveal that the text exposure group was much less likely to 'be content' after the exposure (a mean of 0.1 *vs.* a mean of 0.4) although both groups reported being at the lower end of the 8-point scale range. Thus, neither group was 'content' upon exposure, the text group less so. Conversely, for the Aroused component, the mean scores indicated that the text group was more aroused. Thus the two statistically significant differences detected in the five PCA components indicated that the text exposed trigger group was less content and more aroused than the film exposed trigger group. After adjusting for sex, both the Content and Aroused components remained statistically significantly different for the film versus text trigger groups.

The limitations of this study must be borne in mind as one tries to generalize from these findings, for this was the first use of the SOETUF P-T Questionnaire. All findings must be considered as 'first look' type data. Further, as the first application of the SOETUF P-T Questionnaire, the findings must be seen-at this very early stage of investigation-as being highly specific to the one Tuskegee Syphilis study documentary film used and the one Tuskegee Syphilis Study written text used as exposure triggers. Care, at this stage, must be taken not to generalize the findings of this pilot study to broadly hold for 'films *vs.* text' comparison until subsequent studies have explored that statement by using a variety of film and text triggers on bioethical emotions and principles. Finally, the unique nature of the college student body at the NYU Abu Dhabi campus must be keep in mind as a caution against generalizing the findings of this pilot study as the 83 student volunteers to serve as study subjects were attracted from a total student body where each entering class of ~300 comes from 75-85 different countries. This international student body is truly 'global' in background and culture, undoubtedly another factor to control in future research applications of the SOETUF P-T Questionnaire to enhance generalization to identified specific cultures. Finally, the last limitation is that as there have been no previous studies reporting on a direct comparison of reactions, emotional impact or bioethical principles learned between film *vs*. text triggers, we cannot compare our pilot findings to any prior published work, thus limiting our capability for putting our results into a broader context using comparative published literature.

Future plans for pursuing this line of investigation include administering the SOETUF P-T Questionnaire, using these same two specific trigger exposures, to geographically and culturally identifiable sets of high school students to explore and contrast the impact of 'film *vs*. text' on the teaching of bioethics to high school students across various cultures and regions. Other plans include introducing other films and other texts into the same research design to determine whether there are generalizable consistent patterns as to the reactions of high school students to film *vs*. text triggers.

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