

Instagram Use and Its Effects on Self-Esteem During the COVID-19 Pandemic

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Given Instagram's popularity, a large body of research has been conducted to examine different patterns of its usage, and the effects they might have on various mental well-being outcomes, including self-esteem. However, with the outbreak of the COVID-19 pandemic, the situation and context in which Instagram was being used changed substantially. This in turn might also have had implications on the relationship between Instagram use and mental well-being. Therefore, this research re-examines the different patterns of Instagram usage among young adults and their effect on self-esteem, in the context of the COVID-19 pandemic, using latent class analysis (LCA). The results suggest

the presence of four distinct usage patterns: two usage patterns in which individuals seek to gratify their social needs and need for knowledge and stress relief, respectively, and two patterns that are characterized by low and high intensity of using Instagram for different reasons and to fulfill various needs. The results also show that using Instagram to fulfill social needs is associated with lower self-esteem levels than when this platform is used at high intensity.

Keywords: Instagram; Self-esteem; COVID-19; Social media use; Latent class analysis (LCA)

In recent years, Instagram has become one of the most popular social media platforms worldwide. To illustrate, as of February 2021, more than 1.2 billion people around the world used Instagram (Tankovska, 2021). This photo-sharing application is especially commonly used among young adults, who spend more time on Instagram than on any other social media platform (Huang & Su, 2018; Kircaburun et al., 2020). The extensive use of Instagram has caused it to become an important part of the daily social lives of most young adults (Baruah, 2012).

Given the importance of Instagram, and more broadly speaking of social media, the psychological effects of using these platforms has drawn the attention of many social and behavioral scientists. Specifically, researchers have examined the effects of social media on a variety of mental well-being dimensions, such as self-esteem, loneliness, the fear of missing out, depression, social anxiety, body-image, and life-satisfaction (Alkis et al., 2017; Bonsaksen et al., 2021; Hunt et al., 2018; Wang et al., 2017).

While social media use and its effects on mental well-being have been extensively studied and explained, the situation and context in which social media was used changed substantially in 2020 with the outbreak of the COVID-19 pandemic. Namely, as confinement and isolation were seen as necessary to combat the pandemic, most countries declared lockdowns of varying degrees in 2020 and 2021, which substantially limited the possibilities for real-life social interactions (Cagnin et al., 2020).

As a result, young adults had to find different ways to satisfy the needs that are normally fulfilled through face-to-face interactions. One of the best functional alternatives available to them were social media platforms, as they offer multiple components that allow for forms of communication that resemble real-life interactions to a much greater degree than any other medium¹ (Michel et al., 2016). Instagram appears particularly relevant in this context, as for many young adults it already was the preferred medium for social interaction, entertainment and passing time. In addition, it was also regarded as easy and convenient to use (Alhabash & Ma, 2017; Kircabarun et al., 2018; Sheldon & Bryant, 2016).

Thus, it is likely that as a result of the COVID-19 pandemic, Instagram usage changed among young adults; this is particularly true with respect to reasons for using Instagram. This in turn implies that previous findings regarding the characteristics of Instagram use might not be fully applicable during and in the aftermath of the COVID-19 pandemic. Therefore, it is important to re-examine the different types of Instagram usage in the context of the pandemic, while focusing on the motives for using this platform. The current study aims to do this by answering the following research question:

RQ1: What were the different patterns of Instagram usage among young adults during the COVID-19 pandemic?

If Instagram usage patterns indeed changed as a result of the pandemic, and the measures introduced to limit the spread of the virus, the impact of Instagram use on various outcomes, including mental well-being, is also likely to be different (Blumler, 1979). Furthermore, as the various impacts of social media are shown to also depend on situational factors, it is possible that the unusual context of the pandemic also altered the

¹ These components include multiple audio and visual cues, a relatively high degree of personal focus, a high degree of natural language use, a relatively high social presence, and the possibility for direct feedback.

previously found relationships between specific Instagram usage patterns and mental well-being among young adults (Severin & Tankard, 1997).

One of the outcomes that might have been affected by Instagram use differently during the COVID-19 pandemic is self-esteem. Overall, it has been shown that Instagram usage has a negative effect on the self-esteem of young adults (Jan et al., 2017; Jiang & Ngien, 2020). As low self-esteem can be linked to a multitude of psychological problems (Hawi & Samaha, 2017; Leary & Baumeister, 2000), it is important to test whether, and under which circumstances, this assumption held true during the COVID-19 lockdown. Therefore, this study also aims to answer the following research question:

RQ2: What were the effects of different Instagram usage patterns on the self-esteem of young adults during the COVID-19 pandemic?

The results of this study can be used to examine and describe differences in Instagram usage patterns and their effects on mental-health outcomes, during situations with limited face-to-face interaction possibilities such as the COVID-19 pandemic. The findings can also be used as a first step in identifying and explaining the differences in usage patterns and their impacts among young adults, before, during, and after the pandemic.

LITERATURE REVIEW

Motivations and Needs of Instagram Usage

Enhancing one's quality of life is often assumed to be a major life goal for most individuals (Costanza et al., 2007). Given its importance, this concept has been studied extensively by many scholars from various disciplines, by looking at a combination of objective and subjective indicators. Although there is no consensus regarding the exact definition of one's quality of life, it is commonly defined as the outcome of the degree to which different human needs are fulfilled (Costanza et al., 2007).

Thus, to gain a better understanding of a person's quality of life, it is important to have a clear overview of the most important human needs and their fulfillment. Many scholars have proposed frameworks that map and explain these needs. While there is no unanimous agreement on which needs should be included in such a framework, some common themes emerge. Namely, needs concerning survival, safety, belongingness,

relatedness, self-enhancement, and self-esteem form the basis of most of these frameworks (Pittman & Zeigler, 2007). The main differences between the various proposed frameworks relate to the hierarchies (or lack thereof) in which these needs are structured, as well as to the ways in which they are categorized into biological, individual, and societal needs (Pittman & Zeigler, 2007).

One of the key theories that explains motivations to use media specifically as a way for individuals to fulfill their needs (and thereby enhance their quality of life) is the Uses and Gratifications theory introduced by Katz et al. (1973). This theory states that individuals will actively seek out media among functional alternatives to fulfill their needs in a way that leads to ultimate gratification. The authors identify five broad categories of needs and explain how these can be fulfilled using media (Katz et al., 1973; Weaver Lariscy et al., 2011): (i) Affective needs – people use media to fulfill their emotional needs; (ii) Cognitive needs – people use media to acquire knowledge and information, and more generally to fulfill their mental and intellectual needs; (iii) Personal integrative needs – people use media to reassure their status and gain credibility; (iv) Social integrative needs – people use media to socialize with family and friends; (v) Tension free needs – people use media to relieve their stress, relax, and alleviate boredom.

While the Uses and Gratifications theory focuses on media in general, it can be also used to explain social media use specifically, as proposed by Whiting and Williams (2013). This is particularly relevant in the context of social media use among young adults as the gratification of a variety of needs through social media is particularly prevalent in this group (Kircabarun et al., 2020; Whiting & Williams, 2013).

Whiting and Williams (2013) constructed their framework on the basis of their own qualitative study as well as previously used scales that were developed for traditional media and based on the Uses and Gratifications theory. This framework identified ten types of needs (which the authors refer to as themes) that can be fulfilled using social media, i.e., social interaction, information seeking, passing time, entertainment, relaxation, expression of opinions, communicatory utility (i.e., helping to facilitate communication), convenience utility (i.e., providing convenience or usefulness to individuals), information sharing, surveillance/knowledge about others. Out of those, the needs for social interaction, information sharing and seeking, as well as entertainment

have been found to be particularly important in predicting social media usage, both in general (Horzum, 2016; Krasnova et al., 2017; Pelletier et al., 2020) and for Instagram specifically (Kircaburun et al., 2020; Sheldon & Bryant, 2016). Additionally, Pelletier et al. (2020) found that Instagram is overall preferred for entertainment purposes and convenience utility, and it is regarded as highly suitable for social purposes, but less so for informational purposes.

The COVID-19 Context. It is important to note that the aforementioned research findings are based on studies conducted prior to the outbreak of COVID-19 and thus it is possible that they do not hold in the context of the pandemic. Namely, the imposed restrictions and lockdowns challenged the fulfilment of some individual needs and more importantly societal needs that are conventionally primarily gratified through face-to-face interactions or communication. As a result, young adults were forced to consider other (online) alternatives to face-to-face communication (the most suitable medium). It is likely that they turned to social media platforms, as, compared to other non-real-life alternatives, they score highly on the two dimensions that are necessary for the gratification of these needs. That is, they can carry large amounts of information and establish a high degree of social presence.

