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Passive and Active Facebook Use Measure (PAUM): Validation and relationship to the Reinforcement Sensitivity Theory

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ABSTRACT

The aims of this study were to design and validate a questionnaire to measure passive and active Facebook use, and to explore the associations of these factors with the Reinforcement Sensitivity Theory (RST) of personality. Passive Facebook use describes the consumption but not the creation of content, while active Facebook use describes active engagement with the site. As Facebook has many features, users may interact with the site differently, thereby creating conflicting results when general use measures are assessed independently. To address this issue, we developed a 13-item questionnaire which reflects three levels of Facebook engagement: *Active social*, *Active non-social*, and *Passive* use. These three multi-item scales demonstrate sufficient internal reliability and discriminant validity. To further investigate individual differences in Facebook use, we used regressions to assess the associations between RST and the factors of the Passive Active Use Measure (PAUM). Reward Reactivity was positively associated with both *Active social* and *Passive* use. Impulsivity and Goal-Drive Persistence were positively associated with *Active non-social* use. FFFS was positively associated with *Passive* use, and Reward Interest was positively associated with all three PAUM factors. The findings of this study highlight how individual differences impact the way users engage with Facebook.

1. Introduction

The popularity of social networking sites has increased rapidly over the past decade (Pew Research Center, 2017). A social networking site is an online service which allows users to create a profile, connect with other users, and view or browse information created by these connections (Boyd & Ellison, 2008). In 2005, only 5% of adult internet users reported using a social networking site, however, as of April 2016, 79% of American adult internet users reported using at least one social networking site (Greenwood, Perrin, & Duggan, 2016; Pew Research Center, 2014). Facebook is the most popular of these sites, with the company reporting 1.23 billion daily users as of December 2016 (Facebook Newsroom, 2016). As Facebook becomes more integrated into modern communication, it draws the attention of social researchers. Research on Facebook use covers topics such as motivations for use, feature use, online relationships, and envy (Amichai-Hamburger & Vinitzky, 2010; Grieve, Indian, Witteveen, Anne Tolan, & Marrington, 2013; Krasnova, Wenninger, Widjaja, & Buxmann, 2013; Rae & Lonborg, 2015). However, Facebook use is a difficult concept to define and measure as the site includes many different features and activities, and two users who both spend an hour a day on the site may spend that time in very different ways. This makes measuring the effects of Facebook use on other concepts, such as subjective well-being, difficult.

Facebook use is typically assessed with measures such as self-estimates of time users spend on the site, frequency of log-ins, or the Facebook intensity scale (for examples see: Burke & Kraut, 2011; Ellison, Steinfield, & Lampe, 2007; Song et al., 2014). The Facebook intensity scale is a composite measure developed by Ellison and colleagues which enquires about the amount of time a user spends on the site, in addition to other measures of use such as number of friends and how the user feels about Facebook ("I would be sorry if Facebook shut down") (Ellison et al., 2007). While these concepts are important, such measures capture a broad view of Facebook usage and neglect to account for how users engage with the site. This may lead to mixed research findings on the impact of Facebook use. For example, studies which assessed Facebook use in the form of Facebook intensity (Ellison et al., 2007; Valenzuela, Park, & Kee, 2009), or number of Facebook friends (Oh, Ozkaya, & LaRose, 2014), typically found a positive association between Facebook use and life satisfaction. In contrast, other studies revealed negative associations between Facebook use

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and life satisfaction when Facebook use was measured as quantity of time spent on the site (Kross et al., 2013; Vigil & Wu, 2015). These contradictory results may stem from measuring Facebook use as a single activity, whereas in fact, Facebook use consists of many nested activities contained within an apparently single activity. To illustrate this point, a recent study on life satisfaction and Facebook feature use found that some features (such as time spent looking through others' photos or tagging photos) were negatively associated with life satisfaction (Vigil & Wu, 2015). These results highlight the importance of identifying how users are engaging with Facebook.

In its original form, Facebook was a social activity. However, as Facebook became more popular it began to offer a wider range of activities such as online games and the newsfeed. These activities do not involve the same level of social connection as the original activities (such as posting on a friend's wall or writing a Facebook status). In a study on social networking activity and social well-being, Burke, Marlow, and Lento (2010) found that users who spent the majority of their time consuming content created by others, but not actively engaging with Facebook, experienced greater loneliness and reduced social capital. This pattern of Facebook use, where users consume but do not create content, was later labeled "passive use" (Burke & Kraut, 2011) or "lurking" (Brandtzæg, 2012). Recent studies have found that passive use is positively associated with envy on Facebook (Krasnova et al., 2013; measured passive use with a scale evaluated with EFA, but not validated further), and negatively associated with affective well-being (Sagioglou & Greitemeyer, 2014; Verduyn et al., 2015; both studies measured passive use experimentally). While much of the research into passive use finds negative associations with subjective well-being (or subjective well-being correlates), a few studies suggest that passive use can be beneficial in specific situations. A previous study found that respondents who engaged in passive use on a Weight Watchers Facebook page received informational and emotional support by browsing the page (Ballantine & Stephenson, 2011). Another study found that passively using one's own Facebook profile page can have a positive impact on emotional well-being, as scrolling through old posts and pictures had a self-soothing effect on respondents (Good, Sambhantham, & Panjganj, 2013).

The same study by Burke and colleagues described above showed that users who engaged in direct communication on Facebook were less likely to experience loneliness and expressed greater feelings of developing social capital (Burke et al., 2010). In our analysis, active use describes a pattern of Facebook activity where users are actively engaged with the site, creating content and communicating with friends. There is evidence that this type of usage is associated with increased subjective well-being, as a number of subjective well-being indicators have been linked to using Facebook to increase social capital (Ellison et al., 2007), establish social connectedness (Grieve et al., 2013), and call on friends for support (Liu & Yu, 2013). It is therefore important to distinguish between passive and active use of social networking sites like Facebook.

