adolescents and late adolescents[6]. There were no differences in social comparison orientation, social comparison and feedback seeking, appearance-contingent self-worth, approval from others-contingent self-worth, depressive symptoms, social competence, and self-perceived physical attractiveness (all *p*'s>.035), and no differences in actively and passively using Instagram, checking Instagram, number of people followed and followers, number of posts, and length of account (*p*'s>.195).

How are Adolescents Allocating their Visual Attention when Browsing Instagram?

The primary outcomes for the visual attention analyses were time to fixation for each feature, as well as total time viewing each post. For visual attention analyses, including correlations, prior exposure to the posts (reported 27.2% of the time; dummy coded 0=first time viewing, 1=viewed prior), post word count (broken up by username, image, likes, caption, and comments), and quality of image were controlled for. As some posts (23.8%) also included location information (placed under the username), location word count was also controlled for. A multilevel analysis examined if feature predicted time to fixation. The estimated marginal means were obtained to examine the average amount of time participants took to visually attend to each feature, and the pairwise comparisons were inspected to examine how time differed across the different features. The overall analysis for feature was significant, $F(4, 1454)=2156.81$, $p<.001$. Participants took the quickest amount of time (in seconds) to look at the image ($M=0.45$, $SE=.01$); this was significantly quicker than the other four features (*p*'s<.001). Participants next visually attended to the username ($M=1.77$, $SE=.04$) and the caption ($M=1.84$,

[6] Regressions were also run examining if gender significantly interacted with age in predicting any of the individual difference and Instagram use variables; no interactions were significant (*p*'s>.042).

SE=.02); these two features did not differ from each other (*p*=.531), but did differ from the likes and the comments (*p*'s<.001). Participants visually attended to the likes (*M*=2.05, *SE*=.03) and comments (*M*=2.06, *SE*=.02) last, with these two features not significantly differing from each other (*p*=1.00). These findings do not account for instances where the participant did not look at a specific feature. Participants did not look at the username of the post 64% of the time, the image .3% of the time, the likes 56% of the time, the caption 25% of the time, and the comments 27% of the time[7]. Therefore, although the analysis reveals the general pattern of attention when participants look at all five features, it is important to note that the majority of the time, the username and the likes were not visually attended to at all[8].

Due to the unexpectedly long time it took for participants to look at the likes, an exploratory follow-up analysis was run examining if participants looked at the likes more quickly for certain types of content (e.g., peer content faster than other types of content). Image category (see *What types of content are adolescents exposed to on Instagram* below) was included as a categorical predictor and time to fixation to the likes as the outcome, with the estimated marginal means obtained and pairwise comparisons inspected to see if certain categories' likes were looked at more quickly. The overall analysis was significant for category,

[7]Average estimates for the multilevel analysis were computed for each feature with instances where the participant did not look at the feature counted as missing and not included in the analysis. Data removals for each feature were independent from each other. For example, the estimate for the image was obtained with .3% of posts removed, whereas the estimate for the likes was obtained with 56% of posts removed; thus, average estimates were not computed based only on posts where all five features were attended.

[8]Exploratory chi-square tests examined if these percentages varied based on gender and age group (early-to-middle adolescents versus late adolescents). For gender, there were significant differences for the username, caption and comments (*p*'s<.008). Girls did not look at the username 62% of the time, and boys did not 70% of the time. Girls did not look at the caption 26% of the time, and boys did not 20% of the time. Girls did not look at the comments 29% of the time, and boys did not 20% of the time. There were no significant differences in terms of age group (*p*'s>.020).

F(4, 835)=4.89, *p*=.001. Adolescents looked at the likes (in seconds) for 'non-people other' images the quickest (*M*=1.87, *SE*=.08), followed by peer images (*M*=2.01, *SE*=.06), celebrity and athlete images (*M*=2.07, *SE*=.07), adults and/or children images (*M*=2.10, *SE*=.13), and finally text-based images and memes (*M*=2.28, *SE*=.08). The only significant pairwise comparison was between other images and text-based images and memes (*p*<.001). Additionally, a series of exploratory binomial logistic regression analyses were done using multilevel modeling, to examine if participants were more likely to look at the likes of certain types of content at all. Whether or not participants looked at the likes was categorically coded as the outcome (0=looked, 1=did not look) and the image categories dummy coded, with the condition of interest used as the reference group. These analyses were not significant (*p*'s>.020).

Next, a multilevel analysis was run to examine if approval from others-contingent self-worth and age predicted time to fixation to the likes. Gender and race/ethnicity were controlled for due to the disproportionate distribution across age. Approval from others-contingent self-worth significantly predicted time to fixation to the likes, but the direction was opposite than expected, *b*=0.11, 95% CI [0.04, 0.19], *SE*=.04, *p*=.002; participants who were higher in approval from others-contingent self-worth took longer to visually attend to the number of likes. Age was not a significant predictor (*b*=-0.04, 95% CI [-0.08, 0.01], *SE*=.02, *p*=.130), and the interaction between age and approval from others-contingent self-worth was not significant (*b*=-0.04, 95% CI [-0.07, -0.01], *SE*=.02, *p*=.020). Due to the high frequency of participants not visually attending to the likes at all, a follow-up exploratory binomial logistic regression analysis was done using multilevel modeling, in order to examine if participants higher in approval from others-contingent self-worth were more likely to look at the likes at all, versus not looking at the

likes. Gender and race/ethnicity were again controlled for. Approval from others-contingent self-worth, age, and the interaction between approval from others-contingent self-worth and age were not significant predictors (*p*'s>.330).

A multilevel analysis was run examining if participants spent more time looking at peer content, with total time viewing as the outcome and image category (using the five main categories) as the predictor. The estimated marginal means were obtained and the pairwise comparisons inspected to see if the image categories differed from each other. The overall effect for image category was significant, $F(4, 1896)=4.74$, $p=.001$. Participants viewed (in seconds) images of peer content the longest ($M=3.16$, $SE=.06$), followed by text-based images and memes ($M=3.13$, $SE=.06$), celebrities and athletes ($M=3.07$, $SE=.06$), adults and/or children ($M=2.99$, $SE=.09$), and non-people other ($M=2.94$, $SE=.06$). Peer content was only viewed significantly longer than other content ($p=.001$); differences between peer content and the remaining categories, as well as the remaining categories between each other, were not significantly different from each other (*p*'s>.019). A follow-up exploratory analysis was also run examining if age interacted with image category in predicting total time viewing, with image category dummy coded and the peer category used as the reference group. Race/ethnicity and gender were controlled for. No interaction was significant (*p*'s>.069).

What Content are Adolescents Exposed to on Instagram, and How do they Report Experiencing This Content?

Frequencies of image category can be found in Table 3. Percentages for individual categories are reported; however, due to low cell sizes, categories were grouped together based on similarities. Specifically, all peer-related categories were grouped together, celebrities and

models were grouped with sports and fitness due to sharing a common theme of fame (as the coding process revealed the sports and fitness posts were overwhelmingly of professional athletes), and landscapes/scenery, entertainment, retail, news and politics, pets/animals, and food were grouped together due to sharing a common theme of not focusing on people ('non-people other'). Adults and/or children, although uncommon, was left as an individual category as it did not group well with any other category. Text-based images and memes were left as an individual category due to its high frequency. Images of peers were most common, followed by celebrities and athletes, text-based images and memes, non-people other, and finally adults and/or children. Frequencies of each caption category were examined to investigate how often each type of category occurred. The most commonly occurring category was factual information, with 50.9% of captions coded as containing factual information. Prosocial talk was second most common (24%), followed by capitalization (22.5%), self-promotion (14.6%), song lyrics and phrases (5.7%), motivation (4.1%), and social aggression (3.3%).

Two multilevel analyses were run to examine if images were more frequently rated as being positive or negative, and if comments were more frequently rated as being positive or negative. The estimated marginal means were obtained and the pairwise comparisons were inspected to examine if codes of positivity and negativity differed from each other, for each of the images and the comments. Image negativity and comment negativity were not square root transformed for this particular analysis, as the aim of these analyses was to observe their actual occurrence. The analysis examining the valence of the image was significant, $F(1, 2097)=1745.14$, $p<.001$. Images were rated higher on positivity ($M=2.68$, $SD=1.60$) than negativity ($M=1.10$, $SD=0.42$; $p<.001$). The analysis examining the valence of the comments was

significant, $F(1, 1750)=1299.37$, $p<.001$. Comments were rated higher on positivity ($M=2.45$, $SD=1.16$) than negativity ($M=1.22$, $SD=0.59$; $p<.001$).

A series of ANCOVAs were run examining if boys and girls differed in the types of image categories followed, as well as the valence of the image and the comments to which they were exposed. Age was controlled for in the analyses. The image categories were summed across the ten posts, and the valence of the image and the comments were averaged across the ten posts. The analysis for text-based images and memes followed was significant, $F(1, 205)=8.20$ $MSE=54.55$, $p=.005$, with boys following more meme content ($M=3.38$, $SD=3.16$) than girls ($M=1.89$, $SD=2.40$). There were no gender differences for following peers, celebrities and athletes, adults and/or children, and other types of content (p's$>.021$). The analysis for positivity of the image was significant, $F(1, 205)=12.63$, $MSE=9.69$, $p<.001$, with girls exposed to more positive images ($M=2.83$, $SD=0.85$) than boys ($M=2.23$, $SD=0.97$). The analysis was not significant for image negativity ($p=.656$). The analysis for positivity of the comments was significant, $F(1, 205)=25.70$, $MSE=9.09$, $p<.001$, with girls exposed to more positive comments ($M=2.60$, $SD=0.60$) than boys ($M=2.05$, $SD=0.58$). The analysis for negativity of the comments was not significant ($p=.031$).

