



Spanish validation of two social media appearance-related constructs associated with disordered eating in adolescents: The Appearance-related Social Media Consciousness scale (ASMC) and the Critical Thinking about Media Messages scale (CTMM)

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ABSTRACT

Appearance-related constructs underlying social media are negatively associated with mental health. However, their impact on the Spanish population is still unexplored. The present study aimed to validate the Spanish versions of two appearance-related scales: (1) the appearance-related social media consciousness (ASMC) scale; and (2) the critical thinking about media messages (CTMM) scale. Translation and cultural adaptation of the scales were carried out. The scales' psychometric properties were assessed using exploratory and confirmatory factor analyses, measurement invariance across gender (boys vs. girls) and age groups (early adolescents vs. middle adolescents), internal consistency, and convergent validity. The sample included 803 Spanish secondary school adolescents aged between 12 and 18 ($M_{age} = 15.1$, 47.9% girls, 47.2% boys, 4.9% non-binary gender/others). The exploratory factor analyses replicated original one-factor structures of both scales, which was verified using confirmatory factor analysis. Regarding the ASMC Scale, a re-specified model (allowing for error correlations between Items 1–2) presented an adequate fit. Both models were invariant across gender and age groups. Excellent internal consistency was found. Bivariate correlations between the ASMC and eating disorders related variables (body esteem, disordered eating, self-esteem, sociocultural attitudes towards appearance, and general mental health) supported its convergent validity and proved ASMC to be a potential target for future preventive eating disorder interventions. However, the CTMM scale correlated only with sociocultural pressures, thus, further research is needed to assess the validity of the CTMM in Spanish samples.

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1. Introduction

As in other Western countries, daily social media use among Spanish adolescents has been dramatically increasing in recent years (Quostodio, 2020; Rideout & Robb, 2018). Specifically, 66.2% of adolescents aged 12–17 have a profile on at least one social media site, rising to 90% over the age of 15 (Ministerio de Interior, 2014). It is noteworthy that photo-based social media sites (i.e., Instagram, Tiktok, Snapchat, Facebook, and Twitter) which set the focus on physical appearance (Deighton-Smith & Bell, 2018; Fox & Vendemia, 2016), are the most used (Quostodio, 2020; Rideout & Robb, 2018).

The overexposure to physical appearance stimuli on social media facilitates the development of appearance-focused behaviors, such as constant monitoring of one's own body (Fardouly et al., 2015; Karsay et al., 2021) (i.e., self-objectification), which had already been identified as being typical among the adolescent population by Fredrickson and Roberts (1997). Moreover, the positive feedback expected from peers regarding one's physical appearance increases motivation to invest time and effort in caring and worrying about the image transmitted to the social media audience (Ranzini & Hoek, 2017; Zheng et al., 2019). These appearance-focused experiences have been related to several mental health issues (Lin et al., 2016; Jeri-Yabar et al., 2019; Primack et al., 2017), especially concerning eating disorder related symptomatology (i.e., body surveillance, dietary restriction, appearance comparison and internalization of the thin ideal) (Choukas-Bradley et al., 2019; Holland & Tiggemann, 2016; Maheux et al., 2022b; McLean et al., 2015; Meier & Gray, 2014;

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Mingoia et al., 2017). These observations are distinctly important during adolescence, as the intersection between developmental and socialization processes, and the influence of social media may increase body image concerns and mental health problems, particularly among girls (Choukas-Bradley et al., 2022).

1.1. Appearance-related Social Media Consciousness (ASMC)

Recent studies have pointed to appearance-related social media consciousness (ASMC) as a risk factor that may underlie the relationship between social media and mental health issues (Choukas-Bradley et al., 2020). ASMC refers to the extent to which individuals are aware of how attractive they might appear to an online social media audience. Based on this perception, young people might be influenced to perform specific appearance-focused social media behaviors such as posing, selecting, and editing photos before posting them, or checking their body parts and appearance even offline (Chae, 2017; Choukas-Bradley et al., 2020; Fox & Vendemia, 2016; Zheng et al., 2019). A pioneering study conducted by Choukas-Bradley et al. (2019) examined, by means of a four-item survey, ASMC among undergraduate women in the United States (U.S.) (Mage = 18.35). The results indicated a high ASMC frequency among approximately three-quarters of the participants. Moreover, ASMC was found to be related to body image concerns, lower self-esteem, and depressive symptoms (Choukas-Bradley et al., 2019). Following, Choukas-Bradley et al. (2020) developed and validated “The Appearance-Related Social Media Consciousness Scale” in two high school samples of girls and boys from the Southeastern U.S. (sample 1: Mage = 15.72; sample 2: Mage = 16.25). A 13-item, one-factor ASMC scale for assessing this construct emerged. The scale showed configural, metric and partial scalar gender invariance, strong internal consistency (sample 1: full sample $\alpha = .95$, girls $\alpha = .94$, boys $\alpha = .96$; sample 2: full sample $\alpha = .92$, girls $\alpha = .90$, boys $\alpha = .91$), and adequate test-retest reliability after one week ($r = .83$). Convergent validity was supported by bivariate correlations between the ASMC scale and measures of body vigilance, body shame, self-objectification, and body comparison. Moreover, ASMC was cross-sectionally associated with adolescents’ disordered eating and depressive symptoms, with a significant interaction predicting an effect of ASMC on disordered eating only in girls (Choukas-Bradley et al., 2020). Subsequently, Maheux et al. (2022b) studied a sample of high-school adolescents in the Southeastern US over one year and found that the high scores in ASMC was prospectively related to depressive symptoms after controlling for social media use. It seems that this experience is particularly prevalent among adolescents. More than 90% of youth presented some degree of ASMC, with higher values among girls (Choukas-Bradley et al., 2020), where it might be underlying the impact of social media use in adolescent girls’ body image cognitions and concerns (i.e. self-objectification, thin-ideal internalization, body shame, body dissatisfaction) (Choukas-Bradley et al., 2022). Overall, although the evidence is limited as this is a recent construct, there is growing interest in the use of the ASMC scale (Burnell et al., 2021; Maheux et al., 2022a; 2022b), which has recently been validated among young adults from five English-speaking countries (U.S., U.K., Canada, Australia, New Zealand) (Maheux et al., 2022a), and cross-culturally adapted and validated among Turkish adolescents, with good psychometric properties (Çetinkaya et al., 2022).

1.2. Critical Thinking about Media Messages (CTMM)

Critical thinking about media messages (CTMM), a key element of media literacy, can be defined as the ability to critically judge the purpose and influence of media messages (Hobbs & Frost, 2003; Silverblatt, 2001). CTMM is thought to promote discussion on the impact of unrealistic aesthetic ideals delivered by social media

messages and photos to reduce its credibility and persuasive influence on body dissatisfaction and eating disorders (Halliwell et al., 2011; McLean et al., 2013, 2016a, 2017). The “Critical Thinking about Media Messages” scale (McLean et al., 2016a; Scull et al., 2010) appears to be the most suitable to assess the frequency of CTMM.

The CTMM scale was first developed as a one dimension-scale by Scull et al. (2010) to evaluate to what extent adolescent women from the Southeastern U.S. claim to think critically about the media messages. The measure presented high levels of internal consistency ($\alpha = .91$), but other psychometric properties were not assessed in the original study (Scull et al., 2010). The CTMM psychometric properties were later assessed by McLean et al. (2016a) on a sample of adolescent women from Australia. The confirmatory factor analysis showed a one-factor structure and the measure obtained good internal consistency ($\alpha = .90$), test-retest reliability ($r = .80$), and construct validity. Moreover, CTMM appeared to be negatively associated with social media exposure and eating disorder risk factors, such as internalization of the thin ideal and body dissatisfaction (McLean et al., 2016a, 2016b). Particularly, in McLean et al.’s study (2016b), high levels of critical thinking mitigated the negative impact of high thin internalization and appearance comparisons traits on body dissatisfaction. However, the literature presents conflicting results regarding its role (McLean et al., 2016c; 2016d). Therefore, while previous studies support the promotion of CTMM as a protective factor in the prevention of eating disorders, further research is needed. Some of the gaps that need to be addressed include the assessment of the psychometric properties of the CTMM scale across cultures, gaining insight into its psychometric properties within samples of boys and men, as well as increasing knowledge about the association of CTMM with adolescent mental health.

