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Instagram Use, Social Comparison, and Psychological Distress: Exploring the Protective Role of Self-Compassion

Social media have permeated our society and changed the way in how especially young people approach life (Aalbers et al., 2019; Pang & Wang, 2020). Social media can be broadly understood as a variety of web-based platforms, where users can share self-generated content and interact socially (Bendel, 2010). There are different categories of social media platforms, with the prototype being social networking sites (SNSs) such as Facebook (Meshi et al., 2015). On SNSs users can generally construct a profile, find a list of other users they share a connection with, and view their connections, as well as the connections made by others (Boyd & Ellison, 2007). The widespread distribution of SNSs can be grasped by looking at the user counts: Facebook (FB), currently being the biggest SNS, had around 2.8 billion monthly active users in the fourth quarter of 2020 (Statista, 2021b). In addition, many more SNSs and other types of social media exist. Media sharing platforms, such as YouTube, belong to another large category of social media. The lines between SNSs and media sharing platforms are frequently blurred, with a good example for that being Instagram (Meshi et al., 2015). Instagram has been categorized as a big SNS with over 1 billion monthly active users as of 2018 (Statista, 2021c) and a strong focus on media sharing (Meshi et al., 2015).

People use SNSs for two primary reasons: to connect with others, and to manage the impression they make on others (Nadkarni & Hofmann, 2012). Thus, SNSs are appealing because they build on strong preexisting social drives (Meshi et al., 2015). These social drives are satisfied by showing certain key behaviors, namely: (a) sharing information and media, (b) observing other users' broadcasts, (c) giving feedback on other users' broadcasts, (d) receiving feedback on own broadcasts, and (e) comparing oneself with others. While these behaviors can be effortlessly compared to the offline world, the conditions under which they occur are decidedly different. Differences can be found, for instance, for the scope of communication (e.g., reaching users all over the globe, reaching hundreds of users with one broadcast); for social norms (e.g., not taking turns in social interactions, not giving answers in real time); and for nonverbal communication (e.g., no communication through facial expressions and tone of voice). Especially mechanisms such as the "like" function reduce the effort of giving and receiving feedback while providing an objective metric with which users can compare their social success.

Since it seems probable that this shift in social behavior might impact well-being and mental health, SNSs use got increasing scientific attention in recent years (Frost & Rickwood, 2017; Keles et al., 2020). Research to this date has primarily focused on FB, but

in consideration of the differences to other SNSs such as Instagram, it appears worthwhile to expand the research to other platforms.

The aim of the present study was to examine the associations of Instagram use intensity and psychological distress through the underlying mechanism of upward social comparison. Additionally, the role of self-compassion as a protective factor in the context of Instagram use was investigated. The following literature review thereby progressively discusses relevant findings while reducing the level of resolution to head towards the specific research questions. At first, research on the relationship between overall SNSs use and well-being is summarized, followed by Instagram's previous links to stress, anxiety, and depressive symptoms. Subsequently, the concept of social comparison is described and situated within previous research. And finally, self-compassion is introduced as a concept of how one can relate to the self.

General SNSs Use and Mental Health

Over the last 15 years a plethora of studies has emerged, trying to answer the question if and how SNSs use might affect psychological health. Since then, SNSs use has been linked to a variety of well-being and mental health indicators. For instance, associations have been found between SNSs use and anxiety, depression, disordered eating, alcohol use, Facebook addiction, psychological distress (for a review, see Frost & Rickwood, 2017; Keles et al., 2020; see also Chen & Lee, 2013), feelings of isolation, decreased well-being (Kross et al., 2013), and lower self-perceived social competence and self-perceived physical attractiveness (Vries & Kühne, 2015), among other things. To the contrary, several studies found relationships between SNSs use and positive mental health indicators such as decreased loneliness through social connectedness, gains in social capital, increased self-esteem, better perceived happiness, and increased subjective well-being (e.g., Deters & Mehl, 2013; Kim & Lee, 2011; E. Lee et al., 2014; Marengo et al., 2021). To better understand why SNSs use may have positive and negative outcomes on comparable metrics, various distinctions and underlying processes can be considered.

SNSs Research From the Beginning

Research investigating whether the overall *SNS use intensity* (SNSI) affects well-being emerged around the year 2005 (for a review, see Kross et al., 2021). At that time, studies almost exclusively investigated FB by applying cross-sectional methods. The results varied, as found associations were in some cases positive, in others negative, and in others again moderated by individual differences. Then in the 2010s, better-powered research designs came along, that is, prospective studies, experience sampling methods, or structural

equation modelling. While some studies linked SNSI to decreases in well-being over time (e.g., Kross et al., 2013), a clear trend could still not be found (Kross et al., 2021). Since around the mid-2010s some experimental research has emerged, manipulating SNSI to examine its causal effects on well-being (e.g., Hanley et al., 2019; Tromholt, 2016). Studies typically reduced SNSI substantially in an experimental group to compare the changes in well-being over time to a control group. Due to these experiments and increasing meta-analyses in recent years (e.g., Huang, 2017), it has been suggested that SNSI may have a small but significant negative effect on well-being overall. Nevertheless, this general approach has limited interpretability.

For one thing, there was considerable variability in how SNSI was measured (Kross et al., 2021). Especially self-report items were not consistent and of questionable validity. One study compared objective server log data to commonly used items to measure SNSI on FB, and found that the best performing question (i.e., “How many times per day do you visit Facebook, on average?”) showed only a moderate correlation ($r = .42$) to objective data (Ernala et al., 2020). Results indicated that participants tended to overestimate the time they spend on the SNSs, while they tended to underestimate the frequency with which they used the SNSs. A different approach was taken by Ellison et al. (2007) with the Facebook Intensity Scale (FIS). The FIS includes self-assessment items that, on one hand, survey the intensity of use based on the number of contacts and average time spent on FB; and on the other hand, measure the user’s emotional attachment to FB and its integration into everyday life (e.g., “Facebook is part of my everyday activity.”). The scale has been widely used but its applicability is limited by the fact that SNSs have drastically changed and increased in complexity over the years (Ernala et al., 2020; Orosz et al., 2016). The lack of standardized measures for SNSI remains a concern to this day, as the vast majority of studies are still conducted cross-sectionally (Frost & Rickwood, 2017).

Another limitation of previous research concerns the use of the term well-being. Well-being is an umbrella term for which different conceptualizations have been suggested. One of the most common definitions is *subjective well-being* (SWB) (Diener, 1984). SWB describes the level of well-being a person reports based on their subjective evaluations. It is regularly divided into *cognitive well-being*, which particularly concerns the assessment of life satisfaction, and *affective well-being*, where a distinction is made between the presence of positive affect and the absence of negative affect. However, SNSs research uses the term well-being inconsistently and often subsumes additional constructs such as fear of missing out, self-esteem, or loneliness (Kross et al., 2021). The present literature review revealed a

heterogeneous picture, in which some studies used SWB (e.g., Hanley et al., 2019; Huang, 2017) while others categorized constructs of negative valence as ill-being (e.g., Valkenburg et al., 2022), or as separate mental health outcomes and indicators (e.g., Faelens et al., 2021; Frost & Rickwood, 2017). Although all these constructs are unquestionably important for psychological health, the inconsistency makes it difficult to draw specific conclusions. A further limitation also concerns terminology. SNSs and their possibilities for studying human behavior are of interest to many academic disciplines. However, the resulting interdisciplinarity in SNSs research favors the inconsistent use of central terms (Kross et al., 2021). Especially the terms social media, social networking sites, online screentime, and online social networks are regularly used as synonyms. At the same time, SNSs use is frequently thought of and analyzed as one universal activity without considering the differences between the specific platforms (Frost & Rickwood, 2017).

Differences Between SNSs

Why this generalization of SNSs is problematic becomes particularly clear when Instagram is considered. Instagram allows users to share image-based content accompanied by a textual caption with their contacts, the “followers”, or with the more public network (Limniou et al., 2021). Other users can interact with this content by liking, sharing, or leaving a comment on the post (Faelens et al., 2021). Especially popular on Instagram is the feature *Instagram Stories*, where users can share edited pictures or short videos which disappear after 24 hours. In January of 2019, there were over 500 million daily active users of Instagram Stories (Statista, 2019).

Instagram differs substantially in terms of environment, information format, text length, and behavioral norms from platforms such as FB, where the focus lies on interpersonal interactions, or from Twitter, which specializes in microblogging (Meshi et al., 2015). These distinctions can cause substantial differences in interaction with the platform and therefore other users. Consequently, it is likely that Instagram also differs from other SNSs in terms of intermediate processes linking its use to SWB (Faelens et al., 2021). These differences are also evident in the motivations with which SNSs are used. For instance, one study revealed that young adults use Instagram primarily for the surveillance or knowledge about others; next to the motivation to document their own life; followed by coolness (i.e., self-promotion); and creative endeavors (Sheldon & Bryant, 2016). Documentation appears to be a motivation specifically related to Instagram use, as individuals who show high levels of social activity (e.g., traveling, going to sporting events) are especially likely to use Instagram as a means of documentation. Instagram is now the most popular SNSs among

young people in Germany, with 74% of individuals between 14–29 years using it at least once weekly (Statista, 2022). However, it sharply rose in popularity only a few years ago. Consequently, Instagram is poorly represented as an SNS in most reviews and meta-analyses (Faelens et al., 2021). Instagram’s relevance, demographic, and the differences between SNSs highlight the necessity for future research regarding the relationship between Instagram use and SWB among young adults. This is emphasized by a recent study by Limniou et al. (2021), which suggested that Instagram users exhibited significantly more problematic usage behaviors compared to FB users. Age was negatively related to problematic use, indicating that this link is particularly relevant for young people.

Instagram Intensity and Psychological Distress

Due to the complexity of SNSs, it can be useful to investigate the associations to mental health based on different categories (Faelens et al., 2021). For instance, research might examine how individuals differ depending on whether they have a SNS membership, how intensely they use the SNS, in what ways they use the SNS, or how their profile on the SNS is characterized (e.g., how many contacts they have). The present study mainly focused on *Instagram use intensity* (II). Typical indicators of II in past studies included the time one spends on Instagram per day, self-reported Instagram use intensity, or self-reported frequency of Instagram use (e.g., how often someone opens the app per day).

The following section considers the relationship between II and the mental health or well-being indicators of interest, namely symptoms of stress, anxiety, and depression. These symptoms are grouped under the term *psychological distress* (PD). According to the American Psychological Association (n.d.), PD describes:

A set of painful mental and physical symptoms that are associated with normal fluctuations of mood in most people. In some cases, however, psychological distress may indicate the beginning of major depressive disorder, anxiety disorder, schizophrenia, somatization disorder, or a variety of other clinical conditions. It is thought to be what is assessed by many putative self-report measures of depression and anxiety.

PD is a sensible construct to investigate in the context of SNSs use, because it encompasses symptoms that are to some degree present in all healthy populations, while at the same time being important indicators of mental health and illness. In the present study, PD is theoretically located within the negative affect dimension of SWB, since SWB is a central domain of SNSs research (Kross et al., 2021). Nevertheless, it is considered equally legitimate to conceptualize PD and its subcomponents as separate indicators of mental health.

Instagram Intensity and Depression

In regard to II and depressive symptoms, previous studies appear to be almost exclusively cross-sectional (for a review, see Faelens et al., 2021), with the majority finding weak to moderate positive associations between the constructs (e.g., Keyte et al., 2020; Lup et al., 2015; Sherlock & Wagstaff, 2019). For instance, one study found that in young adults, Instagram use was marginally positively associated with depressive symptoms, while the effect was stronger for users who followed more strangers in contrast to personally known people (Lup et al., 2015). On the other hand, some studies failed to demonstrate any association between II and depressive symptoms at all (e.g., Vannucci et al., 2019). One study investigated whether millennials with major depressive disorder were more likely to engage in specific SNSs behaviors (Robinson et al., 2019). The results, however, showed that major depressive disorder could not predict II.

II might be significant for the relationship of Instagram use and depressive symptoms, in a comparable way to how the overall use of SNSs was linked to depressive symptoms in the past (Huang, 2017). Nevertheless, no definitive statements can be made about strength, causality, and effect directionality as of now.

Instagram Intensity and Anxiety

Up until now, studies on II and anxiety do not support a clear association (Faelens et al., 2021). Some studies could link II to general anxiety symptoms (e.g., Keyte et al., 2020), fear of missing out, trait anxiety (e.g., Balta et al., 2020), and physical appearance anxiety (e.g., Couture Bue, 2020; Sherlock & Wagstaff, 2019), among others. For instance, one study found that in adolescents and young adults, problematic Instagram use was related to trait anxiety, neuroticism, and state fear of missing out (Balta et al., 2020). On the other hand, several studies could not identify such links (e.g., Mackson et al., 2019; Vannucci et al., 2019). In fact, the relationship between Instagram use and anxiety may be particularly complex and depend on the type of use as well as the type of anxiety. This would be in line with reviews of FB use, hinting at inconsistent and specific associations (Frost & Rickwood, 2017). Similarly, experimental studies that manipulated II cannot draw clear conclusions either, as the experimental conditions usually included several SNSs at a time (Hanley et al., 2019; Hunt et al., 2018).

Instagram Intensity and Stress

The connection between II and stress appears to be highly understudied. One nonpeer-reviewed study found an association between excessive Instagram use and stress that was partially mediated by Instagram addiction (Sanz-Blas et al., 2019). Another study reported a

substantial positive correlation between stress and II, $r = .45$ (Keyte et al., 2020); however, the operationalization of II in this study may differ slightly from other research, since it was assessed using an adapted version of the *Multidimensional Facebook Intensity Scale* (MFIS) (Orosz et al., 2016). The MFIS is a further development of the FIS (Ellison et al., 2007) and aims to assess individual use differences among the most salient aspects of SNSs use. Compared to other means of II, the MFIS appears to be a more comprehensive means of II, and it appears efficient in detecting problematic but not necessarily pathological SNSs use in general populations. It is noted in advance that the present study also used the adapted MFIS. A detailed description is given in the method section.

First Research Question

All in all, it can be stated that the connection between stress and II has a substantial research gap that requires more scientific attention (Faelens et al., 2021). There are some findings for different types of anxiety, but they do not reveal a clear tendency for the association of II and general anxiety symptoms. A positive relationship between II and depressive symptoms appears most probable with the current evidence, leading to the first research question: Is Instagram intensity related to psychological distress among young adults? The following hypotheses were formulated:

- 1.1. Instagram intensity would positively relate to depressive symptoms.
- 1.2. Instagram intensity would positively relate to anxiety symptoms.
- 1.3. Instagram intensity would positively relate to stress symptoms.
- 1.4. Instagram intensity would positively relate to psychological distress.