Reports of social comparison-related emotions. To examine the differential frequency of endorsing upward contrastive, upward assimilative, and downward assimilative emotions, multilevel modeling was used. The estimated marginal means were obtained and the pairwise comparisons were inspected to examine if the reports of the types of emotions significantly differed from each other. Upward contrastive and downward assimilative emotions were not square root transformed for this particular analysis, as the aim of these analyses was to observe

their actual occurrence. The overall effect of emotion type was significant, $F(2, 2061)=1050.47$, $p<.001$. Reports of upward assimilative emotions were reported most frequently ($M=2.42$, $SD=1.19$), and were reported significantly more than upward contrastive ($M=1.21$, $SD=0.45$) and downward assimilative emotions ($M=1.18$, $SD=0.49$; $p<.001$). Upward contrastive emotions and downward assimilative emotions did not differ from each other ($p=.037$).

Relational tie to the poster and similarity to the poster were then examined as predictors of upward assimilative emotions. Relational tie was a significant predictor, $b=0.16$, 95% CI [0.11, 0.21], $SE=.02$, $p<.001$, as was similarity, $b=0.22$, 95% CI [0.17, 0.26], $SE=.02$, $p<.001$. Thus, when viewing posts from closer others and others perceived as more similar, participants reported experiencing greater upward assimilative emotions. However, these findings should be considered in the context of the frequency of when these questions were not applicable, with participants selecting "Does Not Apply" for 56% of the posts for relational tie, and 33% of the time for similarity. Thus, results should be interpreted cautiously due to the limited data.

How do Adolescents' State Self-Esteem and Self-Perceptions Change after Browsing, and do Certain Individual Differences and Browsing Experiences Moderate These Changes?

Descriptive statistics, correlations, and preliminary analyses. ANCOVAs controlling for age were run to examine if there were significant gender differences in average levels of the browsing experience variables: upward assimilative emotions, upward contrastive emotions, downward assimilative emotions, comparison, relational tie, and similarity. None of these analyses were significant (p's>.021). Correlations between the browsing experience variables are reported in Table 4, correlations between the total amount of time each type of image was

viewed and individual difference variables are reported in Table 5, and correlations between the browsing experience variables and individual difference variables are reported in Table 6.

As seen in Table 4, greater levels of image and comment positivity were associated with greater levels of participants' reports of comparison. Image and comment positivity were also associated with greater reports of upward assimilative and contrastive emotions, and lower repots of downward assimilative emotions. Greater image and comment negativity were associated with lower upward assimilative emotions and greater downward assimilative emotions. As seen in Table 5, greater peer content was correlated with greater image and comment positivity, and approval from others-contingent self-worth. It was also associated with lower image negativity. Greater celebrity and athlete content was associated with greater upward assimilative emotions and image positivity. Greater text-based images and memes content was associated with lower upward assimilative emotions, and image positivity and comment positivity; it was also associated with greater image and comment negativity. Other content was associated with lower reports of comparison and image positivity. As seen in Table 6, participants' reports of comparison while browsing was associated with greater social comparison orientation, social comparison and feedback seeking, appearance-contingent self-worth, and approval from others-contingent self-worth. Time to fixation to the likes was correlated with lower self-perceived attractiveness. Relational tie and similarity were both associated with greater self-perceived social competence, and relational tie was associated with younger age. Reports of upward contrastive emotions was associated with greater online social comparison and feedback seeking and depressive symptoms, and negatively with self-perceived attractiveness. Image positivity was correlated with greater approval from others-contingent self-worth.

Changes in state self-esteem and self-perceptions. To examine changes in state self-esteem and self-perceptions from before to after browsing the Instagram posts, multilevel analyses were run with time effects coded (-.5=pre-browsing, .5=post-browsing). For all moderation analyses reported below, the moderator was grand-mean centered and an interaction term was formed with time. Significant interactions were broken down by examining each moderator at lower (-1 SD) and higher (+1 SD) levels. Adolescents reported significant increases in state self-esteem, *b*=2.22, 95% CI [0.66, 3.78], *SE*=.79, *p*=.005, and non-significant decreases in positive self-perceptions, *b*=-2.36, 95% CI [-4.27, -0.46], *SE*=.97, *p*=.015, after browsing Instagram. Exploratory analyses with age (controlling for race/ethnicity and gender) suggested no significant moderation (*p*'s>.019).

***Moderation by browsing experiences*.** Moderation analyses for state self-esteem are presented in Table 7, and for positive self-perceptions in Table 8. The interaction between time and each moderator is reported in the tables. Analyses were first run examining if average reports of upward assimilative emotions, downward assimilative emotions, and upward contrastive emotions moderated changes in state self-esteem and positive self-perceptions. These analyses were not significant (*p*'s>.070). Similar analyses were run examining if average levels of image-coded positivity and negativity, and comment-coded positivity and negativity, moderated changes in state self-esteem and positive self-perceptions; effects from these analyses were also not significant (*p*'s>.014). Analyses subsequently examined if average levels of relational tie to the poster, similarity to the poster, and comparison to the post moderated changes in state self-esteem and positive self-perceptions. Analyses were not significant (*p*'s>.012), except for relational tie predicting positive self-perceptions (*p*=.001). Participants who reported lower

average relational tie decreased in positive self-perceptions, *b*=-5.62, 95% CI [-8.57, -2.68], *SE*=1.49, *p*<.001; participants who reported higher relational ties did not change, *b*=1.23, 95% CI [-1.69, 4.15], *SE*=1.48, *p*=.407. Similar analyses were run examining if average time to fixation to the likes moderated changes in state self-esteem and positive self-perceptions, with word count (averaged across posts), quality (averaged across posts), and prior exposure to the posts (summed across posts) included as controls. Time to fixation to the likes was not a significant predictor (*p*'s>.499).

Moderation by individual differences. Next, a series of analyses were run examining if the individual difference variables significantly moderated changes in state self-esteem and positive self-perceptions. Analyses for the body image variables (appearance-contingent self-worth and self-perceived physical attractiveness) also controlled for gender and BMI. No effects in these analyses were significant (*p*'s>.012).

CHAPTER 4

DISCUSSION

Adolescents' high use of SNSs, particularly Instagram, highlights the need to examine how they are interacting with this content, and how these interactions may reflect their developmental needs. This study examined how younger and older adolescents are interacting with Instagram by utilizing eye-tracking technology and observational coding. In doing so, this research aimed to understand a) how adolescents are allocating visual attention to content that they follow on Instagram; b) what types of content they are following on Instagram and how they report experiencing this content; and c) how their state self-esteem and self-perceptions are immediately influenced after browsing this content, and how individual differences may moderate these relations. Overall, there was mixed support for hypotheses.

Associations with General Instagram Use

The most frequent correlate with indices of general Instagram use was technology-based social comparison and feedback seeking. This construct correlated with checking Instagram, and both number of people followed and number of followers. As technology-based social comparison and feedback seeking inherently requires using SNSs to a higher degree (Nesi & Prinstein, 2015), it follows that it would be positively correlated with SNS behaviors. It is interesting that it was also correlated with number of followers, something that users, to some extent, have limited control over due to Instagram's non-reciprocal nature of following and being followed. As a key component of social comparison and feedback seeking is obtaining feedback from others, individuals who are higher in this construct may be determined to accrue a larger audience that will provide this feedback. Although following others/being followed is non-

reciprocal on Instagram, it is possible that users may follow a large amount of others with the hope that these individuals will follow them back.

It is also worth noting that perceived social competence was positively associated with both number of people followed and number of followers, although the latter association was not significant with the more stringent p-value. Individuals who are more socially skilled may feel more comfortable following others on Instagram, and in turn, may be more likely to be followed back. Moreover, individuals who are more socially skilled are also likely of higher social status, and therefore are more likely to obtain a larger following on Instagram.

Last, self-reported passive Instagram browsing was not associated with poorer well-being, as measured by depressive symptoms, self-perceived social competence, or self-perceived physical attractiveness. The framework utilized in this study suggests that passively browsing Instagram would be linked to lower well-being via upward social comparisons (Verduyn et al., 2017). Previous survey research suggests a negative correlation between passive SNS use and well-being (Frison & Eggermont, 2015; Rousseau, Eggermont, & Frison, 2017; Thorisdottir et al., 2019). However, other research is inconsistent (e.g., the association is only observed for girls and women; Frison & Eggermont, 2016). These discrepancies could be a result of measurement differences, with previous research often focusing on browsing other people's profiles (e.g., Frison & Eggermont, 2016; Rousseau et al., 2017), which may provide a qualitatively different experience than browsing SNSs as a whole. Moreover, these null results could be an artifact of the recruited sample, with the younger adolescents appearing to be rather high in overall psychosocial adjustment, and the older adolescents rather unique in their demographic composition (i.e., race/ethnicity).

How are Adolescents Allocating their Visual Attention when Browsing Instagram?

