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Just a few more minutes: Longitudinal and cross-national perspectives on the role of online identity bubbles in addictive internet use

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ABSTRACT

Background/aims: Increasingly identity-based online presence raises concerns due to its potential contribution to addictive internet use. We report two separate studies of European adults, investigating how online identity bubbles relate to addictive internet use both cross-nationally and longitudinally.

Methods: Cross-national Study 1 involved participants aged 18–75 from Finland (N = 1541), France (N = 1561), Germany (N = 1529), Ireland (N = 1112), Italy (N = 1530), and Poland (N = 1533). Longitudinal Study 2 focused on Finnish participants (N = 1530) aged 18–75. Surveys were collected at six-month intervals from 2021 to 2023. Online identity bubble involvement was measured using the nine-item Identity Bubble Reinforcement Scale (IBRS-9). Addictive internet use was assessed with the Bergen Social Media Addiction Scale (BSMAS) in Study 1 and with the Compulsive Internet Use Scale (CIUS) in Study 2. Mental health factors and confounding internet behaviors, namely, problem gambling and internet gaming disorder were included in the models. The cross-national data were analyzed using robust regression modeling. Hybrid multilevel regression modeling was utilized for the longitudinal data.

Results: Study 1 found that online identity bubble involvement was consistently linked to addictive internet use across European countries. Addictive internet use was positively associated with mental distress and negatively with happiness. Happiness also buffered the impact of online identity bubbles on addictive use in five countries. Study 2 revealed that increased online identity bubble involvement over time predicted addictive internet use.

Conclusions: We found robust cross-national and longitudinal evidence that identity-based online engagement contributes to addictive internet use. General mental health is strongly associated with this phenomenon.

1. Introduction

Today, over five billion people globally use the internet and social media (DataReportal, 2024; Statista, 2024). It is the foundational element of our modern information society and, undoubtedly, here to stay. People use the internet for a variety of reasons, including social networking with others, accessing information, working, and entertainment. It has become so deeply integrated into almost every aspect of daily life that, in the modern and digitally interconnected world, functioning without the internet would be challenging for many. While this connectivity and integration has numerous benefits, it also comes with serious downsides. According to a systematic review and meta-analysis, generalized internet addiction has become increasingly prevalent over

time (Pan et al., 2020). However, determining the prevalence rates of addictive internet use is challenging due to a wide range of measurement tools and lack of consistency in terminology and diagnostic criteria (Kuss & Lopez-Fernandez, 2016; Montag et al., 2021; Pan et al., 2020; Sanchez-Fernandez et al., 2023). Some researchers suggest that internet use patterns vary along a spectrum from moderate to excessive, and in some cases, reaching pathological levels (Kaess et al., 2021). Addictive internet use typically involves similar elements and severe adverse consequences that are present in all types of addictions, such as increased tolerance, loss of control, withdrawal symptoms, compromised opportunities in other areas of life, disruptions in social relationships, and negative mood and emotions (Baloglu et al., 2020; Pan et al., 2020; Su et al., 2020).

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People have an innate need to belong to social groups (Baumeister & Leary, 2017) and the internet and ubiquitous social media platforms offer means for fulfilling that need (Kim et al., 2016; Weinstein, 2018). Recent research on social networking and online communities has shown that the online environment can offer meaningful interactions, groups of contact, and a sense of support for users. Social psychological research on the phenomenon of social processes online has deepened our understanding and introduced the concept of online identity bubbles (Kaakinen et al., 2020; Keipi et al., 2017) which explains the intertwining nature of behavioral and algorithmic mechanisms taking place online, and through which individuals relate themselves with groups and information on the internet. Despite the vastness of networking opportunities, individuals can curate their interactions and selectively manage their connections. This facilitates the creation of exclusive online cliques, i.e., *online identity bubbles*, which are characterized by shared interests, values, activities, or ideologies within like-minded and identity-driven online settings (Kaakinen et al., 2020; Koivula et al., 2019).

