The relationship between Instagram use and indicators of mental health: A systematic review

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ABSTRACT

The rise of Instagram has prompted researchers to examine its effects on mental health, yet an overview of the current literature is missing. Therefore, the aim of this systematic review was to summarize research investigating the relationship between Instagram use and indicators of mental health such as self-reported well-being, depression, anxiety, stress, alcohol and drug use, and indicators of body image and disordered eating. Next, we aimed to provide an overview of possible key psychological variables that may be involved in the relationship between Instagram use and indicators of mental health, including social comparison, self-esteem, indicators of body image and disordered eating, self-presentation and belonginess factors. Our systematic search on Web of Science and Scopus led to the identification of 93 eligible articles. To sufficiently map the complexity of the relationship between Instagram use and indicators of mental health, we organized the research findings of every variable into four categories: Instagram membership, intensity of Instagram use, type of use and Instagram content and characteristics of Instagram profile. Most evidence has been obtained for the relationships between Instagram use and social comparison, body image, and disordered eating outcomes. Evidence for the relation between Instagram use and the other variables is inconclusive and, for certain constructs, still scarce. Therefore, more longitudinal and experimental research designs are needed to further support and extend these initial findings.

1. Introduction

The introduction of social network sites (SNS) has provided several new opportunities for social relationships as these platforms are particularly suitable for self-presentation and social interaction. Hence, it is not surprising that SNS gained massive popularity worldwide in the recent past. Although Facebook is still the most popular SNS with 2.75 billion monthly users, Instagram has risen in popularity and recently reached a milestone of 1 billion monthly active users (Statista, 2020). This platform allows users to share image-based content (i.e., photos and videos) accompanied by a textual caption. Other users can interact with this content by liking, sharing or leaving a comment on the post. Recent estimates have suggested that Instagram especially gains popularity among adolescents and young adults, with the majority checking their account at least once a day (Pew Research Center, 2019). Given the popularity of Instagram and the platform's variety of features, researchers became interested in the effects of Instagram use on users'

well-being and mental health. Accordingly, the literature in this area is growing steadily. For this reason, we aimed to synthesize the current state of the emerging literature on how intensity of Instagram use relates to mental health and which key psychological variables may be involved in this relationship.

1.1. Instagram Use and mental health problems

Several studies have linked excessive SNS use to lower psychological well-being (see Huang, 2017, for a meta-analysis). For example, SNS use has been associated with disordered eating and poorer body image outcomes (Holland & Tiggemann, 2016). Holland and Tiggeman's systematic review (2016) indicated that especially posting, viewing, and commenting on image-based content played a crucial role in this relationship. In addition, multiple meta-analyses provided evidence for the relation between SNS use and depressive symptomatology. For instance, both time investment on SNS and frequency of SNS use show a weak

positive correlation with depressive symptomatology (Huang, 2017; Keles et al., 2020; Yoon et al., 2019). Furthermore, Keles et al. (2020) examined the influence of SNS use on anxiety and psychological distress in a systematic review. Results indicated that a higher SNS intensity was positively linked with anxiety and psychological distress. The systematic review of Frost and Rickwood (2017) and meta-analysis of Curtis et al. (2018) illustrated the relationship between intensity of SNS use and alcohol addiction. More specifically, excessive users with larger online social networks who post and view more alcohol-related updates report more problematic alcohol use.

Due to the fact that Instagram is a rather novel SNS, it is hardly represented in the abovementioned reviews/meta-analyses. Since every platform has its own functionalities, additional research is needed to further investigate if previous results regarding the impact of SNS use on mental well-being are generalizable to Instagram (e.g., Baker & Algorta, 2016). In particular, compared to other popular SNS such as Facebook or Twitter, Instagram uniquely focuses on image-based content such as photo and video updates. As a result, it is likely that instagram differs from other SNSs in terms of intermediate processes linking use to psychological well-being, reflecting the need for a systematic review on the relation between Instagram use and psychological well-being.

The necessity of this review is also based on initial research showing mixed findings. For instance, some empirical studies have shown that more excessive Instagram users report lower well-being (e.g., Schmuck et al., 2019) and higher scores on different psychological disorders including eating disorders, depression, social anxiety, general anxiety, and problematic alcohol use (e.g., Ceballos et al., 2018; Griffiths et al., 2018; Yurdagü;l et al., 2019). However, not all studies seem to support these findings (e.g., Brailovskaia & Margraf, 2018; Vannucci et al., 2018). Therefore, a systematic review that provides an in-depth investigation on how Instagram use is related to well- or ill-being is needed. Unfortunately, such a clear overview is still missing in the current Instagram literature. Therefore, the first aim of this review is to provide an overview of the literature pertaining the relation between Instagram use, well-being, and diverse mental health problems.

1.2. Key psychological variables that May play a mediating or moderating role

Recent meta-analyses indicate that the observed associations between general SNS use and mental well-being are typically small (e.g., Huang, 2017; Yoon et al., 2019). In order to gain a better understanding of how SNS use is related to psychological well-being, it has been suggested to take the potential intermediate variables into account (Huang, 2017; Keles et al., 2020; Yoon et al., 2019). Accordingly, previous research on the relation between SNS use and well-being or mental health have provided indications for several key psychological variables. Based on previous narrative reviews and research papers on psychological variables that may be involved in the relationship between SNS use and mental well-being, the following constructs have often been conceptualized as intermediate variables: self-presentation, social comparison, self-esteem, social capital, and social support (de Vaate et al., 2020; Faelens et al., 2019, 2021; Holland & Tiggemann, 2017; Verduyn et al., 2017; Jackson & Luchner, 2018; Lee et al., 2014; Wang et al., 2017).

A first important variable is *self-presentation*. The rise of image-based SNS enables users to share self-presentational content with others. Despite the fact that SNS profiles generally represent accurate self-presentation information (Back et al., 2010), SNS users have the tendency to share mainly positive characteristics and life events (Zhao et al., 2008). Logically, this form of optimized *self-presentation* seems to have beneficial effects on users' well-being (e.g. Gonzales & Hancock, 2011). However, passively consuming this selectively presented content of others may induce more detrimental effects, resulting in decreased mental well-being (de Vaate et al., 2020). Indeed, previous reviews suggest that passive SNS use could induce upward *social comparison* (e.

g., Verduyn et al., 2017), which happens when users compare themselves with others who seem to be better off (Chou & Edge, 2012). These processes are often accompanied by negative self- and body evaluations and may therefore affect self-esteem and indicators of body image and disordered eating (e.g., Fardouly & Vartanian, 2016; Vogel et al., 2014). Importantly, both social comparison processes and self-/body evaluative processes are important predictors of mental health problems (Ghaderi & Scott; 2001; Myers & Crowther, 2009; Orth et al., 2009, 2012; Sowislo & Orth, 2013; Verduyn et al., 2017).

A second important motivation for SNS use is communication with others. SNS make it easier than ever before to maintain existing relationships and to expand one's social network, resulting in *social capital* benefits (e.g., Verduyn et al., 2017). Putnam (2000) makes a distinction between two forms of social capital (i.e., bonding and bridging). Bonding social capital refers to benefits such as *social* support, which are often provided by SNS users with whom one shares strong personal relationships (e.g., family members and close friends). Bridging social capital on the other hand refers to the benefits provided by weaker relationships (e.g., acquaintances). More specifically, these connections can provide access to novel information and diverse viewpoints (Burke et al., 2010; Putnam, 2000). Research suggests that active SNS use, where users interact with their connections (e.g., via chat, status or photo updates), increases both types of social capital. In turn, this may increase well-being. Therefore, social capital has been put forward as a potential protective factor against the development of psychopathology.

The abovementioned findings show that it is crucial to investigate the psychological variables involved in the relation between SNS use and mental health. Therefore, the second aim of this review is to explore the mediating and/or moderating role of key psychological variables (i. e., social comparison, self-esteem, body (dis)satisfaction, self-presentation, and belongingness factors in the relationship between Instagram use and indicators of mental health.

2. Method

The search was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Shamseer et al., 2015). The review protocol was registered on the International Prospective Register of Systematic Reviews (Prospero: Registration number CRD42020146475).

2.1. Search strategy

In a first step, we conducted a systematic search on Web of Science and Scopus, two major databases in the field of social psychology/clinical psychology, to identify relevant studies that focus on the relationship between: (a) Instagram use, and (b) indicators of mental health (e.g., well-being, depression, addiction see below for the full list) or (c) key psychological variables that may contribute to this relationship (e. g., social comparison, social capital, social support, self-esteem …). Initially, we did some exploratory searches to fine-tune our keywords. In our full, comprehensive search, which was conducted on the May 4, 2020, we searched for publications using the following search terms: "Instagram" AND ("social comparison" OR "social capital" OR "social support" OR "self-presentation" OR "self-esteem" OR "bod*" OR "affect" OR "mood" OR "sadness" OR "depress*" OR "stress" OR "anx*" OR "addict*" OR "eating dis*" OR "well-being" OR "mental health" OR "psychological health" OR "emotional health" OR "quality of life" OR "life satisfaction" OR "happiness").

In a second step, we screened the reference lists of the selected manuscripts, in addition to reviews and meta-analyses regarding Instagram use and mental health that were identified during the first step (cf. snowballing).

2.2. Eligibility criteria

A study was eligible for inclusion when the following criteria were met: (1) the results of the study were reported in English and published in a peer-reviewed journal; (2) the study contained (a) a measure reflecting (intensity of) use of Instagram, and (b) an indicator of mental health, and/or (c) a key psychological variable that may contribute to this relationship. Qualitative research articles, review articles, meta-analyses, editorial articles, book chapters, and dissertations were excluded.

2.3. Study selection

During the first phase of the search, 1334 records were identified via Web of Science and Scopus (see Fig. 1). After removing duplicates, titles and abstracts of 824 records were screened for eligibility. Full copies of 124 articles were read, which resulted in the inclusion of 85 manuscripts focusing on the relationship between Instagram use and mental health. Next, snowballing took place, based on the reference lists of selected manuscripts, in addition to reviews and meta-analyses regarding Instagram use and mental health that were identified during the first step. This resulted in 123 articles, which were again screened based on title and/or abstract, after removing duplicates. Eighty-nine additional full-text articles were evaluated, resulting in the inclusion of 8 additional manuscripts. In sum, after both phases, 93 manuscripts were included in the systematic review, focusing on the relationship between Instagram use and mental health, and key psychological variables that may contribute to this relationship (see Supplemental Table S1 for an overview of the research findings). Quality of the rating procedure was assessed using indicators of inter-rater agreement. This led to $\kappa = 0.89$ inter rater agreement on inclusion/exclusion illustrating excellent agreement (Orwin, 1994).