Therefore, it is expected that social media was used to gratify needs in a different way during COVID-19 pandemic than beforehand. Instagram, in particular, is expected to be used by young adults to gratify these needs as it had already been extensively used by them to fulfill some needs (such as entertainment and social interaction) prior to the pandemic. This is justified by the fact that receiving gratification from a particular form of media has been shown to be a good predictor of recurring usage of it (Kaye & Johnson, 2002; Palmgreen & Rayburn, 1979).

The Effect of Instagram Use on Self-Esteem

Self-esteem can be defined as a person's positive or negative evaluation of themselves and the extent to which they view themselves as worthwhile and competent (Coopersmith, 1965). It is highly important for one's mental health and well-being; low self-esteem can be linked to a multitude of psychological problems, including depression, anxiety, jealousy, hurt feelings, and low life satisfaction (Hawi & Samaha, 2017; Leary &

Baumeister, 2000). Given its importance, self-esteem is among the most extensively studied constructs in behavioral sciences (Leary & Baumeister, 2000).

A behavior or behavioral aspect that has long been hypothesized to influence one's self-esteem is social media use. While studies to-date have found both negative and positive effects of social media use on self-esteem, a meta-analysis by Saiphoo et al. (2020) that included over 100 samples revealed a small but significant negative correlation between social media use and self-esteem. This finding can be partially explained by the replacement hypothesis, which states that self-esteem is reduced as strong, face-to-face relationships are replaced with weaker, online relationships (Huang, 2017). Another potential explanation, that has been studied more extensively, relies on the Social Comparison Theory, and argues that people have the drive to evaluate their opinions and abilities by comparing them with those of others (Festinger, 1954).

Social comparisons can be upward or downward in nature. Upward social comparison occurs when an individual compares themselves to someone who is perceived to be better off than them, while downward social comparison occurs when an individual compares themselves with someone who is perceived to be worse off than them. It is generally assumed that downward social comparisons improve self-esteem. Upward social comparisons, on the other hand, tend to lead to a decrease in self-esteem (as they lead to situations in which individuals believe they lead an inferior life to others), unless the individual expects to be able to match their own abilities with those of the person, they are comparing themselves to (Halliwel & Dittmar, 2005). Overall, individuals have been found to engage more in upward social comparisons than downward social comparisons (Gerber et al., 2018).

As social media offers readily available, detailed, and personal information about others, individuals are inclined to engage in social comparisons more on these platforms than in real-life. What is more, these platforms, and Instagram in particular, have made it easier for individuals to 'quantitatively' compare themselves with others, using such information as the user's number of followers, as well as the number of likes or comments on a post (Vogel et al., 2014).

Young adults are particularly likely to engage in upward (rather than downward) social comparisons on social media, and especially on Instagram. To illustrate, Jan et al.

(2017) found that students engaged up to 49 times more in upward social comparisons than downward social comparisons. This is because this demographic has been found to often use these platforms to present a favorable version or image of themselves to others and as a result, they appear to have a better life online than they actually do in reality. In other words, the average Instagram user seems to live a better life, and to be doing better generally speaking, than the average person in real-life (Krämer & Winter, 2008).

The COVID-19 context. In the context of the COVID-19 pandemic, the replacement hypothesis might not prove very useful in understanding the relationship between Instagram use and self-esteem. This is because the specific period under consideration was characterized by very few possibilities of face-to-face interactions that could have been replaced by Instagram use, which would in turn deteriorate one's self-esteem.

The effect of engaging in (upward) social comparisons on Instagram on self-esteem, on the other hand, is likely to remain relevant for two main reasons. First, the lives of most people, especially young adults, changed considerably during the COVID-19 pandemic and overall became less exciting and less entertaining. This contributed to an even greater contrast between one's actual, day-to-day life and the unrealistic lives portrayed on Instagram. Second, in times where the possibility of face-to-face interactions is very limited, individuals might not have a realistic framework that they can use to compare their lives to those of others. In more detail, Chou and Edge (2012) found that social media users have a firm belief that other users are living a healthier, happier, and more prosperous life than them, particularly when they do not know the people in question very well in reality. As people are likely to have a less clear picture of what the lives of their friends and acquaintances looked like during the COVID-19 pandemic, it is possible that they were more likely to perceive the (unrealistic) lives portrayed on social media as real and engage in more upward comparison.

It is important to note that, during the COVID-19 period, the use of Instagram could have also positively affected the self-esteem of young adults. Namely, because of the lockdowns used by governments, the relative distance between people increased during the pandemic. Thus, it can be argued that the ways in which individuals interacted with their friends and family resembled the way in which individuals in long-distance relationships and friendships interacted prior to the pandemic. Long-distance

relationships (or friendships) can be defined as such in which different actors expect to sustain their kinship ties despite limited face-to-face interaction (Stafford, 2004). Existing research on long-distance relationships suggests that Instagram can help to maintain these kinds of relationships (Ruppel et al., 2017) and as a result increase social inclusion. This would imply that Instagram could have had a positive effect on self-esteem, if it was used to sustain relationships characterized by limited possibilities for face-to-face interactions (Leary & Baumeister, 2000).

Given the potential, contradicting effects of Instagram usage on one's self-esteem, it is difficult to predict the direction of the aforementioned effect. To restate, upward social comparisons on Instagram are expected to lead to a decrease in self-esteem, whereas the possibilities to sustain relationships at times of limited face-to-face interactions might lead to an increase in self-esteem. In addition, as the Uses and Gratifications theory states that the effects of a medium can be partly explained by the motivations for using the medium, it is likely that the effect of Instagram use on self-esteem differs depending on the usage pattern.

METHODS

Participants

The participants for the current study were recruited in May 2021, using the online participant recruitment platform Prolific (www.prolific.co). Through Prolific, the participants were automatically rewarded with a small monetary compensation of £1.25 for completing the survey. This was based on an hourly wage of £7.50 and an expected duration time of 10 minutes for completion. In total, 384 international young adults (aged 18-29 years) completed the online survey. During the data cleaning and preparation process, 58 participants were removed from the sample as they did not use Instagram (N = 33), did not complete the entire survey (N = 12), completed the survey in under 2:45 minutes (N = 7), failed the attention check (N = 5)², or used straight lining as their response strategy (N = 1)³; thus, the final sample amounted to N = 326. The mean age of

² For the last statement in the survey, the participants were asked to fill out the option "Strongly Agree" on a 5-point Likert Scale to test whether they carefully read the questions and statements.

³ When participants filled out the exact same option on every item of a scale, they were identified as 'straight liners' and removed from the sample.

the participants was 22.26 years old ($SD = 2.87$). The mean time for completing the survey was 7:31 minutes. With regards to gender, 52.2% reported to be male whereas 46.9% reported to be female. The remaining participants chose the option 'other' ($N = 2$) or 'prefer not to say' ($N = 1$). In terms of education, 95.7% of the participants obtained at least a high school degree or equivalent. Out of those, 6.1% completed a vocational degree, 29.1% a bachelors' degree and 9.5% a masters' degree.

Although the participants were recruited globally, about 92% of them resided in Europe, primarily in Poland, Portugal, or Italy. The remaining eight percent of the participants resided in Africa, North America, Asia, Australia, or South America. The resulting sample therefore overrepresented participants residing in Europe and in particular those residing in Eastern and Southern Europe.

Procedure

The recruitment of the participants took place in May 2021. The procedure was such that Prolific users who were determined to be eligible to participate could see the study as available to them when logging into their accounts. Users on Prolific were eligible for participation in case they were between 18 and 29 years old, had at least already completed 10 surveys on Prolific before and had been approved for having valid responses on all prior completed surveys. The description of the study contained information about the title of the study, the estimated survey completion time, and the monetary compensation for participation. Those who chose to participate in the study and fill in the survey (by clicking the link provided in the description) were redirected to the questionnaire that was hosted via the Qualtrics online surveys platform.

The survey started with a short introduction, which included a brief description of the study aim (i.e., to investigate the positive and negative effects of Instagram usage during the COVID-19 pandemic, among an international pool of young adults) and some information regarding participation and data handling. Once the participants gave their informed consent to voluntarily participate in the research and agreed for the data obtained to be used anonymously in the analysis, they could start filling in the survey (see Appendix A). The inclusion of personality traits questions in the survey and subsequent analysis are justified by the fact that they are likely to be a confounding factor in the relationship between Instagram usage and self-esteem, as they are related to both.

Specifically, previous studies have found individual personality traits and differences between personalities to impact Instagram usage (Kocak et al., 2020) and to correlate highly with self-esteem (Robins et al., 2001).

Measures

Instagram usage. The different motivations for and needs fulfilled by using Instagram were measured using 23 separate items. All items were based on a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) with 3 being the neutral option (Neither Agree nor Disagree). A higher score on an item represents a higher agreement of the participant that they use Instagram for the reason specified by the item.