So far, it was established which links between SNSs use and well-being would be examined. Leaving it at that, however, would run the risk of not doing justice to the complexity of SNSs use. Therefore, the following question was whether there are mechanisms which are responsible for a possible effect between II and PD. Several reviews conclude that social behavior in the online world is probably mediated and moderated by various social, behavioral, and individual factors, which may in turn relate to psychological health (Baker & Algorta, 2016; Faelens et al., 2021; Frost & Rickwood, 2017; Keles et al., 2020). Underlying mechanisms that are regularly discussed include social comparison, self-esteem, social connectedness, rumination, and envy. Especially upward social comparison has received much scientific attention and is therefore part of the present study.

Social Comparison

Leon Festinger's (1954) well established social comparison theory postulates that human beings have a strong drive to evaluate their opinions and abilities in order to reduce

uncertainty. Since objective sources are not available most of the time, other people frequently serve as point of reference. The information obtained facilitates self-assessments and assessments of the social environment, which then allows for better navigation of the social surroundings. The importance of social comparison is demonstrated by the fact that they occur across cultures (Baldwin & Mussweiler, 2018), begin in early childhood (Steinbeis & Singer, 2013), and have been described as an important basis of human evolution (Gilbert et al., 1995). Social comparisons can be distinguished based on two aspects: On one hand, whether the comparison target is perceived as superior (upward) or inferior (downward), and on the other hand, whether the comparison results in assimilation or contrast. Assimilation describes a motion of self-evaluation towards the other person, whereas contrast means the opposite (Festinger, 1954; Verduyn et al., 2020). Consequently, downward assimilation and upward contrast cause the self-evaluation to become more negative, while upward assimilation and downward contrast improve it. Social comparisons are more likely to happen if the target is perceived as similar to the self and if the comparison dimension is relevant for the comparing individual. According to a meta-analysis, people in the offline world tend to predominantly engage in contrasting upward social comparison with people who outperform them, which then likely leads to envy, low self-evaluations, and worsened mood (Yoon et al., 2019).

The relationship between SNSs, social comparison and SWB is of particular interest, because with SNSs it is easier than ever to compare one's own looks, social feedback, online relationships, and career path with others (Haferkamp & Krämer, 2011). Additionally, this information is readily available for a vast number of people from similar demographics, favoring the engagement in social comparison (for a review, see Verduyn et al., 2020). Instagram appears to be an environment that lends itself especially well to social comparisons, because several possible topics for comparison are salient there. For instance, certain skills, lifestyle, or beauty can be well expressed through pictures or videos. Similarly, popularity can be compared based on the number of followers, which is clearly visible on the profile page of the user. This is probably reinforced by the fact that on Instagram, unlike FB, users do not have to form bidirectional "friendships" but can also be followed unilaterally. As a result, particularly successful Instagram users usually have a multitude of followers compared to the users they follow themselves. Furthermore, users on Instagram can "tag" their images with identifying words, making them easy to search for themed content (Limniou et al., 2021). Due to Instagram's algorithms, it gets progressively easier to find images that are relevant for the individual and thus, for possible social comparisons.

Self-Presentation

Why SNSs substantially favor upward social comparison (USC) (Verduyn et al., 2017) can be understood based on the arguments on *self-presentation* Erving Goffman first formulated 1956 in his book *The Presentation of Self in Everyday Life* (Goffman, 1990). In order to explain social behavior, he drew comparisons to the art of acting, whereby every person in everyday social life inevitably plays a role in which they present themselves and their behavior with a goal in mind, namely to influence the impressions other people have of them. This assumption has been evidenced repeatedly (Kross et al., 2021). People want to impress each other but while the parameters of the offline world offer limited possibilities for impression management, SNSs open completely new doors in this regard (Halpern et al., 2017). For example, users can think carefully about their broadcasts, only disclose of them what they want to, and take their time in a conversation until they come up with a satisfactory response. Since uploading selfies and other thoughtfully arranged images is a central behavior on Instagram, the platform uniquely invites for impression management in a beauty sense. Instagram allows its users to enhance the appearance of their photos through several filters (Limniou et al., 2021). These filters can, for example, improve the lighting conditions and thus make the skin look smoother, but there are also augmented reality filters that can, among other things, change face symmetry, eye color, bone structure, and head shape. Therefore, users can compare themselves not only with others, but also with improved versions of themselves (Javornik et al., 2022). The circulation of these idealized images can also affect SWB when users engage in appearance comparison. One study showed that viewing idealized selfies increased women's face-related concerns, while viewing nomakeup selfies reduced them (Fardouly & Rapee, 2019).

Interpersonal-Connection-Behaviors Framework

In this context, a corresponding theoretical approach needs mentioning that tries to merge the partly contradictory results on SNSs usage and well-being. The *interpersonal-connection-behaviors framework* (ICBF) postulates that SNSs use is fundamentally neither good nor bad for well-being but depends on how it is used (Clark et al., 2018). Active SNSs use (e.g., sending private messages, broadcasting a status update) may help meeting needs for acceptance and belonging through self-disclosure, intimacy, increased social support, and increased social capital. However, if passive SNSs use is exhibited that feels social but is not based on interaction (e.g., scrolling the newsfeed, looking at other profiles), this might create feelings of isolation. Another risk of passive SNSs use appears to stem from social comparisons. When users compare their lived experiences with the constructed self-

presentations of others, they may evaluate their lives negatively, which can then lead to envy and depressive symptoms (Liu et al., 2019). Additionally, social comparison and passive use may pose the greatest risk when information about other users is missing, which may make it harder to realize the positive skewedness of other profiles. Passive use of SNSs is frequently recognized in the literature as an important antecedent of maladaptive social comparisons (Verduyn et al., 2020). Supporting evidence for the effects of social comparisons are reported in the following sections.

Interrelationships of Social Comparison on SNSs

Specific links in the realm of social comparison and SNSs use were found for negative self-perceptions of one's attractiveness and social competence, envy, PD, and fear of missing out, among other things (e.g., Appel et al., 2015; Keles et al., 2020; Pang, 2021; Vries & Kühne, 2015). Meta-analyses of SNSs use suggest that non-directive social comparisons have an aggregate weak to moderate negative effect on SWB, while USC show a moderate effect (e.g., Yoon et al., 2019). Yet there are conditions to consider that affect the consequences of social comparisons (Verduyn et al., 2020). For one thing, as described earlier, social comparisons are divided into opinion and ability. The comparison of ability is inherently judgmental and competitive, whereas the comparison of opinion may aim at knowledge enhancement or behavior regulation (Festinger, 1954; Yang et al., 2018). One study examined 219 college freshmen and found that ability comparisons were associated with negative psycho-emotional implications such as lower identity clarity, while the same was not true for opinion comparisons (Yang et al., 2018). It can be derived that since the focus on Instagram is more on lifestyle and aesthetics than, for example, on the opinion-based platform Twitter, harmful ability comparisons might tend to happen more frequently on Instagram. However, this is not to suggest that Instagram is problematic while Twitter is not. Research indicates that SNSs such as Twitter may play an important role in sharing emotion, which could lead to, for instance, the moralization of a cause, moral outrage, and thus the endorsement of violence (Mooijman et al., 2018). Regarding comparisons on SNSs, research also showed that decreases in SWB are more likely to happen after USC than after downward social comparison (Feltman & Szymanski, 2018). And lastly, the consequences of the comparisons play a role too. It was demonstrated that assimilation rather than contrast after USC can lead to feelings of inspiration, which may in turn induce positive consequences for SWB (Park & Baek, 2018; Verduyn et al., 2020).

As USC has been identified as an important mechanism between SNSs use and SWB, increasing cross-sectional and longitudinal studies have examined corresponding models with

social comparison as mediator. These studies have repeatedly shown that USC can play a mediating role in the relationship of passive or general SNSs use and SWB. Some studies have assessed positive and negative evaluative consequences of USC (e.g., Wang et al., 2017), while others have focused solely on negative evaluations (S. Y. Lee, 2014; Schmuck et al., 2019). Based on the literature review, it can be assumed that contrasting upward social comparisons are the most probable type of comparison to pose a risk factor for PD due to II. Considering the negative consequences on self-evaluation, the present study named the construct *negative upward social comparison* (NUSC) and aimed to assess it specifically.

Instagram Intensity and Upward Social Comparison

A limited number of around 14 studies on II and USC have been performed to date (Faelens et al., 2021). Overall, it appears that the slight majority of these studies demonstrated a weak to moderate positive association between II and USC (Chae, 2018; Couture Bue, 2020; Faelens et al., 2021; Fardouly & Rapee, 2019; Modica, 2020; Sherlock & Wagstaff, 2019). For instance, one study found that the frequency of checking Instagram and LinkedIn, another SNSs, positively predicted USC which in turn predicted relative happiness negatively (Chae, 2018). Twitter on the other hand predicted USC negatively. It should also be mentioned that several of the mentioned studies focused directly on appearance comparison or appearance related content (Couture Bue, 2020; Fatt et al., 2019; Modica, 2020; Sherlock & Wagstaff, 2019). As an example serves one study which showed that II, unlike FB use intensity, predicted visual attention to high-anxiety regions on self-photos in young women (Couture Bue, 2020). Thereby, appearance comparison mediated the relationship of II and visual attention. Body dissatisfied individuals selectively attended to high-anxiety body regions, indicating a precursor for this behavior.

On the other hand, some studies reported mixed findings or could not show any relationship between II and social comparison at all (Fatt et al., 2019; Lup et al., 2015; Mackson et al., 2019). For instance, one study could not show a relationship between time spent on Instagram and appearance comparison tendency in young men (Fatt et al., 2019). However, the frequency of viewing “fitspiration” content, a combination of fitness and inspiration, was related to greater body dissatisfaction and reasons to exercise through an indirect effect of appearance comparison tendency. Similarly, most studies examining social or appearance comparison as a mediator revolved around appearance, showing significant indirect effects for body image, physical appearance anxiety, and disordered eating (Modica, 2020; Sherlock & Wagstaff, 2019). Regarding outcomes of PD, one relevant study found social comparison to be a mediator between II and trait anxiety as well as depressive

symptoms (Sherlock & Wagstaff, 2019), while Lup et al. (2015) found no indirect effect of USC between II and depressive symptoms. Nonetheless, Lup et al. (2015) found a weak negative mediation of downward social comparison on depressive symptoms.

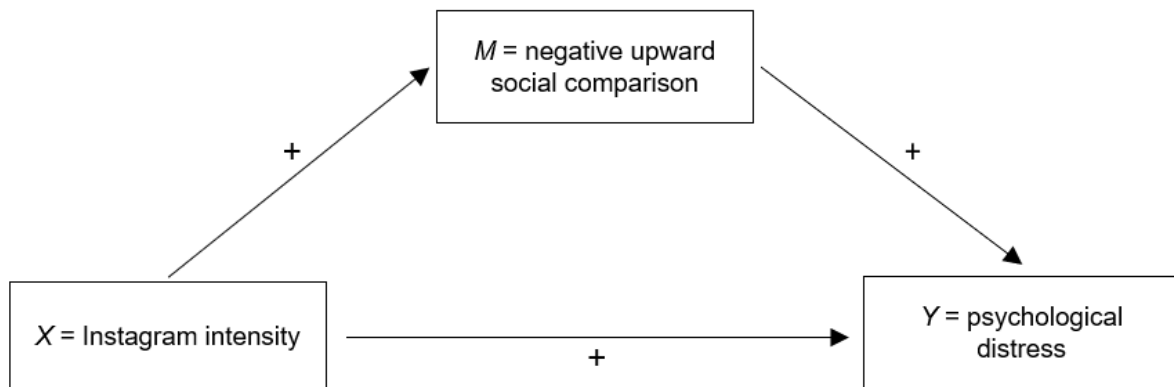
Second Research Question

In summary, the majority of studies link II to USC, although the type of Instagram use and consumed content may play a role (Faelens et al., 2021). As a mediator between II and well-being, social comparison has been studied mainly around appearance comparison. Other indicators of SWB, especially PD, urgently need further study. Considering that Instagram is well suited to present its users with customized, graphic, and idealized content, which in its individual meaning may go beyond the exposure to non-specific idealized images, the present study assumed that more intensely invested Instagram users may fall into personalized maladaptive comparison routines that affect their psychological health. Young individuals appear especially susceptible to social comparison and peer influence (e.g., Maxwell, 2002).

Therefore, the second research question was whether negative upward social comparison played a mediating role in the relationship between Instagram use intensity and psychological distress among young adults. An illustration of the hypothesized model is shown in figure 1. It was hypothesized that:

Figure 1

Path Diagram of a Simple Mediation Model



Note. The hypothesized mediation model with negative upward social comparison as mediator. *X* = Independent variable, *Y* = dependent variable, *M* = mediator.

- 2.1. Instagram intensity would positively relate to negative upward social comparison.
- 2.2. Negative upward social comparison would positively relate to psychological distress.
- 2.3. The positive relationship of Instagram intensity on psychological distress would be

mediated by negative upward social comparison.

Individual Differences in Social Comparison on SNSs

Previously, passive SNSs use was identified as an antecedent of social comparison. Apart from this, there is another class that is considered as antecedent, namely individual differences between SNSs users (Frost & Rickwood, 2017; Kross et al., 2021). Studies have shown that personality plays a role, as neuroticism is positively related to NUSC and envy on SNSs (Rozgonjuk et al., 2019; Wallace et al., 2017). Envy is in turn related to NUSC (Appel et al., 2015) and specific motivations for SNSs use, as individuals who use FB to gather information; seek attention; or pass time, more frequently report feelings of envy after SNSs use (Wallace et al., 2017). Fittingly, these dimensions are captured by the MFIS (Orosz et al., 2016), which might indicate that high multidimensional II is also associated with higher NUSC. Furthermore, some studies suggest that indicators of SWB such as life satisfaction (e.g., Vries & Kühne, 2015) may also predict social comparison. A two-wave study found that increased NUSC predicted lower life satisfaction and self-esteem over time (Frison & Eggermont, 2016). On the opposite site, lower life satisfaction also predicted higher NUSC over time, suggesting that the relationship between SNSs use and SWB over NUSC may be bidirectional. One might suspect that the relationship is not only bidirectional but more of a circular one, in which higher PD also leads to more social comparison. However, one study showed that levels of depression did not act as a mediator between Facebook use and social comparison (Steers et al., 2014).

Another construct of individual differences that has been repeatedly described as relevant in the context of SNSs use and SWB is self-esteem (SE). Findings on SE are relevant to this study as SE is closely related to a concept of interest that also describes how one can relate to the self, namely self-compassion (SC). SC has received little attention in most domains of SNSs research to date and is therefore examined for its relevance. The following sections define SC and SE, delineate them, and discuss relevant findings.