The concept of online identity bubbles was originally proposed by Keipi and colleagues (2017) in their Identity Bubble Reinforcement Model (IBRM). These bubbles are a psychosocial phenomenon rooted in traditional, face-to-face, social processes and group behaviors, but that are now facilitated by the virtual environment. Online identity bubbles share similar features and mechanisms with bonding social capital (Putnam, 2000; Williams, 2006, 2019) but differ in purpose and structure. Online identity bubbles are based on online interactions that consist of three interconnected components: social identification (i.e., identification with one's social networks), homophily (i.e., the tendency to engage with like-minded individuals), and information bias (i.e., reliance on information sourced from one's social networks; Kaakinen et al., 2020). Computer science literature often examines online networks and group dynamics within specific platforms and discussions using computational methods, whereas the online identity bubble approach offers social psychological and socio-cognitive insights into how individuals shape their group affiliations and disseminate information in the online sphere (Kaakinen et al., 2020; Keipi et al., 2017).

Engaging with like-minded individuals online fosters social identification but also increases homophily, leading to heightened trust in information from one's online social group. This dynamic of online identity bubbles stems from the fundamental human desire for identity validation (Choi & Hogg, 2020; Marcia, 1966). While online identity bubbles can provide support and a sense of belonging in some situations (Latikka et al., 2022), engagement in such bubbles can also lead to significant harm which accentuates in online interaction. Increasingly interacting with others online who share similar attitudes and ideologies, and exchanging information that supports those ideologies, can intensify harmful and risky behaviors among online community members. Indeed, previous research has linked online identity bubbles to issues such as cyberaggression (Zych et al., 2023), cyberbullying victimization (Oksanen et al., 2020), risky drinking (Oksanen et al., 2021), and problem gambling and gaming (Savolainen et al., 2020; Sirola et al., 2021; Vepsäläinen et al., 2024) which can negatively impact individuals' well-being and psychological functioning. Bonding social capital, which is also related to online interactions, refers to strong social ties that develop organically, typically within closely-knit, often face-to-face or stable online communities. It has a more positive connotation because it facilitates emotional support and mutual trust within these groups. Online identity bubbles, on the other hand, are driven primarily by algorithms and self-selection in online spaces, and group membership is often based on perceived similarity in beliefs or opinions rather than meaningful shared personal bonds. These differences and connections with social phenomena translating to the online sphere underscore a need for more comprehensive research into the broader implications of online identity bubbles. In particular, there is a gap in understanding how these bubbles contribute to internet use itself, and especially addictive internet use.

Previous research has only recently begun to investigate the IBRM and online identity bubbles using longitudinal designs. For example, Vepsäläinen and colleagues (2024) found that increased engagement in online identity bubbles was associated with more intense gaming problems over time. Another study showed that, while involvement in such bubbles offered social resources to lonely individuals during the COVID-19 pandemic, it did not meaningfully buffer against mental distress (Latikka et al., 2022). These findings highlight the potential and importance of longitudinal approaches in evaluating and inferring causal relationships. However, significant gaps remain in understanding how identity bubbles evolve over time and their broader implications. The current study aims to address this gap by using a longitudinal design to contribute new insights into the potential causal mechanisms of online identity bubbles in addictive internet use.

Internet and social media use have been associated with both positive and negative well-being outcomes (Verduyn et al., 2017; Weinstein, 2018). Following the dual-factor model of mental health (e.g., Keyes et al., 2002; Suldo & Shaffer, 2008), mental health consists of two interrelated but distinct dimensions: positive and negative dimensions. A state of complete mental health is described by a low level of the negative dimension and a high level of the positive dimension (e.g., Suldo & Shaffer, 2008). Further, Diener, Oishi, and Tay (2018) have effectively captured different aspects of overall well-being, describing subjective well-being (SWB) as the quality of a person's life as experienced from their own perspective. SWB is categorized into three clear components: positive affect, negative affect, and life satisfaction. These components of SWB are closely related to mental health and happiness, and, given that SWB is nonunitary, they can be meaningfully investigated separately (Diener, Lucas, & Oishi, 2018). The dual-factor model of mental health builds on this perspective by allowing for a nuanced exploration of these constructs as distinct yet interrelated dimensions. Earlier research has shown that addictive social media use is positively associated with mental distress that often serves as an operationalization of the negative mental health dimension (e.g., Brailovskaia & Margraf, 2022). In contrast, its link to life satisfaction and happiness that represent the positive dimension of mental health has been found to be negative (e.g., Longobardi et al., 2020; Marttila et al., 2021). Problematic and excessive social media use can have detrimental effects on individuals (Cheng et al., 2018; Çikrikci, 2016; Marino et al., 2018). Past research has further found that social media use predicts increased social comparison, decreased self-esteem, negative affect, and repetitive negative thinking among young adults (Faelens et al., 2021).

