CAN MUSIC LIKES IN FACEBOOK DETERMINE YOUR PERSONALITY?

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DOI: https://doi.org/10.22452/mjcs.vol34no1.4

ABSTRACT

The 'like' icon is the most frequently used among all icons on Facebook. Although this social media platform is used by many people to express their music preferences publicly, Facebook 'likes' are still underutilised in determining personality. Thus, music 'likes' was employed in this study to gauge the personality of individuals based on a model that was developed by mapping music genres and personality traits. A computational technique that gauges users' personalities on the basis of their music 'likes' on Facebook was also introduced. Results discovered that personality traits based on music preferences on Facebook assisted in revealing the personality of individuals. Furthermore, similar patterns in personality traits were obtained from a manual test, i.e., the Big Five inventory test performed on each respondent. Music genres and personality traits were mapped by the proposed model to examine the relationship between these two variables and the findings revealed that music 'likes' can be utilised to identify the personality of individuals.

Keywords: ***Music, Like, Preferences, Facebook, Music Genres, Big Five Personality***

1.0 INTRODUCTION

Facebook is considered as the most popular social networking site (SNS) among all SNSs, with more than half of the world's Internet users engaging in this social media platform. Thus far, it has reached more than a billion users of which 81.7% are daily active users [1]. The rising amount of 'likes' comments and shares depict that Facebook is also an effective communication platform. Almost half of the Facebook user population use 'likes' on a daily basis; leading to more than 4.5 billion 'likes' generated each day [2]. Based on the numerous clicks on the 'like' icon, it is evident that 'like' is crucial to Facebook [3]. Although in February 2016, Facebook has added their reaction icons such as love, haha, wow, sad and angry; [4] proved that "Like" icon being used the most by Facebook users; therefore this research aims to study on Facebook "Likes".

Additionally, this button enables online users to identify their preferred sites easily. Studies have also demonstrated that Facebook 'likes' can be employed to predict a wide spectrum of personal attributes including intelligence, happiness, and personality traits [5]. It has been revealed that 'likes' represent the behaviour of individuals because they correlate with users' personality traits [6]. Hence, a few studies have been conducted in gauging the personality of Facebook users [7], [8] in which the correlation between Facebook 'likes' and personality traits was analysed in relation with different types of behaviour. The existing correlation between user personality and Facebook profile features have been studied based on the number of Facebook 'likes' being measured as part of such profile features [6]. Additionally, research by [9] have found that different websites can attract persons with different personalities, in addition to a correlation between website preference demonstrated via Facebook 'likes' and one's personality traits [9].

Personality traits have also been predicted based on the number of Facebook 'likes' [4]. Individual psychographic profiles are predicted using a model that can distinguish between homosexual and heterosexual

men, African Americans and Caucasian Americans, and between Democrats and Republicans based on the number of Facebook 'likes'. Nevertheless, another recent research claimed that multiple entertainment domains on Facebook, such as music, movies, books, television shows, and sports, can also be used to determine various personalities [10].

The purpose of this research paper is to identify user's personality based on number of music likes. There were over, 89% of people around the world listening to music [11].The amount of these much of data if utilized correctly can be beneficial in predicting personality. As far as this study is concerned, a computational technique is used to determine user's personality by measuring the number of music 'likes' on Facebook. Subsequently, the computed Facebook personality scores were benchmarked using the Big Five inventory score. This study does not aim to replace the widely used traditional personality test (Big Five Inventory test); rather it intends to demonstrate that Facebook 'likes' can be utilized to provide an indication of likely personality traits.

The paper comprises of six sections including this section. The following section, Section 2 presents relevant studies that deal with issues such as Facebook 'likes', music and personality, Big Five personality model and traits and Internet/Facebook. Furthermore, Section 3 provides a detailed explanation of the research methodology, followed by Section 4, which presents the research results and Section 5 elaborates on the discussion. Finally, Section 6 concludes the study with a few suggestions for future research.

2.0 RELATED WORKS

2.1 Facebook Like

Over one billion users click the like button () daily to express their approval for Facebook features including pages, photos, videos, and status updates [12]. Digital records of human behaviour, such as 'likes', can be used accurately to estimate the range of personal attributes. For instance, Facebook users typically employ this mechanism to express their positive association (i.e., like) to online content. Accordingly, the 'like' button is a powerful tool that can predict highly sensitive personal attributes, such as ethnicity, religion, political views, personality traits, and preference, among others [5], [7].

Data acquired through the number of Facebook 'likes', have been utilised to evaluate the personality traits of individual users [6], [7], [8], [12]. Based on the number of 'likes' on Facebook, users' personalities were able to be predicted according to their website choice [9]. Additionally, an online preference tool was developed based on the popular websites featured on Facebook to determine users' characters[9].

Non-popular music genres have also been exploited to analyse the relationship between Facebook music genres and personality [9]. Despite extensive research that has been conducted to link unique features on Facebook with individual traits, previous studies have not employed any computational technique to investigate this relationship. Hence, the current research primarily highlights popular music genres because they tend to generate numerous 'likes' compared to non-popular music genres. Moreover, biased results could be produced if all music genres are considered in this study. Therefore, user personalities will be identified by only examining popular music preferences on Facebook music domain using the proposed computational technique.

2.2 Facebook Music and Personality

'Likes' features on the Facebook music domain are commonly used by researchers to determine the users' personalities [10],[15]. The investigation was conducted by categorising music fan pages according to various music genres, such as blues, classical, country, dance, hip hop, indie, jazz, metal, oldies, pop, R&B, rap, reggae, rock, salsa, and techno [10]. Nevertheless, popular music genres have not been specifically highlighted, i.e., pop, blues, classical, country, dance, hip hop, jazz, metal, R&B, rap and rock and excluded oldies, reggae, salsa, and techno [16].

[17] grouped sixteen familiar music genres into four dimensions, namely (1) reflective and complex (classical, jazz, blues, folk) , (2) intense and rebellious (alternative, rock, heavy metal), (3) upbeat and conventional (country, pop, religious, soundtracks), and (4) energetic and rhythmic (soul/R&B, dance, rap/hip

hop) [17]. Likewise, the current study used these familiar music genres to identify users' personalities on the basis of their music preferences displayed on Facebook.

This section describes the relationship between music genres and user personalities via the Big Five personality model. On the one hand, it has been recorded in several studies that preference for classical, jazz, blues, folk, alternative, rock, and heavy metal music positively correlates with openness to experience [14], [15], [16], [17]. On the other hand, the inclination to pop, religious, soundtracks, country, dance, R&B, and rap music negatively correlates with openness to experience [10], [17], [19], [21]. The aspect of conscientiousness positively correlates with one's preference for classical, jazz, blues, folk, pop, religious soundtracks, and country-style music [17], [21], [22] and negatively correlates with preference for alternative, heavy metal, rock, dance and soul, and R&B music [18], [21], [22].