In previous studies, passive use has been measured in various ways: (a) through experimental manipulation of Facebook activity (Sagioglou & Greitemeyer, 2014; Verduyn et al., 2015), (b) through access to server logs from Facebook (Burke et al., 2010), or (c) by using subscales which measure feature use from other Facebook measures (Krasnova et al., 2013; Shaw, Timpano, Tran, & Joormann, 2015). Measuring passive use experimentally can be expensive and time consuming. It also potentially creates inaccurate results, as the people who are being asked to use Facebook passively for a certain amount of time may not use it passively in the real world (and similarly for active users). Alternatively, while subscales from other measures may reflect passive and active use, there is a need for a standardized measure which has been designed and validated specifically to measure these concepts. To the best of our knowledge, there is currently no validated scale designed for differentiating passive and active Facebook use. Therefore, the first purpose of this study was to design and validate a brief questionnaire to measure passive and active Facebook use, which should facilitate future research.

Although, to our knowledge, no research has investigated how active and passive use relate to personality traits, there is evidence that personality influences how users engage with Facebook. Studies on Facebook use and the Five-Factor Model (FFM) of personality have found that individual differences influenced whether users favored certain features, such as uploading photos, posting personal information, or joining groups (Amichai-Hamburger & Vinitzky, 2010; Ross et al., 2009). As feature use can reflect active or passive use, we believe that there will also be individual differences in how users engage with Facebook. There is already indirect evidence of this relationship, as personality has been found to influence how often users comment on other's posts, click "like", and share content (Lee, Ahn, & Kim, 2014; Seidman, 2013). While previous studies on Facebook use typically use the FFM of personality to investigate individual differences, the FFM of personality does not provide an explanation for the causal source of personality traits (Corr, DeYoung, & McNaughton, 2013). In contrast, the Reinforcement Sensitivity Theory (RST) of personality is based on the biological and psychological processes which motivate behavior (Corr, 2008). It theorizes that individual differences in personality reflect variations in three evolutionary-based systems: the *behavioral approach system* (BAS), the *fight-flight-freeze system* (FFFS), and the *behavioral inhibition system* (BIS). Therefore, we use RST to explore the relationships between active and passive Facebook use and personality.

The BAS is activated by rewarding stimuli such as food or sexual partners; it is responsible for positive-incentive behavior and related to anticipatory pleasure. On a more contemporary level, the BAS can be activated by social rewards, such as gaining social prestige or making friends. While the BAS was initially conceptualized as a single dimension, recent developments in RST research (Corr & Cooper, 2016) suggest that the BAS is multidimensional (Carver & White, 1994; Smederevac, Mitrović, Čolović, & Nikolašević, 2014; see Corr, 2016 for an overview). We have therefore chosen to focus on the Reinforcement Sensitivity Theory Personality Questionnaire (RST-PQ) operationalization of RST (Corr & Cooper, 2016), as RST-PQ represents BAS in four subscales as opposed to a unidimensional trait.

In RST-PQ, the BAS has been broken down into four sub-processes: Reward Interest, Reward Reactivity, Goal-Drive Persistence, and Impulsivity (Corr & Cooper, 2016). Reward Interest is associated with the pursuit of novelty, and consequently individuals who are high in Reward Interest are motivated to seek out new relationships, places and activities. We would therefore expect individuals high in Reward Interest to use Facebook actively, as engaging with others on the site may lead to new friendships. Reward Reactivity is associated with the exhilaration of victory or the pleasure of obtaining rewards; individuals high in Reward Reactivity are likely sensitive to praise, thus we would expect these individuals to use Facebook actively, as creating content on Facebook may lead to friends "liking" their posts. Goal-Drive Persistence is related to focus, restraint and goal-planning, and is responsible for the drive to establish goals. As previous research has found that Goal-Drive Persistence is positively associated with Facebook social comparison (Gerson, Plagnol, & Corr, 2016), and using Facebook passively tends to elicit social comparison behavior (Verduyn, Ybarra, Resibois, Jonides, & Kross, 2017), we expect individuals high in Goal-Drive Persistence to be passive users. Impulsivity measures an individuals' inclination to disinhibited and unplanned behavior. Impulsivity can be advantageous when caution and planning are no longer appropriate and the reward needs to be seized. We predict that individuals who are high in Impulsivity will be active Facebook users, as they may impulsively "like" posts and "share" links with Facebook friends.

The FFFS is activated by threatening stimuli, such as predators or rivals, and elicits avoidance or escape behaviors. As the motive of the FFFS

is to remove the individual from threatening situations, it is unlikely to be related to Facebook engagement.

The BIS is activated when there are conflicts within or between systems, and is responsible for assessing the risk and resolving the conflict. The BIS can be triggered when there is a conflict within a single system (i.e., FFFS has been activated by a threatening situation and needs to determine whether to flee or fight), or when two systems conflict with each other (i.e., in a new social environment, the BAS may be prompting an individual to socialize, while the FFFS is motivating the individual to flee). The BIS contributes to anxious behavior, and is associated with passive avoidance and increased arousal (Corr, 2008; Corr et al., 2013). As the BIS is theorized to be an underlying component of the FFM personality trait Neuroticism (Corr et al., 2013), and a previous study found a positive correlation between Neuroticism and passive Facebook use (Ryan & Xenos, 2011), we predict that individuals who are high in BIS will use Facebook passively.

As active use has been previously linked to positive correlates of subjective well-being (Ellison et al., 2007; Grieve et al., 2013), and passive use has been linked to negative correlates of subjective well-being (Krasnova et al., 2013; Verduyn et al., 2015), it is important to understand if personality traits play a role in how users engage with Facebook.

2. Study 1: exploratory factor analysis

The aim of study 1 was to adapt the Facebook activity questionnaire (Junco, 2012) into a multi-scale measure reflecting active and passive Facebook engagement. The results of the exploratory factor analysis were then subjected to replication with new samples in study 2.

