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# Factor structure and psychometric properties of the Italian version of the online fear of missing out in young adults

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## ARTICLE INFO

## ABSTRACT

The 20-item Online Fear of Missing Out (ON-FoMO) is the only existing instrument to measure fear of missing out (FoMO) levels in strict association with online behaviors and social media and, for this reason, it is relevant to evaluate its psychometric properties also in the Italian context. In Study 1, exploratory factor analysis was conducted on the scale items using a sample of 311 Italian young adults [F = 66.2%; M (SD) = 23.5 (3.5) years old]. In Study 2, confirmatory factor analysis was conducted to determine whether the results of Study 1 could be confirmed with another sample of Italian young adults [N = 506; F = 53.2%; M (SD) = 23.6 (3.7) years old]. The model was also tested for measurement invariance by gender and age. Full scalar invariance of the ON-FoMO across gender and age was supported and adequate internal consistency was found. Convergent validity was also demonstrated.

## 1. Introduction

The Fear of Missing Out (FoMO) has been defined, starting from the seminal study of Przybylski and colleagues (Przybylski et al., 2013), as a pervasive concern related to the perception that other people might experience or possess something significant and rewarding that one lacks, with a consequent feeling of being excluded, left behind (Gil et al., 2015; Przybylski et al., 2013), involving the desire to continually stay connected with what others are doing. Especially due to its specific correlated dimensions, such as the need to belong and to seek approval from others, FoMO has increasingly found fertile ground in the digital world, especially with respect to the Social Networking Sites (SNSs) use described as privileged channels for maintaining and fulfilling social connections (Shapiro & Margolin, 2013) and social needs, including the need to belong and to increase one's popularity (e.g., Baumeister & Leary, 1995; Beyens et al., 2016; Santor et al., 2000). Indeed, as using SNSs seems to satisfy the individuals' desire (perhaps the need) to be constantly connected with others, FoMO might represent a risk factor for problematic SNSs-related activities, also strictly associated with psychopathologies (e.g., Author & Colleagues, 2021; Blackwell et al., 2017; Fioravanti et al., 2021; Wolniewicz et al., 2018). Moreover, FoMO may

play a mediating role between psychopathological symptoms and the consequences of maladaptive use of SNSs on the smartphone, between motivational deficits and social media engagement, and between deficits in emotional needs or problems and social media use (e.g., Alt, 2015; Oberst et al., 2017; Przybylski et al., 2013). In addition, research findings have highlighted that FoMO may play a predictive role in emotional distress and smartphone addiction (e.g., Elhai et al., 2016; Elhai et al., 2018; Gil et al., 2015; Chotpitayasunondh & Douglas, 2016), suggesting that higher preoccupation concerning missing friends' rewarding experiences might lead to using the smartphone to keep in touch with significant others. Only recently, exploring process and social use of the smartphone (Elhai et al., 2017), researchers showed that smartphone social use did not mediate the relationship between FoMO and problematic smartphone use, suggesting that excessive smartphone use might not be necessarily due to social and communicative purposes (i.e., SNSs, messages, phone calls), but rather to other non-social oriented applications (i.e., news consumption, web surfing) (Casale, Fioravanti, Gioia, Redditi, & Spada, 2022). Nevertheless, since FoMO seems to be increasingly related to online social media use and addiction (e.g., Blackwell et al., 2017; Casale & Fioravanti, 2020; Fabris et al., 2020; Fang et al., 2020; Koç et al., 2023), the concept of Online Fear of Missing

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Out (On-FoMO) was recently proposed by Sette et al. (2020).

## 1.1. The Online Fear of Missing Out (ON-FoMO)

As aforementioned, the scholar interest increasingly focused on the relationship between FoMO and SNSs-related activities (e.g., Author & Colleagues, 2021; Blackwell et al., 2017; Fioravanti et al., 2021; Wolniewicz et al., 2018), and the construct of FoMO has been usually described and explored in online contexts (Wegmann et al., 2017). However, the Fear of Missing Out Scale by Przybylski et al. (2013) is the only available measure of FoMO and it refers to general social settings, with no emphasis on SNSs and other online activities (Sette et al., 2020). In this regard, an instrument aimed to specifically explore FoMO experiences in online contexts might provide new and more specific achievements in the problematic social networking research field. Accordingly, building on the FoMO scale created by Przybylski et al. (2013), Sette et al. (2020) developed a self-report instrument aimed at assessing individuals' fears and worries about being out of touch with their online social environment, and then more focused on online behaviors and social media. Starting from an initial 47-item pool, the final measure was developed with a convenience community sample of 405 Brazilian adults (80.2% women) aged 18–63 years ($M = 29.1$; $SD = 8.1$) and resulted in a 20-item self-report instrument assessing online fear of missing out. A four-factor model of the 20-item ON-FoMO was found with a reasonable fit to the data [$\chi^2_{(116)} = 205.3$, RMSEA = 0.04, CFI = 0.98, and TLI = 0.98]. The final measure also showed good internal consistency, with Cronbach's $\alpha$ ranging from 0.73 to 0.85 for the four dimensions ($\alpha = 0.92$ for the total score). The identified four factors were: 1) *Need to Belong* (NB - 5 items; e.g., "I get sad to learn from posts that my friends went to events and I wasn't invited"), 2) *Need for Popularity* (NP - 5 items; e.g., "I get annoyed when my posts don't get many likes and/or comments"), 3) *Anxiety* (ANX - 5 items; e.g., "If I do not have access to social networks, I think of ways to get connected"), and 4) *Addiction* (ADD - 5 items; e.g., "In social situations, I pay more attention to my cell phone than to my friends").