Furthermore, extraversion positively correlates to one's preference for pop, religious soundtracks, country, dance, soul, R&B, rap, and hip hop [17], [20], [21]. No finding exists for extraversion for negative relationship. The quality of agreeableness positively correlates with one's preference for pop, religious soundtracks, country, dance, soul, R&B, rap, and hip hop [17], [21], [23], and negatively correlates to the inclination towards classical, jazz, blues, folk, alternative, heavy metal, and rock [21], [22]. Meanwhile, neuroticism only positively correlates with one's preference for pop, religious soundtracks, and dance music [21], [23], whereas this trait negatively correlates with a person's predilection for classical, jazz, blues, folk, alternative, heavy metal, dance, soul, R&B, rap, and hip hop [21], [23]. Nevertheless, previous studies did not map popular music genres with personality traits. Contrastingly, the relationship between music genre and personality was mapped in this study, in addition to the computation of users' personality scores based on music 'likes'.

2.3 The Big Five Personality Model

Some personality models that have been used in the past studies, include the Big Five model, Holland's model, and the Myer–Briggs Type Indicator (MBTI) model. Holland's model consists of personality traits such as realistic, investigative, artistic, social, enterprising, and conventional [24]. The MBTI model is a popular instrument in measuring and identifying individual personality types, and the four-dimensional pairs developed in this model are *extraversion* (E) and *introversion* (I), *sensing* (S) and *intuition* (N), *thinking* (T) and *feeling* (F), and *judging* (J) and *perceiving* (P) [25]. The Five Factor model, also known as the Big Five, has received an abundance of empirical support and has become a standard taxonomy in the organisation and evaluation of personality traits [26], [27]. Furthermore, the Big Five is also considered as one of the most widespread and generally accepted models for mining personality in SNSs [7], [10], [28]. The Big Five personality factors (OCEAN) include *openness to experience*, *conscientiousness*, *extraversion*, *agreeableness*, and *neuroticism*. As far as this study is concerned, the Big Five model was selected as the neuroticism trait is not included in Holland's model and the MBTI model.

Openness to experience refers to one's quality of being imaginative, spontaneous, and adventurous [8]. Additionally, openness to experience is also concerned with an individuals' accessibility to novelty and 'likes' in order to generate new ideas [29]. People with a high level of openness have a positive disposition towards learning [30] and are more likely to commit rule violations, experimentation, and improvisation [31]. In contrast, people with a low level of openness tend to be more conventional, less creative, and more authoritarian [7]. Next, conscientiousness is described as being ambitious, resourceful, and persistent [8]. Highly conscientious individuals tend to be more organised, reliable, and consistent, while less conscientious people are more easy-going, spontaneous, and creative [7]. Furthermore, extraversion is used to measure one's tendency to express positive emotions as well as to find stimulation in the external world and comfort in the company of others. It has been recorded that extroverts tend to write long messages instead of short ones [29]. Highly extrovert people are also sensitive to monotony [32] and are high sensation seekers who are more likely to face risks and challenges in their life [33]. Agreeableness is about the qualities of being trustworthy, altruistic, and tender-minded [8]. People who are agreeable typically demonstrate optimism and usually have balanced relationships with their friends [29]. Highly-agreeable people tend to have positive feelings towards others due to their friendly, polite, and sympathetic nature [34]. Contrastingly, less agreeable people may face some difficulties to compromise as they may be too assertive and not bound by social expectations [7]. Moreover, neuroticism refers to emotional instability, tendency to change moods according to the situation, being short-tempered, and being overwhelmed by negative emotions, such as nervousness,

guilt, and despair [7]. Highly neurotic people are more anxious, emotional, and have less tendency to use the Internet except in circumstances where they wish to minimise their feeling of loneliness [35].

2.4 Big Five Personality and Internet/Facebook

The rapid growth of the Internet, especially with regard to the SNSs, has attracted substantial attention from social scientists who are specifically involved in the field of personality mining. Several studies have analysed the correlation between the online preferences and browsing behaviour on the one hand, and the demographic characteristics of website audiences, namely age, gender, occupation and educational level, income, and race on the other [36]–[42]. Furthermore, previous studies have demonstrated the correlation between certain personality traits and total Internet usage based on users' propensity on SNSs [43]–[45]. Data mining and machine learning techniques have also been employed to predict Facebook users' personality according to the Big Five Model [29], [46], [47]. As a result, a strong correlation has been found to exist between Facebook activities and personality traits [7], [29], [48],[12]. In addition, previous research has explored the extent to which it is possible to determine users' personality and privacy concerns from Facebook activities [41].

3.0 RESEARCH METHODOLOGY

3.1 Research Procedure

This section explains the data gathering process and coding system employed in the current research. This study was conducted for six months which included 100 respondents (53 females and 47 males) out of 135 respondents with the age range of 18 to 25 years old; These 100 respondents have been selected based on the following two inclusion criterias;

- Total number of Facebook music 'likes' for each respondent must be more than or equals to 30 music likes, and
- Facebook music 'likes' must be from all four music dimensions (detailed descriptions of the four music genre dimensions are provided in Section 2.2 [17].

The respondents were Bachelor of Computer Science students from two higher education institutions located in the capital of Malaysia, i.e., Kuala Lumpur.

The first part of the study required the respondents to complete the standard measurement for five factors of personality traits called the Big Five Inventory Test [49]. The Big Five Inventory Test comprised of 44 questions in total, and the respondents were required to rate each question using a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Each personality trait was associated with a set of questions, and the score for a trait is given as the average of the respondents ratings on the associated questions. It should be noted that the sample questions are provided in the Appendix at the end of this paper. Each respondents scores acquired from the Big Five Inventory Test are necessary to determine the research output.

The second part involved accessing and analysing the respondents Facebook music 'likes'. The tools and language that were used to retrieve users' music 'likes' included the Facebook Software Development Kit, Facebook API, Graph API explorer, and Facebook Query language. The participants who have answered the Big Five Inventory Test were then requested to log in to the Facebook music 'likes' application created by the investigator. Once they have been logged in, the application would request for access and permission via the Facebook Software Development Kit (SDK), one of the sources provided by Facebook to access its server aside from API calls. The respondents must authenticate and allow Facebook music 'like' application to access their Facebook 'likes'. Once the access token is returned, the Facebook music 'like' application will subsequently access and retrieve Facebook music 'likes' from the respondents Facebook page. Once all the Facebook music 'likes' have been retrieved from each respondent's profile, their Facebook 'likes' will be analysed based on the mentioned inclusion criterias.

It is important to highlight that users' activeness in using Facebook music 'likes' is a significant criteria for this research. If a respondent does not have a minimum number of 30 Facebook music 'likes', then he/she will be excluded as the total number of 'likes' is not sufficient for the prediction of the likely personality traits. This assumption is supported by previous research [5], where the same minimum number of 'likes' (30) was adopted to determine a user's personality through his/her preferred websites. Thus, the total number

of Facebook music 'likes' in this study has been set to a minimum of 30 to preserve the reliability of the computed Facebook music 'likes' personality scores.

Four dimensions of music genres were evaluated in order to avoid the situation of bias towards any music genres and personality traits. Hence, four dimensions of music genres as proposed by [17] were employed as the filtering criteria to ensure that all the individual personality traits were effectively examined in the research output [17]. After the data is processed through the above mentioned filtering criteria, 100 respondents were subsequently selected from the 135 respondents.

3.2 Conceptual Framework of Facebook Personality

The conceptual framework describes the overall process involved in the identification of Facebook personalities based on music 'likes'. The conceptual framework of the current research includes four stages: retrieving users' Facebook music 'likes' [5], categorising music genres [16], computing music genre scores based on the correlation model of music genres and personality, and computing Facebook music personality results. The detailed explanations are illustrated in Fig.1 below.