2.4. Data extraction

Data were extracted by two reviewers (LF and RC, co-authors). One person performed the data extraction for each included paper. The second reviewer double-checked the data extraction. The data included the last name of the first author, year of publication, sample size, measures reflecting (intensity of) Instagram use, indicators of mental health or other important psychological variables.

2.5. Quality assessment

We assessed the quality of each included study by modifying the Downs and Black instrument for randomized controlled trials and
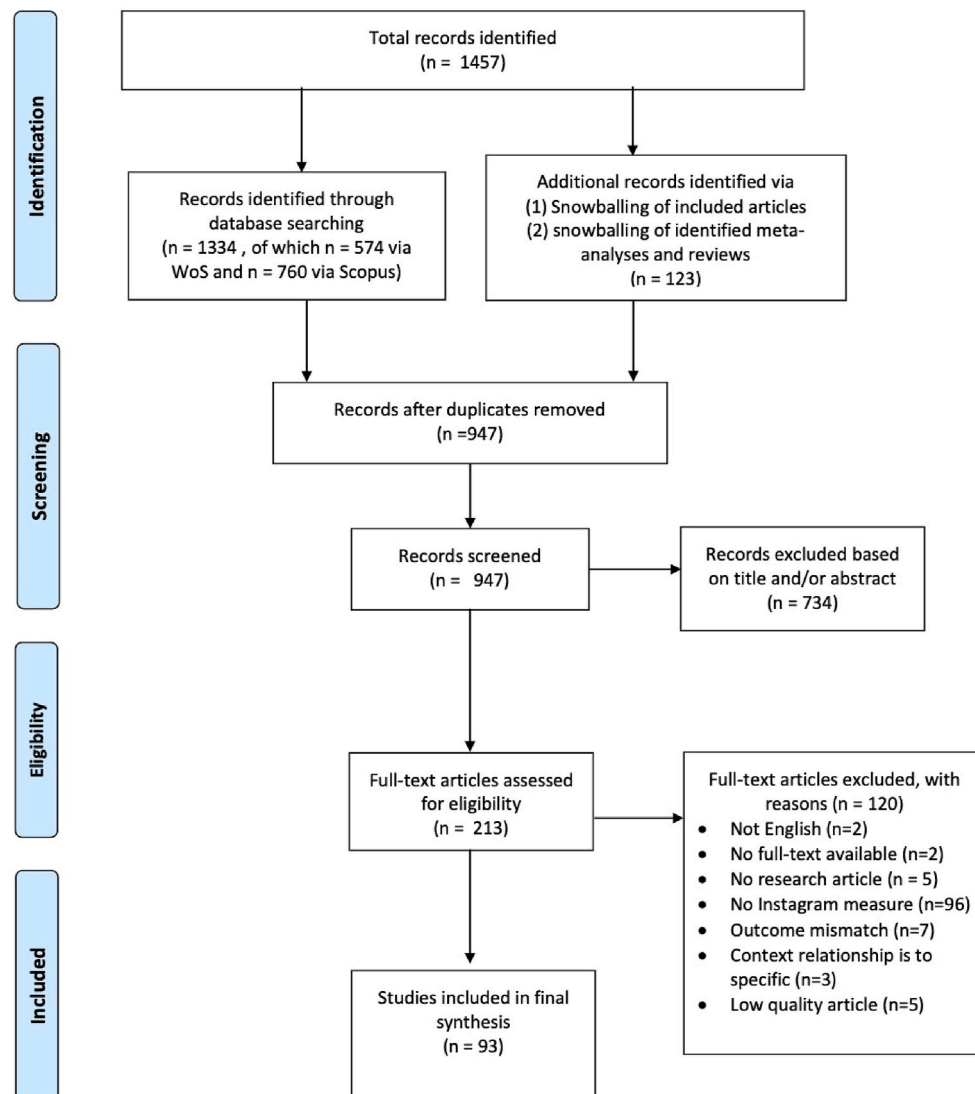

Fig. 1. Prisma flow chart.

observational studies (Downs & Black, 1998). More specifically, we made three different versions for cross-sectional, prospective, and experimental studies, since not all items were relevant for every study design. For cross-sectional studies, the scale included 11 items with a maximum score of 11. The checklist for prospective studies was modified to 14 items, with a maximum score of 14. Finally, we used a checklist with a maximum score of 22 for experimental designs without longitudinal component or 25 for longitudinal experimental designs, to assess the quality of experimental studies. More points reflect a superior quality of investigation. Two independent raters (LF and RC) scored each included study. Discrepancies between reviewers were resolved by discussion and consensus between two reviewers. If necessary, a third reviewer was consulted. The corresponding rating scales have been added as supplementary materials.

3. Results

3.1. Overview of study characteristics/design

The aim of this review was to provide a systematic overview of (a) the relation between Instagram use and mental health outcomes, as well as (b) key psychological variables that may link these constructs. Based on our literature search, the following categories of mental health were identified and will be discussed in the following order: well-being, depression, anxiety, stress, addiction, body image and disordered eating, social and appearance comparison, self-esteem, self-presentation, and belongingness factors. For each of these topics, pending on the availability of studies, we will first discuss studies exploring the relation between Instagram membership and the mental health indicator of interest, followed by discussion of the association with other indicators of Instagram use, such as intensity of Instagram use, type of Instagram use and content to which one is exposed (e.g., upward comparison material), as well as specific characteristics of one's Instagram profile (e.g., amount of followers). To interpret the strength of the associations, we will use Cohen's (1988) conventions, where a correlation coefficient of 0.10 represents a weak or small association; a correlation coefficient of 0.30 represents a moderate association and a correlation coefficient of 0.50 or larger is thought to represent a strong or large association. Table S1 provides a comprehensive overview of all the selected studies that passed through the inclusion criteria of this review. However, in the manuscript we only discuss in detail the topics for which there was ample scientific evidence.

3.2. Evidence for a direct relation between Instagram Use and indicators of mental health

3.2.1. Well-being

We identified ten articles (11% of all identified articles) focusing on the direct relationship between Instagram use and indicators of well-being, such as life satisfaction, happiness and mental well-being.

Instagram Membership. First, we investigated the studies examining Instagram membership in relation to indicators of well-being. One correlational study examined the relationship between Instagram membership and life satisfaction and found a small positive association, yet in this study, no association was found between Instagram membership and happiness (Brailovskaia & Margraf, 2018).

Intensity of Instagram. Use Two studies that focused on the relation between intensity of Instagram use and happiness found no evidence for an association between both variables (Chae, 2018; Longobardi et al., 2020). In line with this, de Lenne and colleagues (2018) did not find a direct relationship between Instagram use and poor mental well-being.

In contrast, an evaluation of the association between Intensity of Instagram use and life satisfaction yielded mixed evidence. That is, one study found evidence for a positive but small relationship between (intensity of) Instagram use and life satisfaction (Lowe-Calverley et al., 2019) and one study reported mixed findings (Chae et al., 2018).

Nevertheless, two manuscripts reporting the results of the same prospective study found evidence for a small negative association (Matthes et al., 2020; Schmuck et al., 2019), suggesting that (excessive) Instagram use may have detrimental effects. In line with this, another study reported a negative association between Instagram addiction and life satisfaction (Ponnusamy et al., 2020). The results of an experimental study suggested beneficial effects of reducing intensity of Instagram use. For instance, Fioravanti et al. (2020) showed that women who had to take a break from Instagram for seven days reported higher life satisfaction and positive affect scores at post-test compared to women who continued their habitual pattern of Instagram use. Interestingly, the effects seemed to be specific for women, where no significant differences between both conditions were observed for men.

Type of Use and Instagram Content. We identified only one experimental study which examined the causal effects of (type of) Instagram use on life satisfaction. Building on the literature pertaining effects of gratitude interventions, Koay et al. (2019) instructed participants to post gratitude images on Instagram for seven consecutive days, which – compared to a control condition in which participants had to post control images – they hypothesized to have a beneficial impact on life satisfaction. However, this experimental manipulation of type of Instagram use did not significantly impact well-being.

Characteristics of Instagram Profile. It has been suggested that certain characteristics of Instagram use may link activity on this SNS with indicators of well-being. In particular, when including both the number of Instagram followers and followees (accounts one follows) in the same model, only the number of Instagram followers showed a positive association with happiness (Longobardi et al., 2020). This suggests that the link between Instagram use and well-being may be dependent on very specific circumstances (e.g., whether you have a lot of followers on the SNS).

Intermediate Conclusion. Evidence for the relationship between Instagram use and well-being, as indicated by ratings of life satisfaction and happiness, is limited and mixed. Evidence stemming from cross-sectional and prospective studies investigating the association between intensity of Instagram use and life satisfaction provide evidence for both beneficial and detrimental effects. In particular, excessive Instagram use (e.g., in the context of Instagram addiction) seems to be negatively related to life satisfaction. In contrast, the current literature provides less evidence for a direct association between Instagram use and happiness. However, both constructs warrant further investigation since the number of studies is relatively limited.

3.2.2. Depression

Our systematic search led to 16 articles (17% of all identified articles) focusing on the direct relationship between Instagram use and depressive symptomatology.

Instagram Membership. Four cross-sectional studies explored the relation between Instagram membership and depressive symptomatology, two of which reported no significant association (Brailovskaia & Margraf, 2018; Fardouly et al., 2020). Two other studies found evidence for an association between Instagram membership and severity of depressive symptomatology. Mackson et al. (2019) suggested that Instagram users may report lower levels of depressive symptoms than non-users. In contrast, Khodarahimi and Fathi (2017) found evidence for the opposite pattern, where Instagram users reported higher levels of depressive symptoms.

Intensity of Instagram Use. Eleven cross-sectional studies and one prospective study looked into the relationship between indicators for intensity of Instagram use (e.g., time spent using Instagram per day, self-reported Instagram intensity, self-reported frequency of Instagram use) and depressive symptomatology.

In one study, it was specifically tested whether individuals diagnosed with major depressive disorder differ from controls in terms of intensity of Instagram use, but no significant differences between groups were found (Robinson et al., 2019). Of the remaining ten studies including

cross-sectional analyses, 60% (6 studies) provided evidence for a small to moderate positive association between both constructs (Donnelly & Kuss, 2016; Li et al., 2018; Lup et al., 2015; Sherlock & Wagstaff, 2019; Yurdagül et al., 2019; Vannucci et al., 2018).

Nevertheless, 30% (3 studies) found no evidence for a relationship between Instagram intensity and depressive symptomatology (Fardouly et al., 2020; Lowe-Calverley et al., 2019; Vannucci et al., 2018).