Positive mental health effects of social media use have been attributed to the way that people engage with it. For instance, passive social media use (i.e., browsing content) has been associated with social comparisons and envy, while active social media use (i.e., content production) has been linked to building social capital and feelings of social connectedness (Verduyn et al., 2017). In research on adolescents, social media use has been found to provide various positive experiences, offering opportunities for self-expression, sharing interests with others, and facilitating keeping in touch with friends and family (Weinstein, 2018). At the same time, active social media use often results in negative emotions and anxiety about being accepted by the online communities. Moreover, it may hinder development and maintenance of meaningful social relationships due to possibilities for misinterpretation and miscommunication, and the use of metrics that may de-value a relationship (e.g., lack of reactions to posted content, unfollowing; Weinstein, 2018). According to meta-analyses in the field, problematic internet use (Çikrikci, 2016), problematic social media use (Marino et al., 2018), and internet gaming disorder (Cheng et al., 2018) are associated with internet-related negative mental health consequences and psychological problems.

Recent approach on the link between social media use and mental health has considered different 'social media mindsets' that consist of user's core assumptions and beliefs regarding their social media use, such as agency, expectations, and goals (Lee & Hancock, 2024). This

approach helps to understand why some users are more prone to negative mental health effects of social media while others are better able to navigate in social media without significant harm or addictive tendencies. According to Lee and Hancock (2024), having a positive mindset and a sense of agency on social media use is associated with better wellbeing while low agency and negative mindset are associated with worse wellbeing. Therefore, it is likely that individuals who are generally happy also have a more positive mindset and orientation towards their social media use, making them more prone to utilize social media in a more beneficial manner, even if using it frequently. Other relevant approaches investigating the predisposing vulnerabilities of internet addiction propose that it can be a compensatory behavior (Karddefelt-Winther, 2014), particularly attracting individuals with high social anxiety and, indirectly, loneliness. These individuals often have difficulties in forming and maintaining social relationships and may engage online as a way to compensate for their social needs (Caplan, 2003, 2006, 2007).

The need for more research, and more diverse methods, has been previously recognized in order to develop our understanding of the mental health outcomes of heavy social media and internet use (Parry et al., 2022). The objective of this study was to explore the role of online identity bubbles in addictive internet usage. We ground our investigation in the Identity Bubble Reinforcement Model (IBRM; Keipi et al., 2017). According to the IBRM, online identity bubbles are rooted in a fundamental human motivation for identity validation. While they provide a sense of belonging and reinforcement of shared values, they can also create new problems, particularly through their exclusive and immersive nature. Importantly, the real-world consequences of identity bubbles remain underexplored. As many online phenomena increasingly manifest in the physical world, such as online political movements driving real-life actions or ideological confrontations leading to offline conflicts, it is increasingly crucial to investigate how online identity reinforcement translates into individual-level outcomes in the real world.

Through two distinct studies involving cross-national and longitudinal samples of European adults, we aimed to fill existing gaps in the literature regarding the relationship between online identity bubbles and addictive internet behavior. We also map the connection of mental health in this association. Addictive internet use is a global phenomenon, but its prevalence, measurement, and user patterns may vary across countries (Bisen & Deshpande, 2018; Ryding & Kaye, 2018). In this study, we refer to general *addictive internet use* that encompasses different ways of assessing problematic and addictive internet behaviors, including specific activities like social media use as well as more general internet engagement. Social media addiction specifically can be viewed as its own manifestation of generalized internet addiction, reflecting the fact that social media platforms are among the most common forms of online engagement for many (Su et al., 2020). At the same time, there is evidence that specific platforms (e.g., Facebook, Instagram) differ in their design and purpose, which can have varying impact on user engagement patterns and the addictive nature of these social media platforms (Rozgonjuk et al., 2020). However, given the extensive overlap in behavioral and psychological symptoms between these two constructs, we treated them as part of the broader phenomenon of addictive internet behaviors.