1.3. The current study

Overall, there is growing interest in ASMC and CTMM as two appearance-related constructs that may underlie the impact of social media on adolescents’ mental health. However, cross-culturally, scientific evidence on these two constructs is still limited. To our knowledge, Spanish-validated versions of the ASMC and CTMM scales are still not available. Hence, the present study aimed to validate both scales in a Spanish adolescent population. First, we aimed to translate into Spanish and culturally adapt both scales. Second, we sought to assess their psychometric properties. Specifically, we assessed the factorial structure of the scales (ASMC and CTMM) via exploratory and confirmatory factor analyses. Measurement invariance across gender (boys vs. girls) and age groups (early adolescence vs. middle adolescence) was also tested to compare mean scores between groups. We also examined internal consistency and tested convergent validity by studying the correlations with other eating disorders, body image, and well-being related variables separately between genders (boys vs. girls).

Based on the previous literature, we expected (1) to replicate the original one-factor structure in both scales, (2) to support gender and age groups invariance of ASMC Scale, while no directional hypotheses were made regarding CTMM Scale given the lack of previous evidence (3) to find high internal consistency with values similar to the original validation studies, and (4) to find adequate convergent validity of the measures by gender. Specifically, we expected higher levels of ASMC to be associated with higher social media exposure, sociocultural pressure towards appearance, and eating disorder symptomatology, as well as lower body esteem, mental health and general self-esteem. Moreover, we hypothesized higher levels of CTMM to be associated with lower scores in social media exposure, internalization of the thin-ideal and sociocultural pressure, and, on the other hand, to be positively associated with body-esteem. As a final, exploratory hypothesis, higher correlations

between ASMC and conceptually-related variables were expected for girls compared to boys.

2. Method

2.1. Participants

The sample comprised 803 adolescents aged between 12 and 18 ($M_{\text{age}} = 15.1$; $SD = 1.40$, 47.9% “girls”, 47.2% “boys”, 4.9% non-binary gender/others) from four public and private urban secondary schools located in the Community of Madrid (Spain). Approximately, 7.4% ($n = 59$) of the students were aged 12, 16.9% ($n = 135$) were 13, 24.8% ($n = 198$) were 14, 20.5% ($n = 164$) were 15 years, 20.4% ($n = 163$) were 16, 9.1% ($n = 73$) 17 and 1% ($n = 8$) were 18. Exclusion criteria were insufficient knowledge of Spanish, necessary for completing the study protocol, and non-availability of parents’ informed consent or adolescents’ assent. Participants were randomly divided in a 1:1 ratio into two split-half subsamples. Data was randomly divided into a first split-half ($n = 401$) ($M_{\text{age}} = 15.01$, $SD = 1.36$, 45.6% girls, 50.4% boys and 4% non-binary gender/others) to perform the exploratory factor analysis (EFA) and a second split-half ($n = 402$, $M_{\text{age}} = 15.19$, $SD = 1.42$, 50.2% girls, 44% boys, 5.7% non-binary gender/others = 0%) subsample for conducting the confirmatory factor analysis (CFA).

2.2. Procedure

2.2.1. Translation

A double forward and backward method was conducted following the [International Test Commission, 2017](#). Three independent bilingual translators participated in the process. First, two interpreters whose native language was the target language (Spanish) translated the original English versions into Spanish. Second, a bilingual expert panel specialized in the eating disorder/obesity field, whose native language was Spanish, unified a preliminary Spanish version. Third, the Spanish versions were back-translated into English by another independent translator. A bilingual expert-reconciliation panel comprising the translators and members of the research team, then resolved any discrepancies between the two versions of the instruments and concluded a final Spanish version of the two scales that guaranteed conceptual and semantic equivalence. Lastly, a pilot study with the translated versions was carried out among ten adolescents within the age and group of interest. Specifically, a 5-point Likert scale was used to assess the degree of clarity (1 = not at all clear, 5 = very clear), appropriateness (1 = not at all appropriate, 5 = very appropriate), and emotional discomfort (1 = no discomfort, 5 = a lot of discomfort) generated by each item. In addition, an open-ended question was used to obtain unstructured information. Due to the high percentage of clarity, appropriateness and low discomfort generated by the items, the final Spanish versions did not need to be modified (see [Tables 3 and 4](#)).

2.2.2. Sample recruitment and data collection

The recruitment of participants was conducted through five public and private secondary schools in the urban South-East area of Madrid, selected using convenience sampling, between April 19th to June 10th 2021. Prior contact with the headteacher allowed us to establish suitable spots in the students’ schedule for data collection. Meetings were held at the centers with the school management teams to provide them with all the information about the study. Parents were informed by the headmasters about the study and signed the informed consent to participate. At this point, students received the link to the online survey (via Qualtrics Software) which firstly presents an information page and an assent form. They completed the anonymous online survey which lasted around 35–40 min using either school computers, or their own electronic devices. As previously mentioned, data collection occurred during

regular school hours in the presence of one or two research team members and a teacher. A week after the survey completion, participants attended a workshop on media literacy, as compensation for participating in the study. This research was conducted following the ethical guidelines of the Declaration of Helsinki. Ethics approval was given by the Niño Jesús University Children’s Hospital (Ref. 076/18), and by the Autonomous University of Madrid Ethics Committee (CEI-98–1803).

2.3. Measures

2.3.1. Sociodemographic data

Participants self-reported information about their date of birth (for age calculation), gender identity, school grade and father and mother education.

2.3.2. Social media exposure

Participants reported their daily time on different social media (Instagram, WhatsApp, TikTok, Facebook, Snapchat, and other social media) using a 5-point Likert scale (1 = Never, 2 = Less than 1 h, 3 = Between 1 and 2 h, 4 = Between 2 and 5 h, 5 = 5 or more hours). The maximum value over the daily time spent (average across the days) on social media was calculated. It reflects the largest daily amount of time spent on social media expressed in hours.

2.3.3. Appearance-related Social Media Consciousness scale

(ASMC, original version by [Choukas-Bradley et al., 2020](#)). The original ASMC scale consists of 13 items with a single factor structure aimed at measuring the frequency of an individual’s thoughts and behaviors related to ongoing awareness about their physical appearance on social media. Items are measured on a 7-point Likert scale (1 = Never, 7 = Always). Higher mean scores indicate higher levels of appearance-related social media consciousness. Past analyzed psychometric properties of this scale are summarized above. In the current study, internal consistency was high ($\omega = .94$).

2.3.4. Critical Thinking about Media Messages scale

(CTMM, original version by [Scull et al., 2010](#); [McLean et al., 2016a](#)). The CTMM is a 6-item measure with a one-factor structure that examines the degree to which individuals think critically about media messages using a 6-point Likert Scale ranging from 1 (Never) to 6 (Always). In our study, participants completed the questionnaire based on specific instructions “Please answer the following questionnaire about the analyses you made through media messages, noting that “media message” refers to those messages through social media (such as Instagram, Tik Tok, among others), TV or other media, which provide information about appearance, body image, or specific aesthetic ideals.” that explicitly listed the contexts in which the items should have been applied (e.g. the influence of media messages spread from such as Instagram, TikTok, TV etc. on appearance/body image). The mean of the scores was calculated, with higher values indicating higher critical thinking about media messages. Past psychometric properties of this scale are summarized above. In the current study, internal consistency was also high ($\omega = .91$).

2.3.5. Eating Disorder Examination Questionnaire for Adolescents

(EDE-Q-A, original version by [Carter et al., 2001](#), Spanish version by [Sepúlveda et al., 2019](#)). This version of the instrument is meant for the adolescent population and includes 36 items aimed at measuring the frequency or severity of eating disorder-related behaviors and cognitions over the past 14 days. In the present study, only 22 items were used, that evaluate specific eating disorder attitudes. Items are rated on a 7-point Likert scale (0 = No days, 6 = Everyday). While the original instrument counts four subscales ([Carter et al., 2001](#)), the Spanish validation confirmed a 2-factor model: “Restraint” ($\alpha = .89$), and “Eating, Shape and Weight

Concerns" ($\alpha = .98$), unifying the 3-factor original structure. The average of both subscales constitutes the Global Score of the EDE-Q-A ($\alpha = .97$) (Sepúlveda et al., 2019). In the current study, internal consistencies were excellent ($\omega = .88 - .96$).

2.3.6. Sociocultural Attitudes Towards Appearance Questionnaire-4

(SATAQ-4, original version by Schaefer et al., 2015; Spanish version by Llorente et al., 2015). This questionnaire includes 22 items which assess the perceived sociocultural pressure towards beauty ideals (from family, peers, and media) and the internalization of beauty standards (thin and muscular). Items are measured on a 7-point Likert scale (1 = Completely Disagree, 7 = Completely Agree). A replication of the original five-factor structure was used in the validity analyses of the Spanish-language version of this measure. Mean scores of each subscale were computed, with higher scores indicating a higher degree of endorsement of Western cultural standards. The Spanish version showed high reliability (with a Cronbach's alpha between .88 and .97). In the current study, the internal consistencies were similar ($\omega = .82 - .96$).