For its good psychometric properties, the ON-FoMO has been adapted to Turkish and Indonesian. The Turkish version (Bakioğlu et al., 2022) of the ON-FoMO, developed with a convenience sample of 419 adults (69% women) aged 18–38 years ($M = 25.4$; $SD = 6.4$), confirmed the original four-factor structure (Sette et al., 2020), with a good fit to the data ($\chi^2 = 10,608.62$, $df = 190$, p = .05; CFI = 0.99, NNFI = 0.99, TLI = 0.99, RMSEA = 0.02, SRMR = 0.05). The internal consistency was also good, with Cronbach's $\alpha$ ranging from 0.80 to 0.89 for the four dimensions ($\alpha = 0.93$ for the total score). The Indonesian version (Kurniawan & Utami, 2022) of the ON-FoMO, developed with a convenience sample of 254 students (79.6% women) aged 17–24 years ($M = 19.0$; $SD = 1.3$), also confirmed the original four-factor structure (Sette et al., 2020), despite only through exploratory factor analysis (KMO = 0.85, Bartlett's test $\chi^2 = 2608.84$; $p < .001$; explained variance = 57%). The internal consistency was also good, with Cronbach's $\alpha$ ranging from 0.69 to 0.89 for the four dimensions ($\alpha = 0.85$ for the total score).

Regarding the convergent validity, ON-FoMO factors and total score were found to be significantly correlated with FoMO, smartphone addiction, and social media dependency or addiction (Bakioğlu et al., 2022; Kurniawan & Utami, 2022; Sette et al., 2020), as well as with neuroticism (Kurniawan & Utami, 2022). Moreover, ON-FoMO was negatively correlated with life satisfaction (Bakioğlu et al., 2022; Sette et al., 2020).

Finally, no studies report evidence of gender differences in ON-FoMO levels.

## 1.2. The present study

The present study aims at determining whether the ON-FoMO could be a psychometrically valid instrument in the Italian context, thus providing a useful tool with which to assess this fear in Italy. This is important because, while the FoMO construct has already received attention in the Italian context (e.g., Casale & Fioravanti, 2020; Casale et al., 2018; Casale et al., 2022; Fabris et al., 2020; Gioia et al., 2021; Marengo et al., 2021; Servidio, 2021; Ramaglia & Sommantico, 2022), the ON-FoMO construct, more strictly related to online behaviors and social media, was only measured in Brazil (Sette et al., 2020), Turkey (Bakioğlu et al., 2022), and Indonesia (Kurniawan & Utami, 2022). In this vein, this study aims at providing further cross-cultural research on the ON-FoMO.

The present study aims to examine and verify the dimensionality, internal consistency, and convergent validity of the Italian version of the ON-FoMO. Furthermore, because the measurement invariance of the ON-FoMO across gender has never been the focus of scientific attention, the current study also aims at investigating its measurement invariance across gender.

Based on previous results about the ON-FoMO factor structure (Bakioğlu et al., 2022; Kurniawan & Utami, 2022; Sette et al., 2020), we hypothesized to find a similar four-factor structure, while no predictions were made about the measurement invariance across gender. Also based on conflicting previous results regarding gender differences in FoMO scores (e.g., Akbari et al., 2021; Elhai et al., 2018; Przybylski et al., 2013), we investigated gender differences in ON-FoMO without a definition of specific hypotheses. Finally, based on previous research findings (e.g., Alt, 2015; Authors & Colleague, 2023; Bakioğlu et al., 2022; Blackwell et al., 2017; Casale et al., 2018; Fabris et al., 2020; Koç et al., 2023; Li et al., 2022; Sette et al., 2020), we hypothesized significant positive correlations between ON-FoMO, FoMO, NoMoPhobia, and social media addiction.

## 2. Study 1

The purpose of Study 1, part of a larger investigation (Sommantico et al., 2023), was to explore the factor structure and internal consistency of the ON-FoMO items.