2.1. Methods

2.1.1. Respondents

Two hundred and thirty-four respondents (84 males, 150 females, $M_{age} = 33.80$, $SD = 9.31$) who used Facebook were recruited online through Amazon Mechanical Turk (MTurk) over a three-day period during June 2016. Respondents were American residents and paid $3 for participation. They accessed the study through a survey website where they gave informed consent and completed a questionnaire that contained measures for multiple studies. The age in this sample ranged from 21 to 67 years old, with most respondents reporting full-time or part-time employment (193 employed, 22 unemployed, 1 maternity leave, 3 students, 8 retired, and 7 "other"). Less than half of the sample (107 respondents) had obtained a university degree (90 had bachelor's degrees, 16 had master's degrees and 1 had a professional/doctoral degree).

2.1.2. Measures

To create our measure for passive and active Facebook use we adapted the Facebook activity questionnaire (FAQ) developed by Junco (2012). The FAQ includes 14 questions which identify activities Facebook users engage in when visiting the site. The questionnaire asks respondents to determine how frequently they engage in each activity on a scale of 1 to 5, with (1) representing "Never (0% of the time)" and (5) representing "Very frequently (close to 100% of the time)". In the original study, each item is regarded as a separate variable and is not scored to create composite scales for quantitative analysis (2012). However, many of its items capture the essence of active use (such as "Commenting") and passive use (such as "Viewing photos"). The frequency of feature use can be used to imply style of engagement, as active users will be more likely to use features which demonstrate social engagement (such as leaving comments) and/or leave traceable evidence of site interaction (such as clicking 'like'). In contrast, passive users will be more likely to use features which are socially disengaged (such as looking through friends' profiles) and are less likely to use features which leave traceable evidence of interaction with the site (e.g., likes, comments). We therefore used the FAQ as a base for creating composite scales to assess passive and active use, adding new items which directly pertain to active and passive use, and removing items which were no longer relevant. The resulting Passive and Active Use Measure (PAUM) retains the format of the FAQ and asks respondents "How frequently do you perform the following activities when you are on Facebook?" Answer categories are presented on a 5-point scale, ranging from (1) "Never" (0% of the time) to (5) "Very frequently" (close to 100% of the time). While the PAUM retains most of the items from the FAQ, we dropped one item and added three additional items to better reflect passive and active Facebook use. The rationale for these choices is explained below.

As Facebook updates its features, sometimes features which used to be separate become merged. This is the case with Facebook chat and Facebook private messenger. Originally, Facebook chat was an instant messaging type service where users could chat with friends who were online, and Facebook private messenger was similar to email. However, as Facebook has merged these two features, the items "Sending private messages" and "Chatting on Facebook chat" have become synonymous. As such, we dropped "Sending private messages" as all messages now go through Facebook chat.

Prior research on Facebook has identified that Facebook use can be broken down into two broad categories: passive social browsing and extractive social searching (Wise, Alhabash, & Park, 2010). Wise and colleagues defined passive social browsing as "seeking general information about friends in a collective manner (i.e., newsfeed page)" (2010, p. 556). As none of the items in the FAQ represent passive social browsing specifically through the newsfeed and the use of the newsfeed is mentioned frequently in the literature (Deters & Mehl, 2013; Fox & Moreland, 2015; Tandoc, Ferrucci, & Duffy, 2015), we added items which represent passive social browsing through the newsfeed. As the newsfeed is a feature that can be used both actively and passively, we felt that two items were needed to reflect the use of the newsfeed, and we consulted the literature to create these items. As previous studies have directly explained passive and active usage to respondents (Verduyn et al., 2015), we created an item for active newsfeed use, "Browsing the newsfeed actively (liking and commenting on posts, pictures and updates)", and an item for passive newsfeed use, "Browsing the newsfeed passively (without liking or commenting on anything)" based on the prompts given to respondents in Verduyn et al.'s study (2015). Wise and colleagues defined extractive social searching as a type of use where "users seek direct interaction with their Facebook friends by acquiring specific information about them (i.e., visiting a friend's profile page) and communicating with them (i.e., writing on a friend's wall)" (2010, p. 556). While some types of extractive social searching were already represented in the Facebook activity scale, the act of directly visiting a friend's profile page was not represented. The FAQ included an item about looking at friends' lives, "Checking to see what someone is up to", however, we felt that this statement could include viewing friends on the newsfeed as opposed to viewing a friend's Facebook profile page. Therefore, we added "Looking through my friends' profiles" which specifically represents extractive social searching. Information on subscales, validity and reliability are included in the results section.

As part of the validation process, we also included four subjective well-being variables and Facebook intensity. Subjective well-being was measured with the satisfaction with life scale (Diener, Emmons, Larsen, & Griffin, 1985), the eudaimonic well-being questionnaire (Waterman et al., 2010), and the positive and negative affect scales (PANAS; Watson, Clark, & Tellegen, 1988). The satisfaction with life scale is a 5-item scale which measures hedonic well-being. It is anchored on a 7-point Likert scale, and responses range from (1) strongly disagree to (7) strongly agree. The eudaimonic well-being questionnaire is a 21-item scale, and responses range from (1) strongly disagree

Table 1
Descriptive statistics and reliability for study 1 measures.

Statistic	Mean	St. Dev.	Min	Max	α
Life satisfaction	22.7	8.0	5	35	0.95
Eudaimonic well-being	56.1	10.7	20	83	0.87
Positive affect	29.8	9.5	10	50	0.93
Negative affect	12.2	4.5	10	40	0.92
Multi-dimensional Facebook intensity	44.2	14.3	12	84	0.90

Note: $N = 234$. α = Cronbach's alpha from study 1 data.

to (5) strongly agree. The positive and negative affect scales comprise 20 items which ask respondents to identify the extent to which they currently feel the emotions listed, with 10 items for positive affect and 10 items for negative affect. It is anchored on a 5-point Likert scale, and responses range from (1) very slightly or not at all to (5) extremely. Facebook intensity was assessed with the multi-dimensional Facebook intensity scale (Orosz, Tóth-Király, & Bőthe, 2015). Facebook intensity measures an individual's level of involvement with Facebook in day-to-day life (i.e., "I feel bad if I don't check my Facebook daily"), as well as their motivations for use (i.e., "When I'm bored, I often go to Facebook"). The measure is anchored on a 5-point Likert scale with responses ranging from (1) strongly disagree to (5) strongly agree. See Table 1 for descriptive statistics and reliability for all measures used for validation.