Type of Use and Instagram Content. Apart from time investment, the way people use Instagram may also result in different outcomes regarding experienced depressive symptomatology. For example, using a prospective design, Frison and Eggermont (2017) illustrated that only Instagram browsing, and not Instagram liking nor posting, predicts more depressive symptoms over time. Furthermore, this study also provides evidence for a relation between Instagram use and depressive symptomatology in the opposite direction, where level of depressed mood has shown to positively predict Instagram posting over a six-month interval (Frison & Eggermont, 2017). These findings suggest a bidirectional relation between Instagram use and depressive mood. Furthermore, one study has obtained a positive association between depression and the number of selfies (photo taken by oneself) taken before posting it on Instagram (Lamp et al., 2019). In contrast, no significant relationship with depressive symptomatology was found for the number of selfies posted in a week and selfie manipulation (Lamp et al., 2019; Li et al., 2018).

Characteristics of Instagram Profile. One study observed a small positive association between self-reported depressive symptoms and the number of followers and followees (Sherlock & Wagstaff, 2019). Nevertheless, another study found evidence for an opposite pattern, where individuals with major depressive disorder reported less followers and followees than individuals without major depressive disorder (Robinson et al., 2019).

Intermediate Conclusion. Initial evidence suggests that Instagram membership does not seem to be linked to depressive symptoms. In contrast, intensity of Instagram use and type of use seem to be important factors to take into account when exploring the association between Instagram use and depression.

3.2.3. Anxiety and stress

We identified 13 studies (14% of all studies) in which the direct relationship between Instagram use and anxiety symptoms was explored. In addition, we identified only five studies (5% of all studies) that investigated the relationship between Instagram use and stress.

Instagram Membership. Four studies investigated the relation between Instagram membership and anxiety symptoms. Evidence for a positive relation between these two constructs could only be shown in one of them. That is, Khodarahimi and Fathi (2017) observed higher levels of anxiety in Instagram users compared to non-users. In contrast, Mackson et al. (2019) observed the opposite pattern of results, suggesting beneficial effects of Instagram use on anxiety symptoms. In addition, in two studies evidence for a relation between individuals' (social) anxiety symptoms and Instagram membership could not be found (Brailovskaia & Margraf, 2018; Fardouly et al., 2020). These findings seem to be in line with the above presented results regarding depression, suggesting that Instagram membership does not seem to be related to anxiety symptoms. Similarly, Instagram users did not differ significantly from non-users regarding their self-reported stress levels (Brailovskaia & Margraf, 2018; Khodarahimi & Fathi, 2017).

Intensity of Instagram Use. Of the nine studies looking into the relationship between indicators for Intensity of Instagram use and anxiety, 44% (4 studies) found evidence for a positive relationship, whereas 56% (5 studies) failed to observe a relation between both constructs.

Specifically, four studies reported a small to moderate positive association between time spent on Instagram and trait anxiety, physical appearance anxiety, social anxiety and attention to high insecurity-eliciting body regions (Balta et al., 2018; Couture Bue, 2020; Sherlock & Wagstaff, 2019; Yurdagül et al., 2019). However, five other studies

did not obtain evidence for a relationship between indicators of Instagram intensity and anxiety symptoms (Fardouly et al., 2020; Lowe-Calverley et al., 2019; Mackson et al., 2019; Vannucci et al., 2018; Vannucci & McCauley Ohannessian, 2019). In addition, for stress, only an indirect effect for intensity of Instagram use emerged in the study of Sanz-Blas et al. (2019). They showed that people who feel that they spend too much time on Instagram report higher levels of Instagram addiction, which in turn was related to higher self-reported levels of Instagram induced stress.

Type of Use and Instagram Content. We identified three studies with an experimental design modeling the causal relationship between type of Instagram use and symptoms of anxiety. For example, Sherlock and Wagstaff (2019) let participants watch beauty images, fitspiration images, travel images, or no images (control condition) and modeled effects on appearance and general anxiety. However, no significant time-by-condition interactions were obtained. Couture, Bue and Harrison (2020) let participants view thin ideal images with a thin ideal comment (e.g., comment that romanticized the image, and offered information about diet/exercise or daily routines) or thin ideal images with a disclaimer comment (e.g., "not real life"). Although post-exposure state body anxiety was higher than baseline body anxiety for women who viewed the thin ideal images with an idealized comment, the difference in post-test body anxiety between conditions did not reach significance. Consequently, these studies suggest that the impact of exposure to idealized images on reported anxiety seems to be rather limited.

Characteristics of Instagram Profile. Finally, one study examined the relation between Instagram profile characteristics, such as the number of followers and followees, and anxiety, in addition to effects of intensity of Instagram use (Sherlock & Wagstaff, 2019). The findings illustrate that both the number of followers and followees show a small positive relationship with trait anxiety. Interestingly, only the number of followees was positively related with appearance anxiety, indicating that young adults who follow more Instagram accounts show more concerns about their appearance (Sherlock & Wagstaff, 2019).

Intermediate Conclusion. Evidence for the association between Instagram use and anxiety is scarce. The majority of the studies suggests that Instagram membership does not seem to put one at-risk for experiencing elevated anxiety levels. Moreover, although some findings suggest an association between intensity of Instagram use, characteristics of Instagram use (e.g., amount of followers) and anxiety, the multitude of studies did not find evidence for such a relation. Furthermore, initial experimental studies failed to find evidence for the impact of Instagram manipulations on self-reported anxiety. In addition, although there is evidence for an (in)direct link between Instagram use and stress through addiction, studies failed to provide evidence for a direct link. However, the amount of studies investigating the relationship between Instagram use and self-reported stress levels is scarce. Hence, future studies are needed to make more conclusive interpretations possible.

3.2.5. Alcohol and drug use

So far, little attention has been paid to the direct relationship between Instagram use and alcohol and/or drug-use. Consequently, we only identified three studies (3% of all articles) with two studies focusing on the relationship between (intensity of) Instagram use on alcohol/drug use and one examining the associations between alcohol exposure on Instagram and alcohol related perceptions and behaviors.

Intensity of Instagram Use. The cross-sectional study of Ceballos et al. (2018) illustrated that Instagram intensity shows a small positive association with number of alcohol consumptions, with binge drinkers reporting greater intensity of Instagram use than non-binge drinkers.

Type of Use and Instagram Content. Rather than focusing on time spent on Instagram, the longitudinal study of Boyle et al. (2016) examined the relationship between alcohol exposure on Instagram and a set of perceptions and behaviors regarding alcohol use during college.

More specifically, they found small to moderate positive associations between alcohol exposure on Instagram, enhanced drinking motives, and drinking behavior.

Intermediate Conclusion. The majority of these studies suggest that there may be a link between Instagram use and alcohol/drug related perceptions or behaviors.

3.2.6. Body image and disordered eating

Of all indicators of psychopathology, the direct relationship between Instagram use and body image or disordered eating is the most widely examined. More specifically, of our total of 93 included articles, 55% (51 articles) focused on the relationship between Instagram and body related outcomes.

Instagram Membership. While looking at potential differences between Instagram users and non-users in the context of body image and disordered eating, five of the identified studies reported significant differences between users and non-users. More specifically, users reporting higher body surveillance (Cohen et al., 2017), appearance related pressure (Aberg et al., 2020), eating pathology (Fardouly et al., 2020) and lower body satisfaction (Fardouly et al., 2020) than non-users. However, no differences were found for body image (Mackson et al., 2019), drive for thinness, thin ideal internalization, and appearance evaluations (Cohen et al., 2017). Interestingly, some of the associations between Instagram membership, body image and disordered eating seem to be gender specific. For instance, comparison of Instagram users with non-users showed that boys with an Instagram account differ from boys without an account in terms of over-evaluation of their shape and weight, skipping meals, and levels of reported disordered eating cognitions. Girls with an Instagram account also differed from girls without an account in terms of skipping meals. However, none of the other associations that were reported for boys were observed for girls. Instead, girls with an Instagram account differed from girls without an account in that they used a stricter exercise schedule. This suggests a possible differential effect of Instagram membership on body (dis)satisfaction and disordered eating for boys and girls (Wilksch et al., 2020).

Intensity of Instagram use. Regarding the relationship between time investment on Instagram and body image and/or disordered eating, we noticed that several body-related constructs were consistently linked to indicators of Instagram use. More specifically, several studies identified a small positive association between time spent on Instagram and both internalization (of beauty ideals or muscular ideals) and self-objectification across studies (Fardouly et al., 2018; Fatt et al., 2019; Feltman & Szymanski, 2017). In addition, the majority of studies found a positive link between intensity of Instagram use and both body surveillance and dietary behaviors or disordered eating. In particular, two out of three studies revealed a small positive link between Instagram use and body surveillance (Arroyo & Brunner, 2016; Feltman & Szymanski, 2017), whereas one study observed no evidence for an association between both constructs (Butkowski et al., 2019). Furthermore, five out of seven studies reported a small positive relationship between (intensity of) Instagram use and dietary behaviors or disordered eating (Griffiths et al., 2018; Stein et al., 2019; Teo & Collinson, 2019; Turner & Lefevre, 2017). Two studies reported no evidence for the role of intensity of Instagram use in the context of dietary behaviors or disordered eating (Butkowski et al., 2019; Fardouly et al., 2020).

Less support was found for the relationship between (intensity of) Instagram use and body (dis)satisaction, and drive for thinness. In particular, four studies reported a small to moderate positive association between Instagram use and body dissatisfaction, body image disturbance, height dissatisfaction, weight satisfaction, muscularity dissatisfaction, or drive for thinness (Couture Bue, 2020; Griffiths et al., 2018; Modica, 2020; Sherlock & Wagstaff, 2019). In contrast, in seven studies no relationship was observed between intensity of Instagram use, body (dis)satisfaction or drive for thinness (Arroyo & Brunner, 2016; Butkowski et al., 2019; Couture; Couture Bue, 2020; Fardouly et al., 2018;

Fatt et al., 2019; Mackson et al., 2019; Stein et al., 2019).

Type of use and Instagram Content. Next to time investment online, the way users spend their time can also make a difference. One specific focus is selfie-behavior. For example, multiple studies have shown that users who take more selfies (before posting) and strategically present themselves on Instagram, for example by editing or manipulating selfies, report higher levels of body surveillance, body dissatisfaction, and lower body esteem (Chang et al., 2019; Lamp et al., 2019; Wagner et al., 2016). This is also confirmed by the experimental study of Tiggeman and colleagues (2020b) who found that taking and editing selfies led to higher facial dissatisfaction.

Nevertheless, the relationship between selfie-posting behavior and indicators of body image and disordered eating patterns is less clear. In particular, whereas some studies found no association between selfie-posting and drive for thinness, bulimia, body dissatisfaction and body surveillance (Butkowski et al., 2019; Wagner et al., 2016) other studies suggested that people who post selfies are more satisfied with their body (Butkowski et al., 2019; Ridgway & Clayton, 2016). Furthermore, the experimental study of Coulthard and Ogden (2018) illustrated that posting no selfies resulted in a greater improvement in appearance satisfaction compared to posting selfies (Coulthard & Ogden, 2018). The authors suggest that these findings illustrate that self-surveillance through social media may have detrimental effects. In sum, these findings suggest that people who engage more in active Instagram use, such as selfie taking and selfie-editing, report more negative body outcomes, although the relationship between selfie-posting and body outcomes is still inconclusive and needs further investigation.