The indicators for Instagram usage were theoretically derived from the Uses and Gratifications Theory. To the best of the researchers' knowledge, there is no complete and fully validated scale to-date that corresponds to the aforementioned theory. Therefore, the items were constructed using elements of the six most representative and well-studied basic human needs theories according to Pittman and Zeigler (2007). These human needs scales include the Hierarchy of Needs theory (Maslow, 1943), Core Social Motives theory (Fiske, 2004), Terror Management theory (Pyszczynski et al., 1997), Attachment theory (Bowlby, 1969), Cognitive-Experiential Self-theory (Epstein, 1998) and the self-determination Theory (Deci & Ryan, 1985). That is, in the current study, the relevant items from the SONTUS scale (Olufadi, 2016), FPIS scale (Yu, 2015), GoToFB scale (Aladwani, 2014) and SNAIS scale (Li et al., 2016) were selected and adapted to fit the Uses and Gratifications theory and/or to reflect the focus on Instagram usage specifically. The SONTUS, FPIS, GoToFB and SNAIS scales are all (partly) theoretically derived from, and thus include measures of, the Uses and Gratifications theory. Examples of items include: 'I use Instagram to express myself without limits' and 'I use Instagram to keep an eye on my friends'. See Appendix A for the full list of the 23 items.

Self-esteem. The variable self-esteem was measured using the Rosenberg Self-Esteem scale (RSE) (Rosenberg, 1965). The scale consists of 10 items, wherein each item is measured using a 4-point Likert scale ranging from 1 (Strongly Disagree) to 4 (Strongly Agree). A higher score or value on this variable represents a higher degree of self-esteem. Examples of items used include: 'On the whole, I am satisfied with myself' and 'I feel that I

am a person of worth'. The 10-item scores were averaged into a mean composite (after reversals, where necessary) with Cronbach's alpha = .89.

Personality. Personality was operationalized and measured in accordance with the commonly accepted model of the Big Five personality dimensions consisting of agreeableness, conscientiousness, extraversion, neuroticism, and openness to experience (Donnellan et al., 2006; McCrae et al., 1998). The scales used were based on the 'Mini-IPIP' scales, which consist of 20 items in total (Donnellan et al., 2006). The 'Mini-IPIP' offers a short assessment of the five personality traits, without significantly impairing reliability and validity compared to longer scales (Burns et al., 2017; Donnellan et al., 2006; Goldberg, 2006).

Examples of the items in this scale include: 'I talk to a lot of different people at parties' for extraversion, 'I sympathize with others' feelings' for agreeableness, 'I like order' for conscientiousness, 'I have frequent mood swings' for neuroticism and 'I have a vivid imagination' for openness to experience.

Using the 20 items, five scales (that correspond to the 5 personality traits) were created by taking the mean of the relevant four items (after reversals, where necessary). Scale reliability was found to be satisfactory ($\alpha_{\text{agreeableness}} = .72$, $\alpha_{\text{openness to experience}} = .67$, $\alpha_{\text{conscientiousness}} = .62$, $\alpha_{\text{neuroticism}} = .71$) or high ($\alpha_{\text{extraversion}} = .81$). The reliability of the neuroticism scale was initially found to be low with Cronbach's alpha = .43, however, after deleting the item 'I seldom feel blue (depressed/sad)', Cronbach's alpha was improved to an acceptable score of .71.

Attention check. The attention check was included among the items measuring self-esteem. In line with those items, it was measured on a 4-point Likert scale, ranging from 1 (Strongly Disagree) to 4 (Strongly Agree). The attention check used can be classified as an instructional manipulation check and was based on the research conducted by Oppenheimer et al. (2009). Specifically, the check stated: 'It is important that you pay attention during this study. Please choose the option "Strongly Agree" for this statement.'

Data analysis

RQ1: Instagram usage patterns. The first step of the analysis focused on identifying different patterns of Instagram usage among young adults during the COVID-19 pandemic, using latent class analysis (LCA). LCA is a statistical modelling technique that

is increasingly used in the social and behavioral sciences, including communication research, to identify different subgroups within a population. It is often referred to as a model-based or probabilistic clustering method (Karnowski, 2017; Weller et al., 2020). More specifically, LCA is used to identify underlying, categorical constructs (which are referred to as latent variables) that explain the interrelations between a set of observed indicators (or manifest variables). Thus, LCA relies on the assumption that the indicators are caused by the latent variable(s). By assigning cases to the category of the latent variable that they have the highest probability of belonging to, LCA can be used for clustering (Karnowski, 2017).

The model specification used in the analysis included the following eight indicators of reasons or motivations to use Instagram that were selected from the total of 23 indicators included in the survey: I use Instagram to (i) ‘reduce my mental stress’; (ii) ‘share my feelings’; (iii) ‘reveal my presence’; (iv) ‘keep in touch with old friends’; (v) ‘make my voice heard’; (vi) ‘improve my knowledge’; (vii) ‘exchange information with others’; (viii) ‘see or hear something entertaining’.

This selection was based on several considerations. Namely, to ensure high theoretical relevance, the selected indicators were diverse and represented a wide range of motivations for using Instagram to fulfill various needs (particularly those that were shown most relevant for Instagram). In cases in which several indicators were highly correlated with each other and thus represented the same (or similar) motivation or category of needs, only one of the indicators was kept. As indicators with higher response variability are more useful in distinguishing different usage patterns, indicators with (very) low variance were also excluded from the analysis. Finally, the use of only eight indicators was also motivated by the fact that using a relatively large number of indicators (i.e., all 23 indicators), given the sample size, could adversely affect model stability and lead to convergence issues. For more details regarding the selection of the indicators see Appendix B. The eight indicators used in the analysis were re-coded to a 3-points Likert scale, wherein the categories Strongly Disagree and Disagree as well as Strongly Agree and Agree were combined. This was done as LCA is conventionally used for categorical observed indicators, rather than ordinal or continuous indicators. The re-coded indicators contain three categories - ‘agree’, ‘neutral’, and ‘disagree’- and are more representative of a

categorical variable than the original 5-point Likert scale variables (which also include the ‘strongly agree’ and ‘strongly disagree’ categories). What is more, having indicators with fewer categories and with categories that are more distinct from one another aids the interpretation of the latent classes.

The model specification also included the covariates gender, age, amount of Instagram use, and the five personality traits (i.e., extraversion, agreeableness, neuroticism, conscientiousness, and openness to experience) and thus the analysis relied on a latent class regression model. The inclusion of covariates in LCA implies that the probability of belonging to a certain class (that represents a specific Instagram usage pattern) is not equal for everyone but rather depends on individual-level characteristics. A correlation analysis confirmed that all covariates have relatively high and statistically significant associations with (some of) the Instagram usage indicators that were included in the model. In the analysis, model specifications with varying numbers of classes – k – were considered and the final selection was based on model fit criteria as well as substantive considerations.

RQ2: The effect of Instagram usage on self-esteem. The second step of the analysis tested whether the effects of Instagram use on individuals’ self-esteem are different for the different usage patterns. To do so, the estimated latent classes (which represent distinct usage patterns) were used as predictors/explanatory variables in a multivariate regression analysis with self-esteem as the dependent variable. Gender, age, amount of Instagram use, and the five personality traits were included in the model as control variables.

Data preparation and cleaning was performed using the R environment for statistical computing. The analysis, which is illustrated in Fig. 1, was carried out using the Step3 submodule in Latent GOLD. The submodule allows users to identify latent classes (in this case Instagram usage patterns) and relate them to external variables (in this case as predictors of self-esteem) using a bias adjusted three-step method. In this method, first a latent class model is built for a set of indicators. Then, each of the observations is assigned to the latent class based on their posterior class membership probabilities, and this information is stored in a file. Class assignment can be modal, wherein observations are assigned to classes with the highest probability of belonging to, or proportional, wherein observations are assigned to each class with a weight that equals

to the probability of belonging to that class. Finally, the saved latent classifications are related to an external variable of interest, while correcting for classification error to prevent bias (Bakk & Vermunt, 2015).