2.1.3. Online data quality

To ensure that the respondents were reading the questions and answering honestly, a variety of quality checks were added to the questionnaire. The questionnaire included attention checks such as "Please select 'slightly disagree' for this question" which were integrated into matrix-style questions. Respondents who answered these questions incorrectly were disqualified and were not allowed to complete the questionnaire. Additionally, the survey also disqualified respondents who answered matrix style questions by selecting the same choice for every item in the questionnaire (for example, choosing "Disagree" for all 20 items in the PANAS scale). The survey prevented respondents who had previously attempted to take the questionnaire from trying again if they had been disqualified. Additionally, respondents who finished the questionnaires in half the time expected or less were removed from the final sample.

2.1.4. Data analysis

The data were analyzed with R statistical software (R Core Team, 2015) using the psych (Revelle, 2016) and lavaan (Rosseel, 2012) packages. Each item of the PAUM was tested for normality; all items were within the range of normal distribution. The PAUM uses frequency of feature use as an indicator of engagement style, however, it cannot directly measure how engaged an individual is while using Facebook. As the purpose of the PAUM is to measure Facebook engagement style (a latent construct which can be inferred through measuring Facebook activities), the most appropriate method of analysis is exploratory factor analysis (EFA). We therefore ran maximum likelihood EFA with two, three and four-factor solutions using an oblique rotation method. We first tested the models with an oblimin rotation. Many items cross-loaded on multiple factors. Previous research on rotations has recommended that when factor indicators have strong loadings on multiple factors, a geomin rotation should be used (Browne, 2001). Therefore, we retested the factor structure with the two, three and four-factor solutions with a geomin rotation. To establish discriminant validity, we ran Pearson's correlations between the factors of the PAUM, subjective well-being, and Facebook intensity measures.

2.2. Results

2.2.1. Exploratory factor analysis

The results indicate a fair model fit for the two-factor solution, $\chi^2 = 249.85$, df(89), $p < 0.001$, RMSR = 0.06. However, the item loadings for the two-factor solution did not accurately reflect passive and active use as some "active" items loaded onto the second factor which mainly reflected passive use. The three-factor solution demonstrated an improved model fit, $\chi^2 = 157.35$, df(75), $p < 0.001$, RMSR = 0.04, and the item loadings fit the concepts of passive and active use better. The four-factor solution improved the model fit marginally, $\chi^2 = 112.15$, df(62), $p < 0.001$, RMSR = 0.03. However, only one item strongly loaded onto the 4th factor.

We therefore determined that the PAUM consists of three factors. The first factor contains items reflecting active use of a social nature such as "Commenting" and "Chatting on Facebook chat", and we therefore named the first factor 'Active social'. The second factor consists of items reflecting active use of a non-social nature such as "Posting videos" and "Tagging photos" where the user is creating content, but not directly interacting with others. Therefore, we named the second factor 'Active non-social'. The third factor consists of items reflecting passive use such as "Viewing photos" and "Checking to see what someone is up to". We therefore named the third factor 'Passive'.

The factor loading for item 1 was below the 0.30 benchmark, and was therefore removed from the scale and further analyses. Additionally, we removed items 3 and 13, as they cross-loaded closely onto two factors (the cut-off for cross-loading was ≤0.05). Once items 1, 3 and 13 were removed, the fit of the three-factor solution improved slightly, $\chi^2 = 107.69$, df(42), $p < 0.001$, RMSR = 0.04. See Table 2 for factor loadings, eigenvalues and variances.

2.2.2. Internal reliability and correlation

Cronbach's alphas for all three factors demonstrated adequate internal reliability (*Active social* α = 0.80; *Active non-social* α = 0.78; *Passive* α = 0.70).

The factors of the PAUM were distinct, but correlated. The two active factors: *Active social* use and *Active non-social* use were strongly correlated ($r = 0.66$, $p < 0.001$), which demonstrates the similarity of the

Table 2
Factor loadings for the Passive and Active Use Measure.

Item	Active social	Active non-social	Passive
1. *Playing games* (*Farmville, MafiaWars,* etc.)			
2. Posting status updates	**0.83**		
3. *Sharing links*	*0.35*	*0.34*	
4. Commenting (on statuses, wall posts, pictures, etc)	**0.76**		
5. Chatting on FB chat	**0.34**		
6. Checking to see what someone is up to	0.36		**0.43**
7. Creating or RSVPing to events		**0.35**	
8. Posting photos	**0.52**		
9. Tagging photos		**0.70**	
10. Viewing photos			**0.83**
11. Posting videos	0.36	**0.53**	
12. Tagging videos		**0.87**	
13. *Viewing videos*		*0.36*	*0.41*
14. Browsing the newsfeed passively (without liking or commenting on anything)			**0.62**
15. Browsing the newsfeed actively (liking and commenting on posts, pictures and updates)	**0.43**		
16. Looking through my friends' profiles			**0.47**
Eigenvalue	2.3	2.3	1.7
Variance	17%	16%	12%

Note: Bold indicates which factor an item belongs. Italics denote item removal. Factor loadings are only displayed if they are above 0.30. Eigenvalues and variances do not include removed items.

concepts, as would be expected from two measures of active engagement. The *Passive use* factor was moderately correlated with both the *Active social* use factor ($r = 0.56$, $p < 0.001$) and the *Active non-social* use factor ($r = 0.47$, $p < 0.001$). Some correlation is to be expected as all the factors are measuring engagement on Facebook, however, the moderate correlations demonstrate that the factors are measuring separate, but related constructs.

2.2.3. Discriminant validity

We employed four subjective well-being measures and a Facebook Intensity measure to establish discriminant validity. Correlations were used to demonstrate that different scales were not measuring the same concept. While there were some significant correlations, the PAUM shows good evidence of measuring distinct constructs from the other scales administered (Table 3).