Internet addiction is a multifaceted phenomenon that can manifest through various online activities. By using a general term, we acknowledge the complexity and interconnectedness of these behaviors, which may share underlying mechanisms of addiction despite differences in specific activities and ways of measuring them. Making this decision, however, we do recognize that there are alternative conceptualizations and models of internet addiction within the broader literature and our choice of this framework has its implications. Essentially, our framing aims to view common mechanisms in addictive online use. Thus, we caution from interpreting prevalence estimates as variable distributions may differ from other models or measures of internet

addiction and not provide meaningful interpretations or comparisons. We further consider in our investigation other problematic behaviors that involve online engagement, namely, problem gambling and internet gaming disorder. This is due to their characteristics that align closely with our study's focus. Specifically, both these activities represent highly common types of problematic digital behaviors and involve significant engagement with related online communities, where identity reinforcement and group dynamics play a role similar to identity bubble involvement (Vepsäläinen et al., 2024). They also have been shown to impact mental health and have potential contribution to heavy internet use (Baggio, Dupuis, et al., 2016; Baggio, Gainsbury et al., 2016).

More cross-national research is needed on the matter as it allows for the recognition of global trends in addictive internet use and extends the examination of factors that contribute to its potential variability. Addictive internet use is also a dynamic phenomenon that may change over time. Longitudinal research provides insights into the trajectory of addictive internet use and associated risk factors. With this study, we aim to contribute to these research needs. Our research questions are:

RQ1. Is online identity bubble involvement related to addictive internet use in different European countries?

RQ2. Is involvement in online identity bubbles related to addictive internet use over time?

RQ3. How are mental health factors related to online identity bubble involvement and internet addiction?

Based on prior research, we expected addictive internet use to be positively related to mental distress (Hypothesis 1a) and negatively related to happiness (Hypothesis 1b).

2. Study 1

2.1. Method

2.1.1. Participants and procedure

We employed survey methods to collect data from participants aged 18 to 75 across six European countries; Finland, France, Germany, Ireland, Italy, and Poland. The demographic statistics of the samples are reported in Table 1. The samples closely mirror data on age and gender distribution of the populations aged 18 to 75 in their respective countries (see Eurostat, 2022). The survey was originally constructed in English and subsequently translated by professionals and native speakers into the relevant languages by using the well-established translation-back-translation method (Berry, 1989). Validated scales of the measures were used in each language when available.

Data collections were carried out by a data solutions provider company, Norstat. Participants were invited by Norstat via email to complete the survey through their online submission system. Response rates were highest in Finland and lowest in France; Finland (40.0%), France (13.5%), Germany (16.5%), Ireland (18.0%), Italy (23.0%), and Poland (27.3%). The average time taken to complete the survey was 21.30 min in Finland, 20.90 in France, 21.43 in Germany, 21.02 in Ireland, 18.70 in Italy, and 22.48 in Poland. We adhered to our registered data quality protocol (<https://osf.io/4mzk5>) to ensure high quality of the data which included assessments for response speed, attention, and patterned responses, such as straight-lining. The study protocol was assessed by the Ethics Committee of the Tampere Region which stated in Fall 2022 that all ethical considerations had been addressed. Participants received information about the study's objectives and voluntarily chose to participate. Online consent to participate was given by completing the survey form and the participants were informed they could withdraw from the survey at any point without consequences. Norstat's panel members are compensated by receiving Norstat coins that can be turned into gift cards or, alternatively, be donated to charity should the participant choose to do so. This study complies with the General Data Protection Regulation of the European Union. The data will be archived in the Finnish Social

Table 1
Descriptive statistics of the Study 1 variables.