Self-Compassion

In recent years, there has been a surge of interest in the concept of *self-compassion* and its connections to well-being and psychopathology (Neff et al., 2018). In the West, compassion has long been described only in terms of relating to other people, but Buddhist psychology has held that compassion should be felt as much for oneself as for others (Neff, 2003b). Compassion means to be open and moved by the suffering of others, so that one desires to reduce their suffering. It also includes offering patience, kindness, and non-judgmental understanding, recognizing that all people are imperfect and make mistakes. In

this sense, SC is not essentially different from compassion, except that this attitude is taken toward oneself in difficult times. The construct was first defined by Neff (2003a) and consists of three main dimensions, each of which are made up of a positive and a negative distinct component: Self-kindness vs. self-judgment, common humanity vs. self-isolation, and mindfulness vs. over-identification. The main dimension *self-kindness* describes an understanding attitude towards oneself when confronted with suffering. *Common humanity* describes the view that difficult experiences are part of the human experience and not unique to the individual. And *mindfulness* describes the balanced perception of negative thoughts without over-identifying with them (Neff, 2003b; Zessin et al., 2015). These main components are experienced separately, but they also tend to engender each other, generating a self-compassionate frame of mind.

Self-Compassion and Well-Being

Since SC describes a healthy way of coping with difficult experiences, it has been suggested that SC can in a way also be seen as an emotion regulation strategy, whereby distressing feelings are not avoided but held in awareness with kindness, understanding, and a sense of shared humanity (Neff, 2003b). In fact, SC has been repeatedly associated with increased well-being and decreased psychopathology (MacBeth & Gumley, 2012; Zessin et al., 2015). There are several theories that can be considered when trying to fathom how SC increases SWB. In the context of this study, one fitting approach is the relative standards theory (Diener & Ryan, 2009). This theory assumes that an individual's past, goals, ideals, or other people serve as a standard for comparison to the actual condition, changing well-being temporarily when the experienced living conditions change. Accordingly, a positive experience triggers a positive peak in well-being relative to the individual's standard. Over time, this peak can emerge into the new standard. The same is true for negative experiences. Considering the relative standards theory, individuals high in SC may buffer negative events by engaging in cognitive emotional reframing, attenuating negative peaks and therefore the corresponding decreases in well-being (Zessin et al., 2015).

The usefulness of the relative standards theory in the context of SC is underlined by a meta-analysis of over 16,400 participants from 79 samples, which examined the association of SC and various forms of well-being (Zessin et al., 2015). A strong association between SC and overall well-being was found, $r = .47$. With respect to SWB, the association was stronger to cognitive well-being, which was consistent with the authors' assumptions. Their rationale was that the cognitive-emotional mindset of SC may in fact not bypass negative feelings in general, instead rather framing them in an adaptive manner.

Moreover, SC is related to psychopathology. A meta-analysis of over 4,000 participants from 20 samples found a strong negative association for SC and psychopathology, $r = -.54$ (MacBeth & Gumley, 2012). Interestingly, sensitivity analyses have shown that when replacing the average estimates of effect sizes with a single effect for either depression, anxiety, or stress, it did not markedly alter the mean estimate for the aggregate effect size.

In view of the present study, this allows for a theoretical assumption that SC might also mitigate the negative consequences of NUSC by providing a sense of calm and security when feelings of inadequacy arise. That could in turn allow fewer resources to be directed toward obsessively fixating on whether the self is good or bad (Neff & Vonk, 2009). Further it is implied that if the association of PD and SC is examined, the associations should hold approximately equal for the single components of PD, namely depression, anxiety, and stress. The following section further outlines the theoretical rationale by comparing SC and SE in the context of SNSs.

Self-Esteem

SE refers to an individual's overall evaluation of the self (Rosenberg, 1965). SE is a complex construct with many conceptions, but in general it consists of a basic stable trait (*global self-esteem*) and a more dynamically fluctuating state (*contingent SE*) (Faelens et al., 2021; Franck & Raedt, 2007; Rosenberg, 1965). Contingent SE depends on whether certain societal goals are achieved and on how one experiences their external impression on others (Deci & Ryan, 1995). Due to its interdependence with the outside world, SE may well be related to social comparison and changes of self-evaluation in the context of SNSs use (Vogel et al., 2014). Because low SE increases risk for psychopathology and high SE improves life satisfaction (e.g., Diener & Diener, 1995), understanding the role of SE in the context of SNSs use is of importance (Faelens et al., 2021).

Evidence suggests that social comparative internet use can reduce state SE, and that passive FB use is positively related to depressive tendencies, mediated by higher social comparison orientation and lower SE as a long-term effect (Ozimek & Bierhoff, 2020). There are also findings indicating that high SNSI predicts lower contingent SE (Stapleton et al., 2017). In the case of SE and II, the evidence is limited and mixed, as some studies find a weak to moderate association of II and contingent SE (e.g., Schmuck et al., 2019; Sherlock & Wagstaff, 2019), whereas others could not report such an association (e.g., Mackson et al., 2019; Stapleton et al., 2017).

On the other hand, studies also suggest that high SE may be an antecedent for less

excessive Instagram use (Martinez-Pecino & Garcia-Gavilán, 2019) and low susceptibility to harmful social comparisons (Jang et al., 2016). In particular, when self-worth is highly dependent on the validation of others, there seems to be a strong link between II and social comparisons (Stapleton et al., 2017).

In summary, SE may have a bidirectional relationship with II and may likewise be relevant as a mechanism for linking II, SWB, and social comparison. This raises the question of how SE relates to SC and whether assumptions for SC can be made based on the findings for SE.

Self-Compassion Versus Self-Esteem

Global SE and SC resemble each other in that both are concepts of how one can relate to the self, while high expressions tend to entail positive rather than negative emotions toward the self (Neff & Vonk, 2009). However, SE relies heavily on positive evaluation of the self, while SC refrains from evaluations altogether. Moreover, SE builds more on achieving certain goals and perceiving oneself as special, while SC emphasizes similarity rather than differences and becomes important precisely in times when life is difficult. There is evidence to support this distinction (Barnard & Curry, 2011). On one hand, both constructs seem to correlate, but not so much as to assume identical constructs. In this regard, the strongest correlation between global SE and SC identified by the literature review was $r = .68$ (Neff & Vonk, 2009). Moreover, differences between the constructs are evident by different correlates. For instance, global SE is positively correlated with narcissism ($r = .59$), whereas the same is not true for SC. And finally, SC uniquely explains variance in psychological health, such as positive affect, and aspects of psychopathology, such as self-rumination, even after controlling for SE (Neff & Vonk, 2009).

SC is also related to personality and especially negatively related to neuroticism, but it has been shown to predict unique variance in psychological health over and above personality (Neff et al., 2007). Less is known about the origins of individual differences in SC, but it seems likely that some of the variance is due to innate differences in neuroticism and rumination.

These findings allow to assume that SC may not only be important in mitigating negative consequences of social comparisons, but that high SC may also condition fewer social comparisons. Further corroborating this, one study found a negative correlation ($r = -.35$) for SC and social comparison orientation (Neff & Vonk, 2009). Hence, SC, much like SE, may be an important individual difference factor for the links between II, NUSC, and PD. However, instead of relying on contrasts to others and evaluations of the self, higher SC

might result in lower social comparison altogether. Therefore, it may be assumed that SC, in contrast to SE, might have a moderating rather than a mediating role in the relationship of II and PD through NUSC. After laying out the theoretical assumptions, the following section discusses the existing findings on SC and SNSs usage.

Self-Compassion in the Context of SNSs Use

Research on SC in the context of SNSs use is limited and focused primarily on its protective qualities for body image concerns, whereby the evidence appears promising thus far. For instance, experimental studies suggest that brief SC interventions (Gobin et al., 2022; Slater et al., 2017) can protect against the risk of body image concerns after exposure to thin-ideal images or fitspiration content. Similarly, one cross-sectional study found high SC to be positively related to body esteem and negatively related to body surveillance (Modica, 2019). Other findings indicated that individuals high in SC tend to digitally edit their selfies less and put less effort into choosing a selfie to upload as well as monitoring other users' feedback (Lonergan et al., 2019).

However, the results for SC as a moderator are more inconsistent. The studies of Lonergan et al. (2019) and Modica (2019) could not find any moderation effect by SC on the body image related outcomes. On the other hand, one study showed that for young women who consumed fitspiration content, upward appearance comparison mediated the relationship of fitspiration use on two types of body concerns, namely body dissatisfaction and drive for thinness (Seekis et al., 2021). The single components of SC were analyzed as moderators and while reduced self-judgment, self-isolation, and over-identification buffered the relationship of fitspiration use to upward appearance comparison; self-kindness, common humanity, mindfulness, and reduced self-isolation buffered the relationship of fitspiration use on drive for thinness.

Only two studies investigated the relationship between SC, SNSs use and aspects of PD. One of these studies assessed different social media indicators (e.g., time spent, frequency of use) to create different profiles of social media use (Phillips & Wisniewski, 2021). Only the profile “Problem Users” showed higher mean scores for anxiety and depression compared to other profiles. SC moderated these relationships, with highly self-compassionate Problem Users having similar anxiety and depression scores as participants belonging to other profiles. The other study examined in a cross-sectional design if SC negatively predicted II, and whether this relationship was mediated by negative affect (Keyte et al., 2020). Although SC correlated negatively with II and negative affect as hypothesized, the results did not confirm a relevant indirect effect of negative affect. This may be

understood as preliminary evidence that lower II due to higher SC may not solely be explained by the lower negative affect associated with high SC.

All in all, it can be stated that research regarding the role of SC in the relationship between SNSs use and PD is scarce but might prove beneficial to study in the future. The finding that SC simultaneously moderated different pathways in a mediation model (Seekis et al., 2021); as well as the finding that SC attenuated the relationship between problematic use and anxiety and depression (Phillips & Wisniewski, 2021), strengthen the rationale to investigate SC as a simultaneous moderator between II to NUSC, and NUSC to PD. However, there are limitations to consider. For one thing, the two mentioned studies did not focus specifically on Instagram. Additionally, the samples did either include no men at all (Seekis et al., 2021) or less than 25% (Phillips & Wisniewski, 2021). Since there is some evidence that men have slightly higher average scores in SC (e.g., Neff, 2003b), future inquiries with more balanced gender ratios would be desirable.

Third Research Question

Based on these findings and the theoretical derivation prior, the following research question was formulated: Does self-compassion act as a moderator in the relationship of Instagram intensity and negative upward social comparison, as well as in the relationship of negative upward social comparison and psychological distress among young adults? It was hypothesized that:

- 3.1 Self-compassion would negatively relate to negative upward social comparison.
- 3.2 Self-compassion would negatively relate to psychological distress.
- 3.3 Higher SC would have an attenuating effect on the positive relationship of II on NUSC, as well as an attenuating effect on the positive relationship of NUSC on PD.

The hypothesized model is visualized in figure 2.

Possible Implications

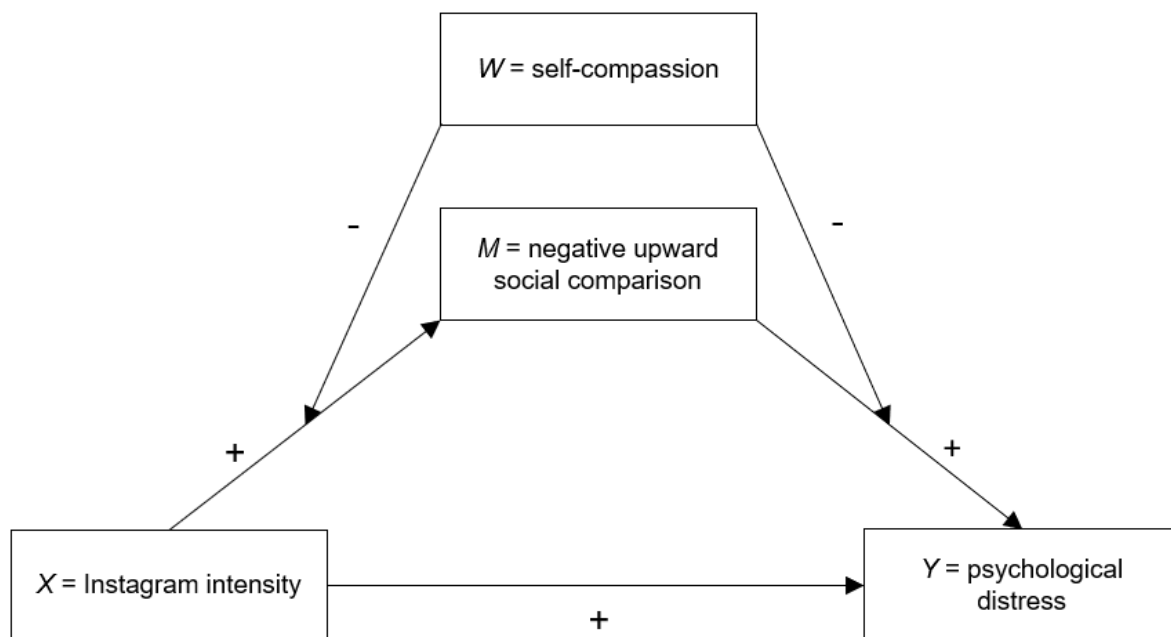
Why it is important to study SC in this context becomes evident when looking at self-compassion interventions. Evidence suggests that there is a causal relationship between SC and well-being, as a broad diversity of approaches and interventions can successfully increase SC, resulting in better well-being (Zessin et al., 2015). On top of that, a recent review analyzed the results of 20 randomized controlled trials (RCTs) and concluded that SC interventions are a promising tool to reduce self-criticism (Wakelin et al., 2022). This is important because high levels of self-criticism are associated with psychopathology and poorer therapeutic outcomes. Since self-criticism is, by definition, the negative evaluation of the self (Kannan & Levitt, 2013), it is conceivable that SC interventions might also decrease

NUSC and its negative consequences of excessive Instagram use for individuals at risk.

A finding of this sort would be promising since it appears more achievable to improve the relationship to the self by adopting a non-judgmental attitude with SC, than to consistently increase the competitive and goal-achievement related SE (Neff & Vonk, 2009; Wakelin et al., 2022).

Figure 2

Path Diagram of a Moderated Mediation Model



Note. The hypothesized moderated mediation model with self-compassion as moderator. X = Independent variable, Y = dependent variable, M = mediator, W = moderator.

Self-Compassion as Antecedent of II

After establishing how SC might relate to II and PD, further consideration is given to how SC may antecede II. Earlier it was noted that SE might have a bidirectional relationship with II, in which high SE predicts less excessive Instagram use (Martinez-Pecino & Garcia-Gavilán, 2019). The transfer to SC can theoretically be based on Neff's (2003b) suggestion that high SC also implies avoiding harmful behavior for well-being. This was supported by a review that found SC interventions to be effective in increasing self-regulation of health behaviors (Biber & Ellis, 2019). Therefore, if Instagram users were high in SC but still negatively affected by Instagram use, they may possibly engage less intensely in Instagram altogether. Preliminary evidence for this was provided in one study, whereby SC was

negatively correlated to II, with $r = -.22$ (Keyte et al., 2020). The relevance of this investigation is also reflected in one study finding that Instagram users showed significantly more problematic usage behavior than FB users (Limniou et al., 2021).