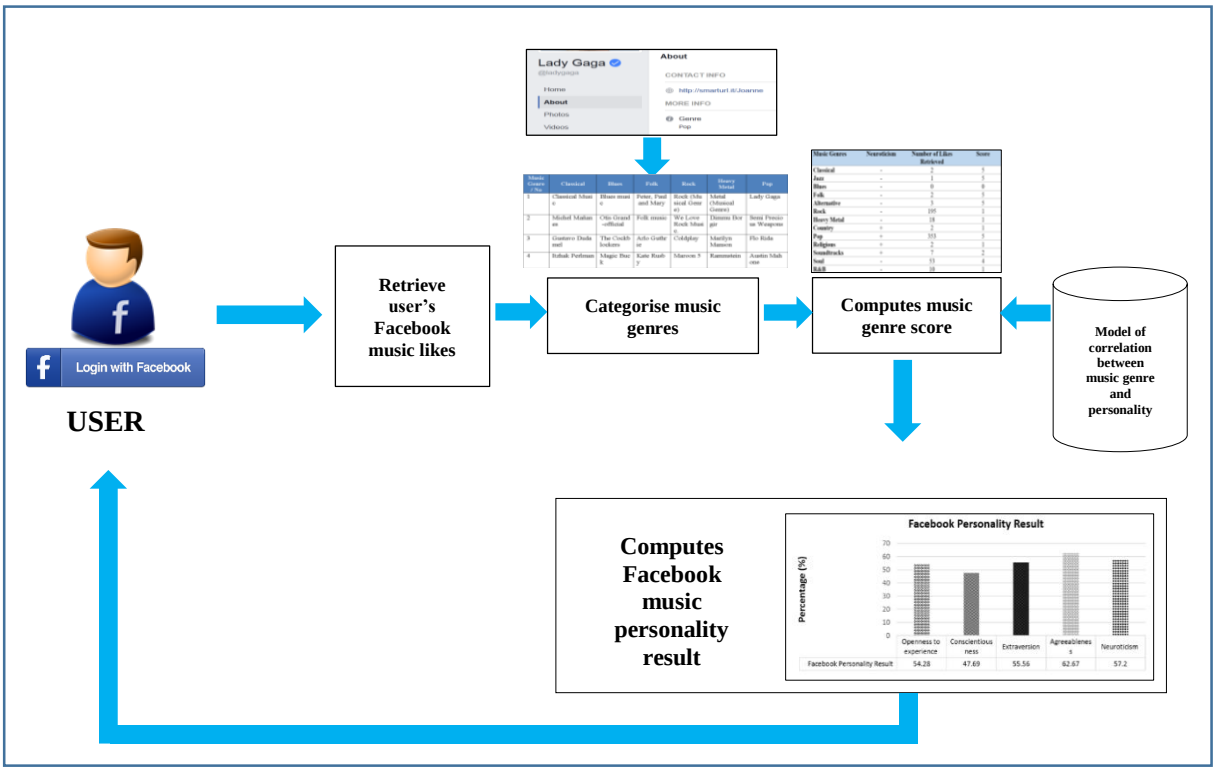

Fig 1: Conceptual Framework of Facebook Personality

3.3 Retrieving Facebook Music 'Likes' of Users

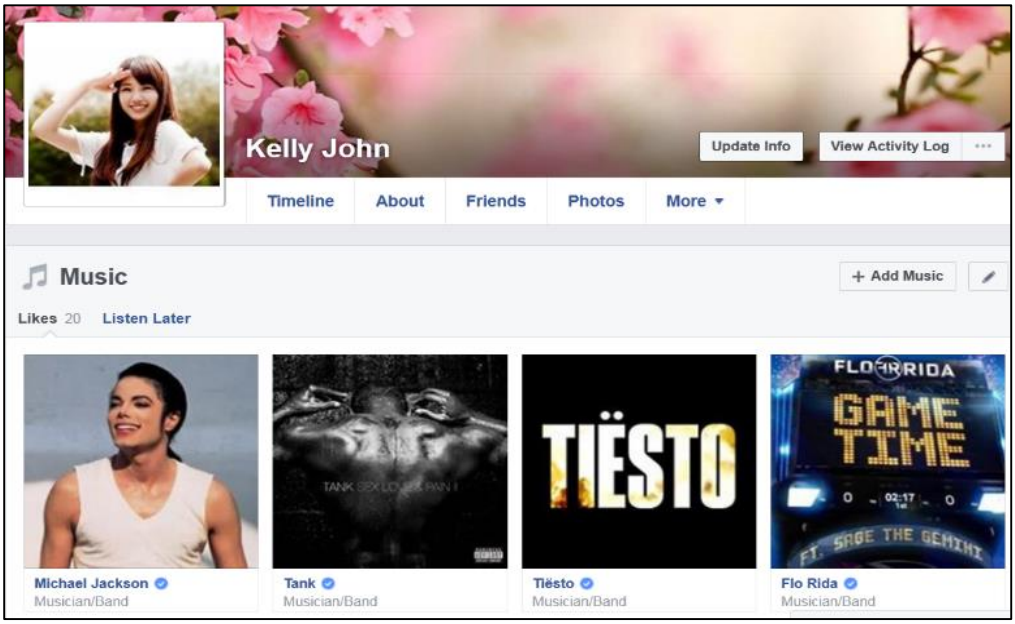

Fig. 2: Facebook music 'likes' of a user

Fig.2 shows a screenshot of Facebook music 'likes' on a user's profile. The account shown in Fig.2 with the name of Kelly John is a fake account created to demonstrate how the music 'likes' were retrieved for this research. Initially, the records of users' 'likes' are placed on the Facebook profiles of users based on their 'like' domains. Hence, the music 'likes' of users were retrieved from their Facebook profiles. Thereafter, the retrieved music 'likes' were analysed and categorised accordingly.

3.4 Categorising Music Genre

This research focuses on 16 popular music genres, namely classical, jazz, blues, folk, alternative, rock, heavy metal, country, pop, religious, soundtracks, soul, R&B, dance, rap, hip hop. The process of music genre classification is illustrated in Fig.3 below where music 'likes' were obtained from the Facebook accounts of users, followed by the evaluation of data against the music genre in a Facebook fan page. Next, a sample of Lady Gaga's Facebook music fan page is shown in Fig. 4 and Fig. 5. The right column which is highlighted in red indicates the type of music genre of the page, and this particular Facebook page is categorised as a pop music genre. Subsequently, this categorisation is retrieved and used in the classification of music 'likes'.