### 2.1. Method

#### 2.1.1. Participants and procedure

311 young adults (66.2% women and 33.8% men) aged 18–35 yrs ($M = 23.5$; $SD = 3.5$) and residing in various regions of Italy participated in the study. Regarding participants' relationship status, 54.3% were partnered. Regarding participants' educational level, 64.7% had completed secondary school and 33.8% had completed a university or a post-university degree. Regarding employment, 63% were students, 32.5% were workers, and 4.5% were unemployed. Finally, regarding social media engagement, 15.4% of the participants frequented more than two social media platforms (44.7% frequented two social media platforms), 10.3% spent more than 4 h a day on social media platforms (29.3% spent between two and 4 h, and 34.4% spent between one and 2 h), and 41.5% frequented social media platforms not only during leisure but also during academic and/or work time.

Participants were recruited on Internet forums and through social media ads, according to the following criteria: a) have one or several social media accounts; b) be 18–35 years old. There was no financial incentive for anonymous and voluntary participation in the study. At the beginning of the survey, participants were explained the rationale, procedures, and overall purpose of the study. In addition, participants were asked to sign the informed consent.

#### 2.1.2. Ethical standards and informed consent

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (Ethical Code of the Psychologist of the Italian National Council of the Order of Psychologists) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants for being

included in the study. The study was reviewed and approved by the Psychological Research Ethics Committee of the Department of Humanities of the University of Naples Federico II (prot. no. 17/2023).

### 2.1.3. Measures

An ad-hoc basic demographic questionnaire was administered to collect information regarding participants' age, gender, educational level, relationship status (single/partnered), employment status, and social media engagement.

*2.1.3.1. Online Fear of Missing Out.* The Italian translation of the ON-FoMO (Sette et al., 2020) was obtained by performing a standard translation-back-translation (Brislin, 1986; Geisinger, 1994). In this vein, a bilingual researcher, not involved in the study, translated the scale from English to Italian; a second researcher then translated the Italian version back to English; finally, the research team compared the back translation to the original text to make sure the back translation was accurate and complete. Participants are asked to respond according to a 4-point Likert-type scale (from 1 = *Has nothing to do with me* to 4 = *Has a lot to do with me*).

### 2.1.4. Statistical analyses

We then entered survey data into SPSS 28.0 (IBM Corp, 2021) and project staff verified their accuracy. There were no missing data and, addressing univariate and multivariate distribution, residuals resulted normally distributed as assessed by visual inspection of a normal probability plot. We then conducted a principal component analysis using principal axis factoring as the method of extraction, with Promax rotation, and factor loadings were interpreted using Tabachnick and Fidell (2013) suggestions. Internal consistency was examined in the total sample by using Cronbach's $\alpha$ (>0.70) (Nunnally & Berstein, 1995).

### 2.2. Results

Table 1 shows descriptive statistics of the ON-FoMO items, while Table 2 shows the results of the factor analysis.

The Kaiser–Meyer–Olkin index was 0.894, thus indicating the suitability of the factor analysis. In a similar way, Bartlett's test of sphericity showed that the correlation matrix was suitable for factor analysis ($\chi^2$ = 2386.27, $df$ = 190, $p$ < .001). It was possible to individuate four components with eigenvalue ≥1. Furthermore, the visual inspection of the scree plot indicated a four-factor structure for the ON-FoMO, with the extracted factors explaining 55.99% of the total variance.

**Table 1**
ON-FoMO items descriptive statistics.

| Item | M | SD | Asymmetry | SE | Curtosis | SE | Corrected item total correlation |
|---|---|---|---|---|---|---|---|
| 1 | 1.8 | .89 | .73 | .14 | −.42 | .28 | .46 |
| 2 | 1.6 | .81 | 1.25 | .14 | .60 | .28 | .47 |
| 3 | 2.6 | 1.06 | −.15 | .14 | −1.19 | .28 | .53 |
| 4 | 2.0 | 1.07 | .59 | .14 | −.97 | .28 | .54 |
| 5 | 1.8 | .98 | .97 | .14 | −.29 | .28 | .51 |
| 6 | 1.7 | .83 | 1.04 | .14 | .20 | .28 | .54 |
| 7 | 1.6 | .81 | 1.29 | .14 | .81 | .28 | .49 |
| 8 | 1.7 | .86 | 1.06 | .14 | .15 | .28 | .55 |
| 9 | 2.4 | .96 | .31 | .14 | −.84 | .28 | .54 |
| 10 | 1.7 | .88 | 1.13 | .14 | .32 | .28 | .59 |
| 11 | 2.4 | 1.01 | .07 | .14 | −1.10 | .28 | .51 |
| 12 | 2.2 | .99 | .29 | .14 | −1.05 | .28 | .63 |
| 13 | 1.8 | .86 | .79 | .14 | −.26 | .28 | .63 |
| 14 | 1.8 | .85 | .87 | .14 | .05 | .28 | .66 |
| 15 | 1.8 | .88 | .73 | .14 | −.39 | .28 | .58 |
| 16 | 2.0 | .96 | .54 | .14 | −.86 | .28 | .42 |
| 17 | 1.7 | .86 | 1.08 | .14 | .14 | .28 | .44 |
| 18 | 2.3 | 1.06 | .07 | .14 | −1.32 | .28 | .61 |
| 19 | 1.4 | .69 | 1.62 | .14 | 2.47 | .28 | .39 |
| 20 | 1.3 | .69 | 2.08 | .14 | 3.71 | .28 | .39 |