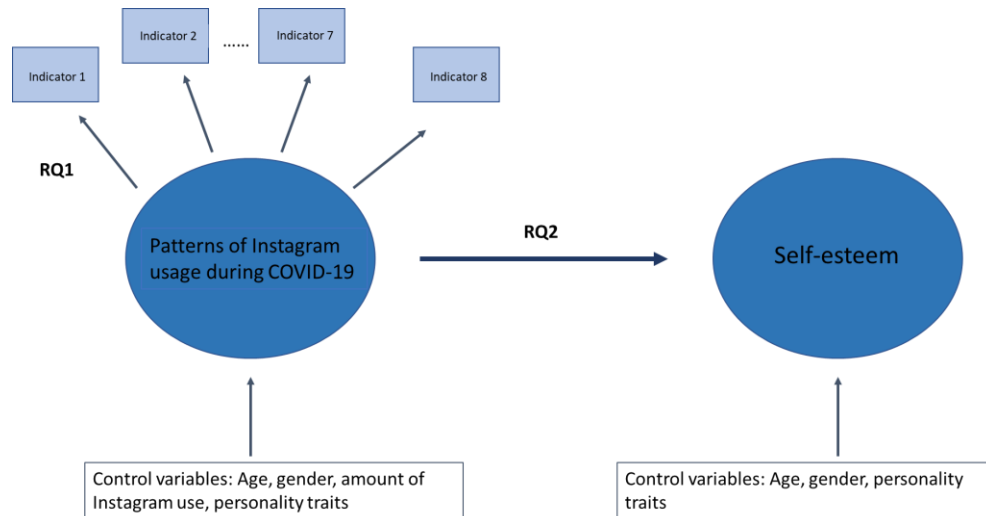


Figure 1. Path diagram of the analysis. A path diagram illustrating the two-step analysis consisting of LCA (to identify Instagram usage patterns) and multivariate regression analysis (to examine effect of Instagram usage on self-esteem).

RESULTS

Descriptive statistics

Table 1 provides an overview of the means and standard deviations of the main variables included in the analysis. That is, the eight indicators used to identify different Instagram usage patterns (used in the LCA in the first step), self-esteem (the dependent variable used in the regression analysis in the second step), the amount of Instagram use, age, gender, and the five personality traits (the control variables).

Overall, as can be seen in Table 1, the participants tend to use Instagram the most for seeing or hearing something entertaining and the least to share their feelings, to make their voice heard, and to reveal their presence. The use of Instagram for the remaining reasons ('keep in touch with old friends', 'exchange information with others', 'improve knowledge', and 'reduce mental stress') is relatively moderate. The variability in the responses (which can be assessed looking at the standard deviations) is relatively similar for all indicators.

The table further shows the levels of self-esteem are moderate in the sample used for this study, with a mean of 2.65. With regards to the five personality traits, the

participants scored high on agreeableness and openness to experience, while they scored rather low on extraversion and neuroticism; the score on conscientiousness was moderate. Finally, the average amount of Instagram use was moderate, while the daily active use of Instagram in the week preceding the survey was somewhat higher.

Table 1

Mean and SD scores of Instagram usage, self-esteem, personality traits and characteristics.

VARIABLE	<i>M</i>	<i>SD</i>
Instagram usage		
Reduce mental stress	3.02	1.31
Share feeling	2.19	1.26
Reveal presence	2.35	1.21
Keep in touch with old friends	3.29	1.39
Make voice heard	2.18	1.24
Improve knowledge	3.07	1.31
Exchange information with others	3.19	1.30
Hear or see something entertaining	4.03	1.07
Self esteem	2.65	0.56
Personality traits		
Extraversion	2.77	0.97
Agreeableness	3.85	0.74
Conscientiousness	3.29	0.76
Neuroticism	2.40	0.71
Openness to experience	3.87	0.71
Average active Instagram use	2.12	1.45
Active Instagram use per day in past week	2.82	1.46
Age	22.26	2.87
Gender	52.2% F	46.9% M

Notes. The Instagram usage indicators and personality traits were measured on a 5-points Likert scale ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*) with 3 being the neutral option (*Neither Agree nor Disagree*). Self-esteem was measured on a 4-points Likert scale ranging from 1 (*Strongly Disagree*) to 4 (*Strongly Agree*). Active Instagram use on average and per day in the last week were measured on a 6-points Likert scale, wherein higher number indicates more Instagram use.

Identifying Instagram usage patterns

To answer the first research question regarding Instagram usage patterns LCA was used. The next subsections highlight the steps undertaken in the analysis and describe the results obtained.

Model selection. Given the exploratory nature of this part of the study, there was no theoretically expected or hypothesized number of Instagram usage patterns and thus of latent classes. Therefore, several models, with the numbers of classes – *k* – varying from

two to seven were considered. The selection of the best fitting model was done based on statistical criteria, i.e., the model fit expressed using BIC, and substantive criteria, i.e., class interpretability and size (Weller et al., 2020).

Table 2 below provides the BIC scores (and the rate of change of the BIC) for the models considered. While, overall, lower values of BIC represent a better model fit, rather than selecting the model with the lowest absolute value, the common ‘elbow method’ was used. This method relies on a visual inspection of a plot that shows how the BIC change as a function of the number of clusters, and on choosing the ‘best’ number of clusters which coincides with the elbow(s) of the figure, i.e., the point after which the decrease in BIC becomes notably smaller. According to the plot included in Figure 2, a solution with three classes appears to provide the best goodness of fit, however the four-class solution has an only marginally worse fit.

While statistical goodness of fit is an important criterion, the final selection of the number of classes should also depend on substantive considerations such as the sizes of the classes, and whether a more complex model with additional classes provides new (and interesting) theoretical insights. Therefore, we inspected the results of the two best fitting models, i.e., the three- and four-class models and concluded that the four-class model is theoretically more interesting, provides more insights, and is more balanced with regards to the class sizes. Most importantly, the three-class solution does not include the overall low-motivation class, which is conceptually a distinct and interesting class to include in the analysis. Therefore, we selected the four-class model for further analysis.

Table 2
AIC, BIC scores for LCA with k ranging from 2 to 7.

Number of classes	BIC	Δ BIC (in%)
2	2728.68	-
3	2704.50	-0,89%
4	2717.61	0,48%
5	2751.23	1,24%
6	2808.56	2,08%
7	2876.13	2,41%

Notes. Δ BIC represents the change in the BIC score when moving to a model with $k+1$ number of classes, compared to a model with k classes. It is calculated as follows: $\Delta BIC = \frac{(BIC_{k+1} - BIC_k)}{BIC_k}$. A negative Δ BIC indicates better model fit (e.g., a three-class model is better than a two-class model) and a positive Δ BIC indicator a worse model fit (e.g., a five-class model is worse than a four-class model).

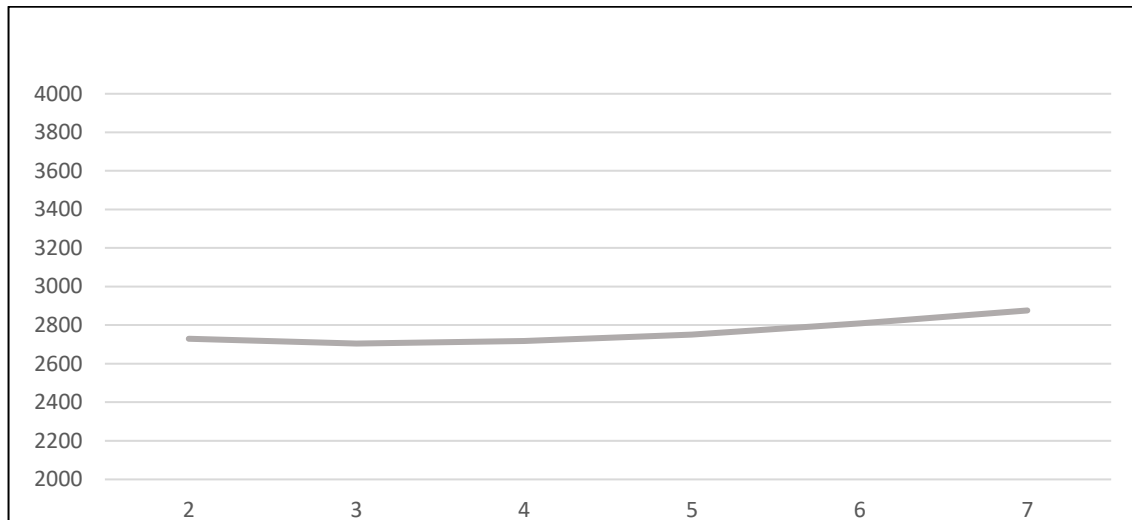


Figure 2. BIC score by number of classes. BIC scores for LCA models with number of classes varying from 2 to 7.

Instagram usage patterns. The four classes identified are summarized in Table 3. Overall, the quality of the classifications appears satisfactory to good with entropy $R^2 = 0.76$; further classification statistics are available in Appendix C.

The classes are labelled as Social needs, Knowledge and stress relief needs, Low-motivation, and High-motivation. The labelling of the first two usage patterns were theoretically derived from the Uses and Gratifications theory, whereas the latter two usage patterns were based on the overall levels of the eight indicators representing motivations and needs to use Instagram.