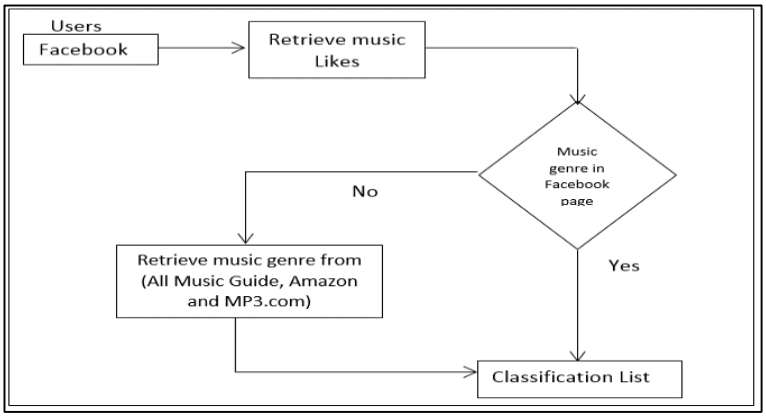

Fig. 3: Process flow of music genre classification

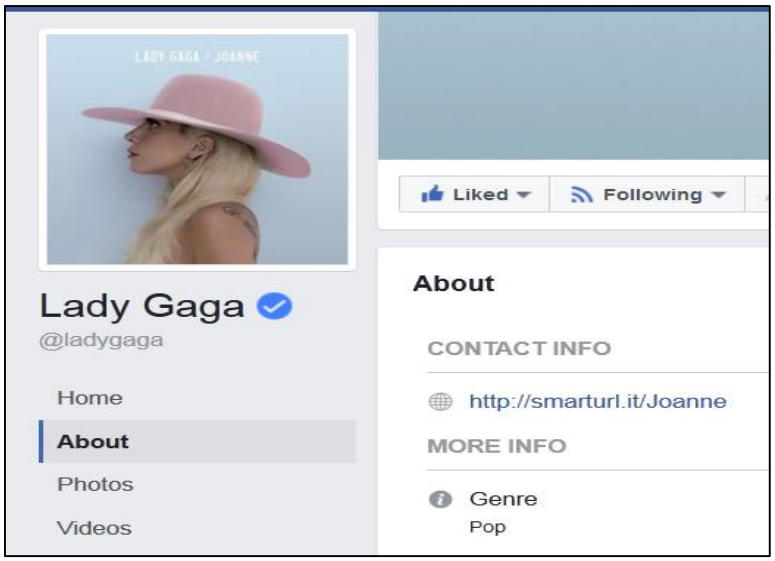

Fig. 4: Sample of a music fan page on Facebook

Facebook Fan page

Music Genre / No	Classical	Blues	Folk	Rock	Heavy Metal	Pop
1	Classical Music	Blues music	Peter, Paul and Mary	Rock (Musical Genre)	Metal (Musical Genre)	Lady Gaga
2	Michel Mañanes	Otis Grand -official	Folk music	We Love Rock Music.	Dimmu Borgir	Semi Precious Weapons
3	Gustavo Dudamel	The Cockblockers	Arlo Guthrie	Coldplay	Marilyn Manson	Flo Rida
4	Itzhak Perlman	Magic Buck	Kate Rusby	Maroon 5	Rammstein	Austin Mahone
5	Jacqueline du Pré	John the Conqueror	Pete Seeger	AC/DC	Cannibal Corpse	Sophia Del Carmen
6	Diana Damrau	Kenny Neal	Christina Perri	Jeff Beck	Judas Priest	Cher

Classification list of music genres

Fig. 5: Classification list of Facebook music fan page based on music genre

A sample of the classification of music 'likes' based on the music genre is depicted in Fig. 5 above. Nonetheless, if any music genre cannot be identified on Facebook, this information will be retrieved from the genres of popular music websites (e.g., All Music Guide, Amazon, and MP3.com) so that the categorization process can occur smoothly. The total 'like' count in each music genre will be used to compute users' scores.

3.5 Scale Setting for Music Genre Scores

This section provides a detailed explanation of the score scale setting for music genre scores. Users' personality was calculated using a score scale table. In view of that, the average of the sample data in each music genre was employed to determine the range for a score scale [5]. The formula $z = \frac{x}{5}$ was used to calculate the average for each music genre, where x was the total number of 'likes' of each music genre; 5 was the range of score scale and; z was the average of each music genre score.

Table 1 shows how the average for folk music was computed. As this study was conducted using Likert's scale, the total number of 'likes' for the total number of participants for each music genre will be divided by five points to identify the scale for scores of each music genre. For example, the 35 'likes' that were retrieved for folk music will be divided by five Likert score points which then produced an average of seven. Thus, this average will be used to create a score scale with a range of seven (see column 1 in Table 2: scale for a number

of 'likes'). It should be noted that this scale setting was also applied to other music genres in the current discussion.

Table 1: Average of Folk Music Genre

Total number of 'like' in the folk music genre	440
Total number of 'like' / 5 Likert scores	5
Average	$z = \frac{x}{5}$ 35/5 Z = 7

x*x= total number of 'likes' of each music genre, z= average of each music genre score

Table 2 demonstrates an example of a score scale of seven for folk music, as indicated by the average score scale. It is depicted that for the number of 'likes' between 1 to 7, the positive score was 1, meanwhile, the score was 5 for 'likes' between 29 and 35. For reversed score items with a negative (−) sign, the computation score was reversed. Hence, the score was 5 for 'likes' between 1 to 7, while, the score was 1 with a range of 29 to 35 [46]. The positive scores were provided based on the positive correlation between music genre and personality traits. Nevertheless, the reverse score was based on the negative correlation between music genre and personality traits.

Table 2: Sample of Score Scale Table for Folk Music Genre

Scale for Number of 'likes'	Positive-score (+sign)	Negative-score (-sign)
1-7	1	5
8-14	2	4
15-21	3	3
22-28	4	2
29-35	5	1

3.6 Model of Correlation between Music Genre and the Big Five Personality

A model was developed to map the correlation between music genre and personality based on previous research that can be referred to in Table 3. The positive (+) and negative (−) signs indicated positive and negative correlations, respectively, with personality traits. For example, pop music was positively correlated with conscientiousness, extraversion, agreeableness, and neuroticism; however, this genre was negatively correlated with openness. "NA" (not applicable) in the cells of Table 3 specified that the correlation between music genres and personality traits has not been analysed in previous studies. Accordingly, the findings in this relationship mapping will be used as a guideline to determine the music scores of Facebook users.

Table 3: Model of The Relationship Mapping Between Music Genre and Personality Traits

Music genres	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
Classical	+	+	NA	-	-
Jazz	+	+	NA	-	-
Blues	+	+	NA	-	-
Folk	+	+	NA	-	-
Alternative	+	-	NA	-	-
Heavy metal	+	-	NA	-	-
Rock	+	-	NA	-	-
Pop	-	+	+	+	+
Religious	-	+	+	+	+
Soundtracks	-	+	+	+	+
Country	-	+	+	+	+
Dance	-	-	+	+	-
Soul	-	-	+	+	-

R&B	-	-	+	+	-
Rap	-	NA	+	+	-
Hip hop	-	NA	+	+	-

3.7 Computation of Music Genre Scores

This section provides a detailed explanation of how users' personality is computed. The music scores of users for the neuroticism trait are demonstrated in Table 4. These scores were obtained based on the correlation between music genre and the Big Five personality model (see Table 3) as well as the score scale of each music genre. For example, as seen in Table 4, folk music was given a score of 5 because the number of 'likes' is between 1 and 7 from the score scale in Table 2, in addition to being negatively correlated with neuroticism in Table 3. Therefore, a reverse score of 5 was given to folk music. It must be highlighted that this similar method was also applied to other music genres in terms of music score identification.

Table 4: Sample of Facebook Personality Score for Neuroticism.