2.3.7. Body-Esteem Scale for Adolescents and Adults

(BESEA-S, original version by Mendelson et al., 2001, Spanish version by Beltrán-Garrayo et al., 2022). This questionnaire evaluates an individual's attitudes and feelings about their own bodies and appearance. The original three-factor structure (BE-Weight, BE-Appearance, and BE-Attribution subscales) was replicated in the Spanish-language measure. The Spanish version reduced the original scale into 14 items scored on a 5-point Likert scale (0 = Never; 4 = Always). It includes three subscales with adequate internal consistency in an adolescent population: BE-Appearance (general feelings about appearance) ($\alpha = .88$), BE-Weight (weight satisfaction) ($\alpha = .88$), and BE-Attribution (evaluations attributed to others toward one's body and appearance) ($\alpha = .75$). The mean of the item scores was calculated for each subscale and the global score was reported as the mean of the subscale, with higher values indicating greater body-esteem levels. The internal consistencies in the current study ranged from $\omega = .74 - .89$.

2.3.8. The Rosenberg Self-Esteem Scale

(RSES, original version by Rosenberg, 1965; Spanish validation by Martín-Albo et al., 2007). This scale measures general self-esteem and general perception of self-worth. It is composed of ten items scored on a 4-point Likert scale (1 = Strongly disagree, 4 = Strongly agree). A total score is calculated summing the item responses (ranging from 10 to 40); higher scores indicate higher self-esteem. A replication of the original one-factor structure was used in the validity analyses of the Spanish-language version of this measure. The original scale has good psychometric properties with a Cronbach's alpha between .77 and .87. The Spanish validation showed adequate internal consistencies ranging from .85 to .88 and with a test-retest coefficient of $r = .84$. Internal consistency for the current study was similar ($\omega = .88$).

2.3.9. Mental Health Continuum-Short Form

(MHC-ST, original version by Keyes et al., 2008; Spanish validation by Piqueras et al., 2022). This instrument consists of 14 items and assesses positive general mental health during the last month. It is formed by three different factors: emotional, psychological, and social well-being. Items are measured on a 6-point Likert scale (1 = Never, 6 = Everyday). A total score (ranged 14–84) was calculated from the sum of item responses with higher scores reflecting greater levels of mental health (well-being). It has shown good internal consistency ($\alpha > .80$), and discriminant reliability across adolescents from different cultures (Keyes, 2009). The Spanish validation (which presents a bifactor model structure, instead of the three-factor

model of the original version) showed adequate Cronbach's alpha values ranging between .77 and .93 and omega coefficient from .79 to .93 in a sample of adolescents. In the current sample, the internal consistencies of the scale ranged from $\omega = .88 - .95$.

2.4. Statistical analyses

2.4.1. Data cleaning

From the 839 initial collected surveys, data from 36 participants were excluded in the final analyses. More specifically, 13 participants only completed the demographic information part, and data from 16 participants was removed due to constant response patterns, which were clearly noticeable despite the inclusion of 12 reverse-scored items in the survey. Moreover, seven cases were excluded due to a lack of response to the ASMC or the CTMM scales. Outliers were detected using boxplot. No extreme outliers emerged, nor were these considerably deviated. Outliers detection was also complemented using Z-scores (absolute values above 3.29), although normal distribution was not supported in some variables. The ASMC and CTMM scores did not reveal any outliers, and those outliers detected in other variables were kept and considered valid as real cases of population. Multivariate outliers were also assessed using Mahalanobis Distance Test (Tabachnick and Fidell, 2013). Only 12 multivariate outliers were identified (< 1.5% from the total sample). Similarly, these were considered real cases from the data with normal deviations, as there were not sufficient reasons to consider them invalid (Orr et al., 1991).

2.4.2. Descriptive analyses

Means, standard deviations and scales ranges for each measure were calculated for the full sample. Item-level means and standard deviations were also calculated for ASMC and CTMM Scales. Student t-test for independent samples was used to compare the two split-halves on quantitative variables and chi-squared tests for categorical variables.

2.4.3. Factorial structure analyses

An exploratory factor analysis (EFA) ($n = 401$) and a confirmatory factor analysis (CFA) ($n = 402$) were conducted on two randomly split halves of the sample for examining the original factor structure of each scale (subsamples were randomly selected using *Sample Function in Rstudio*). Swami & Barron's (2018) guidelines were followed. The sample size considered for the EFA exceeded the recommended participant-to-item ratio of 20:1 (Hogarty et al., 2005), and sample adequacy was proved after data analyses with commonalities $\geq .50$. Minimum sample size for CFA was estimated by power analyses according to the Root Mean Square Error (RMSEA) (power = .95, RMSEA = .05, alpha = .05) (MacCallum et al., 1996). Multivariate normality was rejected after conducting Mardia's test in each sample. Univariate normal distribution of each item was considered with skewness values between $[-3, 3]$ and kurtosis between $[-10, 10]$ (Weston & Gore, 2006). However, the more restrictive criteria by Curran et al. (1996) was considered for the selection of the estimation method for the EFA and CFA, with skewness values $< |2|$ and kurtosis $< |7|$.

Barlett's test of sphericity (Barlett, 1950) and Kaiser-Meyer-Olkin's (KMO) measure (Kaiser, 1974) of sampling adequacy (MSA) were examined to determine if the data set was suitable for factor analysis. A significant test of sphericity indicated appropriateness, and (KMO) values are interpreted as above .70 as adequate, between .80 – .90 are good and above .90 are excellent. Parallel analyses (Horn, 1965) were performed to determine the number of retain factors. Factors were retained if their eigenvalues of components are greater than the eigenvalues of simulated components from the random data.

Table 1

Descriptive statistics of the demographic data for the whole sample and each split-half subsamples.

	Total Sample (N = 803)	EFA: first split-half (n = 401)	CFA: second split-half (n = 402)	
Age <i>M</i> (<i>SD</i>)	15.1 (1.39)	15.01 (1.36)	15.19 (1.42)	$t(798) = -1.79, p = .073$
Gender <i>N</i> (%)				$\chi^2(2) = 3.84, p = .146$
Boys	379 (47.2)	202 (50.4)	177 (44)	
Girls	385 (47.9)	183 (45.6)	202 (50.2)	
Non-binary/Others	39 (4.9)	16 (4)	23 (5.7)	
School Grade <i>N</i> (%)				$\chi^2(5) = .75, p = .189$
1° ESO (7th Grade)	95 (11.9)	53 (13.3)	42 (10.5)	
2° ESO (8th Grade)	203 (25.4)	101 (25.3)	102 (25.5)	
3° ESO (9th Grade)	172 (21.5)	95 (23.8)	77 (19.3)	
4° ESO (10th Grade)	172 (21.5)	80 (20.1)	92 (23)	
1° BACH (11th Grade)	155 (19.4)	70 (17.5)	85 (21.3)	
2° BACH (12th Grade)	2 (0.3)		2 (0.5)	
Father Education <i>N</i> (%)				$\chi^2(4) = 7.17; p = .127$
No education/ Unfinished primary education	10 (1.2)	4 (1)	6 (1.5)	
Completed primary education (10th Grade)	56 (7)	25 (6.2)	31 (7.7)	
Secondary School (12th Grade)/ Vocational training	134 (16.7)	58 (14.5)	76 (18.9)	
University Studies	488 (60.8)	262 (65.3)	226 (56.2)	
No answer	115 (14.3)	52 (13)	63 (15.7)	
Mother Education <i>N</i> (%)				$\chi^2(4) = 3.8; p = .434$
No education/ Unfinished primary education	9 (1.1)	5 (1.2)	4 (1)	
Completed primary education (10th Grade)	45 (5.6)	27 (6.7)	18 (4.5)	
Secondary School (12th Grade)/ Vocational training	114 (14.2)	50 (12.5)	64 (15.9)	
University Studies	546 (68)	276 (68.8)	270 (67.2)	
No answer	89 (11.1)	43 (10.7)	46 (11.4)	
Social Media exposure <i>M</i> (<i>SD</i>)	3.55 (.79)	3.58 (.78)	3.53 (.79)	$t(801) = .83, p = .405$

Note. χ^2 : chi-square; t : t-Student test.