The ‘Social needs’ class contains approximately a third of all the participants. Overall, this class has relatively high probabilities of using Instagram (i.e., the probabilities of agreeing with the statement represented by the indicator) to ‘exchange information with others’ and ‘keep in touch with old friends’; it also has a very high probability of using Instagram to ‘see or hear something entertaining’. These items correspond best to the Social Integrative needs category proposed by the Uses and Gratifications theory and the social interaction theme proposed by Whiting and Williams (2013).

The ‘Knowledge and stress relief needs’ class contains slightly over 30% of the participants, and it has high probabilities of using Instagram to ‘see or hear something entertaining’ and ‘improve knowledge’ than any of the other classes. The probabilities of

using Instagram to ‘reduce mental stress’ and ‘exchange information with others’ are also relatively high. These results suggest that this class is most aligned with the Cognitive needs and the Tension free needs categories proposed by the Uses and Gratifications theory and the information seeking and sharing, as well as relaxation themes proposed by Whiting and Williams (2013).

The ‘Low-motivation’ class is the smallest of all four classes and includes about 16% of the participants. It is characterized by overall low levels of motivation for using Instagram. The probabilities of using Instagram for all items are (well) below 0.25, with the one exception of ‘seeing or hearing something entertaining’ for which the probability is 0,51. In line with this, the means of all indicators are lower in this class than the remaining three classes.

The ‘High-motivation’ class includes about 20% of the participants and is characterized by the highest overall motivations for using Instagram usage, with the probabilities of using Instagram for all items means (well) above 0.6. Furthermore, this class shows the highest probabilities of all classes for 6 of the 8 items, with only ‘improving knowledge’ and ‘seeing or hearing something entertaining’ scoring slightly higher in the knowledge and stress relief class.

Table 3 *Instagram usage patterns: item response probabilities & means per class.*

Item		Latent class			
		Social needs	Knowledge & stress relief	Low-motivation	High-motivation
Class size		0,33	0,32	0,16	0,20
Reduce mental stress	2 (disagree)	0,52	0,23	0,76	0,08
	3 (neutral)	0,16	0,15	0,12	0,10
	4 (agree)	0,32	0,62	0,12	0,81
	mean	2,79	3,39	2,35	3,73
Share feelings	2 (disagree)	0,49	0,92	0,98	0,09
	3 (neutral)	0,29	0,07	0,02	0,22
	4 (agree)	0,22	0,01	0,00	0,68
	mean	2,72	2,08	2,02	3,59
Reveal presence	2 (disagree)	0,46	0,76	0,99	0,14
	3 (neutral)	0,27	0,17	0,01	0,23
	4 (agree)	0,27	0,07	0,00	0,63
	mean	2,81	2,31	2,01	3,49
Keep in touch with old friends	2 (disagree)	0,19	0,37	0,66	0,13
	3 (neutral)	0,10	0,12	0,11	0,09
	4 (agree)	0,71	0,51	0,24	0,78
	mean	3,52	3,15	2,58	3,66
Make voice heard	2 (disagree)	0,57	0,93	1,00	0,05
	3 (neutral)	0,28	0,06	0,00	0,19
	4 (agree)	0,15	0,00	0,00	0,76
	mean	2,59	2,07	2,00	3,71
Improve knowledge	2 (disagree)	0,50	0,11	0,75	0,12
	3 (neutral)	0,20	0,15	0,15	0,16
	4 (agree)	0,30	0,74	0,11	0,72
	mean	2,80	3,64	2,36	3,59
Exchange information with others	2 (disagree)	0,33	0,18	0,82	0,03
	3 (neutral)	0,22	0,19	0,12	0,09
	4 (agree)	0,45	0,63	0,06	0,88
	mean	3,12	3,45	2,23	3,85
See or hear something entertaining	2 (disagree)	0,09	0,01	0,32	0,02
	3 (neutral)	0,11	0,05	0,17	0,05
	4 (agree)	0,80	0,94	0,51	0,93
	mean	3,72	3,93	3,19	3,91

Notes. The table provides the class-specific response probabilities (marginalized over all covariates), which can be defined as the probabilities of obtaining a specific value y_j for indicator Y_j conditional on belonging to a specific latent class $c - P(Y_j = y_j | C = c)$; for ease of interpretation, indicator-specific means per class are also provided. The latent class membership probabilities (belonging to class c conditional on the response pattern Y) are provided in Appendix D. The numbers highlighted in bold represent the proportion of participants belonging to each class/class size.

Covariates predicting class membership. The model specification used in the analysis also included the variables gender, age, weekly amount of Instagram usage, daily amount of Instagram usage and the five personality traits (extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience) as covariates affecting class membership. As can be seen in Table 4, as expected, higher weekly Instagram use is associated with a higher probability of belonging to the ‘High-motivation’ class and with a lower probability of belonging to the ‘Low-motivation’ class (compared to the ‘Social needs’ class); daily Instagram usage has no impact on class membership.

In terms of demographic characteristics, females are significantly more likely than males to belong to the ‘High-motivation’ class, while age has no effect on class membership. Finally, with regards to the personality traits, higher levels of extraversion are associated with lower probabilities of belonging to the ‘Knowledge and stress relief needs’ and ‘Low-motivation’ classes, while higher levels of agreeableness are associated with higher probabilities of belonging to the ‘High-motivation’ and ‘Knowledge and stress relief needs’ classes. Also, individuals with higher neuroticism are more likely to belong to the ‘High-motivation’ class and individuals with higher levels of openness to experience are less likely to belong to the ‘Low-motivation’ class. Conscientiousness does not seem to influence Instagram usage patterns.

Table 4 Instagram (IG) usage patterns: effects of covariates on class membership.

Item	Latent class					
	Knowledge and stress relief needs		Low-motivation		High-motivation	
	<i>B</i>	<i>p</i>	<i>B</i>	<i>p</i>	<i>B</i>	<i>p</i>
Intercept	-2.04	0.47	3.49	0.24	-16.05	0.00
Weekly IG use	-0.16	0.46	-0.69	0.00	0.87	0.00
Daily IG use	0.10	0.20	-0.32	0.27	0.10	0.20
Gender	0.57	0.23	0.46	0.40	1.39	0.00
Age	-0.11	0.21	0.03	0.73	-0.00	0.97
Extraversion	-0.75	0.01	-0.68	0.03	-0.26	0.35
Agreeableness	1.16	0.00	0.17	0.66	0.87	0.03
Conscientiousness	0.54	0.07	0.56	0.11	0.48	0.14
Neuroticism	0.64	0.07	0.06	0.88	1.05	0.01
Openness to experience	-0.43	0.17	-0.70	0.05	0.40	0.27

Notes. The latent class ‘Social needs’ is included as the reference category in this analysis. The *B*s represent the unstandardized coefficients. The *p*-values represent the significance levels of the corresponding *t*-tests; effects in bold represent significant effects at a 5% level ($p < .05$).

Effect of Instagram usage patterns on self-esteem

The second question of this study focused on the effects of different Instagram usage patterns on the self-esteem of young adults during the COVID-19 pandemic. To answer this question, a regression analysis was used with the identified Instagram usage patterns as the main predictors/independent variables and self-esteem as the dependent variable. Age, gender, and the Big-Five personality traits were added as control variables. As can be seen in Table 5, the results confirm that there are significant differences between the effects that different Instagram usage patterns have on the self-esteem of the users. Overall, belonging to the 'High-motivation' class, in comparison with being a part of the 'Social needs' class, is associated with higher self-esteem levels, ($B= 0.31$, $p=0.01$); the effects of belonging to the 'Low-motivation' or 'Knowledge and stress relief needs' classes are not statistically significant. This implies that, on average, individuals who have a usage pattern that is characterized by overall high levels of reasons or motivations to use Instagram have higher self-esteem levels than those who use Instagram to gratify their social needs specifically. As can be further seen from the table, gender, age, and Instagram use do not have a significant effect on self-esteem, while some of the personality traits do. Namely, individuals with higher levels of extraversion and conscientiousness have on average (slightly) higher levels of self-esteem ($B= 0.20$, $p=0.00$ and $B= 0.07$, $p=0.02$, respectively), while individuals with higher levels of neuroticism have on average lower levels of self-esteem ($B= -0.42$, $p=0.00$).

Table 5 *Effect of Instagram usage patterns on self-esteem.*

Independent variable	DV: Self-esteem	
	<i>B</i>	<i>p</i>
Intercept	2.19	0.00
Cluster 1 - 'Social needs' (ref. cat.)	-	-
Cluster 2 - 'Knowledge and stress relief needs'	0.22	0.06
Cluster 3 - 'Low-motivation'	0.16	0.11
Cluster 4 - 'High-motivation'	0.31	0.01
Gender	-0.03	0.61
Age	0.02	0.07
Weekly Instagram use	-0.04	0.10
Daily Instagram use	0.02	0.43
Conscientiousness	0.09	0.02
Extraversion	0.20	0.00
Agreeableness	0.01	0.92
Neuroticism	-0.42	0.00
Openness to experience	0.07	0.05
R ²	0.03	

Notes. Based on proportional assignment of respondents to latent classes; a model assignment provided highly similar results regarding the magnitude of the effects and their significance. The assignment was done using the BCH method proposed by Bolck et al. (2004), which is the preferred method for continuous dependent variables. The latent class 'need for) belonging' is included as the reference category in this analysis. The *B*'s represent the unstandardized coefficients. The *p*-values represent the significance levels of the corresponding t-tests; effects in bold represent significant effects at a 5% level ($p < .05$).