In addition to active SNS behavior, such as creating content (e.g., taking pictures), editing, or posting selfies, participants can also passively view content of others. Passively consuming content of others seems to be negatively related with body esteem and disordered eating (Chang et al., 2019; Stein et al., 2019). Findings suggest that this association may depend on the type of profiles and content one is exposed to. For example, whereas following fitness accounts (i.e., 'fitspiration content') or celebrities accounts seems to show associations with several indicators of body image and disordered eating, whereas following travel accounts shows no associations at all (Cohen et al., 2017). Indeed, two studies illustrated that viewing fitspiration content (fitness content posted to inspire others) is positively related to several indicators of body dissatisfaction and disordered eating (Arroyo & Brunner, 2016; Cohen et al., 2017). Interestingly, users who actively post fitspiration content also report higher scores on drive for thinness, drive for muscularity and bulimia (but not body dissatisfaction) than women who post travel images (Holland & Tiggemann, 2017). These findings suggest that both passively consuming and posting of fitspiration content may be linked to more detrimental body-related outcomes. However, when users perceive photos of others as highly digitally modified or edited, they report lower internalization of the thin ideal, suggesting that this reduces the impact of these images (Vendemia & DeAndrea, 2018).

Next to cross-sectional and prospective studies, we also identified 26 experimental studies which evaluated the impact of (type of) Instagram use on indicators of body image or disordered eating. Nineteen studies focused on the effect of exposure to upward comparison material on indicators of body image and disordered eating (e.g., beauty images, fitspiration images/thin-ideal images/manipulated images). Of these studies, 74% (14 articles) provided evidence for an effect of exposure to upward comparison material on indicators on body image and disordered eating, 21% (4 articles) provided mixed evidence and 5% (1 article) reported no effect. For example, individuals exposed to upward comparison material reported detrimental effects on mental well-being in terms of body dissatisfaction (Anixiadis et al., 2019; Brown & Tiggemann, 2016; Brown & Tiggemann, 2020; Casale et al., 2019; Fardouly & Holland, 2018; Livingston et al., 2020; Prichard et al., 2020; Tiggemann et al., 2018; Tiggeman et al., 2020a; Tiggemann & Anderberg, 2019; Tiggemann & Zaccardo, 2015) facial dissatisfaction (Fardouly & Rapee, 2019; Sampson et al., 2020; Tiggemann et al., 2018; Tiggemann

& Zinoviev, 2019), and self-objectification (Cohen et al., 2019). In addition, upward comparison material was related to decreases in self-rated attractiveness (Sherlock & Wagstaff, 2019), body satisfaction (Cohen et al., 2019; Kleemans et al., 2016; Tamplin et al., 2018) and body appreciation (Brown & Tiggemann, 2020; Tiggeman et al., 2020a) compared to individuals who viewed no images or other images (e.g., control images, images without filters). Despite the fact that most studies found significant effects, some studies found no significant differences between conditions in terms of body appreciation (Slater et al., 2017; Tiggemann & Anderberg, 2019) and overall appearance satisfaction (Fardouly & Rapee, 2019; Slater et al., 2017; Tiggemann & Zinoviev, 2019). Taken together, the majority of these studies suggest that exposure to upward comparison material on Instagram may have detrimental effects on indicators of body image and disordered eating for both females and males, although this process has only been investigated to a limited extent in males.

Investigations of the impact of type of Instagram use and the content one is exposed to has received extensive attention in the context of body image and disordered eating. Four studies used a manipulation to positively influence indicators of body image and disordered eating by exposing participants to other types of Instagram posts. Of these studies, two studies found that exposure to body positive content (e.g., photos of females in different shapes, quotes) or self-compassion content (quotes) seems to have beneficial effects on body satisfaction and body appreciation (Cohen et al., 2019; Slater et al., 2017). Furthermore, results showed that exposure to humorous images (e.g., parody images, Instagram vs. Reality posts) has positive effects on body satisfaction, but no effects on body appreciation (Slater et al., 2019; Tiggemann & Anderberg, 2019). In sum, these findings illustrate that whereas specific Instagram content can have a negative impact on body image (e.g., upward comparison content), Instagram content may also exert a positive impact on mental well-being. That is, both body positivity and humoristic posts hold potential to increase body satisfaction, but only body positive content affects people's body appreciation.

Moreover, in several studies Instagram comments have been manipulated, i.e. captions, and hashtags, to examine the impact of such content features on indicators of body image and disordered eating. For instance, four experimental studies investigated whether disclaimer captions or comments highlighting the unrealistic nature of the picture could buffer against possible harmful effects of upward comparison images on indicators of body image and disordered eating (e.g., thin ideal images). However, all studies failed to find evidence for such mitigated/protective effects (Brown & Tiggemann, 2020; Couture Bue & Harrison, 2020; Fardouly & Holland, 2018; Livingston et al., 2020).

However, two studies also illustrated potential negative effects of exposure to hashtags and comments while passively consuming Instagram content. In particular, Tiggemann and Zinoviev (2019) found that enhanced free hashtags under natural images of females may have a detrimental effect on individual's facial dissatisfaction compared to the same images without hashtag. Moreover, Tiggemann and Barbato (2018) observed that women who viewed images with appearance comments under the photo (e.g., "You look amazing") reported higher body dissatisfaction than women who viewed the same images with place comments (e.g., "Great beach"). Although, disclaimer captions and body positive captions do not affect indicators of body image and disordered eating, enhanced free hashtags and comments focusing on appearance may have more detrimental effects that warrant further investigation.

Characteristics of Instagram Profile. The number of accounts that are followed, and number of followers are also linked to body image and disordered eating. In particular, the number of accounts one follows is positively associated with physical appearance anxiety, body image disturbance, and concerns about how society views an ideal body, but unrelated to body surveillance and appearance pressure from the media (Barry et al., 2019; Sai et al., 2018; Sherlock & Wagstaff, 2019). However, number of followers did not show an association with physical

appearance anxiety, body image disturbance, body surveillance and experience appearance pressure from the media and concerns about how society views an ideal body (Barry et al., 2019; Sai et al., 2018; Sherlock & Wagstaff, 2019).

Intermediate Conclusion. Taken together, evidence for the relationship between Instagram membership and indicators of body image and disordered eating is mixed and warrants further investigation. Interestingly, important differences occurred with regards to how specific indicators for body (dis)satisfaction and disordered eating were related to intensity or type of Instagram use. This suggests that the relationship between these concepts may depend on which body specific construct is taken into account. Similarly, these associations seemed to be contingent on type of indicator used for Instagram use. Regarding specific types of Instagram use, studies showed that individuals who (1) engage in selfie taking or editing behavior, or (2) consume and post fitspiration content report more negative body related outcomes. Especially the latter has also been supported in experimental studies, which illustrated that exposure to upward comparison material on Instagram has a negative impact on multiple indicators of body image and disordered eating. In contrast, manipulations in which individuals were exposed to body positive or humoristic content increased body satisfaction. However, manipulating hashtags, captions and comments showed little effects.

3.3. Key psychological factors underlying the relation between Instagram Use and mental health

The first part of this review aimed to elucidate the direct relationship between SNS use and indicators of mental health. The results stemming from these analyses are indicative of important inconsistencies in the literature, which may at least partially be explained by the presence of other factors moderating or mediating the relation between Instagram use and mental health. As such, the second goal of this review was to map the role of key psychological factors and processes - identified via previous narrative reviews and research papers on the relation between SNS use and mental well-being – that may moderate or mediate the observed findings pertaining to the relation between Instagram use and mental health. More specifically, we will examine the role of social comparison, self-esteem, body (dis)satisfaction, self-presentation, and belongingness factors.

3.3.1. Social comparison

Social comparison emerged as one of the most widely studied constructs that may link SNS use with indicators of mental health. For instance, multiple studies suggest a central role for social comparison in linking patterns of Facebook use with mood, depressive-, anxiety-, and stress symptoms (Appel et al., 2016; Faelens et al., 2019; Faelens et al., 2020; Verduyn et al., 2017). Social comparison is a cognitive process in which people compare themselves with presented information of others for self-evaluation (Festinger, 1954). Hence, exposure to stories and pictures of other people's presumed flawless lives on SNS may lead to the impression that the life of other people is more exciting and satisfying. This impression in turn may induce feelings of inferiority and doubts about one's own life. Therefore, social comparison may have a detrimental influence on people's self-evaluations and self-esteem, which in turn may lead to the development of depressive- or anxiety symptoms (Appel et al., 2016; Chou & Edge, 2012; Orth et al., 2009).

In the context of Instagram use, thirty-six studies (39% of all studies) focused on the relationship between Instagram use and social comparison. In what follows, the results of these studies will be summarized.

Instagram Membership. Out of the thirty-six identified studies exploring the relation between Instagram use and social comparison, only one study used Instagram membership as an indicator for Instagram use. In particular, Mackson et al. (2019) found that Instagram members did not compare themselves more often with others than non-users.

Intensity of Instagram Use. Fourteen studies focused on the direct

relation between intensity of Instagram use and social comparison, of which 57% (8 articles) found evidence for a small to moderate association between intensity of Instagram use and social or appearance comparison (Couture Bue, 2020; Chae, 2018; Couture; Fardouly et al., 2020; Feltman & Szymanski, 2017; Modica, 2020; Sherlock & Wagstaff, 2019; Stapleton et al., 2017; Teo & Collinson, 2019). For instance, Stapleton et al. (2017) found that Instagram intensity was positively associated with social comparison on Instagram. Furthermore, other studies illustrated that the frequency of checking Instagram showed a positive link with social comparison (e.g., Chae, 2018).

Next to some mixed findings in 14% of the studies (2 aticles), 29% (4 articles) reported no relationship at all (Arroyo & Brunner, 2016; Fatt et al., 2019; Lup et al., 2015; Mackson et al., 2019). For example, Lup et al. (2015) did not report a significant relationship between Instagram use and social comparison on Instagram. Also, Fatt et al. (2019) did not observe an association between time spent on Instagram and participants' appearance comparison tendency.

Six studies investigated the (partial) mediating role of social comparison, linking intensity of Instagram use with other indicators of mental health. Of these, 3 studies found evidence for the mediating role of social comparison in the relationship between Instagram intensity and indicators of body image and disordered eating (Modica, 2020; Sherlock & Wagstaff, 2019; Teo & Collinson, 2019). For instance, Modica (2020) found that the relationship between Instagram use and body dissatisfaction was mediated by appearance comparison on Instagram.