2.3. Discussion

The purpose of study 1 was to create a multi-item measure which reflected active and passive Facebook engagement. We adapted the Facebook Activity Questionnaire (Junco, 2012) for this purpose and conducted an EFA to explore the factors of the new measure. The results revealed that the Passive Active Use Measure (PAUM) consists of 13 items which load onto three factors: *Active social*, *Active non-social*, and *Passive* use. The factors of the PAUM demonstrated acceptable internal reliability and good discriminant validity.

The items for *Active social* use describe a type of Facebook engagement which is both active (creating content) and social in nature (communicating with friends). In contrast, the items for *Passive use* show a type of engagement which is both passive and non-social. The existence of the third factor, *Active non-social use*, was unexpected, and identifies a type of Facebook engagement which is somewhere between the traditional definitions of active and passive use. The items for *Active non-social* use describe a level of Facebook engagement where the user creates content, but is not communicating directly with friends. It is likely that *Active non-social* use was either grouped with passive use in previous research due to its non-social nature, or active use due to the creation of content, and thus may have been overlooked as its own level of engagement.

While most of the items for each factor are logical, there was one discrepancy which warrants further investigation. “Posting pictures” and “Posting videos” are similar in nature, and thus we would expect these activities to load onto the same factor. However, “Posting pictures” loads onto the *Active social* factor, while “Posting videos” loads onto the *Active non-social* factor. It is possible this discrepancy stems from the content of the media being posted. For example, users may be posting pictures of themselves or friends, which would be social in nature since they would be sharing pictures to update their Facebook friends about their lives. However, sharing videos found on YouTube or the newsfeed may not contain the same personal information, and thus would still be considered active use, but would lack the social element gained from posting personal information to update friends. We investigate these differences further in study 2.

Table 3
Correlations of the Passive and Active Use Measure with other scales.

	Active social use	Active non-social use	Passive use
Satisfaction with life scale	0.25***	0.16***	0.03
Eudaimonic well-being questionnaire	0.09	0.16*	0.10
Positive affect scale	0.37***	0.33***	0.27***
Negative affect scale	0.04	0.08	0.07
Multi-dimensional Facebook intensity scale	0.54***	0.64***	0.47***

Note:
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

3. Study 2: confirmatory factor analysis

The aim of study 2 was to replicate the factor structure of the scales found in study 1 using the final version of the PAUM, and to establish test re-test reliability for the scales. Respondents were recruited in two samples, and the data from the second sample was collected in two waves. The data from sample 1 and the first wave from sample 2 were used to test the factor structure found in study 1. The data from the first and second waves of sample 2 were used to investigate the test-retest reliability for the scales.

3.1. Methods

3.1.1. Respondents for sample 1

Two-hundred and seventy-six respondents (160 males, 116 females, $M_{age} = 34.63$, $SD = 10.03$) who indicated that they used Facebook were recruited online through MTurk over a 2-day period during October 2016. Respondents were American residents, and accessed the study through a link to a survey website where they gave informed consent and were paid $1.45 for participating in a 10-min survey. The age in the sample ranged from 19 to 71 years old, with most respondents reporting full-time or part-time employment (232 employed, 19 unemployed, 2 maternity leave, 2 retired, 12 students, and 9 “other”). Less than half of the sample (129 respondents) had obtained a university degree (106 had bachelor's degrees, 15 had master's degrees and 8 had a professional/doctoral degree).

3.1.2. Respondents for sample 2, wave 1

Two-hundred and forty-five respondents (106 males, 139 females, $M_{age} = 35.43$, $SD = 11.93$) who used Facebook were recruited online through Prolific Academic over a 2-day period during April 2017. Respondents were United Kingdom and United States residents, and accessed the study through a link to a survey website where they gave informed consent and were paid £2 for participating in a 15-min survey. The age in the sample ranged from 19 to 68 years old, with most respondents reporting full-time or part-time employment (176 employed, 22 unemployed, 2 maternity leave, 2 sick leave, 6 retired, 34 students, and 3 “other”). Over half of the sample (152 respondents) had obtained a university degree (114 had bachelor's degrees, 28 had master's degrees and 10 had a professional/doctoral degree).

3.1.3. Respondents for sample 2, wave 2

Two weeks after the initial survey, respondents from the first wave of sample 2 were asked to return to complete a 2-min follow-up survey, for which they were paid an additional £0.50. One-hundred and seventy-five respondents (81 males, 94 females, $M_{age} = 36.08$, $SD = 11.95$) returned to complete the follow-up survey (71% of wave 1 sample). The age in the returning sample ranged from 19 to 68, with most respondents reporting full-time or part-time employment (134 employed, 13 unemployed, 1 maternity leave, 2 sick leave, 2 retired, 20 students, and 3 “other”). Over half of the sample (107 respondents) had obtained a university degree (86 had bachelor's degrees, 15 had master's degrees and 6 had a professional/doctoral degree).

3.1.4. Measures

Respondents from sample 1 and the first wave of sample 2 completed the PAUM and the same four subjective well-being measures included in study 1. Personality was measured with a shortened version of the Reinforcement Sensitivity Theory of Personality Questionnaire (RST-PQ;

Table 4
Descriptive statistics and internal reliability for study 2 measures.