Participants viewed the image of a post most quickly, followed by the username and the caption, and then finally the likes and comments. The slower fixation time to the likes is counter to hypotheses. Although it is possible that adolescents may be more interested in obtaining other information about the post via the other features before assessing the number of likes, additional findings indicated that adolescents frequently (over half of the time) did not even look at the likes that a post received. Recent literature examining adolescent SNS use suggests that the likes may be particularly compelling for adolescents, as it is a quantifiable index of social approval (Blease, 2015; Sherman et al., 2016). These findings suggest that the like feature may not be of high importance to an adolescent browsing through his or her feed. Instagram itself has voiced concerns over how the like feature could impair mental health (Leventhal, 2019); however, if adolescents are not attending to the likes, it seems unlikely that this feature may heavily influence well-being.

With that said, it is possible that the likes play a larger role for the poster of Instagram content, and that after a user posts something on Instagram, he or she may be more careful to attend to other posters' likes as a source of comparison. Notably, exploratory analyses suggested that certain types of content may more quickly draw attention to the likes than others, although most comparisons between these types of content were not significant, with the exception of the likes of 'non-people other' content being attended to more quickly than text-based images and memes content. A large amount of posts in the other category consisted of retail and entertainment posts, which often focused on promoting some type of product or service. Adolescents may be drawn to the likes for these posts as it may be an index of the popularity of

the product or service, which may drive their desire to acquire the product or service. In contrast, adolescents may find the like index for text-based images and memes as less compelling, as this information may not be of practical use to them. Thus, a ripe line for future research would be to examine which types of content may be more captivating in terms of the number of likes.

It was also expected that participants whose self-worth is highly contingent on approval from others would be particularly quick to fixate on the number of likes; however, the opposite pattern was observed. Perhaps these individuals are less interested in the number of likes that others receive, and instead would be more interested in the number of likes that they themselves receive. Additionally, it was expected that younger adolescents would also look at the likes more quickly; there was no evidence supporting this prediction, which was surprising as previous research has indicated that earlier adolescents place stronger importance on popularity (Gavin & Furman, 1989). Again, this could be an artifact of the sample: correlations between age and the individual difference variables suggest that the sampled younger adolescents reported overall more adaptive psychosocial adjustment. Therefore, these individuals may have been more secure in their overall sense of self, and may be less interested in an index that may serve to sway this sense of self. Alternatively, other platforms such as Snapchat may be more important for early adolescents engrossed by popularity. Whereas Instagram may be filled with relationships that are classified as "weak ties" (e.g., acquaintances or strangers), Snapchat may more commonly be used to enhance closer relationships (Vaterlaus, Barnett, Roche, & Young, 2016), perhaps including those in the school peer group. Specifically, Snapchat's presentation of streaks (i.e., sending a Snap to a particular person several days in a row) and story views (i.e., how many people viewed the content a user uploaded) may serve a better index of popularity as these

indices may be more closely affiliated with one's immediate peer group. Additionally, half of participants reported having "finsta" accounts, which are commonly used to connect to a select group of close others. This study had participants log into their regular Instagram account, and interacting with posts on "finsta" accounts may be a qualitatively different experience regarding popularity and social status.

There were few correlates between time to fixation to the likes and both participants' browsing experiences and individual difference variables, suggesting that time to fixation to the likes is not necessarily associated with poorer adjustment. In fact, one of the few significant findings indicated that participants who reported higher self-perceived physical attractiveness looked at the likes more quickly. It is unclear what may be driving this effect. Perhaps those who are less satisfied with their physical attractiveness may be busy closely examining the image, particularly if it depicts highly attractive people, whereas those more satisfied with their physical attractiveness may spend less initial time examining the image and instead fixate on other features of the post. However, more research is needed to replicate and examine this association further.

It was also predicted that adolescents would spend the longest time looking at peer content, as it was expected that this content would be most relevant to them. Although adolescents did spend the longest amount of time looking at peer content, this did not significantly differ from any other category, with the exception of the non-people other category. There was also no significant interaction with age. Notably, one previous eye-tracking study found that self-reported interest in a certain type of SNS post was not associated with greater visual attention to the post (Vraga et al., 2019). For the current research, it is possible that the

study design limited the extent to which adolescents could fully attend to each type of post. For example, due to constraints with the eye-tracker, only a certain number of comments were captured and displayed, and participants were unable to view other comments if they were present. Adolescents may spend more time interacting with peer posts via these comments, whereas they may be less interested in interacting with the comments for other types of posts. Thus, the null findings could be because the interface of the presented posts prevented adolescents from fully interacting with posts in a way that they normally would (i.e., in a way that would fulfill their developmental needs).

What Content are Adolescents Exposed to on Instagram, and How do they Report Experiencing This Content?

Instagram posts were most commonly coded as depicting peer content, followed by celebrities and athletes, text-based images and memes, non-people focused other, and adults and/or children. This is in line with co-construction theory suggesting that there is a strong overlap between adolescents' offline and online lives (Subrahmanyam & Greenfield, 2008; Subrahmanyam & Smahel, 2012; Subrahmanyam et al., 2006): because adolescents are engrossed with their peers offline (W. A. Collins, 1997; W. A. Collins, & Laursen, 2004), they should also be engrossed with their peers online. That being said, peer content only comprised of less than one-third of the content followed, with a sizable amount of celebrity and athlete posts identified, as well as text-based images and memes. Previous research suggests that adolescents report following their favorite celebrities through SNSs (MacIsaac et al., 2018). Thus, celebrity culture appears to be an important element of adolescents' Instagram experiences. Of interest is how following this culture may influence adolescents' own SNS habits, with some evidence

suggesting that adolescents aim to imitate the self-presentation style exuded by many celebrities (MacIsaac et al., 2018). Meme content also appears to be an important interest for many adolescents. Previous research has illustrated the versatile nature of meme content: memes can be inspirational (Dale et al., 2019; Rieger & Klimmt, 2019a, 2019b), yet also oppressive (Glăveanu, de Saint-Laurent, & Literat, 2018) and sexist (Drakett, Rickett, Day, & Milnes, 2018). Formally coding the content of the text-based images and meme posts obtained in the current research was beyond the scope of the study; however, the coding process revealed that although each of these categories were observed, many text-based images and memes were intended to be humorous without being offensive. With that said, the presence of incendiary content on the participants' Instagram feeds is cause for concern, particularly as this content may trigger or enhance bias (Duchscherer & Dovidio, 2016).

In line with the wealth of research suggesting that a positivity bias exists on SNSs (Reinecke & Trepte, 2014), images were coded higher on positivity than negativity, although the average level of positivity was not as high as one may expect, with the average falling below the midpoint of the scale. This is likely due to the versatile nature of the content adolescents followed. Total number of text-based images and memes was strongly negatively correlated with average levels of image positivity, and non-people other was moderately negatively correlated with image positivity. As these two categories accounted for approximately two-fifths of content, it is likely that they brought the overall average down. It was also expected that this positivity bias would be reflected in the captions; however, the frequencies of positively valenced categories (e.g., prosocial talk, capitalization, self-promotion, and motivation) were relatively low, ranging from nearly one-fourth of captions for prosocial talk to only 4% for motivational

content. Despite this, Instagram does seem to be an outlet for transmitting positive, textual content in addition to images, as prosocial talk was still present in a notable amount of captions. Capitalization was also present in a notable amount of captions (23%), suggesting that the caption can be used for the poster to further elaborate on a positive event or experience. Self-promotion content was rarer (15%), indicating that Instagram users may be less likely to use this space to brag about the self, perhaps because it may lead to perceptions of being unlikeable (e.g., Yau & Reich, 2019).

The positive text content was also observed in the comments, with comments more likely to be coded for positivity than negativity. This is in line with previous research that suggests that feedback on SNSs tends to be highly positive (Rideout et al., 2018; Valkenburg et al., 2006). Notably, however, comment positivity fell below the midpoint of the scale. Comment negativity was coded infrequently, in line with previous research suggesting that negative feedback is rare (Koutamanis et al., 2015; Valkenburg et al., 2006). Comment positivity was strongly positively correlated with total number of peer posts and strongly negatively correlated with number of text-based images and memes (suggesting that the overall average may have again been lowered by the frequency of this type of content). Comment negativity was moderately positively correlated with number of text-based images and memes. These correlations suggest that certain types of comments may be more normative for specific types of posts, and that users may be more inclined to leave positive feedback for their peers but less inclined for text-based images and memes content.

There were also a number of notable associations between types of content followed, image valence, comment valence, and individual differences. Namely, boys followed a greater

amount of text-based images and memes compared to girls, and the content that girls followed was coded higher on image positivity and comment positivity compared to boys. Several studies have suggested that SNS use may be linked to lower well-being more strongly for adolescent girls than boys (Kelly et al., 2018; Twenge et al., 2018; Thorisdottir et al., 2019), including specifically between passive use and well-being (Frison & Eggermont, 2016). Perhaps these findings can be partially explained by type of content followed. If girls are more likely to follow highly positive content that could elicit upward social comparisons, greater use may therefore relate to lower well-being. Comment positivity is especially concerning, as the coding process revealed that many of these comments were highly appearance-oriented, and previous research suggests that exposure to positive appearance-oriented comments on Instagram increases body dissatisfaction in female undergraduates (Tiggemann & Barbato, 2018). On the other hand, if boys are more likely to follow meme content, this may have little influence on their well-being. With that said, however, the content of memes may influence boys in other ways.