Furthermore, social comparison also functioned as a (partial) mediator in the relationship between intensity of Instagram use and trait anxiety, physical appearance anxiety, and depressive symptoms (Sherlock & Wagstaff, 2019). The results regarding the relationship between Instagram use and self-esteem were mixed, with one study supporting the role of social comparison as (partial) mediator, and one study finding no support for this claim (Sherlock & Wagstaff, 2019; Stapleton et al., 2017).

Next to the possible mediating role of social comparison, one study looked into the role of social comparison as a moderator. This study found that taking a break of seven days from Instagram only increased positive affect for women high on social comparison (Fioravanti et al., 2020). Yet, the effect of taking an Instagram break on life satisfaction was not moderated by social comparison.

Type of use and Instagram Content. It has been suggested that the association between Instagram use and social comparison is influenced by type of Instagram use and the specific Instagram content one is exposed to. Multiple cross-sectional and prospective studies have tested this hypothesis. Indeed, Instagram interaction with others, Instagram browsing, Instagram selfie investment, Instagram selfie manipulation, Instagram photo activity, and Instagram selfie editing show a small to moderate positive link with social and/or appearance comparison across studies (Burnell et al., 2019; Chang et al., 2019; Hendrickse et al., 2017; Modica, 2020; Yang, 2016; Yang & Robinson, 2018), whereas the majority of studies suggests that Instagram broadcasting/posting seems to be unrelated to comparison tendencies (Chang et al., 2019; Yang, 2016; Yang & Robinson, 2018). Indeed, only one study found a positive association between (selfie) posting and appearance comparison on Instagram (Modica, 2020).

Furthermore, studies focusing on the relationship between viewing fitspiration and appearance/social comparison are inconclusive, with one study suggesting a positive association between both constructs (Fatt et al., 2019), a second study reporting mixed findings (Fardouly et al., 2018) and another study finding no association at all (Arroyo & Brunner, 2016).

In addition to the abovementioned cross-sectional and prospective studies, we identified ten experimental studies investigating the causal relationship between Instagram use and comparison tendencies. More specifically, nine studies examined whether there were differences in appearance comparison after exposure to upward comparison material or control images. Interestingly, 56% (5 articles) of the experimental

studies suggest that there may be an effect of image type, where thin ideal images and images of attractive people led to more appearance comparison than control images (Brown & Tiggemann, 2016; Brown & Tiggemann, 2020; Tiggemann et al., 2020; Tiggemann et al., 2018; Tiggemann & Zaccardo, 2015). However, 44% (4 articles) did not find a significant difference between conditions in self-reported comparison (Slater et al., 2019; Tiggemann & Anderberg, 2019; Fardouly & Rapee, 2019; Tiggemann & Zinoviev, 2019).

Six studies, three cross-sectional studies and three experimental studies, investigated the role of social or appearance comparison as mediating variable in the relationship between (certain types of) Instagram use and indicators of body image and disordered eating. Five of these studies, two cross-sectional and three experimental, provided clear support for the mediating role of social comparison across constructs (Brown & Tiggeman, 2016, 2020; Fardouly et al., 2018; Hendrickse et al., 2017; Tiggemann & Zaccardo, 2015).

Next, in two cross-sectional studies the role of social comparison has been investigated as part of a serial mediation. For example, Fatt et al. (2019) illustrated that the frequency of viewing fitspiration images is indirectly associated to body satisfaction and health-based exercise motivation via muscular ideal internalization and appearance comparison. Burnell et al. (2019) found that social comparison and fear of missing out sequentially mediated the relationship between passive Instagram use and both depressive symptoms and global self-worth.

Eight studies looked into the role of social comparison as moderator. Two were correlational by nature, six used an experimental design. One cross-sectional study showed that social comparison moderated the relationship between Instagram interaction and loneliness. More specifically, users who compared themselves less, felt less lonely (Yang, 2016). The second cross-sectional study indicated that the relationship between viewing friends' fitness posts on Instagram and a negative perception about one's own body is stronger for participants with higher levels of social comparison (Arroyo & Brunner, 2016). Moreover, one study looked into the relationship between image type and social comparison on positive affect. For example, De Vries et al. (2017) found that individuals with a high social comparison tendency report less positive affect after viewing positive posts as compared to neutral or no posts. In contrast, Individuals with a low tendency to compare reported higher positive affect after viewing positive posts than after viewing neutral or no posts.

Characteristics of Instagram Profile. One study reported a small association between number of followees and social comparison, whereas no relationship between number of followers and social comparison was found (Sherlock & Wagstaff, 2019).

Intermediate Conclusion. In sum, initial evidence suggests that Instagram membership per se is not linked to social comparison. Nevertheless, most studies found a negative link between (intensity of) Instagram use and social comparison, suggesting that excessive Instagram use may be linked to more social comparison behavior. Moreover, this link may depend on type of Instagram use, since only certain types of Instagram use are linked to self-reported comparison. In this context, it is interesting to note that social comparison often functions as a mediator in the relationship between Instagram and well-being. Especially its mediating role in the association between Instagram use and indicators of body image and disordered eating has been proven throughout the majority of studies. Other relationships need further investigation due to the limited number of studies. The abovementioned findings illustrated that social comparison may act as moderator in the relationship between Instagram use and loneliness, body image indicators and positive affect. However, due to the fact that some findings are mixed, and studies are limited, further research is warranted.

3.3.2. Self-esteem

Self-esteem refers to an individual's overall evaluation of the self (Rosenberg et al., 1995). This includes the individual's global positive or negative attitude towards their identity. Self-esteem is a complex

construct that includes both a basic stable trait but also more dynamic aspects that fluctuate depending on daily stressors and information of other people that we are exposed to (Franck & De Raedt, 2007). The degree to which one's self-esteem fluctuates depended on whether certain social standards have been achieved is reflected in the construct contingent self-esteem (e.g., Crocker & Wolfe, 2001; Deci & Ryan, 1995). Social comparison, as is often done on Instagram, may for example affect our self-evaluation and self-esteem (e.g., Clasen, 2015; Vogel et al., 2014). The inclusion of self-esteem as mediator between Instagram use and wellbeing is important as low self-esteem increases the risk for psychopathology (e.g., Sowislo & Orth, 2013) and high self-esteem improves life satisfaction (e.g., Diener & Diener, 1995).

Our systematic search led to the inclusion of 17 articles (18% of all identified articles) which examined the relationship between Instagram use and self-esteem.

Instagram Membership. Studies reporting on the relationship between Instagram membership and self-esteem are inconclusive, with one study suggesting that Instagram users report higher self-esteem than non-users (Mackson et al., 2019), and another study observing no relationship (Brailovskaia & Margraf, 2018). Interestingly, Mackson et al. (2019) also conducted analyses in which they examined the role of self-esteem as a mediating variable between Instagram membership and other indicators of well-being. Importantly, findings stemming from this study suggest that self-esteem mediates the relationship between Instagram membership and severity of depressive and anxiety symptoms (Mackson et al., 2019).

Intensity of Instagram Use. Seven studies looked into the relationship between intensity of Instagram use and self-esteem, of which three studies failed to observe an association between intensity of Instagram use and (contingent) self-esteem (Li et al., 2018; Mackson et al., 2019; Stapleton et al., 2017). In contrast, four studies provided evidence for a small to moderate negative association between both constructs (Kircaburun & Griffiths, 2018; Martinez-Pecino & Garcia-Gavilán, 2019; Schmuck et al., 2019; Sherlock & Wagstaff, 2019), with one prospective study indicating negative effects of Instagram use on self-esteem over time (Schmuck et al., 2019). Interestingly, two cross-sectional studies focused on the relationship between excessive Instagram use and self-esteem and found that problematic Instagram use is negatively correlated with self-liking (Kircaburun & Griffiths, 2018) and that higher self-esteem predicts less excessive Instagram use (Martinez-Pecino & Garcia-Gavilán, 2019). These findings suggest a bidirectional relation between intensity of Instagram use and feelings of self-worth. In addition, self-worth depending on approval from others also appeared as a significant moderator in the relationship between intensity of Instagram use and social comparison. Indeed, participants reporting that their self-esteem is highly contingent on approval from others show a stronger association between intensity of Instagram use and social comparison (Stapleton et al., 2018).

Type of Use and Instagram Content. Aside from the intensity of Instagram use, we also identified several recent studies exploring the relation between self-esteem and type of Instagram use or specific content to which one is exposed on Instagram. For instance, three studies focused on the relationship between posting selfies or posies (photo of the individual taken by others) on Instagram and self-esteem, with the majority of studies finding no association between both. Only one study observed an immediate association between the act of posting selfies and self-esteem. That is, Li et al. (2018) found a small positive association between the number of selfies that were posted on Instagram per week and ratings of self-esteem (Li et al., 2018).

In addition to the abovementioned cross-sectional and prospective studies, our systematic search also identified five (quasi) experimental studies focusing on the direct impact of appearance related Instagram interventions on self-esteem. Three out of five studies found a significant effect of appearance related Instagram interventions on self-esteem. For instance, the quasi-experimental study of Casale et al. (2019) found that women (but not men) who view appearance focused Instagram profiles show an increase in the extent to which they define their self-worth based on their physical appearance. Moreover, Tiggemann and Zaccardo (2015) observed that women who view fitspiration images report decreases in state appearance self-esteem as opposed to those who view travel images. However, two studies found no significant effect of experimental manipulation of exposure to Instagram content (Coulthard & Ogden, 2018; Sherlock & Wagstaff, 2019). In particular, Sherlock and Wagstaff (2019) exposed participants to beauty images, fitspiration images, travel images or no images but did not find a time by condition interaction on self-esteem. In sum, the majority of studies suggest that exposure to upward comparison material can negatively affect self-esteem. Nevertheless, findings were not unanimous which suggests that further research is needed.

Next to studies examining the direct relationship between Instagram use and self-esteem, multiple studies focused on the potential moderating role of self-esteem in the relationship between Instagram use and other indicators of well-being. Interestingly, self-esteem seems to moderate the relationship between the amount of likes one receives and Instagram addiction, with the impact of likes on Instagram addiction being lower for those reporting higher levels of self-esteem (Martinez-Pecino & Garcia-Gavilán, 2019). This suggests that self-esteem may be a buffer against the addictive effects of Instagram use.

When looking at the number of followers and followees, we notice that the latter is negatively related with self-esteem (Barry et al., 2019; Sherlock & Wagstaff, 2019), suggesting that people who follow more accounts feel more insecure. The relationship between Instagram followers and self-esteem is less consistent, with one study finding a negative relationship (Sherlock & Wagstaff, 2019), but a second study finding no relationship at all (Barry et al., 2019). A possible explanation for these mixed results is that other constructs may be involved in this relationship. For example, Lowe-Calverley et al. (2019) found the number of followers positively predicts the preoccupation of users with the process of posting and receiving feedback, which in turn negatively predicts self-esteem. Therefore, these findings illustrate that both number of followers and followees may be linked to lower self-esteem under certain conditions.