**Table 2**
ON-FoMO Item Factor Loadings, Explained Variance, and Cronbach's $\alpha$.

| Item | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|---|---|---|---|---|
| 1 | **.629** | .041 | .006 | −.056 |
| 2 | **.473** | .195 | .123 | .041 |
| 3 | **.503** | .179 | .061 | .059 |
| 4 | **.760** | .125 | −.031 | −.099 |
| 5 | **.689** | .021 | −.010 | −.006 |
| 6 | −.067 | **.936** | −.020 | −.101 |
| 7 | −.070 | **.512** | .015 | .213 |
| 8 | −.029 | **.829** | −.058 | .020 |
| 9 | .258 | **.458** | −.007 | −.001 |
| 10 | .083 | **.623** | .072 | .007 |
| 11 | .023 | −.051 | **.664** | .008 |
| 12 | .000 | .001 | **.803** | −.001 |
| 13 | −.085 | .125 | **.828** | −.061 |
| 14 | −.075 | .046 | **.858** | .010 |
| 15 | .160 | −.122 | **.702** | −.012 |
| 16 | .293 | −.193 | .182 | **.465** |
| 17 | −.166 | .039 | .109 | **.629** |
| 18 | .285 | .104 | .061 | **.493** |
| 19 | −.134 | .055 | .096 | **.515** |
| 20 | .114 | −.025 | −.164 | **.619** |
| Explained variance (%) | 7.09 | 9.49 | 33.56 | 5.85 |
| Cronbach's $\alpha$ | .77 | .76 | .87 | .78 |

The bold and italics indicate the significant factor loadings of the items on the four factors.

As shown in Table 2, the first factor contains five items and refers to anxiety related to the need for affiliation and to maintain stable relationships. The second factor contains five items and relates to the need for peer approval and the fear of not being recognized. The third factor contains five items and relates to the lack of Internet or smartphone availability. Finally, the fourth factor contains five items and refers to problems experienced in relation to excessive online social media use. The factor structure identified in the Italian context aligns with the original ON-FoMO.

There was a strong linear correlation between the four factors ($r$ ranging between 0.47 and 0.65; $p$ < .001). Cronbach's $\alpha$ was 0.77 for Factor 1, 0.76 for Factor 2, 0.87 for Factor 3, and 0.78 for Factor 4. The mean for the first ON-FoMO factor was 9.8 ($SD$ = 3.5), the mean for the second ON-FoMO factor was 8.9 ($SD$ = 2.8), the mean for the third ON-FoMO factor was 10.0 ($SD$ = 3.7), and the mean for the fourth ON-FoMO factor was 8.7 ($SD$ = 2.9). Finally, 118 participants achieved scores that fell above the mean plus one of the $SD$ on the first ON-FoMO factor, 111 participants achieved scores that fell above the mean plus one of the SD on the second ON-FoMO factor, 137 participants achieved scores that fell above the mean plus one of the SD on the third ON-FoMO factor, and 115 participants achieved scores that fell above the mean plus one of the SD on the fourth ON-FoMO factor.

## 3. Study 2

In Study 2, confirmatory factor analysis (CFA) of the 20-item ON-FoMO was conducted to determine whether the results of the EFA in Study 1 could be confirmed with another sample of 506 young adults. Furthermore, we examined convergent and discriminant validity via the relationships with several variables.

### 3.1. Method

#### 3.1.1. Participants

This second sample was composed of 506 young adults (53.2% women) aged 18–35 years. ($M$ = 23.6; $SD$ = 3.7). Participants were recruited with the same recruitment method described in Study 1. Similarly, the ethical standards were the same as described in Study 1. Regarding participants' relationship status, 53.7% were partnered. Regarding participants' educational level, 65.8% had completed

secondary school and 34.2% had completed a university or a post-university degree. Regarding employment, 61% were students, 33.5% were workers, and 5.5% were unemployed. Finally, regarding social media engagement, 16% of the participants frequented more than two social media platforms (43.8% frequented two social media platforms, and 40% frequented one social media), 36.3% spent more than 4 h a day on social media platforms (29.3% spent between two and 4 h, and 34.4% spent between one and 2 h), and 40.5% frequented social media platforms not only during leisure but also during academic and/or work time.

### 3.1.2. Measures

An ad-hoc basic demographic questionnaire was administered to collect information regarding participants' age, gender, educational level, relationship status (single/partnered), employment status, and social media engagement.