Types of content followed as well as valence of the image and the comments were generally not significantly associated with the remaining individual difference variables. One exception was that following greater peer content was associated with greater approval from others-contingent self-worth. These individuals' sense of self-worth is especially dependent on how they believe others view them. If adolescents are particularly engrossed by their peers, individuals higher in this trait may be especially likely to follow peer content in hopes of having their peers follow them back, thus accruing a larger audience that could provide feedback over Instagram. In addition, image positivity was weakly-to-moderately positively correlated with approval from others-contingent self-worth. This is likely an artifact of how peer content was

also generally coded higher on image positivity; indeed, a follow-up partial correlation controlling for total peer content followed rendered this correlation non-significant (p=.066).

As content was generally coded as higher in positivity, it follows that participants also reported experiencing upward assimilative emotions while browsing. Notably, the average was at the mid-point of the scale, suggesting that participants did not report excessively high levels of inspiration, admiration, and optimism. These emotions were endorsed with greater frequency than upward contrastive emotions (envy, resentment, and depression/shame) and downward assimilative emotions (pity, sympathy, and fear/worry), which is similar to the ordering observed in previous research (Park & Baek, 2018). However, both sets of upward contrastive and downward assimilative emotions were reported at rather low rates, suggesting that participants did not commonly experience them while browsing. These findings have important implications for the application of the upward social comparison framework in understanding how browsing SNSs may negatively impair well-being (Verduyn et al., 2017). Far less research has been conducted that examines how browsing SNSs may elicit positive upward comparisons, but some studies suggest that reports of upward assimilative emotions on SNSs may be linked to improved well-being (Meier & Schäfer, 2018; Park & Baek, 2018). As upward contrastive emotions are often the assumed mechanism in understanding the effect of passive browsing on well-being, future studies should broaden this focus to upward assimilative emotions as well, particularly because upward contrastive emotions were endorsed at such a low rate. Importantly, however, it is possible that upward contrastive emotions may be experienced more in certain situations, such as browsing particular people's profiles (e.g., Burnell et al., under review); it may just be that

upward contrastive emotions were endorsed less due to the Instagram feed containing a variety of content that may not necessarily evoke these emotions.

However, upward contrastive emotions were not correlated with following a greater amount of any type of image category. In contrast, average levels of upward assimilative emotions were weakly-to-moderately positively correlated with following celebrity and athlete content, and negatively correlated with following text-based images and meme content. Thus, there is some evidence that certain types of content may be more (or less) likely to evoke certain types of emotions. Notably, although feelings of admiration, inspiration, and optimism may be more likely to be endorsed in the moment when viewing celebrity and athlete posts, it is possible that the effects of this over time may be more negative. For example, if the celebrity or athlete is depicting themselves in a way that an adolescent perceives as attainable (e.g., a celebrity showcasing his or her beauty; an athlete showcasing his or her fitness skills), the adolescent may strive to emulate what is being depicted; if these attempts are unsuccessful, it may accumulate in feelings of envy and depressive symptoms over time. The adolescent may be more likely to perceive that the goal is unattainable, and the psychosocial benefits accrued in the upward assimilation process may be lost (e.g., Mills, Polivy, Herman, & Tiggemann, 2002; Lockwood & Kunda, 1997).

It is also important to note that certain types of people were more likely to report experiencing certain types of emotions. Specifically, those greater in technology-based social comparison and feedback seeking, as well as those who reported greater depressive symptoms and lower self-perceived physical attractiveness, were more likely to report experiencing upward contrastive emotions when browsing. As those higher in technology-based social comparison and

feedback seeking inherently make more social comparisons when using SNSs, it follows that they would report experiencing more contrastive emotions when browsing a sample of posts from their Instagram feeds. However, it is interesting to note that this relation did not extend to upward assimilative and downward assimilative emotions, which are also expected to result from making social comparisons. Thus, those higher in this trait may be more likely to make negative comparisons while browsing, which has important implications for their well-being. Moreover, those who reported greater depressive symptoms also reported greater upward contrastive emotions, which is in line with previous research suggesting that those higher in depressive symptoms may make more harmful social comparisons (Appel et al., 2015; Robinson et al., 2019; Swallow & Kuiper, 1988; Wheeler, 2000). Those lower in self-perceived physical attractiveness also reported greater upward contrastive emotions; previous research suggests that the effect of browsing idealized media images may be enhanced for those with preexisting body concerns (Ferguson, 2013). Perhaps this is due to a greater tendency to experience upward contrastive emotions when viewing this content (e.g., Corning, Krumm, & Smitham, 2006).

All three types of comparison-related emotions were weakly and positively correlated with total time viewing each post, as was general comparison to the post. This suggests that adolescents may pay more visual attention to content that is more likely to evoke social comparisons. Thus, it is important to consider the effects of this over time, as focusing more on comparison-inducing posts may accumulate negative comparison-related emotions (both upward contrastive and downward assimilative), which may impair well-being overall. With that said, the correlation size across the three different types of emotions was comparable, and therefore it is possible that experiencing upward assimilative emotions may counteract these effects

(although as described above, it is possible that repeatedly encountering upward assimilative emotion-inducing content over time may negatively influence well-being).

Specific features of who is posting the content may also influence the types of social comparison-related emotions browsers experience. Both relational tie to the poster and similarity to the poster predicted reports of upward assimilative emotions, which is in line with previous research suggesting that people tend to assimilate to comparison targets perceived as more similar and closer (R. L. Collins, 2000; Mussweiler & Strack, 2000). Thus, if people tend to follow individuals with whom they are closer, as well as individuals who they perceive as more similar to the self, they may be more likely to experience positive effects when browsing. Notably, both similarity and relational tie were weakly, positively correlated with downward assimilative emotions. If a more similar or closer individual posted about a negative event on Instagram, adolescents may be more likely to experience a downward assimilative reaction to it, which results in a negative emotional experience (e.g., experiencing feelings of pity, sympathy, and fear/worry).

How do Adolescents' State Self-Esteem and Self-Perceptions Change after Browsing, and do Certain Individual Differences and Browsing Experiences Moderate These Changes?

It was expected that adolescents would report decreases in state self-esteem and positive self-perceptions after browsing a sample of Instagram posts pulled from their Instagram feeds. However, adolescents actually reported increases in state self-esteem, and marginally significant decreases in positive self-perceptions. As established, the posts pulled from the Instagram feeds were quite eclectic. It is possible that exposure to this diverse content may differentially influence adolescents depending on the domain. To some extent, the measure of state self-esteem

measured current affect, as participants were asked how they currently felt about the self. Participants may have enjoyed the opportunity to browse through their Instagram feeds, particularly if they were interested in seeing what their peers were up to, or if they enjoyed viewing humorous meme content. However, given that this content was more prominently positive, browsing it may have negatively affected interpersonally-oriented constructs (in terms of the extent to which one felt appealing to others, popular, physically attractive, confident, valued, and accepted). In particular, given the higher reports of upward assimilative comparison-related emotions, participants may have felt optimistic or inspired in the moment, thus increasing their state self-esteem, but still may have perceived some type of shortcoming compared to the people they were viewing, thus decreasing their positive self-perceptions.

These changes were generally not moderated by browsing experiences, coded content, or by individual differences, with one exception. Participants who reported lower relational tie to the poster, on average, decreased in positive self-perceptions, whereas those who reported greater relational tie to the poster did not change in their reports of positive self-perceptions. Thus, as suggested above regarding how being closer to the poster of a given Instagram post may be adaptive in terms of social comparison emotions experienced, this finding suggests that this adaptive effect may extend to immediate well-being. As for the remaining null effects, the content may have been too eclectic to elicit consistent moderation effects across browsing experiences and individual difference traits in the moment. However, once again, it is possible that these effects may be observed when considered over time, or when browsing specific profiles. In addition, the null effects could be because the browsing time was too short: participants' average total time of viewing for each post was approximately ten seconds,

indicating that they spent an average of one to two minutes browsing through the ten posts. Likewise, the number of stimuli could be too few; one meta-analysis found trend-level evidence suggesting that exposure to fewer idealized media images more weakly negatively impacted appearance satisfaction than exposure to a greater amount of images (Want, 2009).

Despite these null findings, there were several significant correlations between the individual difference variables and the browsing experience variables (beyond the comparison-related emotions, as outlined above), that are worth noting and may have implications for long-term effects. Specifically, participants' reports of comparison were moderately, positively correlated with social comparison orientation, technology-based social comparison and feedback seeking, appearance-contingent self-worth, and approval from others-contingent self-worth. All of these traits are rooted, to some extent, in an individual's tendency to compare (either in general, through digital communication, or by assessing one's self-worth). Reports of comparison while browsing, although positively correlated with upward assimilative and downward assimilative emotions, was especially strongly positively correlated with upward contrastive emotions. Thus, although the individual difference variables may not have necessarily been correlated with upward contrastive emotions in the moment, it is possible that individuals higher in these traits may engage in a greater amount of harmful comparisons over time, which in turn may detrimentally influence well-being. In addition, self-perceived social competence was weakly-to-moderately positively correlated with both relational tie and similarity, suggesting that individuals who are more socially skilled may be more likely to a) follow individuals perceived as closer on Instagram, and/or b) perceive similarity between themselves and the people that they follow. This, in turn, may have more adaptive effects.

Strengths and Limitations

Strengths of this study include its multimethod design, namely its use of eye-tracking technology to obtain objective reports of adolescents' visual attention as they browse through posts pulled from their Instagram feed, as well as its use of observational coding to objectively assess the types of content adolescents are exposed to on Instagram. Moreover, this study was strengthened by its focus on examining real content that adolescents expose themselves to on Instagram, thus enhancing ecological validity.