Music Genres	Neuroticism	Number of 'Likes' Retrieved	Score
Classical	-	2	5
Jazz	-	1	5
Blues	-	0	0
Folk	-	2	5
Alternative	-	3	5
Rock	-	195	1
Heavy Metal	-	18	1
Country	+	2	1
Pop	+	353	5
Religious	+	2	1
Soundtracks	+	7	2
Soul	-	20	4
R&B	-	10	4
Dance	-	29	3
Rap	-	35	3
Hip hop	-	28	3
Total Score			$\left(\sum_{i}^{n} y\right) / 5n$
Facebook Music Score for Neuroticism trait (%) =		48/5(16) 60 %	

Music genre score $\sum y = y_1 + y_2 + y_3 \ldots$ (2)

Facebook Personality Score for X trait (%) (3) $= \left(\sum_{i}^{n} y\right) / 5n \times 100\%$

* i = total score of music genre, n= type of music genre that has a relation with the Big Five personality, y= music genre score for each genre, x= one of the personality traits (i.e., openness, consciousness, extraversion, agreeableness, neuroticism)

Equation (2) represents the users' total score that was collected from each music genre. Facebook personality score for X trait was calculated using Equation (3). Accordingly, the computation score for two personality traits was presented to clarify the equation above. Table 4 shows an example of how a user's score for neuroticism is measured. A total of 16 Facebook music genres was computed in the preceding example. Furthermore, the total score obtained by a user was 48, comprising 60% of the score. Another example of the computation score is also displayed for extraversion in Table 5 where the total score obtained by a user was

23, comprising 51% of the score. Table 5 depicts that only music genre, which is associated with Big Five personality, will be considered in computing users' personality scores. Moreover, the same computational technique was employed to other three personality traits, namely openness, conscientiousness, and agreeableness.

Table 5: Sample Facebook Personality Score for Extraversion

Music Genres	Extraversion	Number of 'Likes' Retrieved	Score
Country	+	1	1
Pop	+	92	2
Religious	+	1	1
Soundtracks	+	5	2
Soul	+	7	1
R&B	+	21	3
Dance	+	55	4
Rap	+	45	4
Hip-hop	+	46	5
Total Score			$\left(\sum_{i}^{n} y\right) / 5n$
Facebook Music Score for Extraversion trait (%)		= 23/5(9) = 51 %	

3.8 Facebook Personality Scores

The results of users' Facebook music personality will be presented using their music 'likes' that were acquired from this social media platform. Also, the five personality traits will be presented in percentages with a different pattern, thereby enabling users to understand their personality strengths based on each trait (Fig. 6).

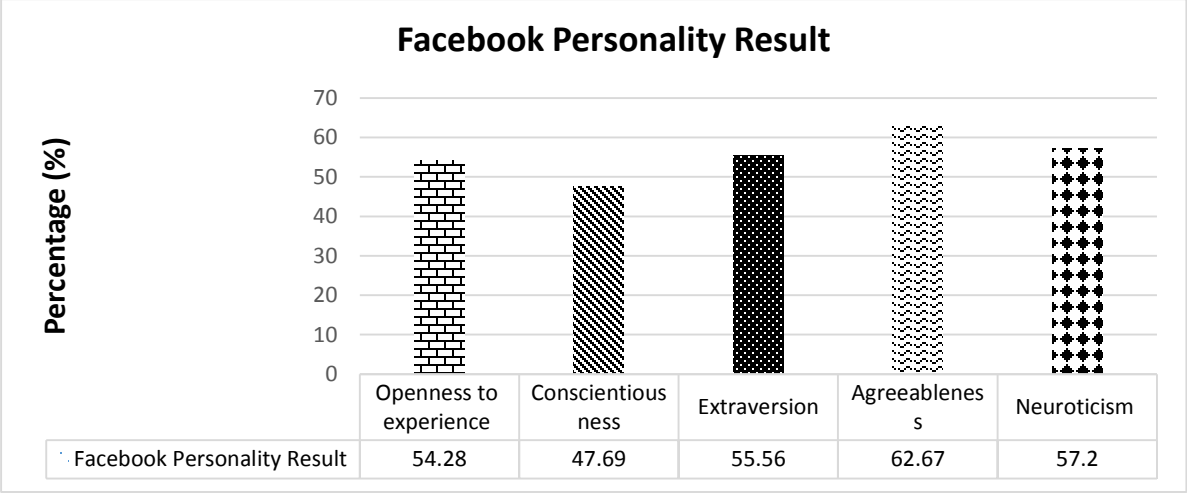

Fig. 6: Facebook Personality Result of a User

4.0 RESULTS

Fig. 7 shows a user's personality result based on his music 'likes' on Facebook which also reflects one's personality. It is demonstrated in Fig. 7 that the Facebook personality scores of users indicate the qualities of agreeableness, neuroticism, extraversion, openness, and conscientiousness.

Music Genres	Classical	Jazz	Blues	Folk	Alternative	Rock	Heavy Metal	Country	Pop	Religious	Soundtracks	Soul	R&B	Dance	Rap	Hip-hop
Number of Likes	2	1	0	2	3	19	18	2	353	2	7	53	10	60	35	51

