Differentiation in Personality Emotion Mappings From Self Reported Emotion and Automatically Classified Emotion

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Abstract. How does the relationship between personality traits and the basic emotions vary across the modalities of self-report and facial expression analysis? This article presents the results of an exploratory study that quantifies consistencies and differences in personality-emotion mappings across these two modalities. Twenty-four participants answered a personality questionnaire before watching twelve emotionally provocative videos. Participant's self-reported their emotional reactions per video, while their facial expressions were being recorded for automated emotional analysis. The results indicated that overall there was greater consistency than differences in personality-emotion mappings across the two modalities. The robustness of this relationship enables direct applications of emotional-state-to-personality-trait in academic and industrial domains.

Keywords: Personality · Five-Factor Model · Emotion · Facial Expression Analysis · Multimodal.

1 Introduction

Cognitive science has shown that the functioning of both personality and emotion is necessary for positive well-being [1] [2]. Personality represents the idiosyncratic way we perceive, feel, and interact with the world. It is a psychological system that structures one's desires, goals, and our methods for fulfilling our wants and attaining our goals in the medium to long-term [3]. Emotions had historically been considered as an impediment to clear thinking and action. However, emotions guide our thoughts, behaviour, feelings, and motivation towards stimuli that can satisfy our needs and desires in the present; emotions are signposts towards our destination, not obstacles [4]. People with a malfunctioning personality are aimless; people with malfunctioning emotions are chaotic.

There exists a wealth of research that has investigated the phenomena of personality and emotion [5] [6]. However, only in a small proportion on such research has focused on how these two phenomena interact with one another. The results of such research showcase that there exists a quantifiable link between

personality and emotion [7]. The existence of this relationship enables potential applications in the domains of academia (e.g. understanding the affective nature of our personality), clinical care (e.g. personality-based screenings for the onset of affective disorders), occupational and marketing (e.g. personalised content and services).

However, whilst the potential for applying personality-emotion mappings in practical domains is exciting, there is a need to assess the robustness and generalisability of this relationship. If emotions are a reliable indicator of personality (or vice versa), then it needs to be demonstrated that this relationship is robust across important factors [8]. Otherwise, the effectiveness of such applications will be erratic and imprecise.

In terms of generalisability, an important factor is the modality of emotional expression, e.g. subjective self-report and facial expressions. Research methodology for assessing personality, emotion, and their relationship is largely reliant on self-report-based questionnaires. From a researcher's point of view, self-report-based questionnaires are cost-effective and quick to administer. However, this reliance on questionnaires can weaken the validity of results in cases where repeated self-report is required per participant (e.g. "retest artifact" effects [9]) and where it is an obstacle to recruiting participant due to the time taken to complete such questionnaires. If the results from self-report-based questionnaires can generalise across modalities, then this enables alternative and automatic methods of data capturing that requires minimal input from participants, even in repeated sessions.

How consistent are emotional-state-to-personality trait mappings converge across multiple modalities? This paper describes an exploratory research experiment that investigated this question. The experiment investigated the level of consistency of personality-to-emotion mappings across the modalities of self-report and facial expressions. If it can be shown that there exists a large degree of consistency with self-reported and automatically extracted emotions, then this fortifies the concept of "state-to-trait" mappings as a usable tool [7].

Personality was conceptualised as personality traits, which are the typical expressions of cognition, behaviour, affect, and motivation across time [10]. The bedrock model of personality traits is the Five-Factor Model (FFM), which categorises personality across five broad traits: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism [11]. Emotion was conceptualised as the basic emotions, which are a group of distinct emotions that are reliably indicated by psychological, behavioural, and physiological signals. The basic emotions considered in this article are Anger, Disgust, Fear, Joy, Sadness, and Surprise [12].

The research study utilised a machine learning-based detection platform, Emotion Viewer [13], to automate the classification of facial expressions. Emotion Viewer analyses real-time video to automatically classify emotions via facial expressions from video recordings of participants taking part in the study. Facial landmarks are defined as the detection and localization of certain key points on a human face. The Emotion Viewer was trained on two data sets (Cohn-

Kanade and Multimedia Understanding Group) to detect the basic emotions. The Emotion Viewer was then tested with real-time video clips resulting in an average accuracy of 88.76% per basic emotion [13]. The Emotion Viewer provided a strong foundation for analysing differences between personality-to-emotion mappings.