Intermediate Conclusion. In sum, although evidence for the association between self-esteem and Instagram membership is limited, recent findings suggest a role for self-esteem in linking Instagram membership with levels of anxiety and depressive symptoms. Furthermore, the majority of the studies found evidence for a negative association between (excessive) Instagram use and self-esteem, suggesting that intensive users report lower levels of self-esteem. Furthermore, the relationship between (1) number of followers, number of followees, and selfie posting and (2) self-esteem has been less examined, but findings suggest that there may be a link under certain conditions (e.g., when having more than 500 followers). Finally, preliminary studies focusing on the role of self-esteem as a moderator suggest that this may be an important process to take into account when examining the relation between indicators of Instagram use and mental health.

3.3.3. Body image and disordered eating as an intermediary variable

Body Image refers to the mental representations of the physical self, including thoughts, beliefs, feelings and behaviors that people have about their body (Cash, 2004). As Instagram is the SNS that is most focused on physical appearance, this might increase the tendency of people to compare one's appearance to the appearance of others. Therefore, Instagram use may lead to body dissatisfaction when people fail to meet the societal standards of physical beauty or feel less attractive than their friends (Thompson et al., 1999; Van den Berg et al., 2002). In turn, body dissatisfaction may lead to disordered eating behavior and health problems as people desperately try to pursue the societal standards of physical beauty that includes thinness (Stice, 2002). Therefore, it is also important to investigate body image as mediator between Instagram use and wellbeing.

In addition to a vast number of studies exploring the direct

association(s) between Instagram use and indicators of body (dis)satisfaction and disordered eating, twelve studies (13% of all identified studies) modeled how indicators of body image and disordered eating are involved in the relationship between Instagram use and well-being.

Intensity of Instagram Use. Three of these studies focused on Instagram intensity and body image and disordered eating. In particular, two cross-sectional studies found evidence for the mediating role of internalization of the beauty ideal in the relationship between time spent on Instagram and self-objectification (Fardouly et al., 2018; Feltman & Szymanski, 2017).

3.3.3.1. Type of use and Instagram Content. Two cross-sectional studies found that internalization (of the beauty ideal/muscular ideal) mediated the relationship between viewing fitspiration images and indicators of body image and disordered eating (Fardouly et al., 2018; Fatt et al., 2019). One cross-sectional study focused on the role of body surveillance, yielding mixed findings, with two out of three mediation analyses supporting the mediating role of body surveillance (Butkowski et al., 2019).

Next, five experimental studies looked into the role of internalization (of the beauty ideal) as moderator of the effect of manipulated Instagram content on indicators of body image and disordered eating. Of these studies, one study (20%) found a marginal significant effect, with greater internalization tendencies to be associated with lower body dissatisfaction and mood (Anixiadis et al., 2019). Twenty percent (one study) found mixed evidence (Slater et al., 2017) and 60% (3 studies) failed to find evidence (Fardouly & Holland, 2018; Slater et al., 2019; Tamplin et al., 2018).

Furthermore, in one experimental study it was demonstrated that both severity of anorexia or bulimia symptoms moderated the effect of being exposed to skinny or popular foodies on social media and envy or benign envy (Jin, 2018).

Intermediate Conclusion. Several studies suggest that body image indicators such as thin ideal internalization and body surveillance may function as a mediator in the relationship between Instagram use and well-being. The role of body image and disordered eating as a moderator remains to be further investigated.

3.3.4. Self-presentation

Self-presentation refers to the strategic presentation of components of your identity so that other people find you more attractive, likeable, or competent (Kim & Dindia, 2016, pp. 156–180). Through Instagram individuals gain much freedom to manipulate the impression that they create on others. As deceptive self-presentation is also linked to depressive symptomatology it is important to investigate self-presentation as mediator in the relationship between Instagram use and wellbeing (Lamp et al., 2019). However, as to date only four cross-sectional studies have examined the association between self-presentation on Instagram and well-being (4% of all identified studies).

Intensity of Instagram Use. Two studies focused specifically on the relationship between intensity of Instagram use and (motivation for) self-presentation. For example, Lee & Borah (2020) found a small positive association between time spent on Instagram and frequency of Instagram use and self-presentation. In line with this, Al-Kandari et al. (2017) also reported a small positive association between frequency of Instagram use and Instagram use for self-presentation purposes.

3.3.4.1. Type of Use and Instagram Content. Self-presentation on Instagram has also been linked to certain well-being outcomes. An example of a link between Instagram and a positive outcome is the positive correlation between strategic self-presentation and Instagram friendship development (Lee & Borah, 2020). However, people who use more deceptive strategies of self-presentation report more body surveillance and depressive symptomatology. In particular, Lamp et al. (2019)

showed that deception on Instagram mediates the relationship between body surveillance and depressive symptomatology, with body surveillance being positively associated with deception on Instagram and deception on Instagram being positively associated with depressive symptomatology. Finally, whereas real self-presentation is linked to less self-criticism and less negative affect, deception on Instagram is linked with more self-criticism and negative affect. Moreover, deception on Instagram mediates the relationship between self-criticism and negative affective responses (Jackson & Luchner, 2018).

Intermediate Conclusion. These cross-sectional studies suggest that individuals who have the tendency to strategically present themselves on Instagram, may use Instagram more intensively, like and comment more on pictures. The relationship between Instagram posting and self-presentation was less clear and therefore requires further investigation. Indeed, deceptive posting behavior seems to be linked to both positive (e.g., friendship development) and negative outcomes (e. g., psychopathology). Future cross-sectional, longitudinal, and experimental research will be needed to explore the (dis-)advantages linked to these self-enhancement strategies and the specific working mechanisms.

3.3.5. Belongingness factors

SNS use can facilitate (offline) social interactions and therefore lead to improved wellbeing through the experienced social support and connectedness with other people (Burke et al., 2010; Ellison et al., 2007; Verduyn et al., 2017). Therefore, it is important to investigate the specific role of different belongingness factors in the relationship between Instagram use and wellbeing.

We identified 19 articles via our systematic search (20% of all identified articles). In this part we will discuss the relationship between Instagram use and loneliness, fear of missing out, social capital and social support, college adjustment, and other factors related to belongingness such as self-competence in forming and maintaining close friendships, development of Instagram friendships, family conflict and support, and social adjustment.

Loneliness. With regards to loneliness four studies were identified. First, Mackson et al. (2019) found that Instagram users were less lonely than non-users. Next, they also examined the role of loneliness as mediator in the relationship between (1) Instagram membership and (2) depressive and anxiety symptoms. The authors found that Instagram membership predicts lower self-reported loneliness. In turn, individuals who feel less lonely reported lower anxiety and depression scores (Mackson et al., 2019).

Second, when we looked at the relationship between (intensity) of Instagram use and loneliness, we found mixed results. More specifically, although two studies observed a small positive link between excessive or problematic Instagram use and loneliness (Ponnusamy et al., 2020; Yurdagül et al., 2019), one study found no link between intensity of Instagram use and loneliness (Mackson et al., 2019). Third, next to intensity of use, Yang (2016) suggested that it may also be important to distinguish between types of Instagram use. In particular, Instagram interaction and Instagram browsing negatively predicted loneliness, whereas broadcasting/posting content positively predicted loneliness (Yang, 2016).

Taken together, these initial studies suggest that Instagram membership may also have beneficial effects when Instagram is not used excessively. Furthermore, loneliness may be an intermediate process in the relationship between Instagram use and well-being. However, due to the fact that all studies are correlational in nature, further prospective or experimental research is warranted.

Fear of Missing Out. Three studies focused on the relationship between Instagram use and fear of missing out. In particular, Balta et al. (2018) found a strong positive association between intensity of Instagram use and fear of missing out. Furthermore, Barry et al. (2019) observed a small correlation between both number of Instagram followers and followees and fear of missing out. Finally, Burnell et al. (2019) illustrated the role of fear of missing out in a mediation path

model. More specifically, they found that browsing on Instagram predicted social comparison, which predicted fear of missing out. In turn, fear of missing out predicted depressive symptomatology.

Social Support **and Social Capital.** Regarding the relationship between Instagram use and *social* support or social capital, five articles were identified. First, Brailovskaia and Margraf (2018) observed that having an Instagram account is related to higher levels of perceived social support. In addition, findings suggest that (intensity of) Instagram use is positively related to bridging social capital, overall online support, online information support, online emotion support, and perceived support from friends. However, a negative association has been observed between (intensity of) Instagram use and family support, whereas Instagram use revealed to be unrelated to perceived online tangible support and online support satisfaction (Paige et al., 2017; Pornsakulvanich, 2017; Vannucci & McCauley Ohannessian, 2019). Third, Wong and colleagues (2020) examined the relation between different types of Instagram use and social capital/social support outcomes. Interestingly, they found that viewing and liking Instagram posts is positively associated with perceived support from the partner and friends, as well as total perceived support. However, no association was found with perceived social support from family. Furthermore, posting images showed no associations with indicators of perceived social support (Wong et al., 2019).

In sum, the majority of studies found evidence for a positive relationship between Instagram use and social support and/or social capital, however, research suggest that this relationship may differ depending on how one uses Instagram.

Social adjustment. Three articles focused on elucidating the relationship between Instagram use and social adjustment. Findings from these studies indicate that having interactions with on campus friends via Instagram can have beneficial effects. For instance, the amount of directed Instagram interactions (e.g., commenting or replying on others posts) with on campus friends has been positively related with college social adjustment across studies (Yang, 2020; Yang & Lee, 2018; Yang & Robinson, 2018). Finally, whereas one study found that Instagram interactions with strangers negatively predicted social adjustment (Yang, 2020; Yang & Lee, 2018), another study reported no association between both constructs (Yang & Robinson, 2018).

Other factors. Next to loneliness, fear of missing out and college social adjustment, studies also found a positive link between (intensity of) Instagram use and other factors such as *perceived social presence of others while using Instagram* (Kırcaburun & Griffiths, 2019), *self-competence in forming and maintaining close friendships* (Vannucci & McCauley Ohannessian, 2019), *development of Instagram friendships*, but also a positive association with *family conflict* and a negative association with *family* support (Lee & Borah, 2020). Furthermore, not only Instagram intensity but also selfie-posting on Instagram revealed to be associated with Instagram related conflict and negative relationship outcomes (Ridgway & Clayton, 2016). This suggests that Instagram may aid in developing and maintaining friendships. At the same time, however, Instagram use can lead to frustrations of loved ones when it is extensively used (Lee & Borah, 2020; Vannucci et al., 2018).

Furthermore, time spent on Instagram (but not selfie-posting) is also positively associated with *perceived importance of Instagram feedback* (via comments/likes/followers; Li et al., 2018). However, being motivated by social or recognition needs can have aversive effects. For example, Ponnusamy et al. (2020) illustrated that recognition and social needs seem to predict Instagram addiction.