Statistic	Sample 1					Sample 2, wave 1					Sample 2, wave 2				
	Mean	St. Dev.	Min	Max	α	Mean	St. Dev.	Min	Max	α	Mean	St. Dev.	Min	Max	α
Subjective well-being															
Life satisfaction	21.5	8.2	5	35	0.94	20.6	7.2	5	35	0.91					
Eudaimonic well-being	55.4	11.3	20	82	0.89	53.8	9.9	24	77	0.86					
Positive affect	28.0	8.6	11	50	0.91	27.2	7.7	11	49	0.89	27.2	7.7	11	47	0.89
Negative affect	11.8	3.9	10	42	0.92	12.9	4.9	10	34	0.91	13.4	5.7	10	40	0.92
RST-PQ															
Reward Interest	5.0	1.6	2	8	0.79	4.8	1.5	2	8	0.72					
Reward Reactivity	5.8	1.4	2	8	0.60	6.1	1.4	2	8	0.64					
Impulsivity	3.5	1.3	2	8	0.60	4.1	1.6	2	8	0.67					
Goal-Drive Persistence	5.7	1.6	2	8	0.73	5.3	1.5	2	8	0.65					
BIS	8.3	3.2	4	16	0.81	10.1	3.1	4	16	0.80					
FFFS	9.6	2.8	4	16	0.48	9.9	2.9	4	16	0.61					
Mini-IPIP															
Extraversion	10.6	4.2	4	20	0.86										
Agreeableness	15.1	3.4	4	20	0.85										
Conscientiousness	14.8	3.4	4	20	0.79										
Neuroticism	9.8	3.7	4	20	0.79										
Intellect	16.2	3.3	4	20	0.78										
PAUM															
Active social	13.8	3.7	5	23	0.79	13.0	3.6	5	25	0.75	13.2	3.5	5	24	0.73
Active non-social	7.3	2.3	4	16	0.71	7.1	2.9	4	20	0.81	7.1	2.6	4	16	0.78
Passive	13.6	2.9	5	20	0.71	12.6	2.8	4	20	0.69	13.4	2.6	7	20	0.65

Note: α = Cronbach's alpha from study 2 data.

Corr & Cooper, 2016). The 18-item questionnaire measures the three major systems of RST: the behavioral inhibition system (BAS), the fight-flight-freeze system (FFFS) and the four behavioral approach system (BAS) factors: Reward Interest, Reward Reactivity, Impulsivity and Goal-Drive Persistence. Respondents were instructed to assess how accurately each statement described them on a scale from (1) not at all to (4) highly. The RST-PQ factors have adequate internal reliability for a short scale (Table 1). We also included the 20-item Mini-IPIP scale in sample 1, which measures Extraversion, Agreeableness, Conscientiousness, Neuroticism and Intellect/Imagination (Cooper, Smillie, & Corr, 2010). Respondents were asked how accurately each statement described them and responded on a scale from (1) not accurate at all to (5) extremely accurate. See Table 4 for descriptive statistics and internal reliability for all measures.

To investigate the differences between posting photos and posting videos found in study 1, respondents from the first wave of sample 2 also answered questions about the content of the photos and videos they post on Facebook. Respondents who indicated that they posted photos on Facebook were asked if the photos they posted were most frequently photos they had taken themselves, photos of them which had been taken by someone they knew, or pictures they had found online such as memes or cute/funny animal pictures. They were also asked to indicate what percentage of the photos they posted on Facebook were original content versus photos they found online and shared. These questions were repeated for videos if the respondent indicated they also post videos on Facebook.

To assess consistency over time, returning respondents for the second wave of sample 2 were asked to complete the PANAS and PAUM scales for a second time. The same data quality parameters from study 1 were used in all samples for study 2.

3.1.5. Data analysis

The data from sample 1 and the first wave of sample 2 were analyzed with maximum likelihood confirmatory factor analysis using R statistical software (R Core Team, 2015) and the lavaan package (Rosseel, 2012). Prior to analysis, we tested the three factors of the PAUM for normality. The Active social and Passive factors were both normally distributed in both samples, however, the Active non-social factor was not (Sample 1: skewness = 5.07, kurtosis = 1.69; Sample 2, wave 1: skewness = 1.15, kurtosis = 1.67). For our CFAs, we therefore applied a Satorra-Bentler scaled chi-square to better approximate chi-square under non-normality. The first and second waves of sample 2 were analyzed with Pearson's correlations to establish test re-test reliability.

3.2. Results

3.2.1. Confirmatory factor analysis

The results of our confirmatory factor analysis revealed an adequate model fit for both sample 1, $\chi^2 = 201.07$, df(74), $p < 0.001$, scaling correction factor for MLR: 1.22, RMSEA = 0.08, CFI = 0.89, SRMR = 0.06 and sample 2, $\chi^2 = 164.97$, df(62), $p < 0.001$, scaling correction factor for MLR: 1.19, RMSEA = 0.08, CFI = 0.90, SRMR = 0.06.

Table 5
Correlations of the Passive and Active Use Measure with other scales.

	Active social use		Active non-social use		Passive use	
	S1	S2	S1	S2	S1	S2
Subjective well-being						
Satisfaction with life scale	0.15**	0.09	0.22***	0.08	−0.03	0.00
Eudaimonic well-being questionnaire	0.09	0.10	0.14*	0.04	0.04	−0.08
Positive affect scale	0.28***	0.29***	0.28***	0.23***	0.24***	0.16**
Negative affect scale	0.07	0.09	0.02	0.20**	0.07	0.13*
Mini-IPIP						
Extraversion	0.22***		0.33***		0.05	
Agreeableness	0.15**		0.09		0.11	
Conscientiousness	0.05		0.09		−0.03	
Neuroticism	0.08		−0.05		0.11	
Intellect/Imagination	0.04		−0.01		0.08	

Note: S1 = Sample 1, S2 = Sample 2.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

3.2.2. Internal reliability and correlation

Cronbach's alphas demonstrated adequate internal reliability for study 2 (see Table 4). We found similar correlations for the factors of the PAUM in study 2 as we did in study 1: Active use and Active non-social use were strongly correlated (Sample 1: $r = 0.62$, $p < 0.001$), and Passive use was moderately correlated with both Active non-social use (Sample 1: $r = 0.35$, $p < 0.001$; Sample 2: $r = 0.42$, $p < 0.001$), and Active social use (Sample 1: $r = 0.45$, $p < 0.001$; Sample 2: $r = 0.48$, $p < 0.001$).

3.2.3. Discriminant validity

To test for discriminant validity, we ran Pearson's correlations with the four subjective well-being measures and the Mini-IPIP to verify that different scales were measuring unique concepts. Despite some significant correlations, the PAUM demonstrated good evidence of measuring distinct constructs (Table 5).