The paper is structured in the following manner. Section 2 describes the experiment's methodology in terms of the design, participant pool, materials used, and procedure. Section 3 presents the results for descriptive and inferential statistical analyses. Section 4 discusses the results in the context of the research question. Section 5 concludes the paper and provides recommendations for future research in this area.

2 Method

The experimental method adopted generated a range of interesting results worthy of publication. Experimental results quantifying the links between personality traits and basic emotions via self-reported emotions were published in [7]. In this paper, the work is extended to include analysis of automated emotion categorisation. The work focuses on the differentiation in emotion-personality mappings between self-reported emotions and automated emotion detection from facial expressions.

2.1 Participants

The sample consisted of 24 participants (n = 24, females = 16, males = 8, M-age = 31.96, SD = 13.73) from a subset of 38 participants. The age range of the sample (range = 19-63) is larger than in most social science research, which tends to primarily consist of 18-23 undergraduate students.

2.2 Materials

Emotions Scale - A Likert-scale was created for the purposes of this study. Participants were asked to answer the question "While watching the previous video, to what extent did you experience these following emotions? Please use the following scale in your self-assessment: 1 = Not at All; 2 = A little bit; 3 = Moderately; 4 = A lot; 5 = A great deal/an extreme amount". This scale was designed to capture the experience of each emotion, but not the level of valence or arousal. Participants completed the scale 12 times each, consisting of 84 questions overall (with alpha = .95). Each individual emotion was assessed 12 times throughout the duration of the study: Anger (alpha = .80), Disgust (alpha =.83), Fear (alpha = .85), Sadness (alpha = .76), Joy (alpha =.66), Surprised (alpha =.88).

Personality Questionnaire - The Big Five Aspects Scale is a reliable measure for Big Five traits and their associated sub-traits [13]. The scale is composed of 100 questions. The results showed that scale had satisfactory

test-retest reliability across each FFM trait: Openness to Experience (0.81), Conscientiousness (.85), Extraversion (.85), Agreeableness (.74), Neuroticism (0.85).

Technology - Participant's reactions were recorded with the camera of a 2015 MacBook Pro, which included a 1080p web-camera. The software, Screen-Cast-O-Matic, was used in order to both record the participant and the MacBook screen simultaneously. Participants were also given a pair of Bose QuietComfort Noise-Cancelling Headphones to wear whilst watching the videos.

Emotional Stimuli - Previous research by independent groups have demonstrated that video clips from movies and TV shows are a reliable method for evoking emotional reactions [14] [15] [16].
Twelve video clips were used in this experimental design. Nine of those video clips were chosen based on prior research demonstrating their ability to evoke emotional reactions. Three new video clips were also selected - the rationale being that the nine tested video clips provided a solid foundation to empirically evaluate new stimuli. The overall list for the videos is presented in Table 2, along with the clip's length and the expected emotional reaction it would elicit.

Emotion Viewer - The Emotion Viewer analyses real-time video to automatically classify emotions using a machine learning supported support vector machine. Figure 1 depicts a demonstration of the tool in operation. The tool comes with three options: track face, track expressions, and to set the voting count. The first two are required to enable facial expression analysis. The voting count refers to the amount of consecutive classified emotions on a frame-by-frame basis required to register a particular emotion. The voting count for this research study was set to 10, which is the highest supported by the Emotion Viewer. This means that for the Emotion Viewer to output an emotion classification (for this example, Anger) it would require 10 consecutive frames where it detected the emotion Anger. This represented a conservative approach and was chosen to reduce the risk for Type 1 errors. More information on the design of the Emotion Viewer is available from [13].

2.3   Procedure for Participants

Participants initially filled out a demographic information form online, which included questions regarding their age, gender, nationality, and previous experience with psychometric tests. Participants were then invited to the laboratory stage of the experiment, provided they fit inclusion criteria for the study (over 18 years of age and have not been diagnosed with an affective disorder).