Intermediate Conclusion. To conclude, preliminary evidence suggests that (excessive) Instagram use may be related to higher self-reported loneliness, fear of missing out, and lack of social support. Moreover, although Instagram interactions with college friends and family seem to be positively related to college adjustment, interactions with off-campus friends or strangers seem to be less beneficial. In turn, type of use is unrelated to college adjustment. All these preliminary findings warrant further cross-sectional, prospective and longitudinal investigation, since the number of studies is limited.

4. Discussion

The growing popularity of Instagram has raised strong interest in how this SNS relates to well-being. Nevertheless, as to date an extensive overview of the current literature is, to the best of our knowledge, still missing. Therefore, the aim of this review was twofold. First, we wanted to summarize the available literature focusing on the relationship between Instagram use and indicators of mental health (i.e., well-being, depression, anxiety, stress, alcohol- and drug use, and body image and disordered eating). Second, due to the fact that previous studies have yielded inconsistent findings regarding the presence and direction of the relationship between Instagram use and indicators of well-being, we also reviewed evidence for mediating or moderating factors which may potentially explain the observed level of heterogeneity in evidence for the relation between SNS use and well-being. In particular, we focused on key psychological variables such as social comparison, self-esteem, body image and disordered eating, self-presentation, and belongingness factors.

The results of the 93 articles that were included in our systematic review suggest strong heterogeneity across studies. Interestingly, relative to the other psychological factors or mental health domains, most evidence was obtained for the relationships between Instagram, social comparison, and body image and disordered eating outcomes, suggesting that (intensity of) Instagram use is linked with more social comparison, negative body image and disordered eating. Importantly, these research domains also received more attention, as reflected by a higher absolute number of included studies, and a relatively better quality of the research designs used. Evidence for the relation between Instagram use and other constructs was more mixed or, for some domains, scarce. In this context, for multiple mental health domains the strength of evidence for the association between Instagram use and mental well-being seemed to be contingent on the type of indicator of Instagram use. As such, we will proceed with a discussion of evidence for the association between Instagram use and mental well-being based on type of indicator for SNS use under investigation.

4.1. Instagram Membership

A first indicator of Instagram use is Instagram membership. When we look at the relationship between Instagram membership and our constructs of interest, most studies suggest that Instagram membership is not harmful. In particular, Instagram membership does not seem to be linked to higher social comparison, depressive-, anxiety-, stress-or loneliness levels, nor to lower self-esteem, well-being or social support scores. The evidence for the relationship between Instagram membership and indicators of body image and disordered eating is more mixed, with some studies suggesting that Instagram membership may be linked to more negative body image and disordered eating outcomes. Overall it seems that having an Instagram account does not necessarily pose a risk for mental well-being. Inconsistent findings may be attributed to the fact that Instagram membership does not allow to differentiate between high vs. low intensity of Instagram use or type of content that one has been exposed to.

Interestingly, when we look at the Facebook literature, we notice that several studies do report negative effects of Facebook membership, especially in the domain of body image and disordered eating, which is partially consistent with the current findings. More specifically, studies illustrated that Facebook membership is linked with detrimental outcomes such as higher internalization, drive for thinness, body surveillance, self-objectification, eating pathology and lower body satisfaction (Fardouly et al., 2020; Stronge et al., 2015; Tiggemann & Slater, 2013). In addition, research suggests that Facebook users report more depressive symptomatology, social stress, and insomnia (Brailovskaia et al., 2019). However, independent of type of SNS used (Facebook or

Instagram), the number of studies investigating the relation between SNS membership and well-being is limited, which suggests that further research is required in order to make scientifically substantiated claims. Ideally, such studies would also control for other features of SNS use, which we will further discuss below.

4.2. Intensity of Instagram Use

Most of the studies investigating the relation between Instagram use and mental well-being relied on an indicator of intensity of Instagram use. However, the association between intensity of Instagram use and indicators of mental health varies heavily depending on the mental health domain under investigation. The majority of the studies included observed a small to moderate negative association between intensity of Instagram use and self-esteem, and small to moderate positive associations between Intensity of Instagram use and social/appearance comparison, depressive symptoms, a negative body image and disordered eating. Next, the reported results are consistent with findings of previous reviews and meta-analyses that focused on the relation between intensity of other widely used SNS platforms (e.g., Facebook), in which a negative relationship has been observed between SNS use and self-esteem (Saiphoo et al., 2020) and a positive association between SNS use, depressive symptomatology (Yoon et al., 2019) a negative body image and disordered eating (Holland & Tiggemann, 2016; Saiphoo & Vahedi, 2019).

This suggests that these constructs may be promising variables in an Instagram context. Hence, future studies with a longitudinal and experimental design are required in order to gain more insight into the directionality and causality of these associations.

However, the positive relationship between intensity of Instagram use and anxiety symptomatology is less supported. Indeed, previous reviews focusing on Facebook and other SNS illustrated similar findings (e.g., Frost & Rickwood, 2017; Seabrook et al., 2016). In particular, Seabrook et al. (2016) highlighted that the majority of studies did not find a significant effect between intensity of SNS use and anxiety. In line with this, Frost and Rickwood (2017) also indicated that the relationship between Facebook use and anxiety is rather complex with some studies reporting positive, negative or null findings. Therefore, it may be important to take the type and context of Instagram use into account when looking at the relationship between Instagram use and anxiety. For example, a cross-sectional study illustrated that for high social anxiety individuals, Facebook social support predicts additional variance in subjective well-being above offline social support. This suggests that Facebook use may be beneficial for social anxious people when using it to gain social capital benefits. In contrast, for low socially anxious individuals, Facebook social support did not explain additional variance in well-being above offline social support (Indian & Grieve, 2014). Nevertheless, in an experimental study, more negative effects of Facebook use were observed in high socially anxious individuals. Moreover, they were more likely to interpret ambiguous Facebook scenarios as negative and reported more safety-seeking behaviors and negative thoughts (Carruthers et al., 2019). Thus, under certain conditions, these anxious individuals may experience more detrimental outcomes. Consequently, future research should examine if the context and motivation of Instagram use may play a role in the mixed findings on the relationship between intensity of Instagram use and anxiety.

Less research focused on the associations between intensity of Instagram use and well-being, stress, alcohol- and drug use, self-presentation, and belongingness factors. The majority of the initial studies found a positive link between Instagram use and alcohol use, self-presentation, fear of missing out, and bridging social capital, and most indicators of social support. These results are in line with previous articles, reviews and meta-analyses illustrating a positive relationship between SNS use and alcohol and drug use (for a review see: Frost & Rickwood, 2017), self-presentation (although these findings are very mixed: de Vaate et al., 2020) fear of missing out (Beyens et al., 2016)

bridging social capital, and social support (for a review see: Verduyn et al., 2017; Williams et al., 2019). Therefore, future studies are required to further replicate and extend these promising findings in an Instagram context.

Nevertheless, the relationship between Instagram intensity and life satisfaction is mixed and no relationship has been found between Instagram intensity and happiness. This is in line with the meta-analysis of Huang (2017) suggesting that the association between time spent on SNS and positive indicators may be close to zero. Nevertheless, these studies only looked at the relationship between intensity of Instagram use and well-being, which does not preclude that there may be an effect of certain types of Instagram use on well-being, or that Instagram use may be linked to well-being in certain circumstances or under certain conditions.

4.3. Type of Use and Instagram Content

Several studies examined the relationship between type of Instagram use and Instagram content with indicators of well-being. The most supported finding throughout this review is that participants who view or are being exposed to upward comparison material on Instagram tend to report more social- and appearance comparison, as well as detrimental effects on self-esteem and indicators of body image and disordered eating. These findings are in line with the general SNS literature (e.g., Alfasi, 2019:; Fardouly & Vartanian, 2015; Holland & Tiggemann, 2016; Vogel et al., 2014). Nevertheless, a recent experimental study suggests that these effects are stronger for Instagram users than for Facebook users, illustrating that the focus of Instagram on images and videos provokes more social comparison behavior and consequently leads to more detrimental effects on body image and disordered eating (Engeln et al., 2020). At the same time, however, other Instagram content may also have beneficial effects. For instance, exposure to body positive content or humorous (parody/Instagram versus reality) images have shown to increase body satisfaction.

Moreover, our review suggests that exposure to upward comparison content does not impact anxiety. This is not surprising, since the experimental manipulations were especially designed to target indicators of body image and disordered eating, where anxiety was one of the secondary outcome measures. To make firm statements about the influence of Instagram use on anxiety, future experimental manipulations targeting participants self-reported anxiety are required. This is also the case in the general SNS literature, where experimental studies targeting anxiety (and other not body related outcomes) are scarce (e.g. Frost & Rickwood, 2017).

Next, some initial studies also looked into the specific role of *Instagram browsing, Instagram posting, Instagram interaction and Instagram liking*. In particular, *Instagram browsing* has been related with both beneficial (higher social support and less loneliness) and detrimental outcomes (higher social/appearance comparison, depressive symptoms, disordered eating and lower body esteem). *Instagram posting* has been linked with increased loneliness, whereas *Instagram interaction* has been linked with decreased loneliness even though Instagram interaction is also linked to heightened social comparison. In addition, *Instagram liking* reveals to be positively related to self-report social support and unrelated to depressive symptomatology.

Finally, some studies also looked into the relationship between *selfie-behavior* on Instagram and well-being. More specifically, taking more selfies before posting reveals to be linked with depressive symptomatology, distorted body image and disordered eating. In line with this, editing selfies also seems to be linked with detrimental effects such as social/appearance comparison and body image and disordered eating. In addition, the included studies found a positive association between selfie-posting and contingent self-esteem, Instagram related conflict, and negative relationship outcomes. Nevertheless, the relationship between selfie-posting and fear of missing out, self-esteem, body image and disordered eating is still inconclusive. Consequently, while initial

studies observed that selfie-taking and selfie-editing is linked with detrimental outcomes, findings on the relationship between selfie-posting and well-being are mixed and therefore require further examination.

Hence, these inconsistent findings indicate that it is important to take other factors into account such as motivation of Instagram use as different motivations may lead to different well-being outcomes. For instance, people who are motivated to stay connected with others may report other effects on well-being than people who use Instagram for self-presentation purposes. Indeed, previous SNS studies already illustrated that motivation of SNS use is predictive of well-being, rather than type of activity or its frequency (Manuoğlu & Uysal, 2019). Further research is needed to examine these post-hoc hypotheses.

4.4. Characteristics of Instagram Profile

In addition to intensity of Instagram use, type of use and the Instagram content one is exposed to, specific characteristics of one's Instagram profile, such as the number of followers one has and the number of accounts one follows are also linked to indicators of well-being.