Fourth Research Question

These considerations led to the fourth and final research question: Can self-compassion predict Instagram use intensity among young adults? To determine whether SC might be able to predict aspects of II that go beyond the mere time someone spends on Instagram, the more conventional measure of Instagram use, namely *Instagram duration* (ID), was added to the subsequent model. In the same sense, because SWB may be a precursor of problematic SNSs use (e.g., Vries & Kühne, 2015), PD was added as a predictor to assess whether SC might explain unique variance in II which could not be explained solely because of a bidirectional relationship between II and PD. It was hypothesized that:

4.1 Self-compassion would negatively relate to Instagram intensity.

4.2 Higher self-compassion would negatively predict Instagram intensity, even after accounting for psychological distress and Instagram duration.

Introduction Summary

To summarize the literature review, there is evidence that the overall time one spends on SNSs shows a slight but significant negative effect on SWB (Huang, 2017). To account for the differences between SNSs and the complexity of their use, hypothesis 1 contributes new evidence on how the multidimensional intensity of Instagram use relates to PD. Moreover, the ICBF (Clark et al., 2018) postulates that the negative effect of SNSs use on well-being may in large part be due to maladaptive social comparisons (Steers et al., 2014). Hypothesis 2 therefore investigates whether NUSC may condition the effect of II on PD. Furthermore, even though maladaptive social comparisons on SNSs may decrease SWB, this effect may happen mostly among a subset of individuals who use SNSs in a certain way (Liu et al., 2019) and are susceptible to maladaptive social comparisons (e.g., Vries & Kühne, 2015). Hypothesis 3 thereby contributes new evidence on whether SC may be an individual difference aspect that plays a protective role in the relationships of II on NUSC, and NUSC on PD. And last, there is evidence that global SE is negatively related to excessive SNSs use (Martinez-Pecino & Garcia-Gavilán, 2019). Hence, since SC has been proven capable of improving self-regulation of health behaviors (Biber & Ellis, 2019), hypothesis 4 explores whether high SC is opposed to high II. To the best of the researcher's knowledge, none of the above hypotheses have been tested in this constellation before. Especially the role of SC in this context is novel and may contribute to a better understanding of the ICBF. The study

may provide implications for interventions through which young adults can successfully navigate the potential risks of Instagram use.

Methods

Research Design

The study took place in the context of a master's thesis at the department of Clinical and Health Psychology at the University of Vienna. The goal was to examine the links between II, PD, NUSC, and SC in young adults. To do so, correlational, and regression-based approaches were used to test different statistical research models. The research design was conducted as a cross-sectional study in which no groups were assigned to certain conditions.

Sample

An online survey was conducted from November 2021 until February 2022. The online survey was realized with the commonly used web-application SoSci Survey (Leiner, 2019). Participants were mainly recruited over the SNSs Instagram and FB by means of the researcher's account. Other than that, participants were recruited using the SurveyCircle (2022) online research platform. On SurveyCircle, users can participate in studies in order to get participants for their own study in return. Participation in the study was not compensated in any form.

Inclusion criteria entailed age 18–29, high proficiency in German, no psychiatric diagnosis in the past, and average Instagram use of at least one hour per week. Participants were excluded if they did not reach the last page of the survey, were not within the inclusion criteria, or provided incomplete data.

As described in the literature review, the age was selected as young adults in Germany primarily use Instagram. (Statista, 2022) and young people appear to be more susceptible to peer influence (e.g., Maxwell, 2002). High proficiency in German was required, as the survey was administered in German only and participants needed to understand the nuances of the questions. Individuals with psychiatric diagnoses were excluded because they were expected to constitute outliers for the variables, especially for PD scores. The minimum value for Instagram use was selected to ensure the examinability of the relationships between the variables of interest.

Sociodemographic characteristics of the sample are visually presented in Table 1. In total, 246 participants completed the survey. Twelve participants were excluded because they did not meet the inclusion criteria for the specified age range. Five participants were excluded because they finished the survey in under two minutes.

Table 1*Sociodemographic Characteristics of Participants*

Assessed characteristics	Proportion	
	<i>n</i>	%
Gender		
Female	122	55
Male	98	45
Country of residence		
German	146	66
Austrian	35	31
Other ^a	3	1
Occupation		
Student in higher education	155	70
Employee	58	26
Teachers and public servants	3	1
Self-employed	2	1
Unemployed	1	< 1
Apprenticeship	1	< 1
Pupil	0	0
Educational status ^b		
Degree in higher education	135	61
Matura or Abitur ^c	74	34
School graduation without Matura / Abitur	11	5
Income category (in €) ^d		
No reported income	34	15
Less than 500	43	20
500–1000	43	20
1000–1500	33	15
1500–2000	14	6
2000–2500	19	9
2500–3000	18	8
More than 3000	16	7

Note. *N* = 220. Participants were on average 24.8 years old (*SD* = 2.6). ^a Other countries

included Spain ($n = 1$), Italy ($n = 1$), and Swiss ($n = 1$).^b Educational status could be fully divided among the three reported categories.^c Matura and Abitur are the highest school leaving-qualifications in Austria and Germany.^d Income refers to the amount that is made up of all earnings and remains after deduction of taxes and social security contributions.

Additionally, six participants were excluded due to incomplete demographic information. One participant was excluded since they did not identify as either male or female and gender was potentially considered as a confounding variable. And finally, two participants were removed for constituting extreme outliers. This resulted in 220 participants aged 18–29 ($M = 24.8$, $SD = 2.6$). The average daily time spent on Instagram in the week prior to assessment was around 59 minutes ($SD = 44.3$).

Measures

The following section describes the operationalizations and variable measures of the present study. If necessary, brief rationales about the measures' selection processes are provided. Except for the *Self-Compassion Scale* (SCS) (Neff, 2003b), which was administered in the German version (Hupfeld & Ruffieux, 2011), all questions were carefully back translated from English into German and then again into English for comparison. Two individuals were involved in the translation process, one of which was blind to the original English questionnaires. To determine internal consistency, Cronbach's alpha was calculated for each scale and interpreted using Cohen's benchmarks (Cohen, 2013).

Instagram Intensity

As stated in the introduction, Instagram use intensity was measured by means of the adapted Multidimensional Facebook Intensity Scale (Orosz et al., 2016). The MFIS is a short questionnaire that determines how intensely the use of an SNS is integrated into an individual's everyday life (Orosz et al., 2016). The 13 items are divided into the four dimensions (a) *persistence*, which grasps the strength of the emotional connection between the individual and the SNS (e.g., "I feel bad if I don't check my Facebook daily."); (b) *boredom*, which refers to the individual's motivation to use the SNS to relieve boredom (e.g., "Watching Facebook posts is good for overcoming boredom."); (c) *overuse*, which relates to aspects relevant for excessive use and FB addiction (e.g., "I spend time on Facebook at the expense of my obligations."); and (d) *self-expression*, which surveys the extent to which the individual uses the SNS to present themselves to the world (e.g., "It is important for me to update my Facebook profile regularly."). Items were answered on a 5-point Likert scale, with responses ranging from 1 (*never*) to 5 (*always*). The MFIS has shown good internal

consistency, temporal stability, and incremental validity, as it predicts posting and liking behavior on FB better than the FIS. In line with the adaptation of Keyte et al. (2020), the term *Facebook* was exchanged with the term *Instagram* for all items. This was deemed appropriate because the MFIS does not assess behavior specific to a SNS, but rather individual involvement.

Additionally, the present study changed the item "If I could visit only one site on the Internet, it would be Instagram." to "If I could use only one app, it would be Instagram.", since Instagram is used almost exclusively as an app. The total score for II was calculated by averaging the mean scores of each subscale. Computation of internal consistency showed a good Cronbach's alpha for the entire scale ($\alpha = .85$). The internal consistencies of the separate scales were good for boredom (3 items; $\alpha = .87$) and self-expression (3 items; $\alpha = .87$), while the score for overuse (3 items; $\alpha = .75$) was acceptable. Only the score for persistence (4 items, $\alpha = .65$) was rated questionable; however, deleting any item would not have increased internal consistency, so the scale was applied as in previous research.

Psychological Distress

PD was assessed using the short version of the *Depression, Anxiety and Stress Scale* (DASS-21) (Lovibond & Lovibond, 1995). The DASS-21 is a commonly used set of three self-report scales designed to measure an individual's emotional states of depression, anxiety, and stress. Participants were instructed to rate how much the presented statement applied to them in the last week. For each scale, 7 items were answered on a 4-point Likert scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much or most of the time*). The scales assess aspects such as dysphoria (e.g., "I couldn't seem to experience any positive feeling at all.") for *depression*; situational anxiety (e.g., "I was worried about situations in which I might panic and make a fool of myself.") for *anxiety*, and difficulty relaxing (e.g., "I found it hard to wind down.") for *stress*. The DASS-21 is based on a dimensional conception of psychiatric disorders, where differences in depression, anxiety, and stress between healthy and clinical populations are thought to be mainly in severity. One study found evidence for the construct validity of the DASS-21 in a large non-clinical sample ($N = 1794$) and for the three scales to index a substantial common factor named *psychological distress* (Henry & Crawford, 2005). Recent research has confirmed its nomological validity as a measure of PD in young adults (D. Lee, 2019). Therefore, the DASS-21 appears suitable for surveying non-clinical populations. In the present study, tests of internal consistency yielded a good Cronbach's alpha for depression ($\alpha = .87$) and stress ($\alpha = .84$), while the alpha for anxiety ($\alpha = .75$) was deemed acceptable. Averaging the means of the three scales produced an excellent

alpha ($\alpha = .92$), which then constituted PD in the further course. To facilitate analysis, a constant was added to the scale so that it ranged from 1–4. Results are reported for the transformed scale.

Negative Upward Social Comparison

NUSC was defined as the degree to which individuals experience negative self-evaluative thoughts after comparison to someone on Instagram who is perceived as superior. Three questions were used for the survey that were originally derived from Buunk et al. (2005) but have since been used several times to assess USC on SNSs (e.g., S. Y. Lee, 2014; Vries & Kühne, 2015). The items were adapted to behaviors on Instagram that are central for social comparison. Participants were asked how much they agreed to the statements: “When I look at Stories, profiles, or photos of others on Instagram, I often think that (a) others have a better life than I do.”; (b) others are better off than I am.”; (c) I am isolated from others.” Responses ranged from 1 (*not at all*) to 5 (*fully*) on a 5-point Likert scale.

The items were selected because they specifically survey the negative consequences of USC and therefore rule out the cases in which individuals may feel inspiration after upward assimilation (Park & Baek, 2018). It was also assumed that for these items, remembering and answering honestly might be considered easier for the participants than it might be for emotional responses such as envy. The three items were added and averaged for a total score of NUSC. Reliability analysis produced a good Cronbach’s alpha ($\alpha = .83$). Analysis indicated that dropping the item (“...I often think that I am isolated from others.”) would have resulted in an excellent alpha of $\alpha = .92$. Since the item differed conceptually by assessing isolation and was also excluded by other studies (e.g., Pang, 2021; Vries & Kühne, 2015), it was excluded in the further course.

Self-Compassion

Self-compassion was assessed using the German version of the Self-Compassion Scale (SCS-D) (Hupfeld & Ruffieux, 2011; Neff, 2003b). The SCS-D measures SC in the sense of a positive basic attitude toward oneself in difficult times. The SCS is the only widely used self-report questionnaire to elicit SC. Both questionnaires, the original (Neff, 2003b) and the German version (Hupfeld & Ruffieux, 2011) contain 26 items and show a six-factor structure for three main components. The main component self-kindness is divided into *self-kindness* (e.g., “I’m kind to myself when I’m experiencing suffering.”) and *self-judgement* (e.g., “When I see aspects of myself that I don’t like, I get down on myself.”); the main component common humanity consists of *common humanity* (e.g., “I try to see my failings as part of the human condition.”) and *self-isolation* (e.g., “When I think about my inadequacies

it tends to make me feel more separate and cut off from the rest of the world.”); and the main component mindfulness is divided into *mindfulness* (e.g., “When something upsets me I try to keep my emotions in balance.”) and *over-identification* (e.g., “When something upsets me I get carried away with my feelings.”). Participants were instructed to answer how often they behave in the described way on a 5-Point Likert scale ranging from 1 (*almost never*) to 5 (*almost always*). The means for each subscale were averaged to a total score of SC. Prior to that, the three negative scales were reversed so that the total score expresses compassionate and reduced uncompassionate behavior, respectively. The findings on construct validity and criterion validity for the SCS-D (Hupfeld & Ruffieux, 2011) are good and nearly identical to those of the original (Neff, 2003b). In the present sample, tests for Cronbach’s alpha showed good to acceptable internal consistencies for self-kindness (5 items; $\alpha = .81$), self-judgement (5 items; $\alpha = .75$), common humanity (4 items; $\alpha = .71$), self-isolation (4 items; $\alpha = .83$), mindfulness (4 items; $\alpha = .70$), and over-identification (4 items; $\alpha = .76$), and an excellent alpha for the total scale (26 items; $\alpha = .91$).

However, there are concerns regarding the internal validity of the SCS. Already about 10 years ago it was stated that it might be helpful to split the compassionate and reduced uncompassionate aspects into two sum scores, to enable better statements about the contributing parts of the SCS (Gilbert et al., 2011). Since then, several studies examined its factor structure in different populations. At times, the best fit was found for a global factor of SC (e.g., Neff et al., 2019), in other cases, the best fit was found for two general factors (e.g., Brenner et al., 2017). The validation study on the SCS-D found that a high but not complete proportion of the variation within the six primary factors was due to an underlying construct SC (Hupfeld & Ruffieux, 2011). As the structure has implications for interpretation, the present study committed to using the overall SC, but also explored whether the subdivision into two general factors, namely *positive self-compassion* (PSC) and *reduced self-coldness* (RSC) would have yielded different results.

Control Variables

Because Instagram use, social comparison, well-being, and self-compassion might be related to development, life stage, and gender, all analyses were controlled for age, occupation, and gender. More specifically, age in years was added as age seems to be positively related to SC (e.g., Zessin et al., 2015) and negatively related to problematic Instagram use (Limniou et al., 2021). Gender (0 = female, 1 = male) was included to check for differences in II and to investigate whether women were lower in SC on average, as some evidence suggests (e.g., Neff, 2003b). Since occupation in the sample was largely divided

among students in higher education and employees or employee-related occupations, the variable was coded dichotomously (0 = students, 1 = others) to allow for meaningful statements. This was deemed relevant because much of the research in psychology is based on university students, regularly posing a problem for generalizability. Instagram Duration was assessed as the average time spent on Instagram per day in minutes over the past seven days, whereby participants were instructed to derive the statistic from the Instagram app. ID was relevant in $H_{4.2}$.