The EFA model for the ASMC Scale was computed using generalized least squares (GLS) estimation (for being item 7 skewness and kurtosis slightly deviated), and maximum likelihood (ML) estimation was used in the case of the CTMM Scale. Factor loadings were considered adequate with a cut-off value of .40 (Stevens, 1992). To verify the retained number of factors in the ASMC Scale, a model retaining one more factor was tested comparing its model fit statistics with the parsimonious model. However, it was dismissed. The CFA assessed the underlying factor structure revealed in the EFA. The maximum likelihood (ML) estimation was used for both scales given the non-multivariate distribution of the data (Satorra & Bentler, 1994). In the case of the ASMC Scale, the robust ML method was employed with the Satorra–Bentler χ^2 correction due to an item's (item 7) skewness and kurtosis values slightly deviated. The fit indices analyzed were the Comparative Fit Index (CFI), the Tucker–Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), with its 90% confidence interval, and the Standardized Root Mean Square Residual (SRMR) (Hu & Bentler, 1999). The ratio of $S-B \chi^2 / df$ was also analyzed, considering good values ≤ 3.0 and adequate within 3–5. For the CFI and TLI, values close to .95 are considered an optimal fit; in the case of RMSEA values below .06 indicate a good fit and between .06 to .08 an adequate fit, and for SRMR values $\leq .08$ (Hu & Bentler, 1999; Schreiber et al., 2006). However, the model fit was considered acceptable but moderate with values above .90 for CFI and TLI and values from .08 to .10 for RMSEA (Browne & Cudeck, 1993). In addition, an unbiased SRMR index was also analyzed with its cut-off value based on commonality following Ximénez et al. (2022) recommendations for preventing model misspecification across sample size: $uSRMR / R^2 \leq .05$ indicates close-fitting models, an $uSRMR / R^2 \leq .10$ adequate fitting models. Factor loadings are considered adequate with a cut-off value of .40 (Stevens, 1992). Data analyses were conducted using the R Software package.

2.4.4. Measurement invariance

Multi-group CFA was performed to assess measurement invariance at the configural, metric, and scalar levels across gender, and across age groups for both scales. Gender invariance was only assessed between boys and girls given the small size of the non-binary/Others group. Age was categorized into the following two groups: (1) 12–14 years, (2) 15–18 years, representing early adolescence and middle adolescence. Configural invariance is assessed with a baseline model in which factor loadings and item intercepts are allowed to freely vary across groups. If the model fits the data, it implies that the factor structure is the same across groups. The metric invariance model constrains factor loadings to be equal across groups. Finally, the scalar invariance model implies both item loadings and item intercepts to be similar across groups. Nested models (metric compared to configural; scalar compared to metric) were compared using CFI, RMSEA and SRMR changes. According to Chen (2007), invariance is supported when $\Delta CFI < .01$ supplemented by $\Delta RMSEA < .015$ or $\Delta SRMR < 0.030$ for metric invariance or $< .015$ for scalar invariance. Chi-squared difference test was conducted as well, with a significant result indicating invariance, however $\Delta \chi^2$ statistics are highly sensitive to large sample sizes and Chen's (2007) criteria is preferably (Meade et al., 2008; Cheung and Rensvold, 2002). Partial scalar invariance was measured in the case scalar invariance was not achieved, releasing item intercept constraints (Byrne et al., 1989). If measurement invariance was established, comparison of means scores across groups was tested using Student t-test and Cohen's (1988) d effect size; values below .20 reflect no effect while values from .21 to .49, .50 to .79, and above .80 reflect small, medium, and large effect sizes, respectively.

2.4.5. Reliability

Internal consistency was calculated through the Omega coefficient (McDonald, 1999) for ASMC and CTMM scales and determined

Table 2
Items and factor loadings for the Spanish version of the ASMC scale.

ASMC Scale		Factor Loadings	
Items		EFA	CFA
1. When people take pictures of me, I think hoy I will look if the pictures are posted on social media. <i>Cuando la gente me hace fotos, pienso en cómo saldré si las fotos se publican en redes sociales.</i>		.74	.67
2. I think about how specific parts of my body will look when people see my pictures on social media. <i>Pienso en cómo se verán ciertas partes específicas de mi cuerpo cuando la gente vea mis fotos en redes sociales.</i>		.79	.79
3. Even when I'm alone, I imagine how my body would look in a social media picture. <i>Incluso cuando estoy a solas, me imagino cómo se vería mi cuerpo en una foto en redes sociales.</i>		.78	.78
4. During the day, I spend time thinking about how attractive I might look when people see pictures of me on social media. <i>Durante el día, paso tiempo pensando en cómo de atractivo/a puedo parecer cuando la gente vea fotos mías en redes sociales.</i>		.76	.82
5. I try to guess how people on social media will react to my physical appearance in my pictures. <i>Intento adivinar cómo la gente en redes sociales reaccionará a mi apariencia física en mis fotos.</i>		.82	.87
6. My attractiveness in pictures is more important than anything else I do on social media. <i>Mi atractivo en fotos es más importante que cualquier otra cosa que hago en redes sociales.</i>		.74	.78
7. When I do to social events, I care more about looking attractive in pictures people might post on social media than I care about having a fun time. <i>Cuando hago planes sociales, me preocupo más sobre parecer atractivo/a en las fotos que la gente pueda publicar en redes sociales que de pasármelo bien.</i>		.60	.57
8. I fan unattractive picture of me is poste don social media, I feel bad about myself. <i>Si se publica en redes sociales una foto en la que no salgo atractivo/a, me siento mal conmigo mismo/a.</i>		.75	.72
9. I look at pictures of myself on social media again and again. <i>Miro fotos mías en redes sociales una y otra vez.</i>		.76	.76
10. I zoom into social media pictures to see what specific parts of my body look like. <i>Amplio fotos en redes sociales para ver cómo salen partes específicas de mi cuerpo.</i>		.80	.80
11. If someone takes a picture of me that might be poste don social media, I ask to look at it first to make sure I look good. <i>Si alguien me hace una foto que pueda ser publicada en redes sociales, primero pido verla para asegurarme de que salgo bien.</i>		.71	.66
12. Before I post pictures on social media, I crop them or apply filters to make myself look better. <i>Antes de publicar fotos en redes sociales, las recorto o les aplico filtros para salir mejor.</i>		.65	.67
13. If someone takes a picture of me that might be posted on social media, I pose in a particular way so that I'll look as attractive as possible. <i>Si alguien me hace una foto que pudiese ser publicada en redes sociales, poso de una forma particular de tal manera que parezca lo más atractivo/a posible.</i>		.77	.72
Average variance extracted (commonality)		.55	.55

Note. Standardized item loadings are presented. All item loadings were significant at $p < .001$. EFA: Exploratory Factor Analysis, CFA: Confirmatory Factor Analysis, ASMC: Appearance-related Social Media Consciousness.

by gender as well. Likewise, omega coefficient t has been also included for the rest of the scales. Values of $\geq .80$ were considered adequate for both coefficients (Nunnally, 1978).

2.4.6. Convergent validity

After checking the assumptions of normality, non-parametric tests were applied. Spearman coefficient was used to assess bivariate correlations between ASMC and CTMM scales and ED related variables in the whole sample ($N=803$) and separately by gender. Relevant overall scale scores or subscale scores from the following measures were used for convergent validity analysis: eating disorder symptoms (EDEQ-A), sociocultural attitudes towards appearance (SATAQ-4), body esteem (BESAA), general self-esteem (RSES), and general mental health (MHC-SF). Missing values were handled by pairwise deletion. Analyses were computed including and excluding outliers and the results remained virtually the same. According to Cohen's (1992) recommendations, correlations of .10 were considered small, correlations of .30 were considered medium and correlations of .50 were considered large. Finally, Fisher's z -transformation was used to compare the correlations between the studied variables among boys and girls (Myers & Sirois, 2004). Positive values depict a higher correlation between the variables in the boys' group compared to the correlations in the girls' group. Conversely, negative values indicate higher correlations in the group of girls as compared to those obtained from the group of boys. The SPSS 24.0 software package was used to perform these analyses.

3. Results

3.1. Descriptive statistics

Item-level and full-scale descriptive statistics for both subsamples are shown in Supplement 1. The outcomes of the Mardia's test for the ASMC (Skewness = 1939.30; Kurtosis = 33.88, $p < .001$)

and for the CTMM Scales (Skewness = 201.83; Kurtosis = 11.45 $p < .001$) in the first half of the sample (EFA, $N=401$). In the second sub-sample, the relative figures were (CFA, $N=402$), for ASMC scale (Skewness=1890.54, Kurtosis = 32.41, $p < .001$) and for CTMM Scale (Skewness = 237.84, Kurtosis = 9.43 $p < .001$). Thus, multivariate normality was not assumed, and univariate normality of the items was analyzed. Regarding ASMC Scale, skewness ranged between -0.26–2.02 and kurtosis between -1.46–3.88 taking into consideration both split-half subsamples. Only item 7 of the ASMC Scale was a little skewed and with slightly deviated kurtosis values but within the limit range; consequently, the item's univariate normality was considered. The CTMM scale presented adequate skewness (between -0.42 and 0.58) and kurtosis (between -1.26 and -0.80) values and univariate normality of each item was assumed.