In the first part of the laboratory stage, participants completed the Big Five Aspects scale questionnaire, which on average took about 15 minutes to complete. In the second part of the laboratory stage, the researcher set up the video recording on the MacBook Pro. Given that participants varied in height, there
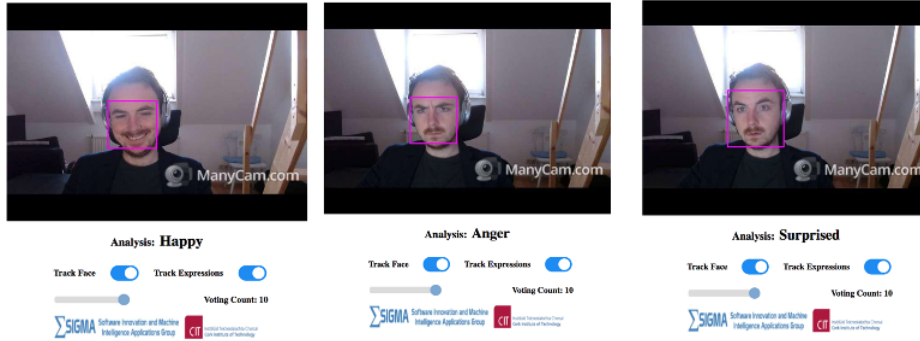
Fig. 1. The Emotion Viewer Platform. Examples shown are of automated emotional analysis of Joy (Happy), Anger, and Surprise

had to be a manual check to ensure that each participant's face occupied the camera frame. Once this was settled, the researcher would leave the room, and the participants watched 12 video clips always in the same order (see Table 2). Participants were alone when viewing videos to elicit a more natural reaction and to prevent the participant from feeling self-conscious about their response. Participants were given a pair of noise-cancelling headphones whilst watching the videos, to help immerse themselves in the video. After each video, participants completed a short emotion questionnaire, asking how they felt whilst watching the video clip. Overall, the study took a participant 1 hour to complete.

3 Results

This section presents the key descriptive and inferential statistics from the study in relation to the level of differentiation between mappings between personality and emotions across modalities.

3.1 Descriptive Statistics

Emotions - Participants did not seem to experience a dominant emotion throughout the study. The mean and standard deviations for both self-report and automatically classified emotions are presented in Table 1.

Self-Reported Emotions per Video Clip - Table 2 presents the mean and standard deviation for self-reported emotional reactions per video clip.

Personality Self-Reported Scores - The descriptive statistics for self-reported personality scores are presented in Table 3.

Emotions	M	SD	Emotions	M	SD
A-Anger	1.96	1.15	SR-Anger	1.92	0.55
A-Fear	1.93	1.27	SR-Fear	2.00	0.70
A-Joy	1.56	1.07	SR-Joy	1.54	0.34
A-Sadness	2.06	1.24	SR-Sadness	2.22	0.41
A-Surprise	2.33	1.29	SR-Surprise	2.78	0.79
A-Disgust	1.42	0.87	SR-Disgust	2.50	0.51

Table 1. Descriptive Statistics for Automatically Classified Emotions

View Sequence: Source	Anger	Disgust	Fear	Joy	Sadness	Surprise
1: When Harry Met Sally	1.30	1.53	1.03	**3.23**	1.00	2.50
2: Peep Show	1.87	1.80	1.37	2.10	2.10	**2.87**
3: The Champ	1.77	1.53	1.63	1.17	**4.13**	1.80
4: The Lion King	2.77	2.33	2.27	1.20	**4.20**	1.77
5: Schindler List	3.93	**4.10**	1.93	1.03	3.30	2.40
6: American History X	3.67	**4.33**	3.00	1.03	3.57	3.13
7: Trainspotting	1.30	**4.47**	1.20	2.17	1.47	3.37
8: Pink Flamingo	1.67	**4.67**	1.50	1.17	1.33	3.87
9: Test Your Awareness	1.03	1.03	1.07	2.50	1.30	**4.43**
10: Sea of Love	1.07	1.00	2.30	1.00	1.00	**2.43**
11: Annabelle	1.37	1.63	**4.10**	1.10	1.57	3.20
12: The Blaire Witch Project	1.33	1.40	**3.53**	1.07	1.67	2.23

Table 2. Mean Emotion per Video Clip Across Sample.

Personality Traits	M	SD	Personality Traits	M	SD
Openness to Experience	3.53	0.42	Agreeableness	1.03	0.29
> Openness	1.87	0.51	> Compassion	1.37	0.40
> Intellect	1.77	0.51	> Politeness	1.63	0.36
Conscientiousness	2.77	0.53	Neuroticism	2.27	0.45
>Industriousness	3.93	0.56	> Withdrawal	1.93	0.45
> Orderliness	3.67	0.60	> Volatiltiy	3.00	0.67
Extraversion	1.30	0.43			
> Enthusiasm	1.67	0.47			
> Assertiveness	1.03	0.60			

Table 3. Descriptive Statistics for Personality Traits.