Income category and educational status did not relate significantly to any variable of interest and were therefore not included in the further analysis. Since the sample stemmed almost exclusively from one cultural area, namely Germany and Austria, country of residence was also not included as control variable.

Procedure

Upon clicking the provided link, potential participants were directed to SoSci Survey (Leiner, 2019) where they were given information about the topic of the study, inclusion and exclusion criteria, voluntariness, anonymous processing of the data, and the researcher's contact details. Participants were instructed to read all questions carefully, but not to think too long about individual questions as there were no right or wrong answers. After providing informed consent, participants were presented with the demographic questionnaire. The demographic questionnaire assessed age, gender, country of residence, occupation, educational level, income category, and average daily time spent on Instagram in the last week. Additionally, there were three yes or no screening questions regarding high language proficiency in German, any psychiatric diagnosis in the past, and minimum time spent on Instagram of at least 1h per week on average. Afterwards, participants answered the questionnaires which are reported in the measures section. Upon completion of the survey, participants were given more detailed information about the aim of the study. The researcher's contact information was presented again with an invitation to contact him with possible questions or comments. Completing the survey took the participants about 7 minutes on average.

Analysis

Data analysis was conducted using SPSS software (version 26.0; IBM Corp. 2021). At first, descriptive statistics of the participants and variables of interest were examined. Zero-order correlations were calculated to test the relations between all variables. Only in the context of H_1 were the individual subscales of the DASS-21 (Lovibond & Lovibond, 1995) considered instead of overall PD.

Subsequently, to test H_2 , a mediation analysis between II and PD over NUSC was performed. Mediation analyses attempt to estimate an indirect effect (ab), which is the product of the effect of the independent variable on the mediator (a), and the effect of the mediator on the outcome (b), while controlling for the direct influence of the independent variable (Preacher & Hayes, 2008). Mediation analyses were computed with the PROCESS macro by Hayes (2018), which produces path coefficients for the total (c), direct (c'), and indirect effect (ab), based on ordinary least squares regression. PROCESS employs bootstrapping as a commonly used resampling approach, which makes it a robust procedure against violations of otherwise relevant assumptions for parametric tests. All analyses in PROCESS employed bootstrapping with 10,000 samples together with heteroscedasticity consistent standard errors (Davidson & MacKinnon, 1993) to compute the confidence intervals and inferential statistics. Effects were deemed significant when the confidence interval did not include zero.

To test the model of H_3 , in which SC was added as a simultaneous moderator between II to NUSC and NUSC to PD, a conditional process analysis (model 58 in PROCESS) was run. Conditional process analysis is an analytical strategy that integrates mediation and moderation analysis with the goal of examining and testing hypotheses about how mechanisms vary as a function of context or individual differences (Hayes & Rockwood, 2020; Preacher & Hayes, 2008). Additionally, an explorative model was analyzed in which SC acted as a second serial mediator chronologically behind NUSC (model 6 in PROCESS).

To test H_4 , a hierarchical regression was run in which PD and ID were added as predictors in addition to SC and the control variables. Moreover, an exploratory hierarchical regression was conducted in which global SC was split into the general factors PSC and RSC. And finally, exploratory partial correlations were calculated that tested for a significant relationship between SC, PSC, RSC, and each separate dimension of II, while controlling for PD. Considerations for statistical power and sample size are provided in the appendix.

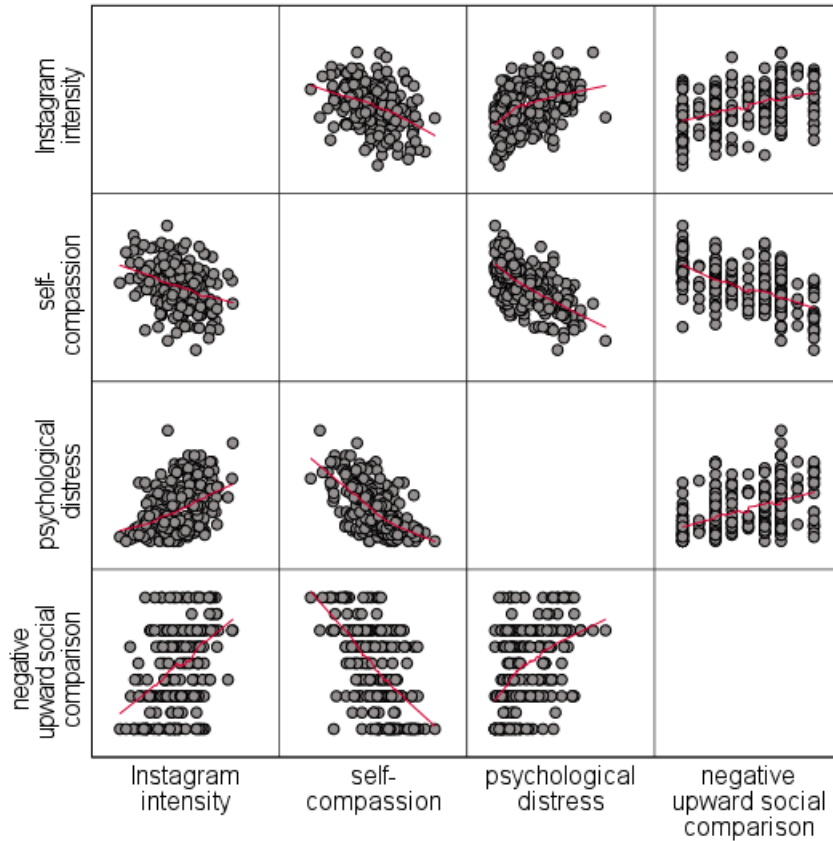
Results

Prior to calculating zero-order correlations, the assumptions for significance testing of Pearson correlation coefficients had to be tested. The level of measurement was given, and the normality of the data could be dismissed due to the sample size. Three participants constituted outliers by visual inspection of the boxplots, two of which were excluded for extreme values. Figure 3 shows that the relationships of all variables were approximately linear, as assessed by visual inspection of the scatterplots after locally estimated scatterplot smoothing (Loess). Loess is a non-parametric regression method, which identifies trends in

the data, that would otherwise be hard to model with parametric designs.

Figure 3

Scatterplot of Independent and Dependent Variables



Note. A matrix-scatterplot including all dependent and independent variables of interest. The red line was generated by LOESS smoothing. An approximately linear line indicates linearity between the variables.

Descriptive statistics and correlations between all variables are noted in table 2. All correlations were in the hypothesized directions. None of the correlations reached a strength at which identical elicited constructs would have to be assumed.

$H_{1.1}$ predicted that II would be positively related to depressive symptoms. In line with $H_{1.1}$, a moderate positive correlation between II and depressive symptoms was found, $r(218) = .36, p < .001$ (Cohen, 2013). In accordance with $H_{1.2}$, a moderate positive correlation between II and anxiety symptoms was detected, $r(218) = .30, p < .001$. $H_{1.3}$ was confirmed too, as a moderate positive correlation between II and stress was identified, $r(218) = .42, p < .001$. In line with $H_{1.4}$, a moderate positive correlation between II and PD was found, $r(218) = .41, p < .001$.

Table 2*Descriptive Statistics and Zero-Order Correlations for Variables of Interest*

Variable	1	2	3	4	5	6	7	<i>M</i>	<i>SD</i>
1. II	—							2.79	0.67
2. SC	-.33**	—						3.03	0.67
3. PD	.41**	-.61**	—					1.75	0.54
4. NUSC	.41**	-.53**	.43**	—				2.92	1.26
5. Gender ^a	-.18*	-.15	-.14*	-.07	—			—	—
6. Age	-.12	.14*	-.16*	-.08	.16*	—		24.8	2.62
7. ID	.44**	-.14*	.22**	.12	-.14*	-.12	—	58.6	44.33
8. OC ^b	-.15*	.11	-.16*	-.08	-.10	.53**	.02	—	—

Note. $N = 220$. Cells contain zero-order Pearson correlations ($df = 218$). II = Instagram intensity, SC = self-compassion, PD = psychological distress, NUSC = negative upward social comparison, ID = Instagram duration (per day in minutes), OC = Occupation. ^a Gender was coded 0 = females, 1 = males. ^b Occupation was coded 0 = students, 1 = others

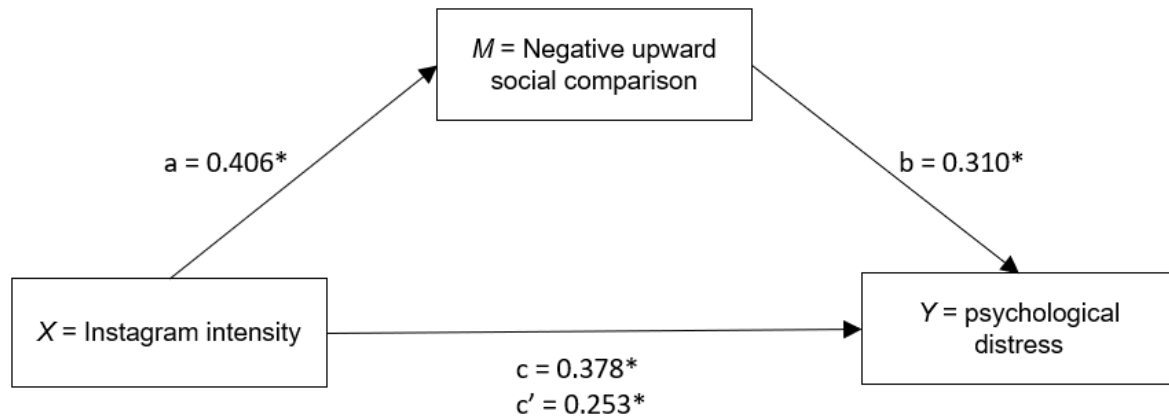
* $p < .05$. ** $p < .001$. (2-tailed).

As can be seen in table 2, $H_{2.1}$ was confirmed as a positive relationship between II and NUSC was detected. The same held true for $H_{2.2}$ since NUSC was positively related to PD. $H_{2.3}$ predicted NUSC to be a mediator between the positive relation of II on PD. Before the mediation analysis was carried out, relevant assumptions had to be checked. Linearity was given, as was already shown in figure 3. Furthermore, normal distribution of the residuals could be dismissed due to bootstrapping and an adequate sample size ($N = 220$) (Hayes, 2018). Possible heteroscedasticity was counteracted by calculating heteroscedasticity consistent standard errors in PROCESS (Davidson & MacKinnon, 1993). Independence of cases could be assumed due to the online survey research design. However, temporal precedence cannot be confirmed within a cross-sectional design, even though mediation analyses are regularly carried out this way. The rationale of the present study and associated limitations are mentioned in detail in the discussion. A simple mediation was performed to

analyze whether II predicted PD and whether the direct path would be mediated by NUSC. Age, gender, and occupation were added as covariates to the model. The path diagram is illustrated in figure 4.

Figure 4

Path Diagram for the Single Mediation Model with Standardized Coefficients



Note. The single mediation model with standardized path coefficients and significance levels.

Total $(c) = (c') + (ab)$.

* $p < .001$.

A summary of the single mediation model from Instagram intensity to psychological distress via negative upward social comparison is shown in table 3. An overall effect of Instagram intensity on psychological distress was found. After entering the mediator to the model, Instagram intensity predicted negative upward social comparison significantly, which in turn predicted psychological distress significantly.

Results indicated that the relationship between Instagram intensity and psychological distress was partly mediated by negative upward social comparison, since the direct effect of Instagram intensity on psychological distress did not become nonsignificant after adding the mediator to the model. Age, gender, and occupation did not contribute significantly to any of the outcomes.

Subsequently, $H_{3.1}$ predicted that SC would be negatively related to NUSC. The hypothesis was confirmed due to a strong negative association (see table 2). $H_{3.2}$ was also supported, as a strong negative relationship between SC and PD was found. $H_{3.3}$ predicted SC to be a simultaneous moderator for path a and path b of the in $H_{2.3}$ established mediation model.

Table 3

Summary of the Single Mediation Model from Instagram Intensity to Psychological Distress over Negative Upward Social Comparison

Effect	B	β	SE (HC3) ^a	t	p	95% CI ^b	
						LL	UL
Total effect c	.305	.378	.045	6.73	< .001	.216	.395
Direct effect c'	.204	.253	.048	4.27	< .001	.110	.298
Indirect effect ab ^c	.101	.126	.025	-	-	.055	.155
Path a	.761	.406	.113	6.74	< .001	.538	.983
Path b	.133	.310	.028	4.75	< .001	.078	.188

Note. ^a HC3 = A heteroscedasticity consistent standard error was used (Davidson and MacKinnon) ^b CI = confidence interval; *LL* = lower limit; *UL* = upper limit. Effects were deemed significant if CI did not include 0. ^c SE and CI bias corrected and accelerated (BCa) via bootstrapping. Number of bootstrap samples: 10,000. Significance testing through BCa CIs did not yield different results.

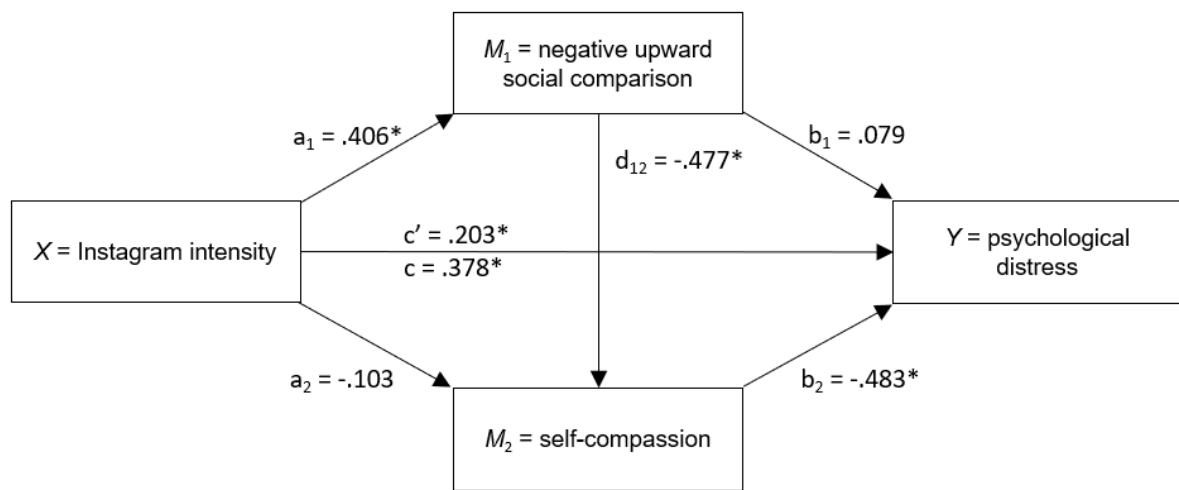
A conditional process analysis (model 58 in PROCESS) was run to determine whether the interaction between II and SC significantly predicted NUSC; and whether the interaction between SC and NUSC significantly predicted PD, while controlling for age, gender, and occupation. Since conditional process analyses also use ordinary least square regression, it could be assumed that the relevant assumptions were still given (Hayes, 2018). The analysis revealed that SC did not moderate the effect between II and NUSC, $\Delta R^2 = 0.001\%$, $F(1, 213) = 0.30$, $p = .585$, 95% CI[-.364, .206], nor the effect between NUSC and PD, $\Delta R^2 < 0.001\%$, $F(1, 212) = 0.01$, $p = .915$, 95% CI[-.059, .066]. Likewise, swapping the global SC score with one of the two general factors for PSC or RSC did not yield significance.