Table 1 shows descriptive statistics for demographic data for the whole sample and the two split-half subsamples. No differences were found between the two halves in age ($t(798) = -1.79$, $p = .073$), gender ($\chi^2(2) = 3.84$, $p = .146$), school grade ($\chi^2(5) = .74$, $p = .189$), father education ($\chi^2(4) = 7.17$, $p = .127$), mother education ($\chi^2(4) = 3.79$, $p = .434$), or social media exposure ($t(801) = .83$, $p = .405$). The means, standard deviations, and scale ranges of all the measures are reported in Table 6. Mean levels of ASMC total score for the whole sample were $M = 2.94$, $SD = 1.49$, and for CTMM general score, $M = 3.28$, $SD = 1.32$. Regarding social media daily time use, only one participant (0.1%) reported never using social media, 6.2% using less than 1 h per day, 43.72% between 1 and 2 h, 38.1% between 2 and 5 h, and 11.8% more than 5 h per day.

3.2. Factorial structure of the ASMC scale

KMO factor adequacy for the ASMC scale was excellent. The overall KMO = .95 and KMO values for each item ranged from .92 to .97. Bartlett's test of sphericity was significant, $\chi^2(78) = 3379.36$,

$p < .001$. The EFA using GLS estimation, after parallel analysis, revealed a one-factor structure. Only one factor was retained with an eigenvalue greater than the simulated one ($\lambda = 7.60 > 1.31$; $\lambda = 0.83 < 1.24$), which explained 55% of the total variance (mean commonality $\geq .50$). Model fit for the single factor model was moderate, $\chi^2(65) = 326.18$, $p < .001$; TLI = .905; RMSEA [CI 90%] = .10 [.09–.11]; SRMR = .05. Item standardized loadings were higher than .60 (see Table 2). A 2-factor model was tested by EFA analyses (GLS estimation, rotation *oblimin*) and there were not any factor loadings higher than .40 in the second factor, thus the model was dismissed. The single-factor model was tested by CFA analyses (robust ML estimation method). The values revealed a poor model fit with some fit indices marginally above the acceptable threshold: $\chi^2(65) = 281.16$, $p < .001$ (S-B $\chi^2/df = 4.32$) (Scaling correction factor 1.38); CFI = .916; TLI = .899; RMSEA [CI 90%] = .107 [.94–.12]; SRMR = .049. The null hypothesis for the absolute fit by S-B χ^2 was rejected ($p < .001$), due to sample size, and the ratio of S-B χ^2/df presented a value < 5 . Regarding the fit indices, CFI and SRMR presented an adequate fit, the TLI was below and the RMSEA and its confidence intervals at 90% were higher than the recommended criteria. However, the unbiased SRMR was .046, with a $uSRMR/R^2 = .08$, showing an adequate fit for the model. Therefore, modification indexes (M.I.) for the one-factor solution were explored showing a high correlation between items 1 and 2 (M.I. = 94.41, expected parameter change (E.P.C.) = 1.04). The model was adjusted adding the error covariances between items 1 and 2, as these two items are theoretically related sharing the same content (both are related to the cognitive experience associated to the ASMC). The re-adjusted model revealed an adequate fit to the data: $\chi^2(64) = 215.91$, $p < .001$ (S-B $\chi^2/df = 3.37$) (Scaling correction factor 1.33); CFI = .943; TLI = .930; RMSEA [CI 90%] = .089 [.76–.102]; SRMR = .046. CFI and TLI fit indexes were close to the values indicative of good fit and were adequate, RMSEA value was slightly high although acceptable and SRMR was excellent. And the unbiased SRMR was .042, with a $uSRMR/R^2 = 0.076$, indicating an adequate fit model. The re-adjusted model significantly improved the model fit, $\Delta\chi^2(1) = 24.05$, $p < .001$. Standardized factor loadings are shown in Table 2. All factor loadings were statistically significant ($p < .001$), and higher than .576 and error variances ranged from .24 to .69. Covariance between items 1 and 2 was .49. The single factor explained 55.31% of the total item variance.

3.3. Factorial structure of the CTMM scale

For the CTMM scale, the overall KMO = .90 and KMO values for each item ranged from .88 to .92, showing indeed good levels. Bartlett's test of sphericity was significant: $\chi^2(15) = 1275.72$, $p < .001$. With the CTMM Scale, the EFA was conducted using ML estimation, and only one factor emerged in the parallel analysis ($\lambda = 3.92 > 1.16$; $\lambda = 0.64 < 1.10$), explaining 59% of the total item variance (mean commonality $\geq .50$). The model showed a good fit to the data, $\chi^2(9) = 34.98$, $p < .001$; TLI = .966; RMSEA = .085, CI 90% [.06–.12]; SRMR = .04. Factor loadings from the items exceeded 0.64 (see Table 3). In the CFA (ML estimation method), the model revealed a good fit to the data: $\chi^2(9) = 25.83$, $p = .002$ (S-B $\chi^2/df = 2.87$); CFI = .989; TLI = .982; RMSEA = .068, CI 90% [.04–.10]; p -value $< .50 = 0.14$; SRMR = .02. The null hypothesis for the absolute fit by S-B χ^2 was rejected ($p < .001$), due to sample size, and the ratio of S-B χ^2/df presented an adequate value within 3–5. All fit indexes presented a good fit, with RMSEA value and confidence intervals at 90% moderate. The unbiased SRMR was .019, with a $uSRMR/R^2 = .029$, indicating a close-fit model. Standardized factor loadings are shown in Table 3. The model fit supported the one-factor structure of the original scale, explaining 64.16% of the total item variance. All items' standardized loadings exceeded .72 and error variances ranged from .25 to .48. All model parameters were statistically significant ($p < .001$).

3.4. Measurement invariance of the ASMC scale

Invariance testing across gender and age group was carried out for the CFA re-specified model. The results for the ASMC Scale from the multi-group CFA by gender and age groups are reported in Table 4. Regarding gender invariance, the configural model showed an adequate fit to the data. Changes in fit indices between metric and configural model were within acceptable range, supporting metric invariance across gender. Full scalar invariance across gender was not supported, as evidenced by a ΔCFI and $\Delta SRMR$ over the threshold, indicating worse model fit. Item intercepts constraints were released, and a model with items 9, 4 and 11 intercepts allowed to freely vary across gender showed an acceptable fit and the changes in fit indices were within the criteria and the $\Delta\chi^2$ test was significant, hence partial scalar invariance was supported. Given partial scalar invariance was supported, gender differences were tested in mean scores. Results revealed a significant effect with higher ASMC levels for girls ($M = 3.66$, $SD = 1.41$) compared to boys ($M = 2.23$, $SD = 1.21$), with large effect size ($t(762) = 15.05$, $p < .001$; $d = 1.09$). In the case of measurement invariance tests across age groups, configural, metric and scalar invariance was supported with adequate fit indices within the recommended cut-off. Only $\Delta\chi^2$ statistics was not significant in the model comparison between metric and configural invariance, but the remaining criteria were appropriate. Similarly, age groups differences were tested, with higher values of ASMC in middle adolescents ($M = 3.15$, $SD = 1.50$) compared to early adolescents ($M = 2.71$, $SD = 1.46$), with a small effect size ($t(798) = 4.25$, $p < .001$; $d = .30$).

3.5. Measurement Invariance of the CTMM Scale

Tests of measurement invariance across gender and age group were conducted for the CFA model from the CTMM Scale, results are shown in Table 5. All changes in model fit indices for gender invariance were acceptable but non-significant chi-square test results were obtained in the comparison between configural and metric invariance. Configural, metric and scalar invariance across gender was considered. No differences were found in CTMM scores between boys ($M = 3.33$, $SD = 1.38$) and girls ($M = 3.22$, $SD = 1.23$) with null effect size ($t(762) = 1.23$, $p = .218$; $d = .09$). Regarding the invariance across age groups, apart from $\Delta\chi^2$ statistics not significant in the configural vs. metric models comparison, all the fit indices changes were adequate and below the acceptable thresholds, supporting configural, metric and scalar invariance across age groups. Likewise, mean scores were compared between age groups differences, resulting in no differences in CTMM levels between early adolescents ($M = 3.21$, $SD = 1.39$) and middle adolescents ($M = 3.33$, $SD = 1.24$) and null effect size ($t(798) = -1.33$, $p = .184$; $d = -.09$).