DISCUSSION

The goal of the current study was to gain new insights into the different patterns of Instagram usage among young adults during the COVID-19 pandemic, and to examine the effects of these different patterns on the self-esteem of users. In doing so, this study focused on the needs and motivations of using Instagram. The need for this study stems from the fact that the findings of previous research might not be applicable in the specific context of the COVID-19 pandemic. This is because the restrictions introduced in this period resulted in limited possibilities to fulfill certain needs in real-life and consequently led people to seek alternative gratification routes.

The results of the first step of the study show that, during the COVID-19 pandemic, most young adults used Instagram either to gratify their social needs or their needs for knowledge and stress relief. In addition to these two usage patterns, two other patterns were identified as well — an overall high and an overall low level of motivations for using Instagram.

The 'Social needs' class can also be described as a class in which individuals seek to fulfill their (societal) needs for belonging(ness) and (maintaining) relatedness, as defined by the Core Social Motives theory (Stevens & Fiske, 1995), Maslow's Hierarchy of needs (Maslow, 1943), the Self Determination theory (Deci & Ryan, 1985) and the Cognitive Experiential Self-theory (Epstein, 1998). While the definition of belonging proposed by the Core Social Motives theory explicitly states that the term refers to belonging to a social group, no such definition is given in any of the theories mentioning relatedness. Therefore, the need for belonging appears to be the best fit for this latent class.

Furthermore, the 'Knowledge and stress relief' class can also be described as one in which users seek to gratify their (individual) needs of competence, self-expansion, and self-enhancement, as defined by the Self Determination theory (Deci & Ryan, 1985; Deci & Ryan, 2012), the Terror Management theory (Greenberg et al., 1997) and the Cognitive Experiential Self-theory (Epstein, 1998). Although all three needs would fit this latent class relatively well, the item 'seeing or hearing something entertaining' does not directly imply self-enhancement or competence but rather self-expansion (Pittman & Zeigler, 2007). Namely, self-enhancement would imply improving the self, which does not necessarily seem to be an outcome of 'seeing or hearing something entertaining'. Moreover, competence is regarded to be related to a need for achievement (Murray, 1938), which also does not fit with the aforementioned item. The term self-expansion does not directly imply an improvement but rather broadening of the self.

The fact that young adults have turned to Instagram to gratify the aforementioned individual and societal needs, at times when confinement and isolation challenged the traditional ways in which these needs were fulfilled, is in line with the Uses and Gratifications theory. Namely, the Uses and Gratifications theory states that individuals will actively seek out media among functional alternatives to fulfill their needs in a way that leads to ultimate gratification (Weaver Lariscy et al., 2011). What is more, to fulfill these needs, it is important that the media used can carry a significant amount of information and can establish a high degree of social presence. Instagram fulfills these requirements as it is considered as one of the richest (social) media options given the possibility for direct feedback, personal focus, a high number of cues, and the possibility for natural language (Ishii et al., 2019).

It is worthwhile mentioning that the results of the Instagram usage analysis also revealed that overall Instagram appeared to be used to a larger extent for informational purposes during the pandemic than beforehand, as reported by Pelletier et al. (2020). A plausible explanation for this could be the fact that the lack of other, usually available alternatives, such as gathering information in-person at school or from acquaintances, relatives, and friends was compensated by using Instagram as an information source.

The results of the second step of the analysis confirmed that different Instagram usage patterns have different effects on the self-esteem of the users. Namely, individuals who primarily used Instagram to gratify their social needs (or their need for belongingness) had significantly lower self-esteem than those who had overall high levels of different motivations to use Instagram.

These findings can be possibly explained by the Social Comparison Theory. Namely, individuals who use Instagram primarily to fulfill their social needs (or need for belongingness) are likely to place more relative emphasis on interactions with other Instagram users, compared to individuals who use the platform intensely to gratify various other needs as well. When interacting with others on Instagram for social reasons, users are more likely to engage in social comparisons (the platform offers readily available, detailed, and personal information about others), and as most people present themselves more favorably on Instagram than in real life, users tend to engage more in upward than downward social comparisons (Jan et al., 2017; Krämer & Winter, 2008). The well-documented, negative effect of upward social comparisons on self-esteem is likely to be particularly strong during the COVID-19 pandemic. This is because life satisfaction was relatively low during this period and thus social media users were likely to believe that others were living a better life than themselves (Chou & Edge, 2012; Hawi & Samaha, 2017; Jan et al. 2017; Vogel et al., 2014).

Limitations and suggestions for further research

It is important to note that the results of this study should be interpreted in the light of some limitations. First, the analyses in this study were conducted using a cross-sectional survey based on observational data, which implies that causality could not be scientifically tested but rather assumed from theory and the observed correlations. While the proposed directions of the causal relationships were chosen after careful examination

of different theories and prior research, there remains a possibility that not all correlations imply causality in the hypothesized direction. Therefore, future research should extend this work and investigate the causal mechanisms assumed in the study using experimental design or longitudinal data.

Second, while the sample of the study consisted of a diverse group of international young adults, most participants resided in Europe, and more specifically in Poland, Portugal, and Italy. Therefore, the generalizability of the findings is somewhat limited, particularly given the country-level differences regarding the measures and restrictions introduced during the COVID-19 pandemic. Using a more internationally diverse sample would allow for a greater generalizability of the results.

Third, the sample size used for the analysis can be regarded as relatively small, which led to the inclusion of only the most important and relevant indicators of Instagram use in the LCA. Using a larger sample would allow to include more indicators in the model (that potentially could go beyond the 23 items mentioned in the current study), which in turn might lead to more insights regarding Instagram usage patterns.

The findings of this study also bring forward some suggestions for future research that go beyond solely addressing the current limitations. Namely, using the Uses and Gratifications theory as a basis, this study identified two sought-after gratifications for using Instagram during the COVID-19 pandemic. It would be interesting to build on these findings and examine whether the gratifications sought after were also met by using Instagram. Therefore, future research could focus on empirically testing the gratification potential of Instagram and comparing it with the gratification potential of other forms of media.

Using a longitudinal study, further research could also examine over-time changes of Instagram usage patterns and their effects on self-esteem (as well as other mental well-being aspects). It could be particularly interesting to investigate whether Instagram usage patterns and their effects had changed once the lockdowns and other restrictions were lifted, thus shedding light on the lasting nature of the effects of the COVID-19 pandemic on Instagram use.

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Appendix A. Survey

Block: Informed consent

Dear participant,

Thank you very much for agreeing to participate in this survey!

Before the survey begins, it is important that you are aware of the procedure followed in this study.

Therefore, please read the following text carefully and do not hesitate to ask for clarification on this text, should it not be clear. The researcher responsible for the study can be contacted via the email address at the bottom of this information and will be happy to answer any questions you may have.

Purpose of the study

The purpose of this study is to get to know more about the positive and negative effects of Instagram usage during the COVID-19 pandemic among an international pool of young adults.

Confidentiality of data

All research data will remain completely confidential and will be processed anonymously. The research data will not be made available to third parties without your expressed consent and only in anonymously encoded form. The key to this data is in the possession of the researchers and will not be passed on to third parties.

Voluntary participation

If you decide to opt out of this survey now, it will not affect you in any way. If you decide to discontinue your cooperation during the survey, this too will not affect you in any way. You can also withdraw your permission to use your data 24 hours after filling out the questionnaire. You can therefore stop your cooperation at any time without giving a reason. Should you discontinue your cooperation or withdraw your permission within 24 hours, your data will be removed from our files and destroyed.

Further information

If you have any questions about this research, beforehand or afterwards, please contact the researcher responsible, Gianni Quaadvlieg, email: g.m.quaadvlieg@student.vu.nl.

STATEMENT OF CONSENT

I have read and understood the information and consent to participate in the research and use of the data obtained from it. I reserve the right to revoke this consent within 24 hours without giving a reason. I also retain the right to discontinue the research at any time I choose.

- Yes, I do consent.
- No, I do not consent.

Block: Demographics

Below is a list of questions concerning your demographics. Please answer each question truthfully.