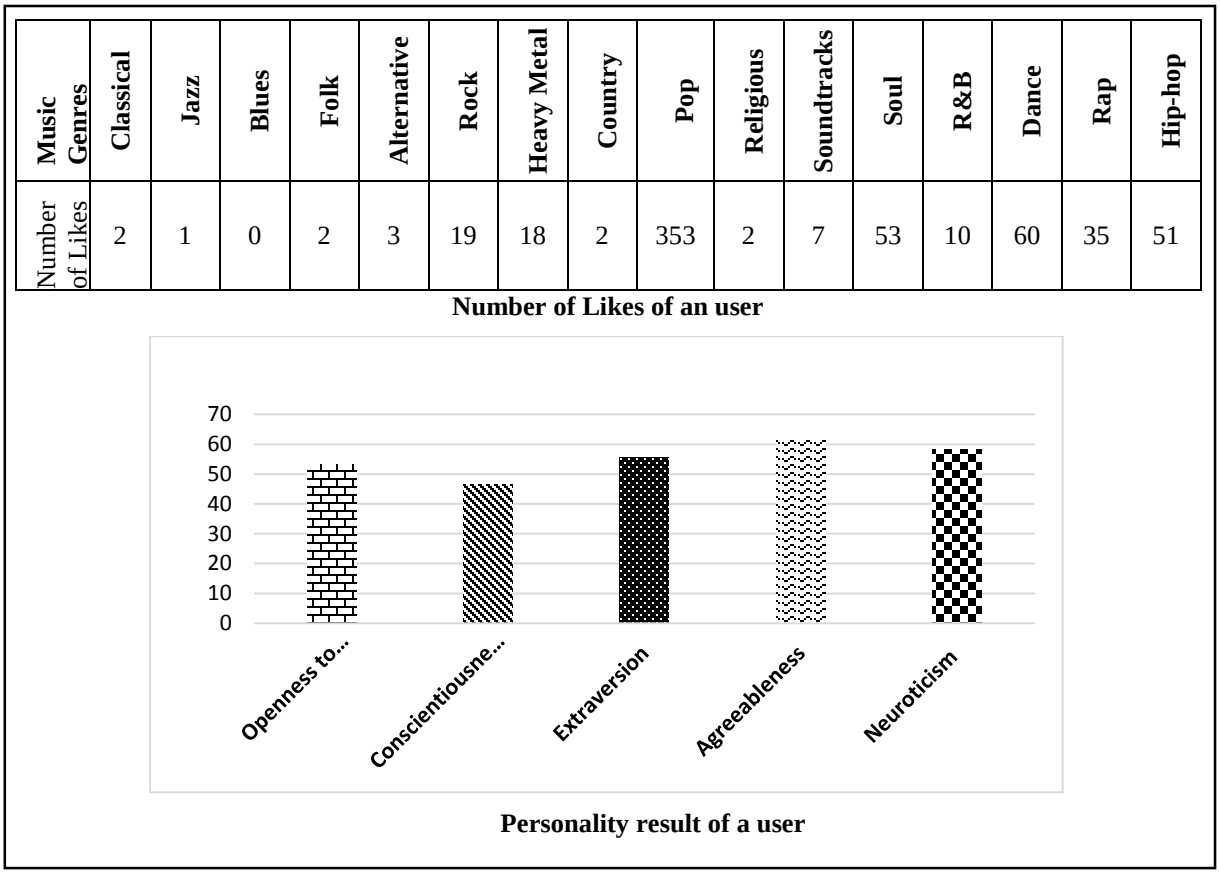

Fig. 7: Facebook Music Personality Scores of a User Based On the Number of His Music 'Likes

4.1 Comparison between the Big Five Personality Test Scores and Facebook Music Personality Scores

The Big Five inventory scores and Facebook music personality scores were compared to gauge the accuracy of the results. Moreover, in order to benchmark the proposed computational technique, users' music personality scores were compared with the Big Five inventory test scores, a standard measurement for personality traits. Accordingly, Table 6 shows the comparison between the Facebook music scores and Big Five inventory test scores of a user.

Table 6: Comparison between Personality Scores based on Facebook Music and Big Five Inventory Test Scores of a User

Big Five Personality	Facebook Music Result	Big Five Personality Result
Openness to experience	54.28	55.00
Conscientiousness	47.69	71.11
Extraversion	55.56	60.00
Agreeableness	62.67	71.11
Neuroticism	56.00	57.50

4.2 Comparison between the Big Five Personality Scores and Facebook Music Personality Scores for 30 Respondents

30 data samples were collected and analysed using the proposed computational technique. Additionally, Big Five inventory scores were used to evaluate the proposed computation. The samples were compared between the Big Five inventory test scores and Facebook music personality scores of the users. Figure 8 shows the

comparison results of the Big Five personality test and the Facebook music personality for the 30 data samples.

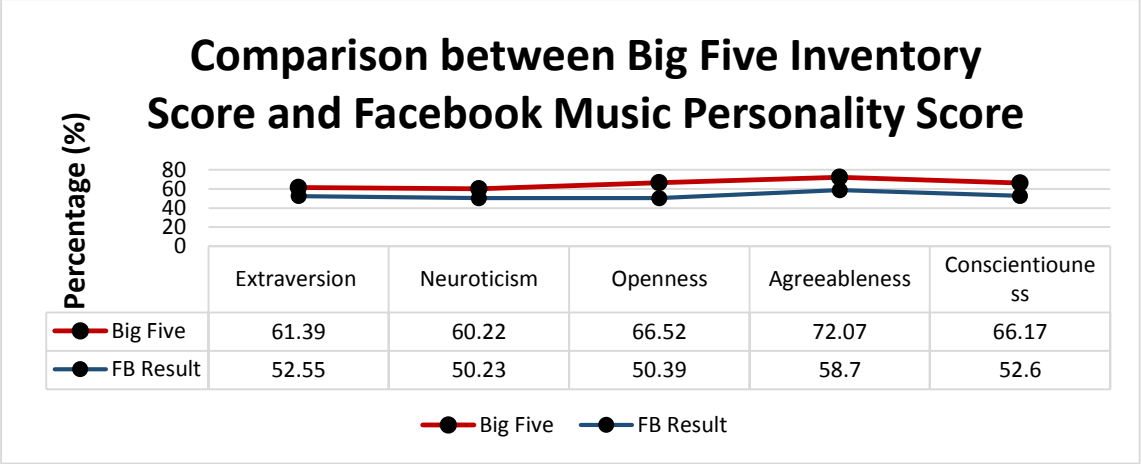

Fig. 8: Comparison results of the Big Five personality scores and Facebook Music Personality scores for 30 data samples

Fig. 8 presents the comparison result of both personality results in which the scores of the Big Five personality inventory and Facebook music personality revealed similar patterns for the sample data.

4.3 Comparison between the Big Five Personality Scores and Facebook Music Personality Scores for 100 Respondents

This research was further extended with an addition of 70 new data samples to the existing 30 data (that were analysed in section 4.2), to identify the similarity between both personality results. Then, the scores acquired from the Big Five personality test and Facebook music personality of the 100 samples were compared in order to examine the patterns.

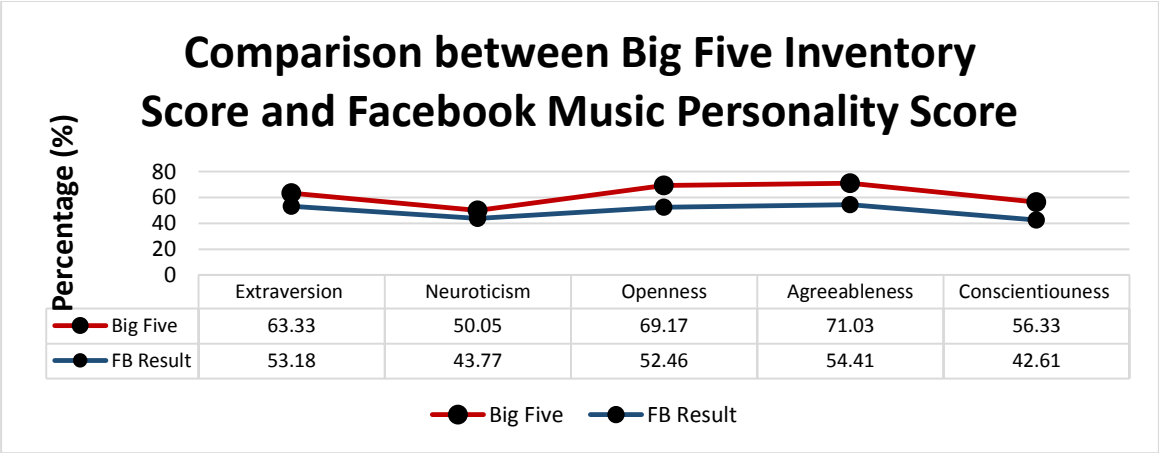

Fig. 9: Comparison results of the Big Five personality scores and Facebook music personality scores for the 100 data samples

Fig. 9 shows the comparison between the overall results of Facebook music personality and Big Five inventory test with 100 respondents. As far as the Big Five personality inventory and Facebook music personality score patterns are concerned, the Facebook personality traits and Big Five Inventory test showed similar patterns. The change in personality traits scores on Big Five reflects on the scores obtained by FB as well. This indicates that relationship exist between these two personality scores.