3.2.4. Difference between posting photos and videos

Results showed differences between the content/source of photos and videos posted by respondents to their Facebook pages. Out of the two-hundred and forty-five respondents, two-hundred and six indicated that they post photos at least "Rarely (25%)" and one-hundred and eighteen indicated that they post videos at least "Rarely (25%)". These respondents were asked to indicate if the pictures/videos they posted most frequently were original content or found online. Respondents were also asked to indicate what percentage of their posted media was original versus found online. See tables 6 and 7 below for results.

3.2.5. Test re-test reliability

To examine test re-test reliability, we ran Pearson's correlations on the PAUM factors from wave 1 and wave 2 of sample 2. The factors of the PAUM demonstrated acceptable test re-test reliability (*Active social*, $r = 0.76$; *Active non-social*, $r = 0.66$; *Passive*, $r = 0.65$).

3.3. Discussion

The aim of study 2 was confirm the factor structure and to establish test re-test reliability for the PAUM scales. The results of the CFA confirmed the factor structure found in study 1 with two samples. The factors of the PAUM demonstrated acceptable internal reliability, and good discriminant validity against the four subjective well-being measures and the Mini-IPIP scales. The PAUM scales also demonstrated acceptable test re-test reliability.

Study 2 also explored whether there are differences posting pictures versus videos, as these items loaded onto different factors in study 1. Although no statistical analysis was conducted, descriptive statistics showed that the respondents in study 2 most frequently posted pictures taken by themselves or friends, but videos found online. This difference may explain why "Posting pictures" loads onto the *Active social* factor while "Posting videos" loads onto *Active non-social* factor.

Table 6
Most frequently posted pictures and videos.

When you post pictures/videos on Facebook, are they most frequently…	Pictures	Videos
Pictures/videos I have taken myself	147	50
Pictures/videos of me taken by friends/family/people I know	24	5
Pictures/videos I found online	35	63

Note: Pictures $N = 206$, Videos $N = 118$.

Table 7
Percentage of pictures/videos taken versus found online.

	N	Mean	St. Dev.	Min	Max
Out of 100%, what percentage of the photos you post on Facebook are:					
Pictures taken by me or someone I know	206	73.0	29.2	0	100
Pictures I found online and "shared" (memes, cute/funny animals, etc.)	206	27.0	29.2	0	100
Out of 100%, what percentage of the videos you post on Facebook are:					
Videos recorded by me or someone I know	118	43.8	39.6	0	100
Videos I found online and "shared" (YouTube, news clips, funny animals, etc.)	118	56.2	39.6	0	100

4. Study 3: relationship of PAUM scales with RST-PQ traits

The aim of study 3 was to explore the associations between the factors of the PAUM and RST-PQ traits to investigate if personality traits were associated with different types of Facebook engagement.

4.1. Methods

To explore the associations between the factors of the PAUM and RST-PQ traits, we combined the samples from study 2 (sample 1 and the first wave from sample 2), resulting in a sample of 521 respondents (see Table 8 for descriptive statistics). The combined data were tested for normality and were found to be normally distributed. We ran OLS regression models using the factors of the PAUM as dependent variables to analyze if RST-PQ traits were associated with different types of Facebook engagement.

4.2. Results

4.2.1. Active social use

The results showed a significant positive association between *Active social* use and two BAS factors, Reward Interest ($\beta = 0.46$, $p < 0.001$, Table 9, column 1) and Reward Reactivity ($\beta = 0.30$, $p = 0.02$, Table 9, column 1).

4.2.2. Active non-social use

Results revealed significant positive associations between *Active non-social* use and three BAS factors, Reward Interest ($\beta = 0.23$, $p = 0.01$, Table 9, column 2), Goal-Drive Persistence ($\beta = 0.21$, $p = 0.01$, Table 9, column 2) and Impulsivity ($\beta = 0.21$, $p = 0.01$, Table 9, column 2).

Table 8
Descriptive statistics for combined sample.

Statistic	N	Mean	St. Dev.	Min	Max	α
Age	521	35.0	11.0	19	71	
Male	521	0.5	0.5	0	1	
University	521	0.5	0.5	0	1	
Reward interest	521	4.9	1.5	2	8	0.76
Reward reactivity	521	5.9	1.4	2	8	0.61
Impulsivity	521	3.8	1.5	2	8	0.65
Goal-drive persistence	521	5.5	1.6	2	8	0.70
BIS	521	9.2	3.3	4	16	0.68
FFFS	521	9.8	2.9	4	16	0.57
Active social	521	13.4	3.7	5	25	0.77
Active non-social	521	7.2	2.6	4	20	0.77
Passive	521	13.1	2.9	4	20	0.71

Note: α = Cronbach's alpha for combined data from study 2. University education was coded as a binary variable with 0 denoting that the respondent did not attend university and 1 denoting that the respondent holds a university or higher degree.

Table 9
Ordinary least squares regressions for PAUM factors and RST traits.

	Active social use	Active non-social use	Passive use
Male	−0.69*	0.10	0.31
	(0.34)	(0.24)	(0.28)
Age	0.17	−0.02	0.07
	(0.09)	(0.06)	(0.07)
Age squared	−0.002*	−0.0001	−0.001
	(0.001)	(0.001)	(0.001)
University education	−0.31	0.07	−0.33
	(0.31)	(0.22)	(0.25)
Reward interest	0.46***	0.23**	0.29**
	(0.13)	(0.09)	(0.10)
Reward reactivity	0.30*	0.08	0.21*
	(0.13)	(0.09)	(0.10)
Goal-drive persistence	0.12	0.21*	0.05
	(0.12)	(0.08)	(0.10)
Impulsivity	0.05	0.21*	−0.04
	(0.12)	(0.08)	(0.09)
BIS	0.03	0.03	0.07
	(0.06)	(0.04)	(0.05)
FFFS	0.04	-0.02	0.15**
	(0.06)	(0.05)	(0.05)
Constant	5.74**	4.25**	7.11***
	(2.07)	(1.45)	(1.66)
Observations	521	521	521
R^2	0.11	0.12	0.08
Adjusted R^2	0.09	0.10	0.06
F Statistic (df = 10; 510)	6.28***	6.64***	4.57***

Note:
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

4.2.3. Passive use

Results revealed significant positive associations between *Passive use* and two BAS factors, Reward Interest ($\beta = 0.29$, $p < 0.001$, Table 9, column 3) and Reward Reactivity ($\beta = 0.21$, $p = 0.04$, Table 9, column 3). *Passive use* was also associated positively with FFFS ($\beta = 0.15$, $p < 0.001$, Table 9, column 3).