However, findings need to be considered in the context of several limitations. First, despite efforts to recruit adolescents from multiple schools and letters detailing the study sent to the parents of nearly one thousand students, parent response was quite low and therefore the sample was supplemented by late adolescents recruited from a college campus. Thus, results may not generalize to a wider set of adolescents. Second, although the focus on real Instagram content that adolescents are following was a strength, it also hindered internal validity. This may have introduced noise that attenuated certain effects, specifically when understanding the effects that browsing may have upon well-being. Third, in order to maximize power for the eye-tracking analyses, a true experimental design was not implemented when examining the effects of browsing. The observed findings may have been influenced by factors other than browsing, such as the passage of time. By randomly assigning participants to either browse their Instagram feeds or to a control, researchers could better ascertain if this type of browsing uniquely influences state well-being, by eliminating possible confounds (e.g., time, possible anxiety resulting from participating in a research study). Fourth, there were high levels of missing data for the time to

fixation analyses due to participants frequently not looking at specific features. Conclusions stemming from these analyses should be interpreted with caution.

Fifth, the sample of posts obtained from participants was not necessarily a random sample of posts from their feed, as the first ten posts were obtained. The first posts to appear after logging into Instagram are contingent on an algorithm that factors in both users' interest with certain types of posts and the recency of a given post, with posts deemed to be of greater interest and that are more recent displayed first (Instagram, 2019). Based on this algorithm, it can be reasoned that the posts observed were more relevant to participants; however, due to the complexity of the algorithm (which also factors in user posting frequency, general use frequency, and number of followers), it is possible that the obtained sample was not representative of what participants typically follow. Sixth, Instagram's interface is constantly changing and therefore participants' experiences during the course of this study may not reflect future experiences. Indeed, shortly after the completion of data collection, Instagram announced its intention to begin hiding the number of likes from the feed (Mosseri, 2019). However, it is important to note that the like feature, although it may vary in name and form, is also common on other SNS platforms (e.g., Facebook, Twitter, YouTube). Thus, findings regarding this feature may have important implications for how users interact with, and are affected by, alternative platforms. Finally, a computer was used to pull and browse through Instagram posts; Instagram is one of the most popular smartphone apps (Stolyar, 2019), and therefore it is likely that adolescents primarily use their phone to access Instagram. Phones may provide a qualitatively different experience than browsing Instagram using a computer. Likewise, the standardization process

required to examine visual attention altered the natural format of Instagram posts, which could further provide a qualitatively different browsing experience.

Conclusions

This study provides important insights on how adolescents are using Instagram. First, adolescents may not be paying as close attention to the like feature as one may think, at least from the perspective of the browser. Therefore, strategies used to minimize the harm that this feature is suspected to have, although well-intentioned, may be misplaced. However, future research should utilize methods that consider how one's own posts may play a role in the relation between viewing others' likes and well-being, as findings may differ once this consideration is made. Second, findings indicate that adolescents follow an eclectic set of content on Instagram, suggesting that broad assessments of use may be inappropriate, as they may not truly capture the diverse experiences that adolescents may have when on Instagram. The effects of following meme content are likely very different than the effects of following celebrity content, and general assessments of frequency of Instagram use would not capture this. Third, despite this mixed content, findings did support that the positivity bias does exist to some extent on Instagram, with the image and the comments coded somewhat positively. Although there was little evidence on exposure to this content affecting state self-esteem and self-perceptions in the moment, it is possible that negative effects may accumulate over time. Fourth, although these negative effects may occur, it was also observed that in the moment, participants reported relatively positive emotional reactions to their browsed content (i.e., feelings of inspiration, admiration, and optimism). These emotions were enhanced when viewing posts that were from individuals rated higher in relational tie and similarity. Thus, the overall negative picture

commonly painted about young people's SNS use (e.g., Twenge et al., 2018), may not be as bleak as it seems (e.g., Heffer, Good, Daly, MacDonell, & Willoughby, 2019; Orben & Przybylski, 2019). Finally, this study demonstrates the importance of how individual differences may influence adolescents' Instagram experiences, with constructs such as gender, approval from others-contingent self-worth, technology-based social comparison and feedback seeking, depressive symptoms, perceived social competence, and perceived physical attractiveness all associated with particular browsing experiences. In all, findings suggest that adolescents' Instagram experiences vary, depending on who they are and what type of content they follow.

APPENDIX

TABLES

Table 1. *Factor analysis examining social comparison-related emotions.*

	Upward Assimilative	Upward Contrastive	Downward Assimilative
Inspiration	.91		
Admiration	.83		
Optimism	.76		
Depression/shame		.69	
Resentment		.57	
Envy		.55	
Pity			.84
Sympathy			.64
Fear			.45

Table 2. *Zero-order correlations between Instagram use variables and individual difference variables.*

	1	2	3	4	5	6	7	8
1. Age	--							
2. Checking	-.02							
3. Browse	.03	.48**						
4. Active	-.22**	.39**	.18**	--				
5. Follow	.09	.26**	.10	.22**	--			
6. Followers	.14*	.24**	.07	.17*	.73**	--		
7. Posts	.28**	.11	-.09	.07	.16*	.16*	--	
8. Length	.43**	.09	.06	.00	.28**	.32**	.38**	--
9. SCO	.18**	.09	.09	-.10	.05	.03	.04	.03
10. SCFS	.26**	.24**	.17*	.00	.22**	.26**	.11	.11
11. COSW-Appearance	.37**	.09	.05	-.12	.12	.10	.16*	.18**
12. COSW-Approval	.24**	.03	.05	-.13	.01	.03	.02	.02
13. Depress	.29**	-.06	-.01	-.15*	.02	.07	.16*	.09
14. Soc Comp	-.17*	.01	-.06	.07	.19**	.17*	-.12	-.06
15. Phys Att	-.18*	.09	.06	.15*	.07	.08	.02	-.04
Mean	17.33	4.38	3.33	2.81	530.70	510.92	53.21	45.27
SD	2.13	1.50	1.83	1.61	372.83	392.57	194.38	24.85

Table 2, continued. *Zero-order correlations between Instagram use variables and individual difference variables.*

	9	10	11	12	13	14	15
9. SCO	--						
10. SCFS	.52**	--					
11. COSW-Appear	.40**	.46**	--				
12. COSW-Approval	.51**	.47**	.52**	--			
13. Depress	.25**	.32**	.30**	.20**	--		
14. Soc Com	-.03	-.08	-.22**	-.19**	-.30**	--	
15. Phys Att	-.30**	-.30**	-.39**	-.38**	-.39**	.35**	
Mean	3.36	2.22	4.73	3.85	1.63	2.71	2.42
SD	0.67	0.90	1.09	1.22	0.49	0.69	0.79

Note. Posts and number of people followed were square root transformed; number of posts was still skewed after transformation, so six extreme outliers (3 SD above the mean) were removed. Values for means and standard deviations are non-transformed. Mean length is reported in months. SCO=Social comparison orientation. SCFS=Social comparison and feedback seeking. COSW-Appearance=Appearance-contingent self-worth. COSW-Approval=Approval from others-contingent self-worth. Depress=Depressive symptoms. Soc Com=Perceived social competence. Phys Att=Perceived physical attractiveness.
**p<.01, *p<.05

Table 3. *Frequencies of image categories.*

Category	Frequency
Peer	30.1%
Peer Groupie	2.0%
Peer Gathering – Non Groupie	13.0%
Peer Travel	2.4%
Peer Selfie	4.3%
Peer – Non Selfie	8.4%
Celebrities and Athletes	23.8%
Celebrities and Models	22.5%
Sports and Fitness	1.3%
Adults and/or Children	4.5%
Text-based Images and Memes	22.6%
Non-People Other	18.9%
Landscapes	3.5%
Entertainment	2.2%
Retail	6.1%
News and Politics	1.3%
Pets and Animals	1.4%
Food	1.9%
Other	2.6%

Table 4. *Correlations between browsing experience variables and coded valence variables.*

	1	2	3	4	5	6	7	8
1. TTV	--							
2. TTF-Likes	.52**	--						
3. Comparison	.13**	.03	--					
4. Tie	.02	.10	.12**	--				
5. Similarity	.08**	.10*	.21**	.61**	--			
6. UAE	.17**	.06	.24**	.25**	.28**	--		
7. UCE	.11**	.04	.46**	.06	.04	.12**	--	
8. DAE	.07**	.02	.20**	.10**	.11**	.07**	.36**	--
9. Image Pos	.01	-.02	.20**	-.07*	-.14**	.16**	.15**	-.13**
10. Image Neg	.03	.06	-.04	.01	.04	-.11**	.01	.24**
11. Comment Pos	-.03	-.06	.10**	-.03	-.05	.09**	.08**	-.13**
12. Comment Neg	.03	.03	-.04	-.01	.01	-.11**	-.01	.14**
Mean	10.45	5.01	2.12	2.72	2.75	2.42	1.21	1.18
SD	8.09	4.77	1.59	1.83	1.57	1.19	0.45	0.49

Table 4, continued. *Correlations between browsing experience variables and coded valence variables.*

	9	10	11	12
9. Image Pos	--			
10. Image Neg	-.23**	--		
11. Comment Pos	.45**	-.18**	--	
12. Comment Neg	-.16**	.20**	-.29**	--
Mean	2.68	1.10	2.45	1.22
SD	1.60	0.42	1.16	0.59