Given the clearly insignificant results of $H_{3.3}$ and the strong correlations found for SC with NUSC and PD, it was subsequently explored whether the prior indirect effect of NUSC ($H_{2.3}$) could be statistically explained by changes in SC. Therefore, SC was included as an additional mediator in the model. To justify the calculation of a serial instead of a parallel

mediation with SC as second mediator, it was prior tested whether the association of NUSC and SC could be solely explained by II. Hence, a partial correlation between NUSC and SC with II as control variable was computed (Hayes, 2018). Results indicated that the partial correlation was of moderate strength, $r_{SCNUSC.II} (217) = -.38, p < .001$, and only partly due to PD, as the comparison to the zero-order correlation between NUSC and SC revealed, $r (218) = -.53, p < .001$. The path diagram of the analysis (model 6 in PROCESS) is visualized in figure 5.

Figure 5

Path Diagram of the Serial Mediation Model with Standardized Coefficients



Note. The serial mediation model with standardized path coefficients and significance levels.

Total (c) = (c') + (a₁b₁) + (a₁d₁₂b₂) + (a₂b₂).

* $p < .001$.

A summary of the serial mediation model with SC as second mediator is further reported in table 4. After SC was included in the model, II significantly and positively predicted NUSC (a_1), but the effect of NUSC on PD (b_1), and thus the prior found indirect effect (a_1b_1) lost significance. SC showed a significant negative effect on PD (b_2), but II did not significantly predict SC (a_2), therefore the indirect effect (a_2b_2) was also not significant. However, II was related to PD in a two-step indirect effect, for which increases in NUSC led to decreases in SC, which in turn led to increases in PD ($a_1d_{12}b_2$). As a result, the prior indirect effect (a_1b_1) was fully mediated by SC. Furthermore, the direct effect of II on PD (c') remained significant. Age, gender, and occupation did not contribute significantly to any of the outcomes.

Table 4

Summary of the Serial Mediation Model from Instagram Intensity to Psychological Distress over Negative Upward Social Comparison and Self-Compassion

Effect	<i>B</i>	β	<i>SE</i> (HC3) ^a	<i>t</i>	<i>p</i>	95% CI ^b	
						<i>LL</i>	<i>UL</i>
<i>c</i>	.305	.378	.045	6.73	< .001	.216	.395
<i>c'</i>	.164	.203	.046	3.59	< .001	.074	.254
<i>a</i> ₁ <i>b</i> ₁ ^c	.026	.032	.022			-.017	.070
<i>a</i> ₂ <i>b</i> ₂ ^c	.040	.050	.025			-.008	.089
<i>a</i> ₁ <i>d</i> ₁₂ <i>b</i> ₂ ^c	.076	.094	.018			.044	.115
<i>a</i> ₁	.761	.406	.113	6.74	< .001	.538	.983
<i>b</i> ₁	.034	.079	.029	1.15	.250	-.024	.092
<i>a</i> ₂	-.098	-.103	.060	-1.63	.104	-.217	.021
<i>b</i> ₂	-.411	-.483	-.057	-7.25	< .001	-.522	-.299
<i>d</i> ₁₂	-.242	-.477	.032	-7.48	< .001	-.305	-.178

Note. ^a HC3: A heteroscedasticity consistent standard was used (Davidson and MacKinnon). ^b CI = confidence interval; *LL* = lower limit; *UL* = upper limit. Effects were deemed significant if CI did not include 0. ^c *SE* and CI of the indirect effects were bias corrected and accelerated (BCa) via bootstrapping. Number of bootstrap samples: 10,000. Significance testing through BCa CIs did not yield different results.

After SC was included in the model, II significantly and positively predicted NUSC (*a*₁), but the effect of NUSC on PD (*b*₁), and thus the prior found indirect effect (*a*₁*b*₁) lost significance. SC showed a significant negative effect on PD (*b*₂), but II did not significantly predict SC (*a*₂), therefore the indirect effect (*a*₂*b*₂) was also not significant. However, II was related to PD in a two-step indirect effect, for which increases in NUSC led to decreases in SC, which in turn led to increases in PD (*a*₁*d*₁₂*b*₂). As a result, the prior indirect effect (*a*₁*b*₁) was fully mediated by SC. Furthermore, the direct effect of II on PD (*c'*) remained significant. Age, gender, and occupation did not contribute significantly to any of the

outcomes.

$H_{4.1}$ stated that SC would be negatively related to II. This was confirmed with a moderate negative correlation (see table 2). $H_{4.2}$ proposed that SC would significantly predict II, even after accounting for ID and PD. A hierarchical multiple regression was conducted to test the hypothesis. Prior to that, the relevant assumptions had to be tested. The sample size of 220 was considered sufficient, considering that seven predictor variables were to be added in the model (Field, 2018). Normality, linearity, and homoscedasticity could be confirmed after visual inspection of residual and scatter plots. Case-wise diagnosis indicated one outlier, which was kept in the data since it did not represent an extreme value. Cook's distances and leverage values indicated no outliers. Independence of residuals was deemed satisfactory as there was no time series data in the present study. Multicollinearity was ruled out because the predictors were not highly correlated and collinearity statistics were well within limits (i.e., Tolerance).

A three-stage hierarchical multiple regression was computed with II as the dependent variable. In stage 1, the control variables gender, age, and occupation were added. PD and ID were included in stage 2 and finally, SC was added in stage 3. The variables were included in this order to determine if SC was an important predictor of II beyond the common control variables, and beyond theoretically plausible influences such as time spent on Instagram and SWB. Analysis revealed that adding SC in stage 3 did not contribute significantly to the explained variance of II, $\Delta R^2 < .01$, $\Delta F(1,213) = 2.47$, $p < .118$. To further explore a possible role of SC, the regression was calculated again but instead of SC, this time PSC and RSC were included as predictors in stage 3.

The results are shown in table 5. The regression revealed that in stage 1, the control variables age, gender, and occupation accounted for 5.9% of the variance in II and therefore contributed significantly to the model, $F(3,216) = 4.50$, $p = .004$. After PD and ID were introduced in stage 2, the model explained an additional 25.8% of variance in II, with this change in R^2 being significant, $F(2,214) = 40.50$, $p < .001$. The inclusion of PSC and RSC in stage 3 led to an increase of 3.6% of the variance in II, which was again significant, $F(2,212) = 6.00$, $p = .003$. When all seven variables were added to the regression model in stage 3, only ID and RSC were significant predictors of II. The best predictor of II was ID, explaining 12% in unique variance. Together, the seven variables accounted for 34.4% of the variance in II, indicating a high goodness-of-fit for the overall model (Cohen, 2013). Additionally, although $H_{4.2}$ could not be confirmed, the exploratory analysis suggested that RSC was a better predictor of II than was PD, and that RSC explained unique variance beyond the

predictive capacity of ID.

Table 5

Summary of Hierarchical Regression Analysis for Variables Predicting Instagram Intensity

Variable	β	t	p	sr^2^a	R	R^2	ΔR^2
Stage 1					.24	.06	.06
Gender ^b	-.194	-2.83	.005	.03			
Age	-.002	-0.03	.980	.00			
Occupation ^c	-.165	-2.06	.041	.02			
Stage 2					.56	.32	.26
Gender	-.108	-1.82	.070	.01			
Age	.068	0.98	.328	.00			
Occupation	-.154	-2.22	.027	.02			
PD	.301	5.08	< .001	.08			
ID	.367	6.26	< .001	.12			
Stage 3					.60	.35	.04
Gender	-.098	-1.68	.095	.01			
Age	.052	0.77	.444	.00			
Occupation	-.130	-1.91	.058	.01			
PD	.149	1.96	.052	.01			
ID	.359	6.25	< .001	.12			
PSC	.089	1.47	.144	.01			
RSC	-.268	-3.42	< .001	.04			

Note. $N = 220$. Dependent Variable = Instagram intensity. PD = psychological distress. ID = Instagram duration (min per day last week). PSC = positive self-compassion. RSC = reduced self-coldness. ^a sr^2 = semi-partial correlation squared, which indicated the unique variance explained by a predictor. ^b Gender was coded 0 = female, 1 = male. ^c Occupation was coded 0 = student, 1 = other.

To explore initial evidence for the underlying structure of RSC predicting II, subsequently, SC, PSC, and RSC were correlated with II and its subdimensions, while controlling for the influence of PD. Partial correlations are reported in table 6.

Table 6

Correlations of Self-Compassion and Instagram Intensity Controlling Psychological Distress

Control	Variable	1	2	3	4	5	6	7	8
PD ^a	1. SC	—							
	2. PSC	.80***	—						
	3. RSC	.79***	.27**	—					
	4. II	-.11	.04	-.22**	—				
	5. PE	-.14*	-.06	-.16*	.75***	—			
	6. BO	-.15*	.02	-.25***	.72***	.39***	—		
	7. OV	-.08	.07	-.19**	.76***	.44***	.45***	—	
	8. EX	.05	.07	.00	.60***	.32***	.21***	.20**	—
None ^b	9. PD	-.61***	-.29***	-.68***	.41***	.31***	.20**	.46***	.20**

Note. $N = 220$. SC = self-compassion, PSC = positive self-compassion, RSC = reduced self-coldness, II = Instagram intensity, PE = persistence, BO = boredom, OV = overuse, EX = expression, PD = psychological distress. ^a Cells contain partial correlations, controlled for PD ($df = 217$) ^b Cells contain zero-order correlations ($df = 218$).

* $p < .05$, ** $p < .01$, *** $p < .001$. (2-tailed).

The results showed that after controlling for PD, SC showed only a significant negative correlation with persistence, $r = -.139$, $p = .040$, and with boredom, $r = -.147$, $p = .029$. While PSC showed no significant partial correlation with II and its dimensions altogether, RSC significantly correlated with every dimension of II except with self-expression, $r = .002$, $p = .973$. Hence, there were clearly significant negative correlations between RSC and II, $r = -.215$, $p = .001$, and RSC and boredom, $r = -.254$, $p < .001$. Additionally, significant negative correlations were also found between RSC and persistence, $r = -.162$, $p = .016$, and RSC and overuse, $r = -.191$, $p = .004$.

Discussion

The present study investigated whether II is positively associated with symptoms of depression, anxiety, and stress, or, more broadly, with PD. Clear evidence was found in this regard. Furthermore, it was examined whether NUSC may be responsible for the positive relationship between II and PD. Again, it was confirmed that NUSC could partially explain the relationship in a statistical sense. Additionally, it was hypothesized that SC may be a protective factor in the context of high II, in that it leads to fewer NUSC on the one hand, but also protects against its negative consequences on the other. No evidence was found in this respect. However, an exploratory analysis suggested that the negative consequences for PD due to NUSC might be statistically explainable by individuals being less compassionate with themselves after engaging in said comparisons on Instagram. Similarly, it was investigated whether high SC may lead to lower II altogether, thus protecting the users from NUSC and PD. This assumption could not be confirmed. Nevertheless, further exploration suggested that this assumption may be correct for a general factor of SC, namely RSC. The division of overall SC into PSR and RSC is supported by growing but not entirely consistent evidence (Brenner et al., 2017). To increase the understanding of how SC and RSC relate to specific aspects of II that go beyond a common component of PD, a further exploratory analysis was conducted. High SC and RSC were primarily associated with using Instagram less intensely out of boredom or out of persistent involvement. In addition, RSC was negatively related to the overuse of Instagram.

The research questions were inspired by limitations and conclusions of previous findings. First, much of the currently existing evidence is based on FB (Frost & Rickwood, 2017). However, Instagram differs significantly from FB because of its media sharing focus, which makes it likely that the relationship between Instagram use and well-being differs from that of FB (Faelens et al., 2021). Since Instagram is now the most popular SNSs among young people in Germany (Statista, 2022) it is crucial to study the impact of its use on psychological health. Second, the term well-being has been used inconsistently and its associations to Instagram use may differ greatly depending on the considered indicator (Faelens et al., 2021). When looking at PD and II, it becomes apparent that the evidence in this regard is far from conclusive. The study of PD is of importance because it encompasses symptoms that are to some degree present in all healthy populations, while, at the same time, being important indicators of well-being and mental illness (American Psychological Association, n.d.). And finally, it has been shown that self-report SNSI measures (e.g., time spent, frequency of use) have limited validity (Ernala et al., 2020). The present study has

therefore used a comprehensive means of II, providing a specific perspective on the links between PD, NUSC, SC, and the most salient aspects of Instagram use.

Instagram Intensity and Psychological Distress

Consistent with previous findings, the results suggested that II may indeed be related to depressive symptoms. The ICBF provides a possible explanatory approach (Clark et al., 2018). According to the ICBF, the effects of SNSs use depend on whether the SNSs behavior results in satisfaction of needs (i.e., acceptance, belonging), or whether the exhibited behavior feels social but is not based on interaction, thus favoring social comparisons and feelings of isolation. Considering that Instagram, compared to FB and Twitter, is less focused on social interactions and more on sharing and consuming media (Meshi et al., 2015), it appears plausible that a portion of users may invest substantial amounts of their attentional resources into Instagram without getting their social needs met. Depressive symptoms such as dysphoria, lack of involvement, anhedonia, and inertia, as assessed by the study, might be favored in certain individuals after feeling isolated for too long. Additionally, according to the ICBF, NUSC may be the crucial mechanism for poorer well-being due to SNSs use. Since Instagram is particularly conducive to comparing oneself to the idealized profiles of others (Javornik et al., 2022), persistent downgrading of self-evaluations may facilitate symptoms of self-deprecation, devaluation of life, and hopelessness in certain individuals, as assessed by the depression scale of the DASS-21 (Lovibond & Lovibond, 1995).