In particular, users' *number of followers* has been positively linked with self-reported happiness. For instance, it is likely that the number of Instagram followers is linked to one's perceived social capital/social support or popularity, which may positively influence one's level of happiness. At the same time, having more followers has also been linked with detrimental outcomes such as depression, anxiety, and fear of missing out. In particular, having more followers also means that more people are evaluating you and your content, which may induce stress, anxiety or depressive symptoms. The relationship with the number of followers and self-esteem is more mixed, with one study reporting a negative relationship and one study reporting no association between these constructs. Furthermore, no relationship has been found between users' number of followers and appearance anxiety, social comparison or indicators of body image.

Next, participants *number of followees,* or accounts one follows, has been positively associated with social comparison, depression, (appearance) anxiety, body image disturbance, concerns about societies beauty ideals and fear of missing out. Moreover, a negative association has been found between number of followees and self-esteem. This may be due to the fact that participants who follow more accounts are exposed to more upward comparison or appearance comparison content, which may negatively affect one's mental health.

In sum these results suggest that, whereas the number of followers is linked to both beneficial as detrimental outcomes, the number of followees is consistently linked with negative outcomes. Further research is recommended to replicate and extend these interesting initial findings.

In sum, it is important to note that the number of studies focusing on the relationship between Instagram use (and other SNS indicators such as Facebook and Twitter) are limited, suggesting that further research is warranted to further support and extend these initial findings.

4.5. Mediating and moderating variables

In addition to studies exploring the direct link between Instagram use and mental well-being, multiple studies investigated the role of possible mediating and moderating variables. Especially *social comparison* revealed to be a well-supported mediator and moderator in the relationship between Instagram use and well-being. Evidence for the role of social comparison in linking SNS use with well-being stems mainly from research exploring the relation between Instagram use and body image or patterns of disordered eating. Importantly, this does not seem to be specific to Instagram. Indeed, similar findings have been found in the general SNS literature, with previous reviews and meta-analyses illustrating both the mediating and moderating role of social comparison in the relationship between SNS use and indicators of mental health such as depressive symptomatology, body image and disordered eating (Appel

et al., 2016; Fardouly & Vartanian, 2016; Holland & Tiggemann, 2016; McLean et al., 2019; Verduyn et al., 2017).

Furthermore, several indicators of *body image and disordered eating* (e.g., internalization of the beauty ideal, body surveillance) act as mediators in the relationship between Instagram use and well-being. However, the moderating role of these indicators is less well supported. Although initial studies found evidence for the possible mediating role of these constructs (e.g., Xiaojing, 2017), more research is required to further establish the intermediate role of indicators of body image and disordered in the relationship between Instagram use and well-being.

Initial studies also suggest that *self-esteem* may serve as a mediating or moderating variable in the association between Instagram use and well-being, but the number of studies examining its indirect role was rather limited, indicating that further research is warranted. These results are in accordance with previous SNS studies, who illustrate the role of self-esteem as an intermediate construct in the relationship between SNS and well-being (e.g., Chen et al., 2016; Faelens et al., 2019; Jang et al., 2018; Wang et al., 2017).

Finally, some studies put forward *self-presentation and loneliness* as possible mediating variables. Again, due to the limited number of studies, further research is required to confirm these initial findings. This is also the case for the general SNS literature, where studies focusing on the mediating role of loneliness and self-presentation in the relationship between SNS use and well-being are scarce (e.g., Chen et al., 2019; Satici, 2019).

In sum, these results give a first indication of which variables may play an important intermediate role in the relationship between Instagram use and well-being. Further, longitudinal and experimental research is needed confirm these initial findings.

4.6. Practical implications

The current review significantly contributed to the current literature by providing an overview of the relationship between Instagram use and mental health indicators, and key psychological factors that may be involved in this relationship. Consequently, these findings can be used to inform the general public via informational campaigns. Furthermore, these findings can also be used by counselors and psychologists who can give patients psychoeducation about possible beneficial and detrimental effects of Instagram use.

4.7. Methodological limitations of the current literature and future directions

The current systematic review was set out to provide an extensive overview of the literature focusing on the relationship between Instagram use and mental health. Nevertheless, the current literature also has some limitations, which have to be addressed by future research.

For example, most of the included Instagram studies were exploratory and used a cross-sectional design. More specifically, 60% (56 articles) of the articles was cross-sectional, 6% (6 articles) had a longitudinal design, and 33% (31 articles) of studies used an experimental design. Of these experimental studies, the majority focused on the impact of specific Instagram features (e.g., upward comparison material) on body image and disordered eating, which hampers the possibility to make strong claims about the direction of the observed associations between Instagram use and other constructs of interest. Consequently, there is a strong need for more longitudinal and experimental research, to be able to make interferences regarding possible long-term effects and the directionality of these effects. For instance, a recent prospective study illustrated that Instagram use positively predicted negative affect over time, and that both self-esteem and repetitive negative thinking are involved as intermediate constructs in this relationship (Faelens et al., 2020). Once this body of research is more substantial, a meta-analysis could be useful to determine the strength of the

reported relationships between Instagram use and our constructs of interest.

Third, there is a strong variation in sample size across the included studies. Whereas small sample sizes may provide inaccurate estimations of the population parameters due to sampling error, large sample sizes may have the risk to overemphasize the importance of statistically significant effects that are in fact close to zero and therefore negligible (Ophir et al., 2019).

Fourth, participants were generally not representative for the entire population of Instagram users. In particular, the great majority of the studies focused on young adults, aged 18–30. This is not unexpected, since young adults are the most prominent Instagram users. Nevertheless, Instagram membership is also winning popularity in adolescents and older people (Vandendriessche & De Marez, 2020). Therefore, more research is needed in both adolescents and older samples to examine if the reported effects in this review are consistent across age groups. Furthermore, in most studies, females where more strongly represented. In particular, the overrepresentation of females was strongest in the experimental studies, where the majority of studies used a female-only sample. This is not surprising since females seem to be more intensive Instagram users (e.g., Mackson et al., 2019) and seem to be more prone to negative effects of social media (e.g., Marino et al., 2018; Orben et al., 2019; Yurdagü;l et al., 2019). This may affect the generalizability of the findings, as a number of studies point to differential effects of gender (e. g., Fioravanti et al., 2020). Therefore, future studies should aim to recruit more gender-balanced samples or further explore gender-differences in an Instagram context. Next, the samples in these studies are mainly recruited from Western countries, where continents such as Asia, Africa and South America, are largely underrepresented. Consequently, future research should use randomized sampling to obtain a more diverse sample regarding age, gender and country of residence. It would also be of added value to compare collectivistic oriented cultures with individualistic oriented cultures to investigate whether there is any differentiation in the influence of SNS on wellbeing between cultures.

Fifth, several issues emerged regarding to how (intensity of) Instagram use is measured. In particular, the operationalization of intensity of Instagram use varies widely across studies, with most studies using one or two items to measure this construct. The literature would benefit from the development of a well-validated and reliable measure of Instagram use that could be used consistently across studies. Next, all studies used self-report estimates for intensity of Instagram use, which may be affected by recall bias. Indeed, previous studies illustrate that self-reported estimates of intensity of SNS use significantly differ from objective indicators of smartphone or SNS use (e.g., Boase & Ling, 2013; Junco, 2013). This bias may influence the estimations of the relationships between Instagram use and indicators of well-being. Therefore, future (longitudinal) studies should use applications and software that are able to objectively monitor participants Instagram use (e.g., Faelens et al., 2020). For instance, the past years several smartphone applications have been developed that may be useful in this context such as MobileDNA, (https://play.google.com/store/apps/details?id=be.ugent.mobiledna), App Usage (https://play.google.com/store/apps/details?id=com.a0soft.gphone.uninstaller) and RescueTime (https://play.google.com/store/apps/details?id=com.rescuetime.android) Next, for desktops, programs such as RescueTime (https://www.rescuetime.com/rp/skey) and ManicTime (www.manictime.com) can be used. Furthermore, certain smartphones, tablets, desktops and laptops, also have built-in features that can monitor screen time.

4.8. Content-related limitations of the current literature and future directions

First, the majority of studies (55% of identified studies; 51 articles) examined the relationship between Instagram use and indicators of body image and disordered eating. This is not unexpected, since Instagram is a strongly image-based platform which consequently can be more detrimental for indicators of body image and disordered eating than other SNS with more content variation (e.g., Engeln et al., 2020). Nevertheless, other indicators of well-being are less well examined and therefore warrant further research.

Second, the great majority of the studies focused on the relationship between Instagram use and ill-being. Indeed, we only identified 10 articles that include indicators of mental well-being, suggesting that the current literature strongly focuses on the negative effects of Instagram use. Therefore, more research is needed to further explore the beneficial effects of Instagram use.

Third, most cross-sectional studies focused on the relationship between intensity of Instagram use and mental health. Nevertheless, it may also be important to further explore the association between type of Instagram use and well-being, since initial studies and previous SNS reviews (e.g., Verduyn et al., 2017) suggested that differential types of use may have differential effects on well-being. In particular, future studies are required that register both indicators of Instagram use (intensity and type of use) via advanced tracking software, to map the complex patterns and interactions in an objective way. Therefore, we need designs and analytical strategies that allow us to investigate such complexity in order to resolve the mixed findings in the current Instagram literature.

Fourth, compared to other SNS such as Facebook, less studies examined the potential intermediate processes such as social comparison, self-esteem, body image, etc. These intermediate processes may however play an important role in some of the reported mixed findings. To disentangle these mixed findings it is important that future research focuses in depth on the role of these intermediate processes (e.g., Appel et al., 2016; Verduyn et al., 2017).

Fifth, Instagram kept evolving in its functionalities throughout the years. Consequently, new functionalities may be accompanied with new potential benefits and risks. Indeed, researchers are continuously challenged in measuring the actual impact of SNS use on well-being due to the rapid evolution of SNS platforms (e.g., Ellison & Boyd, 2013). Nevertheless, the most prominent feature of Instagram, namely sharing images and video's, remained consistent throughout the years.

5. Conclusion

This current systematic review presents a broad overview of the current state-of-the art on the relationship between Instagram use and mental health, and possible key psychological processes that may be involved in this relationship. Key findings have been organized into four categories: Instagram membership, intensity of Instagram use, type of use and Instagram content and characteristics of the Instagram profile. Most evidence has been obtained for the relationships between Instagram and social comparison, body image and disordered eating outcomes. Evidence for the relation between Instagram use and other psychological constructs is mixed or limited. Consequently, more longitudinal and experimental research is needed to further support and extend these initial informative findings.

Author contributions

All authors contributed to the design and search strategy of the study. Lien Faelens and Ruben Cambier conducted the study selection,

and performed the data extraction and quality assessment. Lien Faelens wrote the first draft of the manuscript. The other authors provided critical revisions.

Declaration of competing interest

There are no conflicts of interest associated with this publication.

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Appendix A. Supplementary data

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