4.3. Discussion

The regression results revealed several interesting relationships. Contrary to our predictions that Reward Interest would be associated only with active use, Reward Interest displayed positive associations with all three PAUM factors. Similarly, Reward Reactivity was associated with both Active social use and Passive use. It is possible that Reward Reactivity and Reward Interest may be associated with multiple types of Facebook engagement as users who are high in these traits access Facebook frequently, and therefore use all engagement patterns. As Reward Reactivity and Reward Interest are subscales of the BAS (theorized to be the underlying factor of FFM Extraversion; Depue & Collins, 1999; Lucas & Baird, 2004), these findings may be corroborated by past studies on FFM personality and Facebook use, which found that high Extraversion was associated with frequent access and intense use of the site (Caci, Cardaci, Tabacchi, & Scrima, 2014; Correa, Hinsley, & de Zúñiga, 2010).

In line with our predictions, users high in Impulsivity were more likely to be active users. Impulsivity was positively associated with Active non-social use. This may reflect the amount of time users high in Impulsivity spend on the site, as it is possible that users who are impulsive are checking Facebook for brief periods of time, but at a high frequency, thereby spending a short time browsing the newsfeed in an active yet non-social way (i.e., liking posts, tagging photos), but not creating any content which would be time consuming such as statuses or comments. Goal-Drive Persistence was also positively associated with Active non-social use, contrary to our predictions that those high in the trait would be passive users. Previous research on Facebook use and personality has found that people high in FFM Conscientiousness (which shares many traits with Goal-Drive Persistence including restraint and goal-planning) spend less time on Facebook and are more likely to use the site to gain news and information (Caci et al., 2014; Ryan & Xenos, 2011). This may mean that users high in Goal-Drive Persistence are accessing Facebook as a source of news and information, as opposed to a place to maintain friendships and build social capital. These users may be spending a shorter amount of time on the site and "liking" informational articles and news updates from friends, thus explaining their active, yet non-social use.

In contrast to our predictions, BIS was not associated with passive use in our sample. However, the results revealed a positive association between FFFS and Passive use. While unexpected, this finding is especially interesting, as previous research has linked FFFS to social anxiety (Kambouropoulos, Egan, O'Connor, & Staiger, 2014). These results therefore may indicate that users who are socially anxious are more likely to use Facebook passively. This result also supports previous research which has found a positive association between individuals high in FFM Neuroticism and passive use (Ryan & Xenos, 2011). As BIS and FFFS are thought to be the underlying factors of Neuroticism (Corr et al., 2013), it is possible that the relationship between passive use and Neuroticism is driven by FFFS.

Although the associations between personality and Facebook engagement are significant, our effect sizes are small. These findings suggest that while personality does play a small role in how users interact with Facebook, there are other variables which may have more of an impact on how individuals engage with the site. Our results, however, are in line with previous studies on personality and Facebook use, which typically find small effect sizes for the significant relationships between FFM personality traits and aspects of Facebook use (Amichai-Hamburger & Vinitzky, 2010; Caci et al., 2014; Correa et al., 2010; Lee et al., 2014; Marshall, Lefringhausen, & Ferenczi, 2015; Skues, Williams, & Wise, 2012).

5. General discussion

We developed and validated three scales to measure passive and active forms of Facebook use. Both EFA and CFA confirmed that the 13-item Passive Active Use Measure (PAUM) loads onto three factors: *Active social*, *Active non-social*, and *Passive use*, all of which demonstrated adequate internal reliability. The PAUM scales demonstrated good discriminant validity against other measures.

Additionally, regressions with the factors of the PAUM and RST-PQ traits were conducted to establish if there was a relationship between personality traits and the tendency to use Facebook in a certain way.

5.1. Limitations and conclusion

Additional research is needed to investigate further these relationships. We were not able to test construct validity as, to our knowledge, there are no other validated scales which have been designed to measure active and passive Facebook use. Additionally, although our respondents were compensated, our samples may suffer from self-selection bias, as respondents volunteered to participate.

In conclusion, it is important to account for passive and active use when conducting research on Facebook usage. While measures such as Facebook intensity and access frequency are adequate general measures of use, it is more informative to consider how users are spending time on the site. Thus, we offer the passive active use measure as a valid, reliable, and concise means for measuring Facebook engagement. This study also highlights how individual differences in personality can influence how users engage with Facebook.

Appendix A. The Passive Active Use Measure (PAUM)

How frequently do you perform the following activities when you are on Facebook? (Note: Choosing "Very Frequently" means that about 100% of the time that you log on to Facebook, you perform that activity).

	Never (0%)	Rarely (25%)	Sometimes (50%)	Somewhat frequently (75%)	Very frequently (100%)
1. Posting status updates	1	2	3	4	5
2. Commenting (on statuses, wall posts, pictures, etc)	1	2	3	4	5
3. Chatting on FB chat	1	2	3	4	5
4. Checking to see what someone is up to	1	2	3	4	5
5. Creating or RSVPing to events	1	2	3	4	5
6. Posting photos	1	2	3	4	5
7. Tagging photos	1	2	3	4	5
8. Viewing photos	1	2	3	4	5
9. Posting videos	1	2	3	4	5
10. Tagging videos	1	2	3	4	5
11. Browsing the newsfeed passively (without liking or commenting on anything)	1	2	3	4	5
12. Browsing the newsfeed actively (liking and commenting on posts, pictures and updates)	1	2	3	4	5
13. Looking through my friends' profiles	1	2	3	4	5

Items should be presented to respondents in randomized order.
Scoring: Items are summed.
Active social: 1, 2, 3, 6, 12.
Active non-social: 5, 7, 9, 10.
Passive: 4, 8, 11, 13.

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