1. What is your age?
{Open question}
2. What is your gender?
 Male.
 Female.
 Other.
 Prefer not to say.
3. In which country do you currently reside?
{Dropdown list}
 [1/193] Afghanistan
 [2/193] Albania
 [3/193] Algeria
 [4/193] Andorra
 [.../193] Etc.
4. What is your highest level of education?
 Less than a high school diploma.
 High school degree or equivalent.
 Vocational degree.
 Bachelor's degree.
 Master's degree.
 Other, namely: {open answer}

Block: Instagram usage

On the next two pages you will find some questions regarding your Instagram usage. In these questions, using Instagram “actively” refers to the times you spend the majority of your information on Instagram whilst making use of this social media platform. Please read the questions carefully and answer them to the best of your ability.

1. How often do you actively use Instagram on average?
 More than three times a day.
 2-3 times a day
 Once a day.
 2-6 times a week.
 Once a week.
 Less than once a week.
 I do not use Instagram.
2. In the past week, on average, approximately how much time PER DAY have you spent actively using Instagram?
 Less than 10 minutes.
 10-30 minutes.
 30-59 minutes.
 1-2 hours.
 2-3 hours.
 More than 3 hours.

Block: Instagram usage patterns

Below is a list of statements dealing with your current Instagram usage. Please indicate how strongly you agree or disagree with each statement.

I use Instagram to

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
1. Get a source of emotional support.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Reduce my mental stress.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Feel relaxed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Share my feelings.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Find out more about people I met offline.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Reveal my presence.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Increase my popularity.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Keep in touch with old friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Make my voice heard.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Maintain contact with current friends and relatives.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Express myself without limits.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Relieve boredom.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Improve my knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Exchange information with others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Have fun.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Stay up-to-date.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Give updates about major events in my life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Make new friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. See or hear something entertaining.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Give my own opinion to others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Kill time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Learn new things.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Keep an eye on my friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Block: Personality

How much do you agree with each statement about you as you generally are now, not as you wish to be in the future?

In general, I...

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
1. Am the life of the party.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Sympathize with others' feelings.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Get chores done right away.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Have frequent mood swings.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Have a vivid imagination.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Don't talk a lot.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Am not interested in other people's problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Often forget to put things back in their proper place.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Am relaxed most of the time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Am not interested in abstract ideas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Talk to a lot of different people at parties.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Feel others' emotions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Like order.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Get upset easily.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Have difficulty understanding abstract ideas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Keep in the background.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Am not really interested in others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Make a mess of things.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Seldom feel blue (sad/depressed).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Do not have a good imagination.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Block: Self-esteem

Below is a list of statements dealing with your general feelings about yourself. Please indicate how strongly you agree or disagree with each statement.

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I take a positive attitude toward myself.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. At times I think I am not good at all.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I feel that I have a number of good qualities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I am able to do things as well as most other people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I feel I do not have much to be proud of.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I certainly feel useless at times.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I feel that I am a person of worth, at least on an equal plane with others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 8. I wish I could have more respect for myself. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. All in all, I am inclined to feel that I am a failure. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. I take a positive attitude toward myself. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Block: Debriefing

Thank you very much for participating, your time and effort is very much appreciated!

The goal of this study was to get a better understanding of the Instagram usage patterns among young adults during the COVID-19 pandemic and the effect these usage patterns have on the self-esteem of these young adults.

Please click on the arrow on the bottom right to save your response and end the survey.

End of survey.

Appendix B. Selection of Indicators for Analysis

The selection of the final eight indicators that were used in the LCA was done as follows. We first looked at the correlations between all 23 available indicators using Spearman rank correlation, which is often used to evaluate relationships between ordinal variables. Table B.1 below which contains the correlation matrix for all indicators considered. Based on the correlations, we decided to exclude some indicators as they have (relatively) high correlations with other indicators that were retained in the analysis. Specifically,

- We excluded ‘feeling relaxed’ and ‘get a source of emotional support’ as they are (relatively) highly correlated with ‘reduce my mental stress’ and conceptually represent a similar dimension of needs or motivations to use Instagram, i.e., needs related to relaxation.
- We excluded ‘increase popularity’ as it is correlated with ‘reveal presence’ and both represent needs related to establishing status and presence.
- We excluded ‘maintain contact with current friends and relatives’ as it is highly correlated with ‘keep in touch with old friends’ and both represent social needs.
- We excluded ‘express myself without limits’ and ‘give opinion to others’ as they were highly correlated with ‘make voice heard’ and all three represent needs related to self-expression.
- We excluded ‘learn new things’ as it is highly correlated to ‘improve my knowledge and both represent knowledge gaining needs.
- We excluded ‘give updates about major events in my life’ as it is relatively highly correlated with ‘share my feelings’ and both represent needs related to sharing about oneself.

Furthermore, we also excluded the following indicators ‘relieve boredom’, ‘kill time’, ‘have fun’, and ‘stay up-to-date’ as they all had very low variability (between 70 and 85% of the respondents indicated that they used Instagram to fulfill these needs). What is more, the first three indicators represent a similar dimension to ‘see or hear something entertaining’ (need for pass time or entertainment), while the last one represents a similar dimension to ‘improve my knowledge’ and ‘exchange information with others’ (need for information or knowledge). It is worthwhile noting that while the indicator ‘see or hear something entertaining’ also has low variability, we decided to retain it in the analysis to have at least one indicator representing the entertainment and pastime dimension.

Finally, while in the initial analysis we also included the following three indicators ‘find out more about people I met offline’, ‘make new friends’, and ‘keep an eye on my friends’ (as they were not highly correlated with the other indicators included in the analysis and did not have low variability), their inclusion in the analysis did not help to distinguish between the classes. More specifically, the response patterns for

these three indicators were the same for all classes. Therefore, to use a more parsimonious model, we excluded them and re-ran the analysis. Whether these indicators are included in the analysis does not substantially affect the results. In both cases, the best goodness of fit was a three-class solution with a four-class solution having only marginally worse fit. The four resulting classes are also highly similar and suggest the presence of the same Instagram patterns: ‘social needs’, ‘knowledge and stress relief needs’, ‘low-motivation’, and ‘high motivation’.

As can be seen from Table B.2, the eight indicators used in the analysis represent a balanced set of different dimensions related to needs that are fulfilled by using Instagram; each dimension is represented by one or two indicators.

Table B.1
Correlation matrix for Instagram usage indicators

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1. Get a source of emotional support.	1																							
2. Reduce my mental stress.	0,54	1																						
3. Feel relaxed.	0,43	0,69	1																					
4. Share my feelings.	0,42	0,27	0,24	1																				
5. Find out more about people I met offline.	0,21	0,24	0,25	0,30	1																			
6. Reveal my presence.	0,34	0,25	0,21	0,58	0,43	1																		
7. Increase my popularity.	0,23	0,14	0,12	0,46	0,21	0,66	1																	
8. Keep in touch with old friends.	0,17	0,15	0,09	0,29	0,33	0,27	0,21	1																
9. Make my voice heard.	0,29	0,24	0,17	0,58	0,24	0,53	0,58	0,36	1															
10. Maintain contact with current friends and relatives	0,26	0,26	0,22	0,33	0,37	0,29	0,19	0,68	0,35	1														
11. Express myself without limits.	0,31	0,27	0,22	0,54	0,23	0,53	0,54	0,24	0,68	0,26	1													
12. Relieve boredom.	0,11	0,26	0,27	0,06	0,23	0,12	0,06	0,15	0,13	0,25	0,15	1												
13. Improve my knowledge.	0,44	0,40	0,41	0,20	0,20	0,14	0,06	0,09	0,18	0,15	0,19	0,17	1											
14. Exchange information with others.	0,33	0,30	0,31	0,32	0,33	0,30	0,21	0,47	0,37	0,50	0,32	0,21	0,46	1										
15. Have fun.	0,19	0,39	0,50	0,16	0,19	0,16	0,08	0,21	0,17	0,25	0,16	0,26	0,42	0,39	1									
16. Stay up-to-date.	0,28	0,33	0,31	0,11	0,28	0,21	0,15	0,20	0,14	0,27	0,19	0,29	0,39	0,34	0,31	1								
17. Give updates about major events in my life.	0,34	0,27	0,24	0,53	0,30	0,49	0,47	0,38	0,49	0,38	0,47	0,06	0,21	0,41	0,11	0,28	1							
18. Make new friends.	0,30	0,24	0,19	0,37	0,25	0,40	0,55	0,35	0,46	0,29	0,48	0,08	0,25	0,42	0,20	0,20	0,45	1						
19. See or hear something entertaining.	0,15	0,28	0,32	0,10	0,18	0,09	0,02	0,16	0,11	0,20	0,12	0,41	0,35	0,26	0,45	0,32	0,10	0,10	1					
20. Give my own opinion to others.	0,36	0,22	0,21	0,59	0,23	0,52	0,46	0,26	0,61	0,32	0,58	0,08	0,28	0,44	0,16	0,20	0,54	0,48	0,12	1				
21. Kill time.	0,04	0,19	0,22	0,02	0,08	0,02	0,02	0,14	0,03	0,11	0,05	0,42	0,11	0,11	0,29	0,19	0,03	0,04	0,32	0,01	1			
22. Learn new things.	0,39	0,36	0,32	0,23	0,23	0,18	0,09	0,11	0,20	0,18	0,24	0,12	0,78	0,43	0,36	0,37	0,24	0,28	0,31	0,32	0,13	1		
23. Keep an eye on my friends.	0,28	0,24	0,26	0,31	0,48	0,30	0,20	0,36	0,24	0,41	0,28	0,24	0,26	0,40	0,22	0,39	0,37	0,24	0,30	0,27	0,21	0,30	1	

Notes. The final eight indicators selected for the LCA are highlighted in grey.