Note. TTV=Total time viewing. TTF-Likes=Time to fixation to the likes. UAE=Upward assimilative emotions, UCE=Upward contrastive emotions. DAE=Downward assimilative emotions. Pos=Positivity. Neg=Negativity. UCE, DAE, Image Neg, and Comment Neg were square root transformed for all correlations. Word count, quality, and prior viewing were controlled for with TTV and TTF-Likes correlations. Raw means and SDs are reported. **p<.01, *p<.05

Table 5. *Correlations between frequency of viewing each image category and browsing experience variables, coded valence categories, and individual difference variables.*

	1	2	3	4	5
1. Peer	--				
2. Celeb	-.43**	--			
3. Adults	-.03	-.04	--		
4. Memes	-.50**	-.32**	-.18*	--	
5. Other	-.29**	-.18*	-.08	-.17*	--
6. TTV	-.02	-.01	.02	-.01	.03
7.TTF-Likes	.03	-.06	-.03	.10	-.02
8. Comparison	.13	.00	.07	-.03	-.20**
9. Tie	.04	.01	.11	-.10	.01
10. Similarity	-.05	-.06	-.04	.09	.08
11. UAE	.03	.21**	-.06	-.23**	.04
12. UCE	.10	.08	.00	-.14*	-.08
13. DAE	-.16*	.11	-.11	.14*	-.06
14. Image Pos	.49**	.37**	.13	-.68**	-.36**
15. Image Neg	-.23**	-.17*	.00	.48**	-.11
16. Comment Pos	.55**	.05	.14*	-.61**	-.12
17. Comment Neg	-.16*	-.07	-.10	.31**	-.06
18. SCO	.07	-.01	-.02	-.04	-.02
19. SCFS	.15*	.00	.02	-.11	-.06
20. COSW-Appear	.08	.01	.02	-.03	-.10
21. COSW-Approval	.19**	-.04	.09	-.12	-.13
22. Depress	.04	.06	-.14*	-.08	.06
23. Soc Comp	.05	-.08	.11	.02	-.05
24. Phys Att	-.09	.09	-.05	.05	-.03
25. Age	.04	.03	-.02	-.17*	.17*
Mean	3.00	2.38	0.45	2.26	1.89
SD	2.89	2.44	0.79	2.66	1.79

Note. Image categories were summed across the ten posts. Browsing experience variables were averaged across the ten posts. Image quality (averaged across posts), prior exposure (summed across posts), and word count (averaged across posts) were controlled for total time viewing and time to fixation-likes analyses. Analyses with age were run controlling for gender and race/ethnicity. UCE, DAE, Image Neg, and Comment Neg were square root transformed. **p<.01, *p<.05

Table 6. *Correlations between individual difference variables and browsing experience variables.*

	SCO	SCFS	COSW-Appear	COSW-Approval	Depress	Soc Comp	Phys Att	Age
TTV	.06	.01	.06	.06	.08	-.02	-.04	-.09
TTF-Likes	.14	.03	.11	.19*	.14	-.12	-.21**	.02
Comparison	.25**	.38**	.28**	.26**	.20	.01	-.13	.12
Tie	-.11	-.03	-.15	-.19*	-.08	.29**	.09	-.30**
Similarity	.01	-.06	-.05	-.07	.01	.19**	.16*	-.10
UAE	.01	.08	-.13	.02	.09	.05	.17*	.15*
UCE	.16*	.33**	.11	.14*	.20**	-.02	-.23**	.03
DAE	-.04	.11	-.09	-.11	.07	-.01	-.01	.05
Image Pos	.11	.18*	.11	.20**	.09	-.04	-.02	.11
Image Neg	-.03	.01	-.01	-.16*	.03	-.02	-.06	-.08
Comment Pos	.08	.14	.08	.13	.01	-.01	-.01	.12
Comment Neg	-.04	-.11	-.06	-.10	-.06	.04	.04	-.06

Note. Browsing experience variables were averaged across the ten posts. Image quality (averaged across posts), prior exposure (summed across posts), and word count (averaged across posts) were controlled for total time viewing and time to fixation-likes analyses. Analyses with age were run controlling for gender and race/ethnicity. UCE, DAE, Image Neg, and Comment Neg were square root transformed.
**p<.01, *p<.05

Table 7. *Predictors of changes in state self-esteem*

	b [95% CI]	*SE*	*p*
Browsing Experiences			
Upward Assimilative	0.81 [-0.24, 2.85]	1.04	.439
Upward Contrastive	-5.30 [-18.66, 8.05]	6.77	.435
Downward Assimilative	9.81 [-2.91, 22.53]	6.45	.130
Image Positivity	-1.62 [-3.33, 0.08]	0.86	.062
Image Negativity	28.33 [5.87, 50.79]	11.39	.014
Comment Positivity	-2.34 [-4.78, 0.10]	1.24	.060
Comment Negativity	-2.69 [-21.13, 15.76]	9.36	.774
Relational Tie	0.57 [-0.90, 2.03]	0.74	.445
Similarity	2.10 [0.48, 3.73]	0.82	.012
Comparison	0.58 [-1.10, 2.25]	0.85	.499
Time to Fixation – Likes	0.84 [-1.80, 3.47]	1.33	.532
Individual Differences			
Social Comparison Orientation	1.33 [-1.00, 3.66]	1.18	.261
Social Comparison and Feedback Seeking	0.64 [-1.12, 2.40]	0.89	.472
Depressive Symptoms	3.28 [0.00, 6.56]	1.66	.050
Appearance-Contingent Self-Worth	1.34 [-0.11, 2.80]	0.74	.070
Self-Perceived Social Competence	-2.10 [-4.41, 0.21]	1.17	.074
Self-Perceived Physical Attractiveness	-1.77 [-3.95, 0.40]	1.10	.109

Table 8. *Predictors of changes in positive self-perceptions*

	b [95% CI]	*SE*	*p*
Browsing Experiences			
Upward Assimilative	2.30 [-0.19, 4.79]	1.26	.070
Upward Contrastive	-1.44 [-17.79, 14.92]	8.29	.863
Downward Assimilative	7.02 [-8.57, 22.62]	7.91	.376
Image Positivity	-1.93 [-4.01, 0.15]	1.06	.069
Image Negativity	22.47 [-5.23, 50.16]	14.05	.111
Comment Positivity	-2.94 [-5.92, 0.05]	1.51	.054
Comment Negativity	12.61 [-9.83, 35.05]	11.38	.269
Relational Tie	**2.75 [1.08, 4.42]**	**0.84**	**.001**
Similarity	2.09 [0.10, 4.09]	1.01	.040
Comparison	0.09 [-1.96, 2.13]	1.04	.933
Time to Fixation – Likes	1.09 [-2.09, 4.27]	1.61	.499
Individual Differences			
Social Comparison Orientation	-2.61 [-5.45, 0.23]	1.44	.071
Social Comparison and Feedback Seeking	-0.42 [-2.52, 1.69]	1.07	.697
Depressive Symptoms	3.37 [-0.59, 7.32]	2.01	.095
Appearance-Contingent Self-Worth	-2.18 [-3.87, -0.49]	0.86	.012
Self-Perceived Social Competence	0.22 [-2.57, 3.01]	1.41	.876
Self-Perceived Physical Attractiveness	0.08 [-2.39, 2.55]	1.25	.950

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Zell, A. L., & Moeller, L. (2018). Are you happy for me … on Facebook? The potential importance of Likes and comments. *Computers in Human Behavior*, *78*, 26–33. https://doi.org/10.1016/j.chb.2017.08.050

BIOGRAPHICAL SKETCH

Kaitlyn Burnell was born and raised in Brookfield, Connecticut, graduating from Brookfield High School in 2012. She attended Western Connecticut State University where she majored in Psychology, under the mentorship of Dr. Tara Kuther. With Dr. Kuther's guidance, Kaitlyn developed a series of projects examining emerging adults' and midlife adults' development, with a specific focus on social media use. After graduating in December 2015, Kaitlyn worked briefly with adults diagnosed with schizophrenia and schizoaffective disorder, before entering the Psychological Science PhD program at The University of Texas at Dallas in August 2016. Through this program, she received her Master's in Psychological Science in May 2019. Kaitlyn was supervised throughout the program by Dr. Marion Underwood and Dr. Rob Ackerman, and studied how digital technologies shape adolescent and emerging adult psychosocial development.

CURRICULUM VITAE

EDUCATION

2016 – 2020	Ph.D. expected May 2020 The University of Texas at Dallas Psychological Sciences, Concentration: Developmental Psychology Faculty Advisor: Marion Underwood, Ph.D. Co-Advisor: Robert Ackerman, Ph.D. **Dissertation:** Adolescents' Social Comparison on Instagram: An Eye-Tracking Study (Defended March 2020)
2016 – 2019	M.S. Psychological Sciences, awarded May 2019 Concentration: Developmental Psychology The University of Texas at Dallas Faculty Advisor: Marion Underwood, Ph.D. **Qualifying Thesis:** Self-Presentation on Facebook: Peer Correlates and Adjustment Outcomes of Different Types of Online Self-Presentation (Defended March 2018)
2013 – 2015	B. A. Psychology, awarded December 2015 Western Connecticut State University Summa Cum Laude

PUBLICATIONS

Ehrenreich, S. E., Beron, K. J., **Burnell, K.,** Meter, D. J., & Underwood, M. K. (in press). "When I text I can say just what I want to say": How adolescents use text messaging through the day and through their high school years. *Journal of Research on Adolescence*.