4.4 Comparison Results between both Samples of 30 and 100 respondents

Similar patterns were depicted for both graphs in Figure 8 and Figure 9 which thus justified the samples used for the research. The scores obtained for extraversion and neuroticism showed a relatively small gap between two test comparisons. Nevertheless, a slightly higher gap between both scores was revealed for conscientiousness, openness, and agreeableness. Conscientiousness and agreeableness are negatively correlated with the number of 'likes'. This result implies that individuals who are conscientious and agreeable spend minimal time on social media and they do not express themselves excessively. Hence, only a few features were used by these individuals in social network sites. These findings are consistent with those of previous studies [7].

Furthermore, it is illustrated in Figures 8 and 9 that openness trait revealed a high percentage of differentiation between Big Five inventory scores and Facebook music personality scores which is attributed to the relationship between music genre preferences and openness. Accordingly, openness tends to be associated with the types of music such as classical, blues, and heavy metal. As the sample data used in this research were taken from Malaysia, it was found that Malaysians tend to enjoy pop, R&B, and soul genres compared to classical, blues, and heavy metal. Moreover, this result has been supported by a previous study [50].

Results of the correlation analysis that has been done on 30 data samples between Big Five personality and Facebook personality revealed a significantly strong and positive relationship ($r = 0.7835$, $p < 0.05$) (Table 7).

Table 7: Pearson's R Correlation Between Big Five Personality Result and Facebook Personality Result for 30 Data Samples

	Big Five Result	Facebook Result
Big Five Result	1	0.7835
Facebook Result	0.7835	1

In comparison to 100 data samples, the correlation analysis between Big Five personality and Facebook personality has increased in magnitude and showed a significantly stronger and positive relationship ($r = 0.8992$, $p < 0.05$) (Table 8).

Table 8: Pearson's R Correlation Between Big Five Personality Result and Facebook Personality Result for 100 Data Samples

	Big Five Result	Facebook Result
Big Five Result	1	0.8992
Facebook Result	0.8992	1

4.5 Correlation Analysis between Music Genres and the Big Five Personality among Respondents

Based on the correlation between music genre and personality trait presented in Table 8, a significantly positive and strong correlation was found between alternative music and openness ($r = 0.717$, $p < 0.05$). Classical music genres showed a significant moderate and positive correlation with conscientiousness ($r = 0.625$, $p < 0.05$). Additionally, despite the strongest significant positive correlation was observed between the soul music genre and extraversion personality trait, the correlation was at a moderate level ($r = 0.641$, $p < 0.05$). A significant moderate and positive correlation was also identified between folk music genre and agreeableness ($r = 0.577$, $p < 0.05$). Similarly, the folk music genre has significantly shown a moderate and positive correlation with neuroticism personal trait ($r = 0.500$, $p < 0.05$).

Table 9: Model of Correlation between Music Genres and Personality Traits

Music genres	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
Classical	ns	0.625**	0.492**	0.334**	0.412**
Jazz	ns	0.314**	0.325**	0.401**	0.412**
Blues	ns	ns	ns	0.198*	0.441**
Folk	ns	0.593**	0.480**	0.577**	0.500**
Alternative	0.717**	0.468**	-0.199*	0.222*	0.294**
Heavy Metal	0.375**	ns	-0.328**	ns	0.233**
Rock	0.246*	ns	0.319**	ns	ns
Pop	ns	0.381*	0.539**	0.544*	0.381*
Religious	0.238*	0.246*	0.442**	0.385*	0.246*
Soundtracks	ns	0.322*	0.608**	0.510**	0.322**
Country	0.315**	ns	ns	ns	ns
Dance	0.217*	ns	0.603**	0.507**	ns
Soul	0.419*	ns	0.641**	0.438**	ns
R&B	ns	ns	0.572**	0.381**	ns
Rap	0.276*	0.376**	0.596**	0.506**	0.376*
Hip Hop	0.421*	ns	0.496**	0.428**	ns

**Correlation was significant at the 0.01 level (2-tailed).
*Correlation was significant at the 0.05 level (2-tailed).

4.6 Distribution of Big Five Personality Percentage between Male and Female Respondents

Table 10 showed that agreeableness personality trait score was significantly higher among female respondents compared to male counterparts (56.18 ± 10.49 vs. 50.82 ± 11.67; t – value = -2.417, p = 0.018).

Table 10: Mean Score of Big Five Personality Trait between Male and Female respondents

Big Five Personality %	Mean ± SD		t-value	p-value
	Male (N = 47)	Female (N = 53)		
Openness	46.20 ± 5.45	45.97 ± 6.41	0.192	0.848
Conscientiousness	34.68 ± 7.03	34.29 ± 5.19	0.322	0.748
Extraversion	49.36 ± 14.51	50.57 ± 13.47	-0.430	0.668
Agreeableness	**50.82 ± 11.67**	**56.18 ± 10.49**	**-2.417**	**0.018***
Neuroticism	50.72 ± 9.37	50.54 ± 9.01	0.095	0.924

4.7 Correlation between the Big Five Personality Percentage and the age of study respondents

Significantly moderate and positive relationships have been discovered between age and conscientiousness (r = 0.273, p = 0.006), extraversion (r =0.231, p = 0.021) , and agreeableness (r = 0.211, p = 0.035)such that as age increases, the adherence to these personality traits also increases (Table 11).

Table 11: Correlation between the Big Five Personality Percentage and Respondents' age

Big Five Personality %	***r***	***p-value***
Openness	0.099	0.329
Conscientiousness	**0.273**	**0.006****
Extraversion	**0.231**	**0.021***
Agreeableness	**0.211**	**0.035***
Neuroticism	0.035	0.726

**Correlation was significant at the 0.01 level (2-tailed).
*Correlation was significant at the 0.05 level (2-tailed).

5.0 DISCUSSION

Results have shown that for all personality traits, Big Five inventory scores were higher in percentage compared with Facebook music personality scores. The findings also correspond with those of previous research which indicated that users with personality traits such as extraversion, neuroticism, agreeableness, and conscientiousness tend to be unaffected by social media usage [51]. In addition, highly conscious people tend to be less expressive in displaying their emotions on social media platforms [7].

Furthermore, it is evident in Figures 8 and 9 that the top trait of respondents was agreeableness, followed by extraversion, openness, neuroticism, and conscientiousness. The degree of each personality trait acquired from the Facebook results as shown in both figures relatively correlated with users' preferred music genres. Highly preferred music genres (pop, R&B, soul, dance, and hip hop) positively correlated with the qualities of agreeableness and extraversion. The statistical findings as illustrated in Tables 7 and 8 indicated that a strong correlation exists between users' Facebook music personality and the Big Five personality traits. Since the number of users' music 'likes' can contribute to personality identification, Facebook music 'likes' can, therefore, determine users' personality. This particular discovery is in line with those of past studies which concluded that Facebook data can be utilised to predict user personalities in social network sites [8], [46], [52]. Furthermore, music genres, such as pop, rock, R&B, soul, dance, and hip hop, are the most preferred music genres by Malaysian users compared to blues, jazz, classical, country, heavy metal, folk, rap, religious soundtracks, and alternative music. The results reflected similar findings in [50] which discovered that Facebook users in Malaysia prefer pop, soul, and R&B compared to other music genres.

The current study is able to address the literature gap with regard to the correlation between music genres and personality traits. It is evident that this study has demonstrated a significant contribution of alternative music towards openness, classical music genres towards conscientiousness, soul music genre towards extraversion, as well as folk music genre towards agreeableness and neuroticism personal traits. These correlations were similar to previous findings and proposed model. Nonetheless, the positive relationship between folk music and agreeableness as well as neuroticism contrasted with those of previous studies. This result may be due to the inevitable change in music preference across generations.