Regarding anxiety and II, research to date is limited and shows mixed results (Faelens et al., 2021). As it may be the case for general SNSs use, the experience of anxiety due to Instagram use may depend on the type of anxiety and the type of Instagram use. Especially physical appearance anxiety through appearance comparison and fear of missing out through social or lifestyle comparisons may be relevant in the context of II (e.g., Balta et al., 2020; Couture Bue, 2020; Sherlock & Wagstaff, 2019). Due to the present study's approach, it was indicated that high II may be also associated with state anxiety symptoms such as autonomic arousal and subjective experience of anxious effects. On the other hand, anxiety had the smallest associations to II out of the three components of PD (see $H_{1.2}$).

The finding that II is related to stress appear particularly interesting because as a pair, II and stress are almost entirely unexplored. The study assessed stress as chronic non-specific arousal, which includes, for example, difficulty relaxing, being agitated, or being impatient. Accordingly, the assessed symptoms may be more widespread and fluctuating when compared to symptoms of anxiety or depression. This is further evidenced by the fact that the transformed mean score for stress ($M = 2.1$) was higher in the sample than the one for

depression ($M = 1.7$) or anxiety ($M = 1.5$). Since stress is also interrelated with depression, anxiety, and most psychopathologies (Lovibond & Lovibond, 1995), it is crucial to investigate the role of II for the experience of stress in the future. Stress due to social comparisons on Instagram may be particularly relevant for young adults, as the intraindividual range in aspects of life, such as family formation, educational degrees, or career success, is substantial at that age.

As mentioned earlier, current research suggests that the association of II and PD may depend on which indicator of PD one considers and may in some cases (i.e., anxiety) require an even higher resolution to make reliable statements (Faelens et al., 2021). However, the present study's internal consistency for the overall DASS-21 (Lovibond & Lovibond, 1995) warranted the calculation and examination of PD as a comprehensive latent variable. Further corroborating this, when recommended cut-off scores for severity labels were considered, the sample's average scores for each scale were at the low end of what constitutes a mild score, which appears reasonable for a nonclinical sample and implies quite even relations of the subscale severities to II.

However, due to the study design being cross-sectional—as most research on II and SWB—no conclusions or clear indications about causal effects can be stated (Faelens et al., 2021). What is more, an individual's experience of PD is subject to multivariate influences, and especially for individuals who do not use Instagram pathologically, it can be assumed that any effect from II on PD would only account for a small proportion of variance in PD. Therefore, an actual association of II and PD would likely be substantially smaller as found in this study. Similar limitations apply to directionality. Individual differences in personality, SWB, or age, among other things, probably influence II (e.g., Kross et al., 2021; Limniou et al., 2021; Orosz et al., 2016). In general, the addictive potential of SNSs use speaks to its function as a coping tool, predisposing certain individuals to excessive use. Future longitudinal and experimental research should investigate how, depending on the expression or manipulation of II, the scores of PD, its individual indicators, and their subtypes (e.g., physical appearance anxiety) behave.

MFIS as a Means of Instagram Intensity

To facilitate a more in-depth interpretation of the remaining results, the following section describes the individual dimensions of the MFIS and its correlates to relevant constructs (Orosz et al., 2016). At first, the dimension boredom indicates above all motivational and behavioral aspects, whereby the SNS is used to deal with unpleasant low arousal states. High values are not necessarily associated with high emotional involvement in

the SNS and, in isolation, do not tend to indicate problematic use. Next, self-expression corresponds to the motivation for self-presentation on the SNS, relates positively to extraversion, and is best able to predict typical SNS behavior such as liking and posting. High self-expression also implies affective components, meaning a passion for the SNS. This passion can become obsessive and thus harmful; however, self-expression does not relate to SNS addiction and only slightly to overuse, hinting at a nature that is only problematic to a limited extent, as assessed by the MFIS. On the other hand, individuals high in the dimension persistence are very emotionally involved in the SNS, have strongly integrated it into their everyday life, and attach great value to it. Persistence is positively related to online sociability, liking, and posting. On the downside, persistence also positively correlates with obsessive SNS passion and with SNS addiction. It seems that SNSs persistence is not inherently problematic but can be understood as a prerequisite of addiction. And lastly, overuse is related to excessive use and SNS addiction. Compared to more pathology focused scales, however, overuse appears capable to assess problematic behavior outside and on the low end of the addiction spectrum. Furthermore, overuse correlates positively with neuroticism.

In conclusion, the MFIS is a comprehensive survey instrument that seems capable to assess relevant motivational, affective, and behavioral aspects of SNSs use in healthy populations. At the same time, three of the four dimensions are related to either SNSs addiction or obsessive use. Therefore, it seems conceivable that high scores on the MFIS would more often indicate problematic use behavior than, for example, high self-reported frequency of SNSs use. This might be the reason why the study found such substantial associations between II and PD or its indicators.

The correlates of the MFIS allow to make assumptions about the ICBF on Instagram. According to the ICBF, passive SNSs use is crucial for negative consequences on SWB, while active use may lead to more positive outcomes (Clark et al., 2018). However, the MFIS links the dimensions of self-expression and persistence to potentially harmful attitudes toward SNSs use as well as to active uses such as liking, posting, and online sociability (Orosz et al., 2016). Since the present study found strong relations between II and PD, this may suggest that active use is less relevant on Instagram and therefore has less impact on SWB as may be the case for other SNSs. This may be because Instagram favors overall more passive consumption and social comparison due to its media sharing focus. Additionally, Instagram appears to promote active and complex social interactions (e.g., discussions) to a lesser extent than FB does for example (Frost & Rickwood, 2017; Meshi et al., 2015).

In this sense, while the ICBF may theoretically apply, Instagram's environment might encourage passive use in a way that dividing positive and negative consequences based solely on active and passive use would not be purposeful. Comparably, a recent review suggested that active and passive use may be too broad as distinctions to find meaningful associations to well-being (Valkenburg et al., 2022). The content, its senders, and receivers seem to strongly influence the associations. Additionally, the present study suggests that this may be also the case for the environment of certain SNSs. This assumption is strengthened by a survey, according to which in March 2020 the three most popular Instagram activities in the United States were "Watch other people's Instagram Stories," "Browse your feed for posts from Instagram friends or accounts you follow," and "Watch a video in your feed," all activities attributed to passive use (Statista, 2021a). Therefore, in the context of Instagram use, eliciting the MFIS accompanied by other distinctions of use behavior that are mentioned in the further course could be more meaningful. However, this suggestion is not rooted in specific findings to active and passive use and can therefore just act as an implication for future research.

There are also limitations to the use of the MFIS in this study, though. In addition to the limited comparability to other measures of II, the MFIS was originally designed for FB. Therefore, the same holds true for its incremental validity and previously discussed correlates, that are, obsessive FB use, FB addiction, liking and posting behavior on FB, and online sociability on FB. Although the covered dimensions in the MFIS are in theory general enough to correspond well to Instagram, the complex differences between SNSs (Meshi et al., 2015) indicate the necessity to clarify the validity of the MFIS for Instagram. Nevertheless, considering the limitations of other SNSs self-report means (Ernala et al., 2020), the approach of this study appears feasible. This is also implied by the moderate to strong association of II and the objective measure of Instagram use ID, $r(218) = .44, p < .001$. Another limitation of the results discussed so far is that the complexity and consequences of SNSs use are likely due to different mechanisms (e.g., Keles et al., 2020). Therefore, the present study also examined the influence of NUSC.

NUSC as an Underlying Mechanism

The slight majority of previous findings support a weak to moderate positive association of II and social comparison (Faelens et al., 2021). The moderate to strong positive association for II and NUSC ($r = .41$) found in the present study may, again, be partly due to the MFIS. Compared to other means of II, the MFIS dimensions seem to be stronger predictors of NUSC, which is evident by the nonsignificant correlation of NUSC and ID, $r = .12, p = .085$. Why individuals engage in II this way might be rooted in personality aspects

and motivations for SNSs use, that are precursors of NUSC and mapped by the MFIS. As mentioned before, neuroticism positively relates to social comparison (Rozgonjuk et al., 2019) and envy on SNSs (Wallace et al., 2017). Envy on the other hand, is more frequently assessed in people who use FB to gather information, seek attention, or pass time. Since a proportion of individuals use Instagram probably with the same motivations (Sheldon & Bryant, 2016), which are at least in part assessed by the MFIS (Orosz et al., 2016), the II assessed in the present study may precede NUSC. The strong association between II and NUSC may also be influenced by the study using general items for NUSC which do not survey specific domains of USC. Previous research often focused specifically on appearance comparison on Instagram (e.g., Modica, 2020). Particularly the NUSC item ("...I often think that others have a better life than I do.") should be sensitive for comparison dimensions including lifestyle, social standing, or skills. To summarize, depending on the operationalization II and social comparisons may well be significantly interrelated and relevant in the context of Instagram use.

Similarly, the study demonstrated that NUSC on Instagram was substantially positively related to PD. An explanation for this finding may lie in the NUSC items specifically targeting contrasting upward social comparisons. This was intended to prevent the assessment of assimilating upward and contrasting downward social comparisons that may enhance self-evaluations and thereby possibly buffer the investigated strength of association between social comparison and PD (Park & Baek, 2018). The viable formulation of the items is also hinted at by the mean score of NUSC ($M = 2.92$, $SD = 1.26$), as it can be difficult to assess social comparison in a way that participants admit when they have compared themselves socially (Buunk et al., 2005; Verduyn et al., 2020).

Prior studies that have examined social comparison as a partial mediator between II and well-being are rather rare and have focused mainly on appearance comparison (Faelens et al., 2021). Only one study has shown that USC was a mediator between II and trait anxiety as well as depressive symptoms (Sherlock & Wagstaff, 2019). To properly interpret the partial mediation of the present study, the violation of *temporal precedence* as an assumption for mediation analysis must be discussed. Temporal precedence is relevant because in principle, mediation analyses imply causality whereby the change in the independent variable occurs before the mediator, which in turn occurs before the dependent variable. Proving this assumption is hardly possible with a cross-sectional design (Hayes & Rockwood, 2020). Moreover, PD is influenced by multiple variables, and the relationship between II and PD is likely bidirectional. Even when considering past experimental studies for the general

association between SNSI and SWB, no definitive causal statements can be made because of, for instance, high temporal variability in the experimental conditions (Kross et al., 2021). However, this is also why the present study—alongside many others—used mediation analysis with cross-sectional data.

According to Hayes and Rockwood (2020), causal inference cannot be based on a statistical procedure alone. To make a causal claim, many assumptions need to align, which depend on convincing theoretical argument and sound study design, backed up by statistical evidence. Instead, Hayes and Rockwood (2020) suggest that any mathematical procedure can inform the questions asked of the data because mathematics are not the inference, but the study design determines suitable interpretations. Hence, mediation analysis with correlative data can be informative if the study design is sound, and the interpretation is appropriate to the nature of the data. The present study aimed to account for this by choosing items for NUSC that logically take place between II and PD. Moreover, the limitations for interpretability were held in awareness when the study was designed.

The results suggested that the statistical association between II and PD could partially be explained by NUSC, implying that NUSC is likely to be involved if there is a causal effect altogether. However, it cannot be stated that there is a causal effect, for how much variability II accounts in PD, that the actual effect is unidirectional, that there are no other relevant predictors, or that no other constructs are involved in the investigated indirect pathway. Nevertheless, most of these limitations also account for better powered research designs.

Since about one-third of the total association between II and PD was statistically attributable to NUSC, the results are in line with social comparison theory (Festinger, 1954) and previous findings that Instagram users may, similar to the offline world, engage a lot in contrasting upward social comparisons (Yoon et al., 2019). Moreover, this would be in favor of the present study's assumption that the greatest threat to PD due to Instagram use may come from contrasting upward social comparisons (Feltman & Szymanski, 2018; Park & Baek, 2018) and that Instagram invites for ability rather than opinion comparison (Yang et al., 2018). In line with self-presentation theory (Goffman, 1990), it can also be assumed that Instagram's environment is well suited for NUSC with idealized content and that people may, despite better knowledge, not process idealized profiles as what they are.

However, there are further limitations to interpretability. For one thing, since NUSC was assessed nonspecific, the study cannot make statements to what extent the comparisons were based on appearance, lifestyle, or other dimensions. Similarly, NUSC was measured with only 3 items, one of which was excluded. While the two remaining items have

frequently been used in the past (e.g., Pang, 2021), future research should formulate more valid and reliable items for NUSC and assess the specific comparison dimensions.

Overall, the results are consistent with the ICBF insofar that social comparisons on SNSs appear to be important mechanisms for well-being. However, as mentioned earlier, it might be useful to investigate further subdivisions on Instagram besides or instead of active and passive use. The ICBF suggests that passive use and social comparison might be particularly harmful if information about the comparison subject is missing, because this may make it harder to realize the idealization of other profiles (Clark et al., 2018). On Instagram, the new feature "Instagram Reels" —which was created in 2020— is gaining popularity (Menon, 2022). Reels are similar in format to Instagram Stories in that they allow short videos to be created and consumed, but they are typically rather aimed at being entertaining and at gaining a wider viewer reach. Consequently, consumers of Reels mostly do not know the senders personally. The potential relevance of the familiarity to the sender was underlined by a review to active and passive SNSs use (Valkenburg et al., 2022) and by one study, which found that the association of II and depressive symptoms became stronger when users followed more strangers on Instagram (Lup et al., 2015).

In addition, a very recent study suggested that key motivations for Reels use include, among others, socially rewarding self-promotion, entertainment, escape, and surveillance (Menon, 2022). Since these motivations are consistent with the motivations more often exhibited by users prone to envy on SNSs and social comparison (Appel et al., 2015; Wallace et al., 2017), the use of Reels and accompanied motivations should be examined in the future. For this purpose, the MFIS provides a solid basis as previously discussed. Moreover, future studies might want to investigate how social comparison behaves depending on how much Reels are consumed, to what extent users are personally familiar with the senders of their overall consumed content, and as how idealized users perceive the consumed content. This may help advance the knowledge about the ICBF in general but also about social comparison in the context of Instagram use. Furthermore, future prospective and experimental studies should explore directionality, causes, and temporal mechanisms of action (e.g., how long negative emotional effects of NUSC last, how long-term effects behave).

The accounted control variables did not contribute significantly to the results. Although women and college students tended to show slightly higher II and PD, and age was weakly negatively related to PD, there was no significant relation to NUSC.

As mentioned earlier, however, the central interest of the present study was not only whether social comparisons on Instagram are relevant to well-being, but also which

individual differences may foster or protect against them. Therefore, the role of self-compassion was investigated in addition.