3.6. Internal Consistency and Convergent Validity

The internal consistency reliabilities for ASMC and CTMM scales were excellent. For the ASMC scale, the omega coefficient was .94 in both subsamples and the full sample (boys $\omega = .93$, girls $\omega = .93$). For CTMM Scale, the omega coefficient was .89 and .91 in the first and second subsamples, respectively; and in the full sample .90 (boys $\omega = .91$, girls $\omega = .90$).

Regarding convergent validity in the total sample, the total score of the ASMC scale presented significant associations with all the variables evaluated, with moderate to strong associations. The analysis revealed positive and significant correlations ($p < .01$) between the ASMC scale and EDEQ-A and SATAQ-4 subscales. ASMC had negative significant correlations ($p < .01$) with body esteem (BESAA), mental health (MHC-SF), and general self-esteem (RSES) at moderate levels. There was a small positive significant correlation between ASMC and BESAA Attribution subscale. Moreover, it was related with

Table 3
Items and factor loadings for the Spanish version of the CTMM scale.

CTMM Scale		Factor Loadings	
Items		EFA	CFA
1. I think about the purpose behind a message I see on television. <i>Pienso acerca de la intención que hay detrás de un mensaje que veo en la televisión</i>		.79	.81
2. I think about who created the message I see on the ad. <i>Reflexiono sobre quiénes han creado el mensaje que veo en el anuncio.</i>		.79	.79
3. I think about what the people who made the media message want me to believe. <i>Reflexiono sobre qué quieren hacerme creer las personas que hicieron los mensajes de los medios de comunicación.</i>		.84	.85
4. I think about the things the advertisers do to get my attention. <i>Pienso acerca de las cosas que los publicistas hacen para captar mi atención.</i>		.80	.87
5. I think about whether the things that advertisers want me to do are good for me. <i>Reflexiono sobre si las cosas que los publicistas quieren que haga son buenas para mí.</i>		.73	.77
6. I try to think about how true or false and advertisement is. <i>Trato de pensar sobre cómo de verdadero o falso es un anuncio.</i>		.64	.72
Average variance extracted (commonality)		.59	.64

Standardized item loadings are presented. All item loadings were significant at $p < .001$.

Note. EFA: Exploratory Factor Analysis, CFA: Confirmatory Factor Analysis, CTMM: Critical thinking about media messages.

Table 4
Measurement invariance for the ASMC Scale.

Model Fit Indices					Model Fit Comparisons					
Invariance Model	$\chi^2(df)$	CFI	RMSEA (90%CI)	SRMR	Model Comparisons	$\Delta\chi^2 (\Delta df)$	p	ΔCFI	$\Delta RMSEA$	$\Delta SRMR$
Model Fit Statistics across Gender: boys (n = 379) vs. girls (n = 385)										
Configural Invariance	423.81 (128)	.924	.093 (.084-.103)	.047						
Metric Invariance	455.08 (140)	.920	.091 (.082-.101)	.063	Configural vs. Metric	31.27 (12)	< .001	-.004	-.002	.016
Scalar Invariance	585.46 (152)	.894	.101 (.093-.110)	.079	Metric vs. Scalar	130.38 (12)	< .001	-.026	.010	.016
Partial Scalar Invariance	503.54 (149)	.912	.093 (.084-.102)	.070	Partial Scalar vs. Metric	48.46 (9)	< .001	-.008	.002	-.007
Model Fit Statistics across Age Groups: 12–14 years (n = 392) vs. 15–18 years (n = 408)										
Configural Invariance	415.88 (128)	.94	.089 (.080-.099)	.041						
Metric Invariance	436.23 (140)	.94	.085 (.076-.094)	.049	Configural vs. Metric	20.35 (12)	.309	.000	-.004	.008
Scalar Invariance	468.03 (152)	.937	.083 (.075-.092)	.050	Metric vs. Scalar	31.80 (12)	< .001	-.003	-.002	.001

Note. χ^2 : chi-square; df: degrees of freedom; CFI: Comparative Fit Index; RMSEA: Root Mean Square Error of Approximation; CI: confidence interval; SRMR: Standardized Root-Mean Square Residual; Δ : change in parameter.

moderate significance ($p < .01$) with social media time spent. All these correlations were also revealed in the girls group, except for BESAA Attribution subscale. In the boys' group, ASMC scale did correlate with all the variables except for BESAA Weight subscale, and MHC-SF Social Wellbeing subscale. Moreover, differences between boys and girls were found in the magnitudes of the associations. Higher associations were observed between ASMC and most of the variables studied for girls compared to boys, except for the MHC-SF subscales and the BESAA Attribution subscale. By contrast, the CTMM scale did not correlate with any eating disorder-related variables and showed only a small positive significant correlation with SATAQ-4 sociocultural pressure subscale ($p < .01$ and $p < .05$). When differentiating by gender, those correlations were only maintained in the girls' group. Table 6 shows all bivariate

correlations between the scales both for the full sample, and separated by gender, and the Fisher's z-comparison.

4. Discussion

The current study is, to our knowledge, the first to realize the translation and validation into Spanish, and to assess the psychometric properties of the ASMC (Choukas-Bradley et al., 2020), and CTMM scales (Scull et al., 2010; McLean et al., 2016a) in an adolescent sample (12–18 years old). This study aimed to assess the factor structures and convergent validity of two social media influence measures on body image in an adolescent sample from Spain. The assessment of these constructs is relevant as it allows a deeper understanding of the underlying mechanisms of the impact of social

Table 5
Measurement invariance for the CTMM Scale.

Model Fit Indices					Model Fit Comparisons					
Invariance Model	$\chi^2(df)$	CFI	RMSEA (90%CI)	SRMR	Model Comparisons	$\Delta\chi^2 (\Delta df)$	p	ΔCFI	$\Delta RMSEA$	$\Delta SRMR$
Model Fit Statistics across Gender: boys (n = 379) vs. girls (n = 385)										
Configural Invariance	62.83 (18)	.983	.081 (.060-.103)	.024						
Metric Invariance	67.90 (23)	.983	.071 (.052-.091)	.033	Configural vs. Metric	5.07 (5)	.309	.000	-.010	.009
Scalar Invariance	88.38 (28)	.977	.075 (.058-.093)	.039	Metric vs. Scalar	20.88 (5)	p < .001	-.006	.004	.006
Model Fit Statistics across Age Groups: 12-14 years (n = 392) vs. 15-18 years (n = 408)										
Configural Invariance	66.99 (18)	.982	.082 (.062-.104)	.024						
Metric Invariance	74.08 (23)	.982	.075 (.056-.094)	.037	Configural vs. Metric	7.09 (5)	.168	.000	-.007	.013
Scalar Invariance	90.18 (28)	.978	.075 (.058-.092)	.041	Metric vs. Scalar	16.09 (5)	p < .001	-.004	.001	.004

Note. χ^2 : chi-square; df: degrees of freedom; CFI: Comparative Fit Index; RMSEA: Root Mean Square Error of Approximation; CI: confidence interval; SRMR: Standardized Root-Mean Square Residual; Δ : change in parameter.

Table 6

Means, standard deviations, internal consistency, bivariate correlations of variables in the whole sample (N = 803) and separately by gender, and comparison of the correlations across gender.