#### 3.1.2.1. Online Fear of Missing Out.
The ON-FoMO (Sette et al., 2020) (for a description, see Study 1) was administered. The On-FoMO has demonstrated good psychometric properties (Sette et al., 2020), and its internal reliability was also good in the present study (α ranging between 0.80 and 0.88 across the four subscales). In order to assess convergent validity, the following self-report measures were administered to the sample of 506 young adults.

#### 3.1.2.2. Fear of Missing Out.
The Fear of Missing Out Scale (FoMOS) (Przybylski et al., 2013) is a self-report instrument composed of 10 items that assess the fear of missing out on two subscales (e.g, the Italian adaptation) (Casale & Fioravanti, 2020): 1) *Fear* (FE - 4 items; e.g., "I get worried when I find out my friends are having fun without me") and 2) *Control* (CO - 6 items; e.g., "When I miss out on a planned get-together it bothers me"). Participants are asked to respond according to a 5-point Likert-type scale (from 1 = *Not at all true of me* to 5 = *Extremely true of me*). Previous studies have shown good psychometric properties of the FoMOS (Casale & Fioravanti, 2020; Przybylski et al., 2013), and Cronbach's α was 0.82 in the present study.

#### 3.1.2.3. NoMoPhobia.
The NoMoPhobia Questionnaire (NMP-Q) (Adawi et al., 2018; Yildirim & Correia, 2015) is a 20-item self-report instrument assessing nomophobia on three subscales: 1) *Not Being Able to Access* Information (NAAI - 6 items; e.g., "I would feel uncomfortable without constant access to information through my smartphone"), 2) *Giving up Convenience/Loosing Connectedness* (GCLC - 8 items; e.g., "I would feel weird because I would not know what to do"), and 3) *Not Being Able to Communicate* (NAC - 6 items; e.g., "I would feel anxious because my constant connection to my family and friends would be broken"). Participants are asked to respond according to a 7-point Likert-type scale (from 1 = *Strongly disagree* to 7 = *Strongly agree*). Previous studies have shown excellent psychometric properties of the NMP-Q (Adawi et al., 2018; Yildirim & Correia, 2015), and Cronbach's α was .94 in the present study.

#### 3.1.2.4. Social media addiction.
The Bergen Social Media Addiction Scale (BSMAS) (Andreassen et al., 2016; Monacis et al., 2017) is a self-report instrument that assesses the risk of social media addiction on a dimension consisting of 6 items. Examples of items are: "How often during the last year have you spent a lot of time thinking about social media or planned use of social media," "How often during the last year have you tried to cut down on the use of social media without success?" Participants are asked to respond according to a 5-point Likert-type scale (from 1 = *Very rarely* to 5 = *Very often*). Previous studies have shown good psychometric properties of the BSMAS (Andreassen et al., 2016; Monacis et al., 2017), and Cronbach's α was 0.85 in the present study.

### 3.1.3. Statistical analyses

Survey data were entered into the SPSS 28.0 (IBM Corp, 2021) and Mplus 8.0 (Muthén & Muthén, 2012-2017/2017) databases and project staff verified their accuracy. There were no missing data and, addressing univariate and multivariate distribution, residuals resulted normally distributed as assessed by visual inspection of a normal probability plot. For the CFA, the Maximum Likelihood with Robust standard errors (MLR) estimator and the following fit indices were used: chi-square distribution and the degrees of freedom ($\chi^2/df$; in a range from 2 to 5), root mean square error of approximation (RMSEA; $<0.05$ = good; $<0.08$ = reasonable; and $<0.10$ = average), comparative fit index (CFI; $>0.90$), Tucker and Lewis index (TLI; $>0.90$), standardized root mean square residual (SRMR; $<0.09$) (Bentler, 1990; Hu & Bentler, 1995; Kline, 2005; McDonald & Ho, 2002; Tucker & Lewis, 1973). The convergent validity was verified by means of Pearson's correlation analysis ($p < .01$; $r$ between 0.10 and 0.29 = small association; between 0.30 and 0.49 = medium association; and $>0.50$ = large association) (Cohen, 1988).

### 3.2. Results

#### 3.2.1. Confirmatory factor analysis

To verify the factor structure of the ON-FoMO identified through EFA in Study 1, a CFA was performed on the second sample ($N$ = 506). A good fit for the four-factor solution was obtained ($\chi^2_{(164)}$ = 420.46, $p <$ .001; $\chi^2/df$ = 2.456; RMSEA [90CI] = 0.05 [0.04; 0.06]; CFI = 0.93; TLI = 0.92; SRMR = 0.05). Standardized factor loading ranged from 0.47 to 1.00, all of which were significant at the 0.001 level, as well as the estimated correlations between the four factors (see Fig. 1).