The new scoring mechanism employed for Facebook music personality, enables users to identify the strength of their personality traits to a certain extent. The objective of this research is not to replace the Big Five personality test that has been widely used to gauge personality based on Facebook music 'likes', rather, to demonstrate how music 'likes' can be utilised to gauge the likely personality traits of Facebook users.

5.1 Benchmarking the Output

In this section, our study will be benchmarked against previous research [10], [15] as both managed to map personality and music genre. Nevertheless, this study has employed a scoring mechanism to determine the degree of each personality trait indicated through Facebook music personality scores which was not available in the previous research [10], [15]. It is evident that the strength and weaknesses of an individual's personality traits can be portrayed based on the personality scores generated from Facebook music 'likes'. The benchmarking results between the current study and previous research are presented in Table 12 as follows.

Table 12: Benchmarking Between Current Study and Previous Research

Differences	[10]	[15]	This research
Maps personality and music genre	×	√	√
Computes personality from Facebook	×	×	√
Uses Big Five personality model	√	√	√

6.0 CONCLUSION AND LIMITATIONS

Facebook has become one of the many other social network sites that elicited the interest of social science researchers. The 'like' feature on Facebook represents individuals' behaviour which can, therefore, be correlated with the personality of users. The current study has encompassed an extensive scope of research that established user personality by mining their music preferences and utilising Facebook 'likes' data.

Determining the correlation between music genre and personality is one of the significant outputs of this study. Future studies may adopt this model as a basis for their research which can also be extended to include other music genres and linked to other domains of research.

Besides this model, the current research has created a scoring mechanism that can compute the personality scores for each personality trait in which the results were determined using the Big Five inventory scores. The research does not aim to replace the Big Five inventory test, which is a well-known and established standard of measurement in identifying personality traits. Rather, the Big Five inventory test was employed for evaluation and benchmarking purposes only. It has been posited that Facebook music 'likes' of active users can be analysed to identify the likely personality traits of such users. This research has also focused on popular music genres because these types of music tend to garner more 'likes' compared to the non-popular ones. This research is able to contribute to users who express their music preferences on Facebook. Additionally, music lovers who may want to identify their personality traits can be benefited based on their social behaviour on Facebook, particularly in terms of music 'likes'. The personality strengths and weaknesses of Facebook music likers can also be determined using their 'likes' for each popular music genre which is linked to different personality traits i.e., openness, conscientiousness, neuroticism, agreeableness, and extraversion. Understanding users' personality through Facebook 'likes' has several benefits. First, it creates awareness among Facebook users with regard to the specific group of personality traits that they belong to. Second, this research is expected to benefit people of different backgrounds and fields by helping them understand their own and other people's personalities. It has been identified that students are the top users of Facebook among other demographic groups. Hence, this study can be applied by students in determining their personality traits. By knowing their personalities, the process of choosing the field of studies or higher education institutions that are appropriate for them will be much easier.

Nevertheless, it should be noted that this research still has a few limitations. First, the accuracy of Facebook music personality results depends on the activeness of users in the music domain. Second, the accuracy of the Big Five personality test scores is based on the trustworthiness of respondents. In some circumstances, users click on the 'like' button to acknowledge that they have seen each other's page. Thus, users' personality cannot be represented by this type of data. As far as this study is concerned, all music 'likes' that are expressed on Facebook are assumed to represent the real 'likes' for a particular music page and not merely acknowledgements. Besides that, the authors are aware that users may express their likes by using other reaction symbols such as love and wow. However, since many studies in the past have proved that users tends to use likes symbol more than the other symbols to express their likings, thus this research is focused on the use of likes symbol. Future studies should investigate other symbols in order to explore other domains on Facebook, such as movies, TV shows, books, and other music genres. These domains may be utilised for the personality mining of users as well as improve the accuracy of this process on social network sites. Lastly, future studies should be able to differentiate 'likes' as real or mere acknowledgement provided by users in order to better preserve the accuracy of the findings.

7.0 ACKNOWLEDGEMENT

This work was supported by the Impact-Oriented Interdisciplinary Research Grant Program of University of Malaya (IIRG001A-19SAH).

APPENDIX

Big Five Inventory Test

How I am in general

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who *likes to spend time with others*? Please write a number next to each statement to indicate the extent to which **you agree or disagree with that statement.**

1	2	3	4	5
Disagree	Disagree	Neither agree	Agree	Agree
Strongly	a little	nor disagree	a little	Strongly

I am someone who…

1	___	Is talkative	24	___	Is emotionally stable, not easily upset
2	___	Tends to find fault with others	25	___	Is inventive
3	___	Does a thorough job	26	___	Has an assertive personality
4	___	Is depressed, blue	27	___	Can be cold and aloof
5	___	Is original, comes up with new ideas	28	___	Perseveres until the task is finished
6	___	Is reserved	29	___	Can be moody
7	___	Is helpful and unselfish with others	30	___	Values artistic, aesthetic experiences
8	___	Can be somewhat careless	31	___	Is sometimes shy, inhibited
9	___	Is relaxed, handles stress well.	32	___	Is considerate and kind to almost everyone
10	___	Is curious about many different things	33	___	Does things efficiently
11	___	Is full of energy	34	___	Remains calm in tense situations
12	___	Starts quarrels with others	35	___	Prefers work that is routine
13	___	Is a reliable worker	36	___	Is outgoing, sociable
14	___	Can be tense	37	___	Is sometimes rude to others
15	___	Is ingenious, a deep thinker	38	___	Makes plans and follows through with them
16	___	Generates a lot of enthusiasm	39	___	Gets nervous easily
17	___	Has a forgiving nature	40	___	Likes to reflect, play with ideas
18	___	Tends to be disorganised	41	___	Has few artistic interests
19	___	Worries a lot	42	___	Likes to cooperate with others
20	___	Has an active imagination	43	___	Is easily distracted
21	___	Tends to be quiet	44	___	Is sophisticated in art, music, or literature
22	___	Is generally trustworthy	45	___	Is concerned about privacy issues
23	___	Tends to be lazy			

Scoring Instructions

To score the BFI, you first need to reverse-score all negatively-keyed items:

Extraversion: 6, 21, 31
Agreeableness: 2, 12, 27, 37
Conscientiousness: 8, 18, 23, 43
Neuroticism: 9, 24, 34
Openness: 35, 41

To recode these items, you should subtract your score for all reverse-scored items from 6. For example, if you gave yourself a 5, compute 6 minus 5 and your recorded score is 1. That is, a score of 1 becomes 5, 2 becomes 4, 3 remains 3, 4 becomes 2, and 5 becomes 1.

Next, you will create scale scores by averaging the following items for each B5 domain (where R indicates the reverse-scored item).

Extraversion: 1, 6R 11, 16, 21R, 26, 31R, 36
Agreeableness: 2R, 7, 12R, 17, 22, 27R, 32, 37R, 42
Conscientiousness: 3, 8R, 13, 18R, 23R, 28, 33, 38, 43R
Neuroticism: 4, 9R, 14, 19, 24R, 29, 34R, 39
Openness: 5, 10, 15, 20, 25, 30, 35R, 40, 41R, 44

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