Variables	Interval	M (SD)	ω	Whole sample (N = 803)		Boys (n = 379)		Girls (n = 385)		Boys vs. Girls	
				ASMC rho	CTMM rho	ASMC rho	CTMM rho	ASMC rho	CTMM rho	ASMC Fisher's z-values	CTMM Fisher's z-values
ASMC	1–7	2.94 (1.49)	.94		.04		.06		.008		
CTMM	1–6	3.28 (1.32)	.90	.04		.06		.01			
Social Media exposure	1–5	3.55 (.79)		.33**	.01	.25**	.07	.40**	-.05	-2.32**	
Disordered eating											
EDEQ-A: Total	0–6	1.41 (1.45)	.96	.54**	.05	.37**	.04	.54**	.09	-2.97**	
EDEQ-A: R	0–6	1.13 (1.51)	.88	.37**	.03	.27**	.003	.41**	.07	-2.19*	
EDEQ-A: EWSC	0–6	1.49 (1.53)	.96	.56**	.05	.36**	.03	.55**	.10	-3.32**	
Sociocultural appearance attitudes											
SATAQ:TI	1–5	2.99 (1.05)	.92	.53**	.03	.32**	.07	.56**	.02	-4.15**	
SATAQ:MI	1–5	2.74 (.95)	.89	.25**	.05	.37**	.09	.38**	.002	-0.16	
SATAQ:FP	1–5	2.23 (.99)	.82	.14**	.11**	.12*	.06	.13*	.16**	-0.14	-1.39
SATAQ:PP	1–5	1.8 (.89)	.89	.29**	.08*	.24**	.08	.33**	.07	-1.35	
SATAQ:MP	1–5	2.31 (1.28)	.95	.53**	.11**	.25**	.04	.49**	.21**	-3.86**	-2.38**
SATAQ:SMP	1–5	2.42 (1.35)	.96	.62**	.08*	.42**	.05	.55**	.18**	-2.35**	-1.82*
Body esteem											
BE - Total	0–4	2.13 (.76)	.87	-.36**	-.02	-.16**	.01	-.45**	-.07	-4.45**	
BE - Appearance	0–4	2.25 (1.04)	.88	-.56**	-.03	-.39**	-.02	-.61**	-.06	-4.09**	
BE - Weight	0–4	2.44 (1.20)	.89	-.21**	-.01	-.06	.05	-.29**	-.08	-3.28**	
BE - Attribution	0–4	1.81 (.80)	.74	.08*	.01	.14**	.04	.02	-.04	1.67*	
General self-esteem											
RSES	10–40	28.91 (6.34)	.88	-.34**	-.01	-.18**	-.02	-.37**	-.002	-2.84**	
General mental health											
MHC-SF: General	14–84	58.94 (15.15)	.95	-.26**	-.01	-.17**	-.004	-.24**	-.02	-1.01	
MHC-SF: EW	3–18	13.02 (3.52)	.89	-.28**	.01	-.20**	.02	-.25**	-.02	-0.72	
MHC-SF: PW	6–36	26.49 (6.87)	.89	-.26**	.02	-.19**	.01	-.25**	.01	-0.87	
MHC-SF: SW	5–30	19.43 (6.03)	.88	-.20**	-.04	-.10	-.05	-.19**	-.05	-1.27	

Note. * $p < .05$. ** $p < .01$. ω : McDonald's omega coefficient; EDEQ-A: Eating Disorders Examination Questionnaire for Adolescents; R: Restrain; EWSC: Eating/Weight/Shape Concerns; SATAQ: Sociocultural Attitudes Towards Appearance Questionnaire; MI: Muscular Internalization; TI: Thin Internalization; PP: Peers pressure; FM: Family Pressure; MP: Media Pressure; SMP: Social Media Pressure; BE: Body-Esteem; RSES: Rosenberg's Self-esteem Scale; MHC-ST: Mental Health Continuum-Short Form; EW: Emotional wellbeing; PW: Psychological wellbeing; SW: Social wellbeing.

media on eating disorder symptomatology and emotional well-being during adolescence. Concretely, appearance-related social media consciousness and critical thinking about media messages have been postulated as possible risk (Choukas-Bradley et al., 2020) and protective factors (McLean et al., 2016a, 2016b) for disordered eating and negative body image, respectively. Their factorial structure, measurement invariance across gender and across age groups, internal consistency reliability, and convergent validity were tested. Overall, both scales exhibited adequate psychometric properties similar to the original versions with certain caveats that should be considered in future research.

First, regarding the ASMC scale, results of the EFA and CFA supported a unidimensional model, which is consistent with the original validation (Choukas-Bradley et al., 2020). Nonetheless, model data fit was adjusted, modifying the original one, allowing the error covariances between items 1 and 2 as they were theoretically related. The re-adjusted fit was not as excellent as the original English version and explained less total item variance (i.e.: total item variance of the current study was 55.65% vs. 63.3% of the original one). These differences might be due to cultural disparities between these countries. In fact, our results are similar to the data fit found in the Turkish validation conducted on adolescents (Çetinkaya et al., 2022), and the validation realized by Maheux et al. (2022a), which included adult participants from different anglophone countries. Our results also replicate findings from previous studies which found strong internal consistency of the ASMC Scale both when tested on adolescents (Çetinkaya et al., 2022; Choukas-Bradley et al., 2020; Maheux et al., 2022b), and adults (Burnell et al., 2021; Maheux et al., 2022a). Measurement invariance across gender revealed configural, metric and partial scalar invariance, consistent with Choukas-Bradley et al. (2020), showing a goodness of fit indices similar to the original validation that allows to compare scale scores between boys and girls (Davidov et al., 2012). ASMC levels were higher for girls

than boys with a large effect size, results consistent with Choukas-Bradley et al. (2020). Our study also provides new and previously untested information, supporting groups' age invariance, allowing the comparison of means across early and middle adolescence. Middle adolescents' ASMC levels were higher than early adolescents' ones.

Regarding convergent validity, as expected, higher scores in ASMC were positively associated with higher disordered eating symptomatology, higher perceived media pressures, and internalization ideals. Medium to large effect size magnitudes for relations between ASMC scores and measures of disordered eating were similar to those obtained in Choukas-Bradley et al. (2020), supporting the theoretical link between ASMC and eating disorder pathology risk. As hypothesized, gender differences were found in the strength of the correlations between ASMC and these variables. More specifically, the associations between ASMC and disordered eating, thin ideal internalization, media, and social media pressure were stronger in the girls' subsample compared to the group of boys. However, no gender differences emerged in the relationship between ASMC scale and the muscular ideal, family pressure, and peer pressure subscales (SATAQ-4). These findings highlight the gender differences in the experience of social media ideals internalization (Rodgers et al., 2020), and in the way of exposure to specific physical appearance content on social media (Haferkamp et al., 2012) which particularly targets adolescent girls (Choukas-Bradley et al., 2022; Rodgers et al., 2020). Despite these gender divergences in the results, it must be recognized that boys are also affected by these same variables. The differences that emerged can be ascribed to the EDEQ-A questionnaire, which primarily focuses on shape concerns and the desire to lose weight as motivated by the thinness ideal. Literature shows that physical standards in the male population mainly refer to muscularity ideals (Schaefer et al., 2015), which internalization appears to be directly related to social media use (Rodgers

et al., 2020). Recently, an increasing focus on muscularity in girls has been observed (Rodgers et al., 2018), and that would explain the no differences in the correlations between ASMC and muscular ideals across boys and girls. In addition, ASMC has been negatively correlated with general self-esteem and general mental health, which is consistent to prior studies that related ASMC with depressive symptoms in adolescents (Maheux et al., 2022b; Choukas-Bradley et al., 2020), adult women (Choukas-Bradley et al., 2020), and with self-esteem in young women (Choukas-Bradley et al., 2019). No gender differences were found in the association between ASMC and general mental health, in line with Choukas-Bradley's et al. (2020) study where higher ASMC results predicted depressive symptoms in both boys, and girls. The higher association between ASMC and general self-esteem observed in girls compared to boys can be explained by gender differences in the internalization of appearance ideals and body dissatisfaction, which are negatively related to self-esteem (Rodgers et al., 2020).

Besides, ASMC correlated negatively with total body esteem in the general sample. Differences were found regarding the correlation with body esteem subscales according to gender. Specifically, ASMC correlated negatively with BE-Weight only for girls and positively with BE-Attribution only for boys. To our knowledge, while previous studies confirm the negative association between ASMC and general body esteem measures (Choukas-Bradley et al., 2019), this is the first study to assess the association with different dimensions of this construct. A possible explanation for the above-mentioned gender differences is that in social comparison adolescent girls focus particularly on weight-related dimensions, whereas men's physical attractiveness is more strongly related to body muscularity than to BMI (Calogero & Tylka, 2010; Fisher, Dunn, & Thompson, 2002). The association of body weight perception and eating disorders-related unhealthy weight control behaviors, may predict an effect of ASMC on eating disorders only in girls (Choukas-Bradley et al., 2020). Finally, the attribution subscale is being questioned as a strict BE dimension (Garbett et al., 2021). It is possible that by capturing self-awareness of one's opinion of appearance (i.e., "People my age like the way I look"), it is positively related to ASMC.

Lastly, greater social media exposure was also related to higher levels of ASMC, as hypothesized; adolescents which are more worried about how they look to the online audience may spend more time on social media (Choukas-Bradley et al., 2020). Indeed, it has been argued that the negative impact of social media on mental health has more to do with ASMC than with the time spent on it (Holland & Tiggemann, 2016; Meier & Gray, 2014). Further, ASMC may have a role in the development of mental health issues, as it has been shown to predict disordered eating (Choukas-Bradley et al., 2020; 2022) and depressive symptoms (Maheux et al., 2022b) when controlling time spent on social media, and has been identified as a factor that may increase body image concerns (Choukas-Bradley et al., 2022). In the current study, this association was also stronger for girls than boys, which could be explained by the higher levels of social media related appearance concerns (Choukas-Bradley et al., 2020; 2022; Rodgers et al., 2020).