The mean for the first ON-FoMO factor was 9.7 ($SD$ = 3.3), the mean for the second ON-FoMO factor was 8.9 ($SD$ = 2.9), the mean for the third ON-FoMO factor was 9.9 ($SD$ = 3.8), and the mean for the fourth ON-FoMO factor was 8.5 ($SD$ = 2.8). Finally, 196 participants achieved scores that fell above the mean plus one of the SD on the first ON-FoMO factor, 172 participants achieved scores that fell above the mean plus one of the SD on the second ON-FoMO factor, 200 participants achieved scores that fell above the mean plus one of the SD on the third ON-FoMO factor, and 183 participants achieved scores that fell above the mean plus one of the SD on the fourth ON-FoMO factor.

#### 3.2.2. Gender and age invariance

The overall and comparative fit statistics of gender-invariant models are presented in Table 3. Results showed an adequate fit to the data of the configural model, indicating that the same pattern of common fixed and free parameters holds across groups. $\Delta\chi^2$ was not significant when comparing the configural model with the next model, thus indicating factor loading invariance between genders (i.e., metric invariance). Therefore, the scaled difference chi-square tests supported the scalar invariance hypothesis. The differences in CFI values between the nested models were not greater than 0.01.

Table 4 shows the overall and comparative fit statistics of age-invariant models. Our results showed an adequate fit to the data of the configural model, thus indicating that the same pattern of common fixed and free parameters holds across groups. $\Delta\chi^2$ was not significant when comparing the configural model with next model, thus indicating factor loading invariance between participants aged 18–23, participants aged 24–29, and participants aged 30–35 and undergraduates (i.e. metric invariance). Therefore, the scaled difference chi-square tests supported the scalar invariance hypothesis. The differences in CFI values between the nested models were not greater than 0.01.

Significant gender differences were found in Factor 1 and Factor 3 [Factor 1: $F_{1, 505}$ = 12.59, $p < .01$; $\eta^2$ = 0.02) ($M_F$ = 10.2; $M_M$ = 9.1); Factor 2: $F_{1, 505}$ = 1.63, $p = .20$; $\eta^2$ = 0.00) ($M_F$ = 9.1; $M_M$ = 8.8); Factor 3: $F_{1, 505}$ = 23.79, $p < .01$; $\eta^2$ = 0.05) ($M_F$ = 10.6; $M_M$ = 9.0); and Factor 4: $F_{1, 505}$ = 2.17, $p = .07$; $\eta^2$ = 0.00) ($M_F$ = 8.7; $M_M$ = 8.3)].

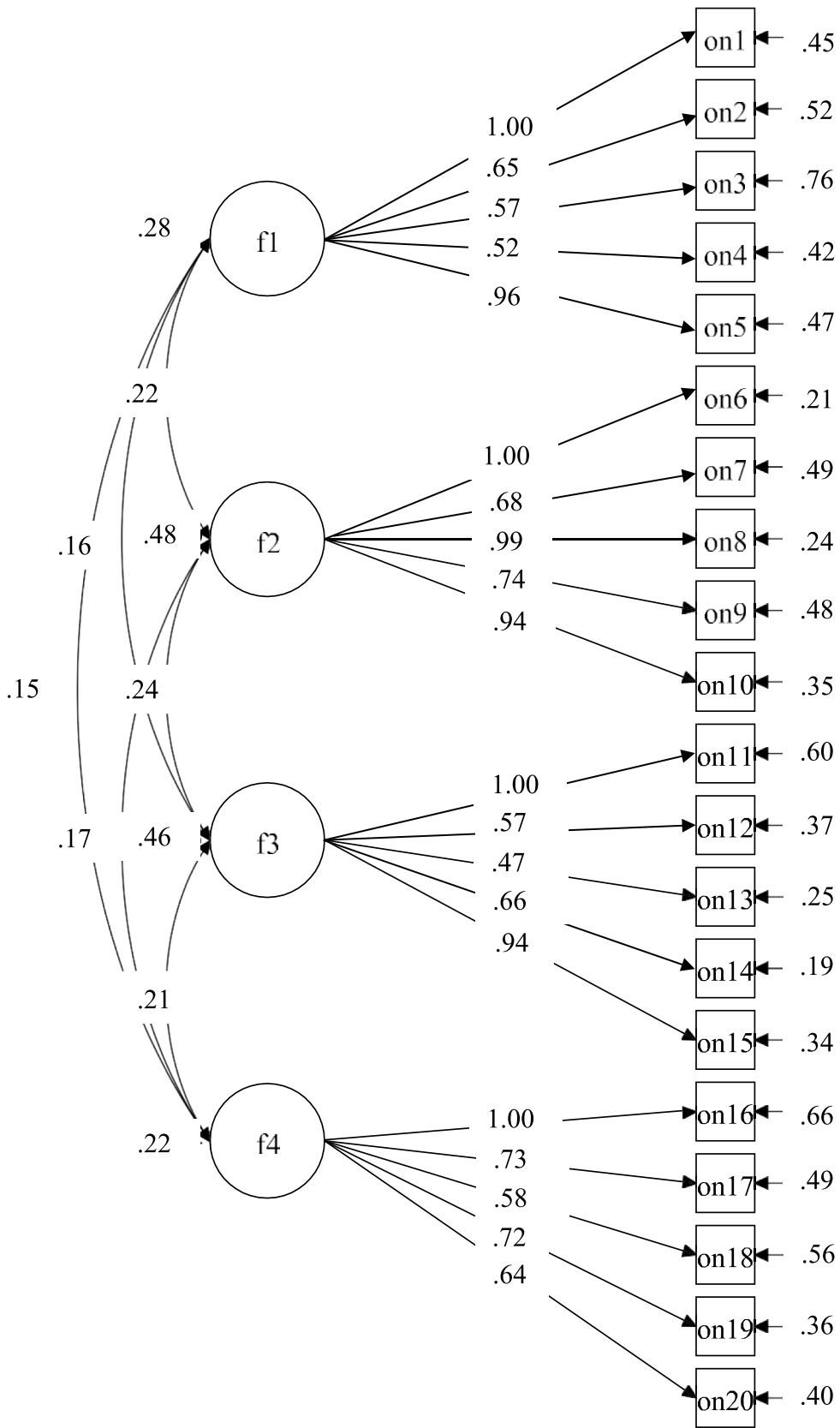Significant differences were also found in FoMO factors 3 and 4