3.2   Inferential Statistics

Relationship Between Personality Traits and Self-Reported Emotions and Automatically Extracted Emotions Table 4 presents the correlated mapping only for sub-sample (n = 24). These results are presented as a means for comparison with the mapping between personality traits, self-reported emotions, and automatically classified emotions.

Traits	Anger		Fear		Joy		Sadness		Surprise		Disgust	
	SR	A	SR	A	SR	A	SR	A	SR	A	SR	A
Openness to Experience	0.01	-0.21	-0.04	0.05	0.20	0.29	0.11	-0.18	0.09	0.22	0.10	0.19
Openness	0.05	-0.06	-0.06	-0.03	0.17	0.28	0.10	-0.14	0.26	0.18	0.18	0.07
Intellect	-0.03	-0.28	0.00	0.11	0.16	0.20	0.08	-0.16	-0.12	0.18	-0.02	0.25
Conscientiousness	0.16	0.58	-0.06	0.01	0.01	0.09	0.30	-0.30	-0.11	-0.19	0.10	0.10
Industriousness	0.11	0.51	-0.15	0.04	-0.15	-0.16	0.19	-0.12	-0.19	-0.14	-0.01	-0.01
Orderliness	0.16	0.50	0.03	-0.01	0.14	0.28	0.33	-0.39	-0.02	-0.19	0.18	0.17
Extraversion	-0.13	0.15	-0.39	0.07	0.12	0.16	-0.09	-0.14	0.03	-0.12	-0.08	-0.18
Enthusiasm	-0.13	0.17	-0.35	0.08	0.12	0.18	-0.19	-0.18	0.04	-0.07	-0.04	-0.20
Assertiveness	-0.08	0.09	-0.29	0.04	0.08	0.09	0.03	-0.06	0.00	-0.13	-0.09	-0.10
Agreeableness	-0.13	0.20	-0.16	-0.15	-0.35	-0.08	0.07	-0.34	0.15	0.26	0.13	0.05
Compassion	-0.15	0.13	-0.29	-0.18	-0.32	0.04	0.01	-0.32	0.23	0.18	0.06	0.06
Politeness	-0.04	0.18	0.07	-0.04	-0.20	-0.16	0.10	-0.19	-0.02	0.21	0.13	0.01
Neuroticism	0.22	0.26	0.14	-0.42	0.40	0.14	0.41	0.08	0.21	0.05	0.25	0.28
Withdrawal	-0.01	0.04	0.24	-0.21	0.50	0.02	0.14	0.10	0.32	0.21	0.15	-0.03
Volatility	0.29	0.32	0.03	-0.42	0.20	0.18	0.45	0.04	0.07	-0.07	0.24	0.39

Table 4. Bi-Directional Mappings of Personality Traits and the Basic Emotions for both Self-Reported (SR) and Automatically Classified Emotions (A).

Relationship between Personality Traits and Automatically Classified Emotions Conscientiousness positively correlated with recognition of Anger with a large effect size ($df = 23$, $p \leq 0.01$, $r = 0.58$). The sub-traits of Conscientiousness, Industriousness and Orderliness also positively correlated with Anger with large effect sizes ($df = 23$, $p \leq 0.05$, $r = 0.51$; $df = 23$, $p \leq 0.05$, $r = 0.50$). Orderliness negatively correlated with recognition of Sadness with a medium effect size ($df = 23$, $p = .059$, $r = -0.39$).

Neuroticism negatively correlated with recognition of Fear with a medium-to-large effect size ($df = 23$, $p = .04$, $r = -0.41$). The sub-trait Volatility negatively correlated with recognition of Fear with a medium-to-large effect size ($df = 23$, $p = .04$, $r = -0.42$). Volatility positively correlated with recognition of Disgust with a medium effect size ($df = 23$, $p = .05$, $r = 0.39$)