Concerning the CTMM scale, the EFA and CFA results supported the same one-factor structure as the original scale (McLean et al., 2016a), with a total item variance explained (59% and 64.16% vs. 60%) compared to the original validations (McLean et al., 2016a; Scull et al., 2010). No studies on between-age nor between-groups invariance had been previously conducted. In our case, configural, metric and scalar invariance was demonstrated both for gender, and age groups. However, no significant differences were found neither between boys and girls, nor across different age groups (middle and early adolescence). The internal consistency showed good levels, as in previous studies (McLean et al., 2016a; 2016b, 2016d; 2017; Scull et al., 2010). However, our results have not gathered evidence for CTMM convergent validity as hypothesized, which is in contrast to

previous work that found an association between CTMM and thin-ideal internalization, body esteem, and media exposure (McLean et al., 2016a, 2016c). In our study, we found no evidence confirming CTMM to be related to disordered eating variables. Similarly, McLean et al. (2016a) did not find any significant association with dietary restraint, and media literacy interventions including CTMM did not contribute to improve disordered eating symptoms (McLean et al., 2016c; 2016d). Due to the role CTMM has in mediating the relation between thin internalization and body dissatisfaction (McLean et al., 2013), gender differences were expected in correlation values between these variables. Accordingly, we observed significant correlations between CTMM and pressure subscales (SATAQ-4) only in girls. Finally, our study did not find any significant association between general self-esteem and general mental health.

As far as we are aware, there are no other studies exploring these associations. Therefore, these results could be interpreted in line with some other contradictory findings in the social media literacy prevention research. McLean et al. (2016d) published a dismantling study about a media literacy programme in early adolescent girls incorporating a critical thinking component for reducing the media influence in body image. Unexpectedly, CTMM values were reduced after the intervention. In a similar way, McLean et al. (2017) did not observe any changes in CTMM scores after a social media literacy intervention in adolescent girls. Similarly, conflicting results have also been found with other media literacy components, such as media processing, which was associated with higher levels of disordered eating and body concerns (McLean et al., 2016c). In light of these findings, it could be argued that the items from the CTMM scale could be interpreted differently as they were designed similarly to the Similarity Scepticism subscale from the Media Attitudes Questionnaire, which was positive associated with body dissatisfaction (McLean et al., 2016a). Thus, greater levels of CTMM could be interpreted as higher consciousness of the sociocultural pressures from the media, explaining the positive relationship with the sociocultural pressure subscales from the SATAQ-4 in this study. And this would be consistent with McLean et al., (2013; 2016b) which postulated CTMM has a protective factor of the negative effects of social media images that promotes aesthetic ideal in body dissatisfaction, suggesting a mitigation role on body satisfaction outcomes in the media literacy prevention research, however, it did not show an enhancing effect on eating disorders risk variables (McLean et al., 2016b). Thus, this effect might not be detected by bivariate correlations in this study. Furthermore, Wade et al. (2017) suggested that the mechanism of change of media literacy in the development of risk eating disorder variables such as the weight and body concerns occurs through the media internalization (thin and muscular ideal), and Halliwell, Easun, Harcourt (2011) adds that appearance comparison may be also involved. Given that, as far as we are aware, no other studies have yet explored these associations, we believe that the degree to which the CTMM scale is related to these psychological variables is inconsistent and should be the focus of future work for its clarification.

4.1. Limitations, strengths, and future directions

While this study provides incremental contributions to the prior literature, it is not free from limitations. First, our study contributes to the understanding of ASMC and CTMM across cultures by validating assessment scales among the adolescent Spanish population; however, our community sample was recruited incidentally (non-probability sampling), thus presenting a risk of not being a representative sample of the population. Another limitation is its cross-sectional design, as causality cannot be explored. Additionally, while the questionnaires used are validated measures in the target population, as they are self-reported, potential biases such as social desirability may exist. Regarding the psychometric properties, test-

retest reliability has not been analyzed, being an objective of potential future research. Additionally, a measure of self-objectification/objectified body consciousness was not included as part of the scale validation process even though this construct is central to ASMC. Hence, future research should include the study of the association of these two variables in the Spanish population, as ASMC may mediate the impact of social media use in self-objectification, contributing to development of mental health concerns (Choukas-Bradley et al., 2022). Regarding CTMM, although specific instructions were included for the CTMM scale, this scale could be improved in future research creating more precise items for body-image related context. However, another version of this measure for evaluating specifically physical appearance media messages called “Critical Thinking about Media Messages- appearance focus” (CTMM-AF) did not show discriminant validity from CTMM Scale (McLean et al., 2016a). Given the poor convergent validity shown in this study, it is also necessary to note the absence of questionnaires that allow us to really evaluate whether the CTMM is assessing the correct construct. Other alternative theoretically-related constructs (e.g. measures of plausibility of media messages or credibility of the realism of the media messages) are proposed for future CTMM convergent Spanish validity assessments in the context of body image research (McLean et al., 2016a). Concretely, Realism Scepticism (McLean et al., 2016a), another media literacy measure, is proposed to be also validated into Spanish to assess convergent validity, as it may evaluate media literacy more accurately (McLean et al., 2016d, 2017).

Despite the limitations, important strengths of this study should be noted. Firstly, a large sample size, made up of both boys and girls, was employed. Another strength of the study is that our method followed best practices for scale validation, including split-half testing for carrying out AFE and AFC analyses. This two-step analytical strategy has been defended as the most robust approach to test adaptation and validation (Swami & Barron, 2019; Worthington & Whittaker, 2006). In addition, the inclusion of both genders is a major contribution, especially regarding the CTMM, since previous studies had been limited to women samples (Scull et al., 2010; McLean et al., 2016a, 2016b). A further strength worthy of mention is the study of measurement invariance, which allows to make comparisons between boys and girls, and early and middle adolescents. Moreover, this study covers a wide range of dimensions among eating disorder risk factors, extending the exploration of these constructs in eating disorder-prevention strategies. Relatedly, it adds to the literature the association between ASMC and the full BESAA and the internalization of the thin and muscular aesthetic standards. Likewise, it is the first to explore the relationship between CTMM and general mental health variables.

To explore gender-related differences among these social media experiences (Choukas-Bradley et al., 2022), future research should examine the gendered appearance and aesthetic ideal differences, and how these constructs may differentially affect adolescents with different gender identities. Most studies have shown a greater social media impact on appearance concerns in girls than in boys (Choukas-Bradley et al., 2022); however, other gender identities should be explored or differences across ages. In addition, it must be mentioned how studying these aspects in a sample of early adolescents might be relevant in terms of early prevention of the impact of social media (Burnette et al., 2017), as this represents a development stage more vulnerable to its influence (Levine & Smolak, 2006). Further, these instruments could be examined in a clinical setting among adolescents with eating disorder risk or diagnosis to assess mediational effects of ASMC and CTMM in the impact of social media on eating disordered symptoms and negative body image. Finally, given the unexpectedly weak associations shown between CTMM and other eating disorder risk variables in the present study, further research on its clinical relevance as a protective factor in ED

prevention must be examined, as well as the accuracy of the scale items when fulfilling this purpose.

4.2. Conclusions

ASMC and CTMM are relevant constructs as emerging risk and protective factors of eating disorders and mental health. The current study validated the Spanish-version of the ASMC and CTMM scales among the Spanish adolescent population. The simple construct and its appropriated psychometric properties (factorial validity, gender and age groups invariance, strong internal consistency, and convergent validity) make the ASMC scale a reliable and useful tool for social media-related construct assessment in the Spanish adolescent population. Furthermore, its use is suggested in further clinical and research settings for understanding the impact of social media on adolescents' mental health. The CTMM Scale exhibited the same single-factor structure as the original scale, gender and age groups invariance, and good reliability (internal consistency). However, its convergent validity may be questioned given the absence of relations with the eating disorder associated variables. Therefore, some preliminary evidence regarding the appropriateness of this scale for Spanish adolescents has been found (with certain caveats). It is recommended to be used with caution and improved in future research, exploring its convergent construct validity, and revising its items' appropriateness.

Data Availability

Data will be made available on request.

Declarations of Competing Interest

None

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.bodyim.2023.04.004](https://doi.org/10.1016/j.bodyim.2023.04.004).

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