**Fig. 1.** Path diagram for the CFA of the Italian ON-FoMO.

**Table 3**
Fit statistics of the ON-FoMO gender-invariant models.

| Model | $\chi^2$ (df) | CFI | RMSEA [90IC] | $\Delta\chi^2$ | $\Delta df$ | p | $\Delta CFI$ |
|---|---|---|---|---|---|---|---|
| Configural invariance | 683.02 (328) | .91 | .06 [.05–.07] | – | – | – | – |
| Metric invariance | 699.03 (344) | .91 | .05 [.04–.06] | 16.01 | 16 | >.26 | 0 |
| Scalar invariance | 729.89 (360) | .90 | .05 [.04–.06] | 30.86 | 16 | ns | .01 |

**Table 4**
Fit statistics of the ON-FoMO age-invariant models.

| Model | $\chi^2$ (df) | CFI | RMSEA [90IC] | $\Delta\chi^2$ | $\Delta df$ | p | $\Delta CFI$ |
|---|---|---|---|---|---|---|---|
| Configural invariance | 705.01 (328) | .94 | .06 [.05–.07] | – | – | – | – |
| Metric invariance | 715.02 (344) | .94 | .05 [.04–.06] | 10.01 | 16 | >.25 | 0 |
| Scalar invariance | 738.12 (360) | .95 | .05 [.04–.06] | 23.10 | 16 | ns | .01 |

between participants aged 18–23 and other participants [Factor 1: $F_{2, 504} = 3.25, p < .06; \eta^2 = 0.01$ ($M_{18-23} = 8.5; M_{24-29} = 8.2; M_{30-35} = 7.8$); Factor 2: $F_{2, 504} = 2.74, p = .07; \eta^2 = 0.01$ ($M_{18-23} = 9.2; M_{24-29} = 8.6; M_{30-35} = 8.6$); Factor 3: $F_{2, 504} = 5.95, p < .01; \eta^2 = 0.02$ ($M_{18-23} = 10.3; M_{24-29} = 9.3; M_{30-35} = 9.0$); and Factor 4: $F_{2, 504} = 3.87, p < .05; \eta^2 = 0.01$ ($M_{18-23} = 8.7; M_{24-29} = 8.4; M_{30-35} = 7.5$)].

*3.2.3. Convergent validity*

We assessed convergent validity by examining bivariate correlations between the four ON-FoMO factor scores and all the other measures in the sample of 506 young adults. As reported in Table 5, the four ON-FoMO factors were significantly positively correlated with FoMO, NoMoPhobia, and social media addiction.

## 4. Discussion

The Italian version of the ON-FoMO was found to have good psychometric properties. The factor analysis identified a four-factor solution which accounted for 55.99% of the total variance. Furthermore, the CFA confirmed the four-factor solution with good fits.

As in the original version of the ON-FoMO (Sette et al., 2020), also in the Italian version Factor 1 (Need to Belong) comprises items related to affiliation and assesses the need to form and maintain stable relationships (e.g., "I get sad to learn from posts that my friends went to events and I wasn't invited"). Factor 2 (Need for Popularity) comprises items related to the internal need for others' approval and the fear of not being recognized (e.g., "I would like to have more likes and/or comments on my posts"). Factor 3 (Anxiety) comprises items related to craving and withdrawal symptoms that an individual with FoMO tends to manifest when smartphone and/or Internet use are unavailable (e.g., "If I do not have access to social networks, I think of ways to get connected").