George, M. J., Ehrenreich, S. E., **Burnell, K.**, Kurup, A. R., Vollet, J. W., & Underwood, M. K. (in press). Emerging adults' public and private discussions of substance use on social media. *Emerging Adulthood*.

Burnell, K., Ackerman, R. A., Meter, D. J., Ehrenreich, S. E., & Underwood, M. K. (2020). Self-absorbed and socially (network) engaged: Narcissistic traits and social media use. *Journal of Research in Personality, 84,* 1-13.

Vollet, J. W., George, M. J., **Burnell, K.,** & Underwood, M. K. (2020). Exploring texting messaging as a platform for peer socialization of social aggression. *Developmental Psychology, 56,* 138-152.

Burnell, K., George, M. J., Vollet, J. W., Ehrenreich, S. E., & Underwood, M. K. (2019). Passive social networking site use and well-being: The mediating roles of social

comparison and the fear of missing out. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, *13*(3), 1-14.

Kuther, T. L. & **Burnell, K**. (2019). A life span developmental perspective on psychosocial development in midlife. *Adultspan*, *18*(1), 27-39.

Burnell, K. & Kuther, T. L. (2016). Predictors of mobile phone and social networking site dependency in adulthood. *Journal of Cyberpsychology, Behavior, and Social Networking, 19*(10), 621-627.

Burnell, K., George, M. J., & Underwood, M. K. (in preparation). Instagram browsing and links with psychological well-being.

Kurup, A. R., George, M. J., **Burnell, K.**, & Underwood, M. K. (revised and resubmitted). A longitudinal investigation of observed adolescent sexting and adjustment correlates. "Risks and Opportunities for Child and Adolescent Mental Health in the Digital Age" special issue in *The Journal of Child Psychology and Psychiatry*.

George, M. J., Beron, K. J., Vollet, J. W., **Burnell, K.**, Ehrenreich, S. E., & Underwood, M. K. (under review). Associations between smartphone billing data and adolescents' mental health symptoms across four years of high school. *Journal of Adolescent Health.*

Burnell, K., Vollet, J. W., Kurup, A. R., & Underwood, M. K. (in preparation). "So you think I'm cute? :P": Appearance evaluative text messages and eating problems.

Burnell, K., George, M. J., Kurup, A. R., & Underwood, M. K. (in preparation). Body image influencers: Changes in self-perceived physical attractiveness after browsing Instagram.

Burnell, K., Kurup, A. R., & Underwood, M. K. (in preparation). Snapchat filter use and relations with body image concerns.

Vollet, J. W., George, M. J., Kurup, A. R., **Burnell, K.,** Meter, D. J., & Underwood, M. K. (in preparation). Leading by example: Parents' promotion of prosociality predicts decreases in social aggression.

Underwood, M. K., Beron, K. J., & **Burnell, K.** (in preparation). How membership in social aggression trajectory groups predicts the observed content of adolescents' text messaging.

INVITED CHAPTERS

Burnell, K., Underwood, M. K., & George, M. J. (in preparation). New media and solitude: Implications for peer relations. In R. J. Coplan, J. C. Bowker, & L. J. Nelson (Eds.), *The Handbook of Solitude: Psychological Perspectives on Social Isolation, Social Withdrawal, and Being Alone (2nd edition).*

Underwood, M. K., George, M. J., & **Burnell, K.** (in preparation). Socially networked lives: How adolescents and young adults engage with media and social media and what it means for their relationships and adjustment. In L. Crockett, G. Carlo, & J. Schulenberg (Eds.), *Handbook of Adolescent and Young Adult Development*.

PRESENTATIONS

† denotes undergraduate student author

†Caouette, K. G., **Burnell, K.,** Kurup, A. R., & Underwood, M. K. (April, 2020). *Social media use and well-being of LGBTQ college students.* Poster to be presented at the annual meeting of the Southwestern Psychological Association, Frisco, TX.

†Venkatesh, R., **Burnell, K.,** & Underwood, M. K. (April, 2020). *Body surveillance across different social media platforms*. Poster to be presented at the annual meeting of the Southwestern Psychological Association, Frisco, TX.

†Yousef, F. T., †Prince, M., †Lee, E., **Burnell, K.,** & Underwood, M. K. (April, 2020). *Parental conflict as a predictor of adolescent aggressive text messaging communication*. Poster to be presented at the annual meeting of the Southwestern Psychological Association, Frisco, TX.

†Lee, E., **Burnell, K.,** & Underwood, M. K. (April, 2020). *Associations between parental monitoring and adolescent sexting behavior*. Poster to be presented at the annual meeting of the Southwestern Psychological Association, Frisco, TX.

Burnell, K., Ackerman, R. A., & Underwood, M. K. (March, 2020). Looking at Likes: Examining adolescents' visual attention to Instagram. H. Xie (Chair). *Social Media Engagement among Adolescents: Motivations and Adjustment Correlates of Different Engagement Behaviors*. Symposium to be presented at the biennial meeting of the Society for Research on Adolescence, San Diego, CA.

Burnell, K., Vollet, J. W., Kurup, A. R., & Underwood, M. K. (March, 2020). *"So you think I'm cute? :P": Appearance evaluative text messages and eating problems.* Poster to be presented at the biennial meeting of the Society for Research on Adolescence, San Diego, CA.

George, M. J., Vollet, J. W., Kurup, A. R., **Burnell, K**., Ehrenreich, S. E., & Underwood, M. K. (March, 2020). Is it enough to be on Facebook? Associations between social media parenting behaviors, parental monitoring, and adolescents' antisocial behaviors. M. George (Chair). *Parental Monitoring and Mediation in the Digital Sphere.* Symposium to be presented at the biennial meeting of the Society for Research on Adolescence, San Diego, CA.

Kurup, A. R., George, M. J., **Burnell, K**., & Underwood, M. K. (March, 2020). A longitudinal investigation of observed adolescent sexting and adjustment correlates. A. Kurup (Chair). *Sexting: Developmental and Psychosocial Associations*. Symposium to be presented at the biennial meeting of the Society for Research on Adolescence, San Diego, CA.

Vollet, J. W., George, M. J., **Burnell, K.,** Kurup, A. R., & Underwood, M. K. (March, 2020). Exploring the longitudinal links between receiving prosocial text messages and externalizing and internalizing symptoms. Paper to be presented at the biennial meeting of the Society for Research on Adolescence, San Diego, CA.

George, M. J., Vollet, J. W., Ehrenreich, S. E., **Burnell, K.**, Kurup, A. R., & Underwood, M. K. (October, 2019). 420 Likes: Emerging adults' risky behavior on social media. Data Blitz presented at the Society for Emerging Adulthood Media Topic pre-conference, Toronto, Ontario, Canada.

Burnell, K., George, M. J., Kurup, A. R., & Underwood, M. K. (March, 2019). Instagram or Insta-great? Social media browsing and immediate well-being and self-perceptions. **K. Burnell (Chair).** *Social Media Use and Adolescent Adjustment: Considering Quality over Quantity*. Symposium presented at the biennial meeting of the Society for Research in Child Development, Baltimore, MD.

Burnell, K., Ackerman, R. A., & Underwood, M. K. (March, 2019). *Observing adolescents' social aggression via text messaging: A one-with-many design*. Poster presented at the biennial meeting of the Society for Research in Child Development, Baltimore, MD.

George, M. J., Vollet, J. W., **Burnell, K.**, Kurup, A. R., & Underwood, M. K. (March, 2019). Facebook profiling: Gender differences in adolescents' Facebook activity and coping strategies. A. Calvin (Chair). *Individual Differences in Adolescents' use of Communication Technology.* Symposium presented for the biennial meeting of the Society for Research in Child Development, Baltimore, MD.

George, M. J., Kurup, A. R., **Burnell, K.**, & Underwood, M. K. (March, 2019). *Cybervictimization highest among LGBTQ students of color.* Poster presented at the International Convention of Psychological Science, Paris, France.

Kurup, A. R., **Burnell, K.**, Vollet, J. W., & Underwood, M. K. (October, 2018). *Romantic texting, duplicitous texting, and infidelity in adolescent boys and girls.* Poster presented at the 2018 Gender Development Research Conference, San Francisco, CA.

Ehrenreich, S. E., Meter, D. J., & **Burnell, K**. (August, 2018). *Love and sext: The impact of relationship status, partner reactions, and regret on risks of sexting.* Poster presented at the annual meeting of the American Psychological Association, San Francisco, CA.

Vollet, J. W., George, M. J., **Burnell, K.,** & Underwood, M. K. (July, 2018). Texting as a platform for peer socialization of social aggression. A. van Dijk (Chair). *Socialization of Aggression in Children and Youth*. Symposium presented at the biennial meeting of the International Society for Research on Aggression, Paris, France.

Kurup, A. R., **Burnell, K**., Vollet, J. W., & Underwood, M. K. (May, 2018). *Romantic texting, duplicitous texting, and infidelity in adolescent boys and girls*. Poster presented at the annual meeting of the Association for Psychological Science, San Francisco, CA.

Burnell, K. (April, 2018). *Self-presentation on Facebook: Peer correlates and adjustment outcomes of different types of online self-presentation.* Paper presented at the Developmental, Cognitive, and Social-Personality Lecture Series, School of Behavioral and Brain Sciences, The University of Texas at Dallas, Richardson, TX.