Table B.2 *Needs represented by the indicators used in the analysis.*

Indicator	Broad needs category	Needs category according to the Uses and Gratifications theory introduced by Katz et al. (1973)
2. Reduce my mental stress.	Relaxation needs	tension free needs
4. Share my feelings.	Needs related to sharing about oneself and self-expression	affective needs
6. Reveal my presence.	Needs related to establishing status and presence	Personal integrative needs
8. Keep in touch with old friends.	Social needs	Social integrative needs
9. Make my voice heard.	Needs related to establishing status and presence	Personal integrative needs
13. Improve my knowledge.	Knowledge and information gaining needs	cognitive needs
14. Exchange information with others.	Information sharing needs	cognitive needs
19. See or hear something entertaining.	Entertainment needs	tension free needs

Appendix C. Classification Statistics

The following statistics provide further information on how well the model can predict which latent classes the respondents belong to, given the observed indicators (i.e., motivations and reasons to use Instagram) and the covariates included in the model specification (i.e., frequency of Instagram use, age, gender, and personality traits). Put differently, these statistics provide information on how well the latent classes are separated (Vermunt & Magidson, 2013). More specifically, tables C.1 and C.2 below cross-tabulate the true class memberships against the assigned (or predicted) class memberships, using both modal and proportional assignments. The diagonal elements represent the proportion correct classifications per latent class and the off-diagonal elements the proportion of misclassifications. From the classification table, we can see how many cases are misclassified and detect which are the most common types of misclassifications.

The tables suggest that the quality of the classifications is good, as for the modal assignment all the probabilities on the diagonal are above 0.8, while for the proportional assignment two of them are slightly below 0.8 and the other two are slightly above 0.8. The overall proportion of classification errors amounts to 0.125.

Table C.1

Cross-tabulation of true and assigned class membership (based on modal assignment)

Latent	Modal				Total
	1	2	3	4	
1	0,86	0,06	0,11	0,05	108,64
2	0,03	0,93	0,01	0,00	64,08
3	0,09	0,01	0,85	0,07	102,81
4	0,01	0,00	0,03	0,87	50,47
Total	104	64	105	53	326

Table C.2

Cross-tabulation of true and assigned class membership (based on proportional assignment)

Latent	Proportional				Total
	1	2	3	4	
1	0,78	0,09	0,15	0,07	108,64
2	0,05	0,89	0,01	0,00	64,08
3	0,14	0,02	0,80	0,09	102,81
4	0,03	0,00	0,04	0,84	50,47
Total	108,64	64,08	102,81	50,47	326,00

Appendix D. Class membership probabilities

Table D.1 provides the probabilities of being classified in a certain latent class c given a specific value y_j of $Y_j - P(C = c|Y_j = y_j)$ – marginalized over all the covariates included in the model.

Table D.1

Class membership probabilities conditional on responses

Item	Latent class			
	Social needs	Knowledge and stress relief needs	Low-motivation	High-motivation
Class size	0,33	0,32	0,16	0,20
Reduce mental stress				
2	0,44	0,20	0,30	0,06
3	0,50	0,27	0,17	0,06
4	0,20	0,42	0,03	0,35
Share feelings				
2	0,26	0,46	0,24	0,03
3	0,62	0,14	0,02	0,23
4	0,33	0,01	0,00	0,66
Reveal presence				
2	0,26	0,41	0,27	0,05
3	0,50	0,31	0,00	0,20
4	0,37	0,08	0,00	0,54
Keep in touch with old friends				
2	0,20	0,39	0,33	0,08
3	0,38	0,28	0,19	0,15
4	0,40	0,28	0,06	0,26
Make voice heard				
2	0,29	0,46	0,24	0,01
3	0,62	0,12	0,00	0,26
4	0,25	0,01	0,00	0,74
Improve knowledge				
2	0,47	0,09	0,35	0,08
3	0,46	0,30	0,08	0,16
4	0,19	0,48	0,04	0,29
Exchange information with others				
2	0,36	0,19	0,42	0,02
3	0,43	0,35	0,12	0,10
4	0,28	0,37	0,01	0,33
See or hear something entertaining				
2	0,33	0,04	0,60	0,04
3	0,42	0,19	0,26	0,13
4	0,32	0,36	0,10	0,22

Appendix E. Analysis Results Using Effect Coding

Tables E.1 and E.2 below provide the results of the regression analyses run using effect coding rather than dummy coding for the first step (examining the effects of covariates on class membership) as well as the second step (examining the effect of class membership on self-esteem).

In the first step of the analysis, we use effect coding for the dependent variable (class membership). This means that the probability of belonging to a specific class *c* is compared with the average (geometric mean) of the probabilities of belonging to all *C* classes. In the second step of the analysis, we use effect coding for the independent variable (class membership) to predict how it affects self-esteem. This means that the parameters will sum to zero over the categories of class membership variable, while in dummy coding, the parameters corresponding to the reference category are fixed to zero. The category-specific effects should be interpreted in terms of deviation from the overall average, rather than from the reference category as with dummy coding (Vermunt & Magidson, 2013).

Table E.1
Effects of covariates on class membership (using effect coding)

Item	Latent class							
	Social needs		Knowledge and stress relief needs		Low-motivation		High-motivation	
	<i>B</i>	<i>p</i>	<i>B</i>	<i>p</i>	<i>B</i>	<i>p</i>	<i>B</i>	<i>p</i>
Intercept	3.65	0.04	1.61	0.34	7.14	0.00	-12.40	0.00
Weekly Instagram use	-0.00	0.98	-0.16	0.24	-0.70	0.00	0.86	0.00
Daily Instagram use	0.03	0.81	0.13	0.31	-0.29	0.14	0.13	0.30
Gender	-0.61	0.04	-0.04	0.89	-0.14	0.71	0.79	0.01
Age	0.02	0.69	-0.09	0.09	0.05	0.42	0.02	0.76
Extraversion	0.42	0.02	-0.33	0.03	-0.26	0.21	0.16	0.36
Agreeableness	-0.55	0.01	0.61	0.01	-0.38	0.18	0.32	0.23
Conscientiousness	-0.40	0.04	0.15	0.40	0.17	0.50	0.09	0.67
Neuroticism	-0.44	0.05	0.20	0.33	-0.38	0.16	0.62	0.02
Openness to experience	0.18	0.36	-0.24	0.19	-0.52	0.04	0.58	0.01

Notes. Effect coding is used in this analysis. The *B*s represent the unstandardized coefficients. The *p*-values represent the significance levels of the corresponding t-tests; effects in bold represent significant effects at a 5% level ($p < .05$).

Table E.2

Effects of Instagram usage patterns on self-esteem (using effect coding)

Independent variable	DV: Self-esteem	
	<i>B</i>	<i>p</i>
Intercept	2.36	0.00
Cluster 1 - 'Social needs'	-0.17	0.01
Cluster 2 - 'Knowledge and stress relief needs'	0.05	0.47
Cluster 3 - 'Low-motivation'	-0.01	0.89
Cluster 4 - 'High-motivation'	0.14	0.04
Gender	-0.03	0.61
Age	0.02	0.07
Weekly Instagram use	-0.04	0.10
Daily Instagram use	0.02	0.43
Conscientiousness	0.09	0.02
Extraversion	0.20	0.00
Agreeableness	0.01	0.91
Neuroticism	-0.42	0.00
Openness to experience	0.07	0.05
R ²	0.03	

Notes. Based on proportional assignment of respondents to latent classes; a model assignment provided highly similar results regarding the magnitude of the effects and their significance. The assignment was done using the BCH method proposed by Bolck et al. (2004), which is the preferred method for continuous dependent variables. The latent class '(need for) belonging' is included as the reference category in this analysis. The *B*s represent the unstandardized coefficients. The *p*-values represent the significance levels of the corresponding t-tests; effects in bold represent significant effects at a 5% level ($p < .05$).

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