Relationship between Self-Reported and Automatically Extracted Emotions A Pearson correlation was conducted on the matrix of self-reported emotions and A-emotions. A matrix depicting the level of consistency and differences
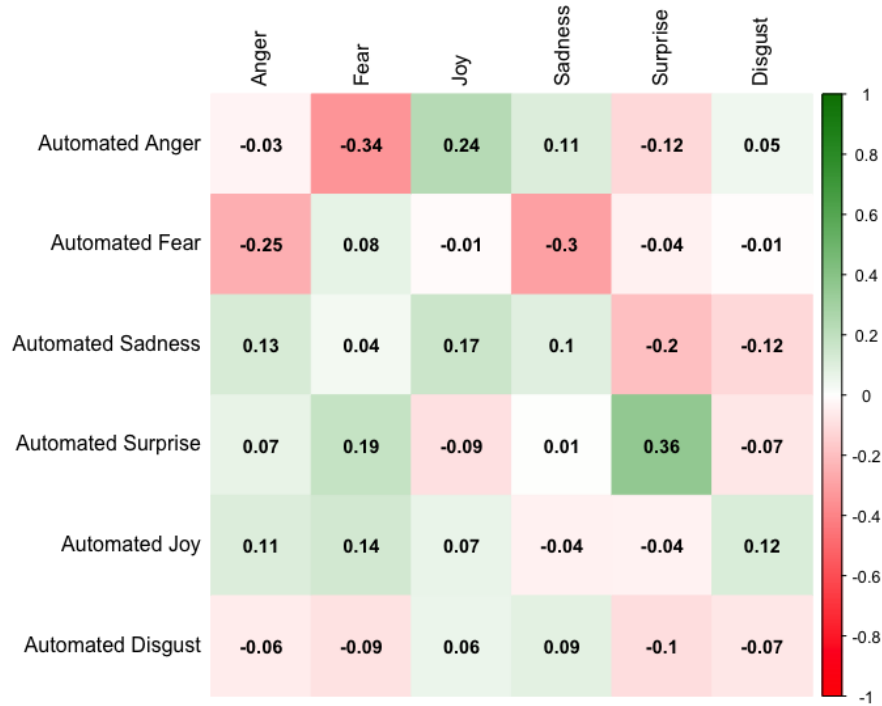
Fig. 2. Overlap between automatic emotions and self-reported emotions. Green indicates consistency, white no overlap, and red differences. The numbers within each cell indicate the Pearson R effect size.

between self-reported emotions and automatically classified emotional expressions,is presented in Figure 2 along with the effect size for each comparison. In terms of consistency/differences for same-emotions across modalities, then 5 of the 7 emotions are positively correlated: Fear ($df = 23$, $p = 0.10$), Sadness ($df = 23$, $p = 0.65$), and Surprise ($df = 23$, $p = 0.08$). The emotion Disgust ($df = 23$, $p = 0.72$) and Anger ($df = 23$, $p = 0.88$) diverge with negative correlations with their modality counterpart.

4   Discussion

This study aimed to investigate whether the relationship between personality traits and emotions is robust enough to generalise across the modalities of self-report and facial expression analysis. The results showed that there existed more consistency than differences in personality-emotion mappings. This section discusses both (i) which personality-emotion mappings showed greater consistency than difference and (ii) which personality-emotion mappings showed greater differences than consistency. Potential reasons for (i) and (ii) are also discussed. Additionally, an evaluation of the video-clips used is conducted and recommen-

dations for future researchers interested in employing video clips in emotion-elicitation research is provided.

4.1   Consistency in Personality to Self-Reported and Automatically Extracted Emotion Mappings

A consistent mapping is defined here as similarity in the direction of correlation (e.g. both positive, both negative) and the existence of non-trivial effect sizes (both must be greater than $r = \pm.10$) across both self-reported and automatically classified emotions. Overall, 11 of the 15 personality traits showed greater consistency than differences across both modalities.

Openness to Experience mapped consistently for Joy and Disgust. Openness mapped consistently for Joy and Surprise; Intellect mapped consistently for Joy. The largest consistency found across both emotion modalities for these traits was the emotion Joy, which positively correlated with small-to-medium effect sizes. This is consistent with prior research linking Openness to Experience with positive emotion systems in the brain [2].

Conscientiousness mapped consistently for emotions Anger, Surprise, Disgust. Industriousness mapped consistently for Anger and Surprise; Orderliness mapped consistently for Anger and Disgust. The positive relationship found between Conscientiousness and Anger was the strongest across the entire data-set for both self-reported and automatically classified emotions.

Extraversion mapped consistently for Joy. Enthusiasm mapped consistently for Joy and Sadness; Assertiveness did not map consistently across any emotion. The consistent relationship found between Extraversion and Joy is consistent with past research findings showing that people high in Extraversion experience more joy on a daily basis [17].

Agreeableness mapped consistently for Fear and Surprise. Compassion also mapped consistently for Fear and Surprise; Politeness mapped consistently for Joy. As detailed out in the next sub-section, there was a considerable amount of differences between the modalities.