The Protective Role of Self-Compassion

SC was investigated in part because of its conceptual similarities to SE (Neff & Vonk, 2009). Evidence indicates that social comparative internet use can reduce state SE, and that passive Facebook use is positively related to lower SE and depressive tendencies as a long-term effect, mediated by higher social comparison orientation (Ozimek & Bierhoff, 2020). However, since the self-referential nature of SC is less evaluative than that of SE, it was hypothesized that SC may play a moderating rather than a mediating role around the occurrence and consequences of social comparisons.

The analysis clearly showed nonsignificant interactions. One reason for that may lie in SC being strongly related to the outcomes of interest regarding the interactions, namely NUSC and PD. Although corresponding negative associations were assumed, the shown associations were stronger than expected in the prespecified study. Statistically speaking, given the strong single effects that SC exerted on NUSC and PD, the interaction effects at different levels of SC would have had to reach considerable strength to reach significance, relative to the single effects (Aberson et al., 2020). Thus, interactions might in principle exist without the research design being able to detect them. Compared to the studies in the literature review that examined SC as a moderator, it appears also conceivable that the variables in the present study were too general and therefore too strongly related to SC to detect an interaction. After all, one of the studies looked at body concerns instead of PD as outcome (Seekis et al., 2021), while the other study examined the profile Problem Users instead of II as a predictor (Phillips & Wisniewski, 2021).

On the other hand, the strong correlation of SC and NUSC may also indicate that, contrary to the study's expectations, SC may have an underlying mediating function. Instead of NUSC leading to poorer self-evaluations and thus lower contingent SE in the sense of SE, repeated social comparisons may lead to a decrease in the buffering effect of the cognitive-emotional reframing of SC, as proposed along the relative standards theory (Diener & Diener, 1995). The decrease in cognitive-emotional reframing may in turn lead to negative peaks due to NUSC not being buffered, hence leading to more PD. Support for this is provided by intervention studies suggesting that brief and even micro-interventions may affect state SC and thus influence well-being (Gobin et al., 2022; Slater et al., 2017). Moreover, SC interventions seem to be particularly effective in reducing self-criticism, which should be a fundamental aspect of social comparison (Wakelin et al., 2022). Therefore, an exploratory

serial mediation model was examined in which SC was located as a mediator between NUSC and PD. Since the indirect effect via NUSC lost significance, the results suggested that the previously found indirect effect of NUSC was fully statistically explainable by differences in SC. Furthermore, it should be mentioned that the exchange of SC with RSC in the model would have led to the indirect effect of II on PD via SC become significant, while the two-stage indirect effect would have remained significant. This indicates the relevance of RSC for the studied links. Although being male and age were slightly positively related to SC (see table 2), the control variables that were considered showed no significant influence in any of the examined models.

The last hypothesis was investigated to consider the possibility that high SC might not actively protect against NUSC but instead cause individuals to protect their well-being by using Instagram less intensely. Likewise, it would be conceivable that this is the case for a portion of individuals with high SC, or that SC fulfills multiple roles. Similar but not yet consistent evidence is found for SE (Martinez-Pecino & Garcia-Gavilán, 2019). To explore the extent to which lower II due to SC may be based on the link between SC and SWB, PD was included as predictor. Moreover, due to the differences between the MFIS and more conventional measures of II, ID was included as a predictor to explore whether SC explained unique variance in MFIS that predicted harmful use of Instagram.

Results showed that not SC, but only PD and ID were significant predictors of II. Exploratory, the same analysis was repeated, but instead of the total score SC, the two general factors PSC and RSC were included. This time the results showed that only RSC and ID were significant predictors of II. This suggests that PD was a better predictor of II than SC, but that RSC was an even better predictor of II than PD. The fact that RSC and not PSC significantly predicted II can be interpreted as an indication that the harshness towards oneself in the face of adversity is crucial for II and its consequences, but that the positive side, that is, how gentle or caring someone is towards the self, has less predictive relevance. This appears reasonable in the light of NUSC, as the harm of negative self-evaluations should be primarily determined by how harsh someone is on themselves. Future research might investigate whether high PSC more frequently leads to other types of social comparison such as assimilating upward social comparisons. Because RSC explained unique variance of II that went beyond ID and PD, it was then explored how SC, PSC, and RSC, related to II and its dimensions, while controlling for PD.

The analysis indicated that PSC showed no significant associations with the separate dimensions of II, and that the significant associations of overall SC were more strongly

expressed by RSC for each dimension. Therefore, only the results of RSC were considered in more detail. Noticeably, when controlling for PD, the strongest association of RSC was found for the dimension boredom. Since boredom was identified as a dimension that was in principle less related to problematic use behavior (Orosz et al., 2016), this might indicate that individuals high in RSC tend to fill their free time less with neutral Instagram use than with different activities which are deemed meaningful. Other significant negative associations were found between RSC and persistence as well as overuse, the dimensions most closely related to problematic use (Orosz et al., 2016). These associations may be interpreted as the components, in which RSC uniquely acts in a protective way against harmful components of II. In addition, PD was strongly associated with these dimensions, suggesting that the association of RSC's protective role for PD may be of central relevance in this regard as well. Lastly, there was no association between RSC and self-expression, although PD was positively related to self-expression. This suggests that the tendency to be harsh with oneself was not related to the motivation for self-expression on Instagram, which is consistent with findings on the rather unproblematic nature of self-expression (Orosz et al., 2016). For the cases in which self-expression becomes obsessive and leads to PD, other mechanisms may be at work.

Based on these findings some general assumptions can be made. On one hand, RSC might be an important construct that determines how intensely, and risk associated people engage in Instagram. This would be in line with previous research indicating that SC acts as a protective component favoring better self-regulation of health behaviors (Biber & Ellis, 2019). Furthermore, the findings are in favor of previous suggestions that the SCS would be more informative when summed up into the two general factors PSC and RSC. In the past, the theoretical rationale for an overall score of SC was that people are complex beings that can simultaneously hold positive and negative attitudes toward themselves on a common component. However, the results support the assumption that the positive and negative components of SC are more likely to be separate constructs that have separate predictive qualities (Brenner et al., 2017). It was suggested in the past that RSC may be especially relevant in predicting indicators of psychopathology such as anxiety, depression, and stress.

This distinction might have consequences for self-compassion as a theoretical concept. Overall SC may be less of an innate self-referential concept such as global SE, but more a set of attitudes or cognitions that help to frame aspects of life in a favorable manner. To gain a more thorough understanding of the concept, research needs to deconstruct SC more frequently (MacBeth & Gumley, 2012) and investigate how the single factors of the

SCS (Neff, 2003b) and the two general factors PSC and RSC may be involved in investigated models and interventions designed to improve SC. For instance, it is not entirely clear whether successful SC interventions change overall SC, or if they primarily operate on the main component mindfulness (MacBeth & Gumley, 2012). In a similar sense, future work needs to assess how stable the changes from SC interventions are (Wakelin et al., 2022) and to what extent certain aspects of SC may directly reflect indicators of psychopathology rather than condition it (MacBeth & Gumley, 2012). It is conceivable that to some degree people report more SC when they suffer less and that when stress increases, state SC decreases consequently. This would be consistent with the theoretical assumptions based on which the serial mediation with SC as second mediator was conducted in the present study.

Furthermore, future research should investigate models in which aspects such as self-worth, contingent SE, global SE, overall SC, PSC, RSC, and state measures of single and overall SC (Neff et al., 2021) are considered in the context of II, PD, and NUSC. This could provide more insight into how social comparisons on Instagram behave but also how SE and SC intertwine and are weighted as concepts in relation to the self-worth of an individual. Prospective and experimental studies are needed to make specific statements about the function of SC and RSC. Due to the cross-sectional study design, it is not possible to determine directionality and therefore the extent to which SC or RSC may play the role of antecedent, underlying mechanism, or long-term outcome. However, the present study provided exploratory evidence as a basis for deeper understanding, for instance by identifying the MFIS as related to NUSC and by identifying RSC as related to specific dimensions of the MFIS. Another key limitation stems from the fact that the findings on SC of the present study are not the results of pre-formulated hypotheses but exploratory post-hoc analyses. This considerably reduces the statistical power, which is why the findings should only be used to guide future inquiries.

General Discussion and Conclusion

All in all, the present study investigated and identified several meaningful research gaps in the relationship between SNSs use and SWB. A key contribution stemmed from assessing II with the MFIS, whereby it was demonstrated that II can be substantially associated with NUSC and PD in nonclinical populations. In this regard, the popularity of Instagram among young adults underscored the need to further investigate how the platform in isolation may impact psychological health.

Size and characteristics of the present sample add a significant contribution to the overall interpretability. The proportion of students limited the generalizability for the

assessed age group; however, a significant proportion of participants was employed, which is not a given for cross-sectional studies in psychology. It was established that occupation did not make a substantial difference to any of the results. In addition, gender was relatively evenly distributed, which was often not the case in SNSs research and very rare when SC was concerned in addition (e.g., Phillips & Wisniewski, 2021; Seekis et al., 2021). Hereby, too, no major differences for gender were identified in the results.

The study indicated that it is useful to examine NUSC without focusing on just one comparison domain. Moreover, suggestions were made about how research might adapt to the particularities of Instagram in order to ask purposeful questions in the future. While confirming evidence for the importance of NUSC on Instagram was found, the present study cannot make definitive statements whether SC is an aspect of individual differences that can in one way or another protect against the possible risks of Instagram use. Nevertheless, it could be shown that SC might be involved in NUSC and II and that especially reduced self-criticism may be a construct of relevance.

It could be derived that all investigated variables may be interrelated in a relevant way. On the other hand, future inquiries should consider that those variables are all related to neuroticism (Balta et al., 2020; Neff et al., 2007; Orosz et al., 2016; Rozgonjuk et al., 2019; Wallace et al., 2017) and commonalities may therefore be partly attributable to personality dimensions. Furthermore, one key limitation to mention is the cross-sectional study design, which is why—besides other repeatedly mentioned drawbacks—social desirability and possible biases cannot be ruled out. Nevertheless, the study has provided important incentives based on which prospective and experimental studies can generate more knowledge about how crucial construct of Instagram use and well-being relate to each other; where exactly the variables might be located in a model; and to what extent the associations function in a causal or maintaining manner.

Practical implications need more preceding examination but the promising results of SC interventions against self-criticism suggest that there may lie an antidote to the risks for psychological health young adults face when using Instagram.

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List of Abbreviations

SNSs (social networking sites)	6
FB (Facebook)	6
SNSI (social networking site use intensity).....	7
FIS (Facebook Intensity Scale).....	8
SWB (subjective well-being).....	8
PD (psychological distress).....	10
II (Instagram use intensity)	10
MFIS (Multidimensional Facebook Intensity Scale).....	12
USC (upward social comparison)	14
ICBF (Interpersonal-connection-behaviors framework).....	14
NUSC (negative upward social comparison).....	16
SE (self-esteem).....	18
SC (self-compassion).....	18
SCS (Self-Compassion Scale).....	28
DASS (Depression, Anxiety and Stress Scale).....	29
SCS-D (Self-Compassion Scale - German Version)	30
PSC (positive self-compassion)	31
RSC (reduced self-coldness).....	31

Appendix A

Abstract English

Previous research has repeatedly linked social comparison on social networking sites to decreases in well-being, yet little is known about individual differences that act as protective factors in this relationship. The present cross-sectional study examined whether the association of Instagram use intensity and psychological distress was mediated by upward social comparison, and whether self-compassion acted as a moderator by attenuating the occurrence and impact of upward social comparison. Additionally, it was investigated whether higher self-compassion predicted lower Instagram use intensity overall. An online survey yielded a final sample of 220 individuals (55% female) between 18 and 29 years of age. Results indicated significant positive associations for Instagram intensity, psychological distress, and an indirect effect for upward social comparison; however, self-compassion did neither moderate the investigated associations nor did it predict Instagram use intensity. Nevertheless, a series of exploratory analyses revealed that, among other things, the indirect effect of upward social comparison could be fully mediated by changes in self-compassion. The study generated relevant new findings and recommendations for future research. The promising success rates of self-compassion interventions may prove to be important in protecting vulnerable users of Instagram from adverse effects on their emotional health.

Abstract German

Frühere Forschung hat wiederholt auf soziale Vergleiche als zugrundeliegenden Mechanismus zwischen der Nutzung sozialer Netzwerke und einer Verschlechterung des Wohlbefindens hingedeutet. Weniger ist jedoch über individuelle Differenzen bekannt, die in dieser Beziehung als Schutzfaktor agieren könnten. Die vorliegende Querschnittsstudie hat untersucht, ob der Zusammenhang aus Instagram-Nutzungsintensität und psychischen Belastungen durch maladaptive soziale Vergleiche mediiert wurde, und ob Selbstmitgefühl als Moderator fungierte, indem es das Auftreten und die negativen Konsequenzen der maladaptiven Vergleiche abschwächte. Zusätzlich wurde untersucht, ob ein hohes Maß an Selbstmitgefühl eine insgesamt geringere Instagram-Nutzungsintensität vorhersagte. Eine Online-Erhebung ergab eine finalen Stichprobe von 220 Personen (55% weiblich) im Alter zwischen 18 und 29 Jahren. Während signifikante positive Assoziationen für die Instagram-Nutzungsintensität und psychische Belastungen sowie einen indirekten Effekt anhand maladaptiver sozialer Vergleiche gefunden wurden; moderierte Selbstmitgefühl weder die interessierenden Zusammenhänge noch konnte es die Instagram-Nutzungsintensität vorhersagen. Eine Reihe von explorativen Analysen ergab jedoch, dass unter anderem der

indirekte Effekt der maladaptiven sozialen Vergleiche vollständig durch Veränderungen des Selbstmitgefühls mediert werden konnte. Die Studie generierte relevante neue Erkenntnisse und Empfehlungen für zukünftige Forschung. Die vielversprechenden Erfolgsraten von Interventionen zur Förderung des Selbstmitgefühls könnten sich in Zukunft als wichtig erweisen, um gefährdete Nutzer von Instagram vor negativen Auswirkungen auf ihre emotionale Gesundheit zu schützen.

Appendix B

Power analysis

To ensure sufficient statistical power for all analyses, the sample calculation was based on the present study's most elaborate model, the conditional process analysis; though even for a simple mediation, the sample calculation needs several estimates for all variables involved and has therefore limited precision. This becomes even more complex for the conditional process analysis. One recommendation is to base the sample calculation on a simple mediation and to combine it with rules of thumb for interactions (Aberson et al., 2020). Hence, since the present study expected attenuation by the moderator, the sample should have been at least double the size than a simple mediation would have required.

The present study took two approaches to determine the necessary sample size. On one hand, the study oriented itself on sample and effect sizes of related papers with similar statistical models and elicited constructs (e.g., Vries & Kühne, 2015); on the other hand, a sample estimate was calculated with initial data and the online tool "MCpwrMed" by Schoemann et al. (2017). All in all, it was concluded that the study should have at least about 180 participants for approximately sufficient power.