**Table 5**
Correlations between ON-FoMO scores and the other measures.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. ON-FoMO Factor 1 | – | | | | | | |
| 2. ON-FoMO Factor 2 | .52* | – | | | | | |
| 3. ON-FoMO Factor 3 | .42* | .44* | – | | | | |
| 4. ON-FoMO Factor 4 | .46* | .42* | .53* | – | | | |
| 5. FoMO | .67* | .46* | .43* | .40* | – | | |
| 6. NoMoPhobia | .41* | .34* | .67* | .45* | .49* | – | |
| 7. BSMAS | .50* | .38* | .56* | .65* | .48* | .54* | – |

*$p < .01$.

Finally, Factor 4 (Addiction) comprises items related to salience and relational, academic or employment, academic or occupational problems due to excessive smartphone and/or Internet use (e.g., "In social situations, I pay more attention to my cell phone than to my friends").

When comparing our four-factor solution with four-factor structures found in other countries, such as Brazil (Sette et al., 2020), Turkey (Bakioğlu et al., 2022), and Indonesia (Kurniawan & Utami, 2022), we found great convergence, in terms of both item aggregations and variance. Moreover, the magnitude of the correlations between the four factors of the ON-FoMO and FoMO in the current study was similar to that reported by Sette et al. (2020), as well as by Bakioğlu et al. (2022).

Gender invariance added important support for the validity of the Italian version of the ON-FoMO, thus indicating that the measurement model is comparable in both sexes. We can thus affirm that the absence of differences in observed test scores between men and women reflects a true absence of differences in ON-FoMO levels rather than an artifact of the measurement method. For instance, significant differences emerged between women and men on ON-FoMO Factor 1, referred to the need to form and maintain stable relationships, and Factor 3, referred to craving and withdrawal symptoms that an individual with FoMO tends to manifest when smartphone and/or Internet use are unavailable. These results are consistent with previous research findings (e.g., Dhir et al., 2018; Stănculescu & Griffiths, 2022; Zhao et al., 2022) indicating on the one hand that women use social media for maintaining social relationships and gossiping, and on the other hand that women report higher levels of anxiety in social interactions, as well as in exposure.

Age invariance also adds support for the validity of the ON-FoMO scale. For instance, significant differences emerged between participants aged 18–23 and participants aged 24–29 or 30–35 on ON-FoMO Factors 3 and 4. This result is consistent with previous literature showing that younger people have a higher risk of suffering from anxiety when they miss out on important shared experiences, as well as have a higher risk of developing addictive symptoms (e.g., Andreassen, 2015; Kuss et al., 2014; Oberst et al., 2017).

The Italian ON-FoMO scale also showed good convergent validity. Significant positive correlations were found between ON-FoMO scores, FoMO, NoMoPhobia, and social media addiction, thus confirming previous research findings (e.g., Alt, 2015; Bakioğlu et al., 2022; Blackwell et al., 2017; Casale et al., 2018; Fabris et al., 2020; Li et al., 2022; Koç et al., 2023; Sette et al., 2020; Sommantico et al., 2023).

*4.1. Limitations and future research*

Some limitations in the present study need to be noted. Firstly, with the having involved a Web-based convenience sample, our results cannot be treated as representative of the entire Italian population. Moreover, focusing on the young adult population, results cannot be generalized to the adult population. Furthermore, test-retest reliability should be determined in order to further explore the Italian ON-FoMO reliability. Finally, relationships between ON-FoMO and associated variables such as depression, anxiety, and stress should be investigated in order to strengthen the validity of the Italian ON-FoMO.

## 5. Conclusions

Our results indicate that the ON-FoMO scale is a useful instrument with good psychometric properties for assessing ON-FoMO among Italian young people. Moreover, given the positive association between ON-FoMO levels, FOMO, NoMoPhobia, and social media addiction, the Italian ON-FoMO could be used in clinical settings to assess people who show a potentially problematic engagement with social media. Indeed, recent studies have shown that high levels of ON-FoMO are linked to problematic social media use (Sette et al., 2020) and problematic mobile phone use (Bakioğlu et al., 2022). Considering the previous considerations, longitudinal studies are needed to better understand the complex relationship between ON-FoMO, problematic social media use, and

psychological symptoms, such as depression, anxiety, and stress.

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## CRediT authorship contribution statement

**Massimiliano Sommantico:** Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Supervision, Validation, Writing – review & editing, Software. **Ferdinando Ramaglia:** Conceptualization, Data curation, Formal analysis, Investigation, Validation, Writing – original draft. **Valentina Boursier:** Conceptualization, Data curation, Formal analysis, Investigation, Validation, Writing – original draft. **Francesca Gioia:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Validation, Writing – review & editing. **Marina Lacatena:** Conceptualization, Data curation, Formal analysis, Investigation, Validation, Writing – original draft.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

Data will be made available on request.

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