Neuroticism mapped consistently for Anger, Joy, and Disgust. Withdrawal mapped consistently for Sadness and Surprise; Volatility mapped consistently for Anger, Joy, and Disgust. The positive correlation found between Joy and the personality traits associated with Neuroticism is inconsistent with past research. Neuroticism has been consistently considered a personality trait that is negatively valenced and it has been repeatedly linked to the experience of mental illnesses [18].

4.2   Differences in Personality to Self-Reported and Automatically Extracted Emotions Mappings

An inconsistent mapping (difference) is defined here as when the direction of correlation for both modalities is the opposite of one another (e.g. one positive, one negative) and the existence of non-trivial effect sizes (both must be greater than

$r = \pm.10$). Overall, 2 of the 15 personality traits showed greater inconsistency (difference) than consistency across both modalities.

Openness to Experience mapped differently for Sadness. Openness also mapped differently for Sadness; Intellect mapped differently for Surprise and Disgust. For both Openness to Experience and Openness, there were more consistencies than differences across modalities. This was the opposite for the sub-trait Intellect.

Conscientiousness mapped differently for Sadness. Industriousness and Orderliness also mapped differently for Sadness. Overall, there were more consistencies than differences for Conscientiousness and its two sub-traits.

Extraversion mapped differently for Anger. Enthusiasm also mapped differently for Anger; Assertiveness did not map differently across both modalities. It should be stated although the differences between self-reported and automatically classified Fear were still striking, it did not hit our threshold.

Agreeableness mapped differently for Anger. Compassion also mapped differently for Anger. Politeness mapped differently for Anger and Sadness. Anger was the major source of divergence for mappings related to Agreeableness. Agreeableness, and in particular Politeness, has been linked to reduced experience of Anger [7]. However, it is an open question as to whether people high in these traits experience less anger or are less likely to report experiencing anger [19]. The self-reported emotion mappings support the first hypothesis, that people high in these traits are less likely to experience Anger. However, the automated emotional analysis suggests that these participants do experience Anger, but are less likely to recognise or admit it. This latter finding is consistent with the description of people high in politeness withholding their feelings to avoid conflict [20].

Neuroticism mapped differently for Fear. Withdrawal also mapped differently for Fear; Volatility did not map differently. There existed several mappings with Neuroticism that were stronger in a given modality (e.g. Sadness), however, these mappings did not have a large enough effect size in both modalities to meaningfully compare and contrast.

4.3   Recommendations for Emotional Stimuli

Twelve video clips were used as emotional stimuli in this research study. Three of those videos had not been previously used in prior experimental research. Two of those new videos, *Annabelle* and *Who Dunnit? Test Your Awareness*, were successfully elicited high levels of self-reported emotion. *Annabelle* evoked the strongest mean experience of Fear across the participant group and *Who Dunnit? Test Your Awareness* evoked the strongest mean experience of Surprise across the participant group. Both videos are recommended as reliable emotional stimuli for future research. However, the third inclusion, *Peep Show*, is not recommended for future usage. The results of this study also cast suspicion on the reliability of the video clip, *Sea of Love*, which has been used in prior research experiments. but only a minimal amount of its targeted emotion, Surprise. Researchers requiring a video to reliably produce Surprise are recommended to use the video clip *Who Dunnit? Test Your Awareness* instead.

5   Conclusion

Personality traits and basic emotions are significant predictors of human be-haviour and the functioning of both phenomena is necessary for positive well-being. Previous research has also found quantifiable links between these two phenomena that can enable state-trait inferences, i.e. personality-emotion map-pings [7]. However, empirical observations of personality and emotion and their relationship are largely reliant on self-report-based methodology (i.e. question-naires). This reliance on self-report limits the validity of empirical research in direct (e.g. "retest artifact") and indirect ways (e.g. makes participant recruit-ment more difficult).

This paper described an empirical research study that tested the generalis-ability of personality-emotion mappings across a self-reported based approach and an automatically classified emotion-based approach via video. If personality-emotion mappings were robust across both modalities, then this would be an indicator that technological-based approaches can directly analyse personality, emotion, and their relationship. Technological-based approaches can enable in-telligent and automatic observations of these phenomena with minimal input from participants.