Burnell, K., Vollet, J. W., Kurup, A. R., & Underwood, M. K. (April, 2018). *Two-faced texting: Exploring friendship validation as a mechanism through which duplicitous texting predicts externalizing symptoms.* Poster presented at Technology, Mind, & Society, Washington, DC.

Burnell, K., George, M. J., Vollet, J. W., & Underwood, M. K. (April, 2018). *Students' online social comparisons and fear of missing out mediate the association between social media browsing and depressive symptoms*. Poster presented at Technology, Mind, & Society, Washington, DC.

Burnell, K., Meter, D. J., & Underwood, M. K. (April, 2018). Eating problems and cyber victimization: Concurrent and longitudinal relations with appearance-related characteristics. J. Casas (Chair). *New advances in the study of links between peer victimization and disordered eating*. Symposium presented at the biennial meeting of the Society for Research on Adolescence, Minneapolis, MN.

Underwood, M. K., Ehrenreich, S. E., Meter, D. J., & **Burnell, K.** (April, 2018). How late adolescents engage with Facebook: Public versus private communication, self-presentation, and lurking. J. Nesi (Moderator). *Digital communication data blitz*. Symposium presented at the biennial meeting of the Society for Research on Adolescence Meeting, Minneapolis, MN.

Burnell, K., Meter, D. J., & Underwood, M. K. (April, 2018). *Sexual self-presentation, cyberbullying, and cyber victimization: The moderating role of gender.* Poster presented at the biennial meeting of the Society for Research on Adolescence, Minneapolis, MN.

Burnell, K., Meter, D. J., & Underwood, M. K. (April, 2018). *Social comparison and feedback seeking as a partial mediator of the relation between fear of missing out and depressive symptoms*. Poster presented at the biennial meeting of the Society for Research on Adolescence, Minneapolis, MN.

Burnell, K., Meter, D. J., & Underwood, M. K. (May, 2017). *Perceived parental rejection and cybervictimization: Indirect pathways*. Poster presented at the annual meeting of the Association for Psychological Science, Boston, MA.

Burnell, K., Meter, D. J., & Underwood, M. K. (April, 2017). *Online social comparison and relations with narcissism and social aggression*. Poster presented at the University of Texas at Dallas Graduate Student Research and Creative Activities Poster Session, Richardson, TX.

Burnell, K., & Kuther, T. L. (March, 2016). *Positive and negative perceptions of midlife*. Poster presented at the annual meeting of the Eastern Psychological Association, New York, NY.

Burnell, K., & Kuther, T. L. (October, 2015). *Identity development and well-being in emerging adulthood*. Poster presented at the annual meeting of the New England Psychological Association, Fitchburg, MA.

RESEARCH EXPERIENCE

Research Assistant, The University of Texas at Dallas
Richardson, TX
August 2016 – May 2020
The Blackberry Project
Research Advisor: Dr. Marion Underwood

- Principal Investigator: *Instagram and Social Exclusion*. Research project conducted during the Fall 2019 and Spring 2020 semesters.
- Principal Investigator: *Adolescents and Instagram Use: An Eye-Tracking Study*. Research project conducted during the Summer 2019 and Fall 2019 semesters.
- Principal Investigator: *Social Media and Identity*. Research project conducted during the Spring 2019, Summer 2019, and Fall 2019 semesters.
- Principal Investigator: *Snapchat and Self-Perceptions*. Research project conducted during the Fall 2018 and Spring 2019 semesters.
- Principal Investigator: *Correlates Between Personality and Social Media Use*. Research project conducted during the Fall 2018 semester.
- Principal Investigator: *Personality and Social Media*. Research project conducted during the Fall 2017 and Spring 2018 semesters.
- Principal Investigator: *Social Media and Social Relationships.* Research project conducted during the Fall 2017 semester.
- Co-investigator: *College Students' Media and Messaging Habits*. Research project conducted during the Fall 2016 and Spring 2017 semesters.
- Main supervisor of 38 undergraduate students and 1 Master's student

Undergraduate Researcher, Western Connecticut State University
Danbury, CT

January 2015 – December 2015
Research Advisor: Dr. Tara Kuther

- Principal Investigator: *Developmental Correlates of Social Networking Dependency*. Research project conducted during the Fall 2015 semester.
- Principal Investigator: *Perceptions of Midlife*. Research project conducted during the Summer 2015 semester.
- Principal Investigator: *Identity, Well-being, and Social Network Use in Emerging Adulthood*. Research project conducted during the Spring 2015 semester.

TEACHING EXPERIENCE

Summer 2019	Instructor, *Adolescence*, The University of Texas at Dallas.
Summer 2019	Instructor, *Introduction to Instagram Coding*, The University of Texas at Dallas.
Spring 2019	Guest Speaker, *Contemporary Moral Issues*, University of North Texas. "Social Media, Well-being, and Body Image: Implications from Image-Centric Social Media Platforms". (2 sections).
Fall 2018	Guest Speaker, *Social and Personality Development*, The University of Texas at Dallas. "Aggressive Behavior and Youth: Considering the Role of the Media".
Fall 2018	Guest Speaker, *Contemporary Moral Issues*, University of North Texas. "Understanding Social Media Browsing and Filter Use: Effects and Implications". (2 Sections).
Spring 2018	Guest Speaker, *Philosophy of the Self*, University of North Texas. "Is Social Media Really Harmful?: It Depends". (2 Sections).
Fall 2017	Instructor, *Introduction to Blackberry Project Micro-Coding*, The University of Texas at Dallas.
Fall 2017	Guest Speaker, *Philosophy of the Self*, University of North Texas. "Psychology and the Self: Understanding how the Self Relates to Social Media Use". (2 Sections).

PROFESSIONAL DEVELOPMENT, AWARDS, AND CERTIFICATES

President's Teaching Excellence Award for Teaching Assistants (February, 2020). Nomination provided through The University of Texas at Dallas Center for Teaching and Learning.

Introduction to Structural Equation Modeling (January, 2020). Paul Allison, Ph.D., Statistical Horizons, Fort Myers, FL.

Graduate Teaching Weekly Seminar (Spring, 2019). Jonas Bunte, Ph.D., Certificate awarded through The University of Texas at Dallas Center for Teaching and Learning.

Responsible Conduct of Research Professional Series Certification (March, 2019). Certificate awarded through The University of Texas at Dallas Office of Research.

Advanced Graduate Teaching Certificate (December, 2018). Certificate awarded through The University of Texas at Dallas Center for Teaching and Learning.

Multilevel and Mixed Models (October, 2018). Stephen Vaisey, Ph.D., Statistical Horizons, Philadelphia, PA.

Graduate Teaching Certificate (May, 2018). Certificate awarded through The University of Texas at Dallas Center for Teaching and Learning.

Peer Relations and Interactions in Childhood and Adolescence (August, 2017). Toon Cillessen, Ph.D., Radboud Universeit, Nijmegen, The Netherlands.

Missing Data Workshop (June, 2017). Paul Allison, Ph.D., Statistical Horizons, Philadelphia, PA.

An Introduction to R Statistical System (May, 2017). William Revelle, Ph.D., David M. Condon, Ph.D., & Sara Weston, Ph.D, The 29th Annual Meeting for the Association for Psychological Science, Boston, MA.

Excellence in Teaching Workshop (January, 2017). Stephen Chew, Ph.D., The Center for Teaching and Learning, The University of Texas at Dallas, Richardson, TX.

COMMUNITY INVOLVEMENT

2020	Contributed post to the Society for Personality and Social Psychology Character and Context Blog; "How Narcissism Relates to Social Media Use".
2019	Interviewed by CBS Dallas / Fort Worth in story on youth social media use
2019	Interviewed by NBC-5 DFW in story on youth social media use
2019	Guest Speaker – Design Create Connect Girls in STEM Workshop; "The World of Psychology"

REVIEWER EXPERIENCE

Ad-hoc Reviewer: Cyberpsychology, Behavior, and Social Networking; European Journal of Personality; Information, Communication, and Society; Journal of Adolescent Health; Journal of Child and Family Studies; Psychology of Popular Media Culture

PROFESSIONAL AFFILIATIONS

January 2019 – Present	Graduate Student Affiliate of the Society for Research in Child Development
January 2018 – Present	Graduate Student Affiliate of the Society for Research on Adolescence
April 2017 – Present	Graduate Student Affiliate of the Association for Psychological Science
April 2014 – Present	Student Affiliate of the American Psychological Association

PROFESSIONAL EXPERIENCE

Rehabilitation Specialist I, Mental Health Connecticut
Danbury, CT
October 2015 – July 2016

- Taught Activities of Daily Living Skills including cooking, cleaning, and proper hygiene to in-patient clients with diagnosed Schizophrenia, Schizoaffective Disorder, Bipolar Disorder, or Borderline Personality Disorder.

- Maintained client progress reports to ensure clients were developing skills to live independently.
- Ensured client safety with preparation to respond appropriately in times of physical or psychiatric crisis.
- Monitored medication use and attended to client refusal to medication, or side effects to medication.
- Participated in mental health trainings, including trainings on hearing voices, crisis intervention, medication monitoring, and mental health disorders.

Intern, Danbury Grassroots Academy
Danbury, CT
June 2014 – August 2014

- Conducted grant research for the non-profit organization, which targeted at-risk youth and provided an after school and summer program consisting of nutrition education and participation in tennis.
- Assisted in basic grant writing and application forms.