The results showed greater consistency than differences in personality-emotion mappings across the two modalities. For the 15 personality traits captured in this study, the results showed that: (i) 11 personality traits showed greater con-sistency than differences personality-emotion mappings across modalities; (ii) 2 traits showed an equal amount of consistency and differences in personality-emotion mappings across modalities; (iii) 2 traits showed greater differences than consistency in personality-emotion mappings across modalities.

The criteria for assessing a personality-emotion mapping was two-fold, a com-parison between the direction of the correlations and the existence of non-trivial effect sizes. However, there is scope for future research to assess the degree of consistency/difference between the two modalities. Quantifying the degree of consistency/difference would enable assessments about the strengths and weak-nesses of self-report and automatically classified approaches.

Overall, the results are a promising indication that the relationship between personality traits and basic emotion is robust enough to enable research and commercial applications. However, given the small sample size of the research study, caution is required in generalising the results. Future research in this area that can (a) scale the number of participants and (b) incorporate other modalities of emotional expression (e.g. language, speech) and (c) quantify the degree of consistency/difference across modalities would represent a significant next step in this research area.

References

1. Antonio R Damasio. *Descartes' error*. Random House, 2006.
2. Colin G DeYoung. Cybernetic big five theory. *Journal of Research in Personality*, 56:33–58, 2015.

3. Dan P McAdams. *The art and science of personality development*. Guilford Publications, 2015.
4. Lisa Feldman Barrett. *How emotions are made: The secret life of the brain*. Houghton Mifflin Harcourt, 2017.
5. Daniel K Mroczek and Todd D Little. *Handbook of personality development*. Psychology Press, 2014.
6. Lisa Feldman Barrett, Michael Lewis, and Jeannette M Haviland-Jones. *Handbook of emotions*. Guilford Publications, 2016.
7. Ryan Donovan, Aoife Johnson, Aine deRoiste, and Ruairi O'Reilly. Quantifying the Links between Personality Sub-Traits and the Basic Emotions. In *Affective Computing and Emotion Recognition*, Lecture Notes in Computer Science, Cagliari, July 2020. Springer.
8. Alessandro Vinciarelli and Gelareh Mohammadi. More personality in personality computing. *IEEE Transactions on Affective Computing*, 5(3):297–300, 2014.
9. Chris J Durham, Lisa Ducommun McGrath, Gary M Burlingame, G Bruce Schaalje, Michael J Lambert, and D Rob Davies. The effects of repeated administrations on self-report and parent-report scales. *Journal of Psychoeducational Assessment*, 20(3):240–257, 2002.
10. Rebecca L Shiner and Colin G DeYoung. 6 CHAPTER The Structure of Temperament and Personality Traits: A Developmental. *The Oxford handbook of developmental psychology, Vol. 2: Self and other*, 2:113, 2013.
11. Oliver P John, Laura P Naumann, and Christopher J Soto. Paradigm shift to the integrative big five trait taxonomy. *Handbook of personality: Theory and research*, 3(2):114–158, 2008.
12. Paul Ekman. Basic emotions. *Handbook of cognition and emotion*, pages 45–60, 1999.
13. Michael Healy, Ryan Donovan, Paul Walsh, and Huiru Zheng. A machine learning emotion detection platform to support affective well being. pages 2694–2700. IEEE, 2018.
14. Crystal A. Gabert-Quillen, Ellen E. Bartolini, Benjamin T. Abravanel, and Charles A. Sanislow. Ratings for emotion film clips. *Behavior Research Methods*, 47(3):773–787, September 2015.
15. T Lee Gilman, Razan Shaheen, K Maria Nylocks, Danielle Halachoff, Jessica Chapman, Jessica J Flynn, Lindsey M Matt, and Karin G Coifman. A film set for the elicitation of emotion in research: A comprehensive catalog derived from four decades of investigation. *Behavior research methods*, 49(6):2061–2082, 2017.
16. James J. Gross and Robert W. Levenson. Emotion elicitation using films. *Cognition and Emotion*, 9(1):87–108, 1995.
17. David Watson and Lee Anna Clark. Extraversion and its positive emotional core. In *Handbook of personality psychology*, pages 767–793. Elsevier, 1997.
18. DH Saklofske, IW Kelly, and BL Janzen. Neuroticism, depression, and depression proneness. *Personality and individual differences*, 18(1):27–31, 1995.
19. William G Graziano and Renée M Tobin. Agreeableness. 2009.
20. Colin G DeYoung and Timothy A Allen. Personality neuroscience. *Handbook of Personality Development*, page 79, 2018.