	Finland			France			Germany		
Continuous variables	Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>
Addictive internet use	6–30	11.10	4.99	6–30	10.77	5.01	6–30	10.80	4.96
Online identity bubbles	9–63	33.61	11.72	9–63	30.94	13.36	9–63	31.57	13.36
Mental distress	0–25	9.87	2.41	0–25	10.72	3.11	0–25	10.15	2.62
Happiness	0–7	4.84	1.22	0–7	4.68	1.29	1–7	4.64	1.41
Age	18–75	46.40	16.34	18–75	46.9	15.84	18–75	47.36	15.16
Categorical variables	<i>n</i>	%		<i>n</i>	%		<i>n</i>	%	
Female	762	49.45		813	52.08		763	49.9	
University degree	413	26.80		572	36.64		450	29.43	
Works	836	54.25		876	56.12		930	60.82	
	Ireland			Italy			Poland		
Continuous variables	Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>
Addictive internet use	6–30	11.46	5.13	6–30	11.46	4.91	6–30	11.66	5.34
Online identity bubbles	9–63	31.31	13.34	9–63	34.51	12.65	9–63	32.02	13.6
Mental distress	0–24	9.60	2.83	0–24	10.44	3.00	0–25	9.83	3.23
Happiness	1–7	4.83	1.36	1–7	4.58	1.37	1–7	4.7	1.37
Age	18–75	46.77	14.5	18–75	47.67	15.34	18–75	45.70	15.41
Categorical variables	<i>n</i>	%		<i>n</i>	%		<i>n</i>	%	
Female	569	51.17		779	50.92		787	51.34	
University degree	564	50.72		592	38.69		853	54.47	
Works	719	64.66		871	56.93		1009	65.82	

Science Data Archive upon the completion of the project.

2.1.2. Measures

Addictive internet use. We utilized the Bergen Social Media Addiction Scale (BSMAS; Andreassen et al., 2016) to measure addictive internet use. The scale is adapted from the original Bergen Facebook Addiction Scale (Andreassen et al., 2012), modification namely entailing substituting the term Facebook with the broader term “social media”, with social media described as including platforms such as Facebook, Twitter (“X” since 2023), Instagram, and similar services. The scale consists of six items tapping into addictive patterns of social media use (e.g., “How often during the last year have you tried to cut down on the use of social media without success?”). Response options range from 1 (*very rarely*) to 5 (*very often*). The scale has been translated to multiple languages and shown good psychometric properties across studies (e.g., Leung et al., 2020; Monacis et al., 2017; Zarate et al., 2023). We further tested the unidimensional structure of the scale using confirmatory factor analyses (CFA). The CFA showed a generally acceptable fit in CFI, TLI, and SRMR. RMSEA was higher than 0.06 but is likely to be affected by our large-scale data. In all countries convergent validity (AVE) was good. The scale had good internal consistency in our samples assessed with McDonald’s omega (Finland: $\omega = 0.87$; France: $\omega = 0.86$; Italy: $\omega = 0.86$; Germany: $\omega = 0.87$; Ireland: $\omega = 0.87$; Poland: $\omega = 0.89$) and was used as a continuous variable in the analyses.

Online identity bubble involvement. We assessed the intensity of online identity bubble involvement by using the nine-item Identity Bubble Reinforcement Scale (IBRS-9; Kaakinen et al., 2020). The measure includes subscales on social identification, homophily, and information bias. Items assessing social identification evaluate the extent to which online communities and contacts within are integral to the participant’s identity and foster a sense of pride. Homophily items measure the disposition to engage with like-minded individuals on social media. Items assessing information bias gauge for the trust placed in information disseminated through one’s social media and the perception that others on these platforms share similar viewpoints. Items are rated on a scale ranging from 1 (*does not describe me at all*) to 7 (*describes me completely*). The IBRS-9 is designed to be used as a unidimensional measure of identity-driven social media group behavior. It is also possible to use the subscales separately for a detailed investigation (see Kaakinen et al., 2020), but, in this study, we handle online identity

bubbles as a unified construct consisting of the three mutually reinforcing dimensions. This theoretical approach is based on the understanding that these dimensions work together to create the experience of an online identity bubble, where perceived similarity, group identification, and selective information exposure reinforce one another as part of a singular phenomenon. The scale had excellent internal consistency in the samples (Finland: $\omega = 0.91$; France: $\omega = 0.92$; Italy: $\omega = 0.92$; Germany: $\omega = 0.93$; Ireland: $\omega = 0.93$; Poland: $\omega = 0.94$).

Mental health was assessed using the five item Mental Health Inventory (MHI-5; Berwick et al., 1991; Cuijpers et al., 2009). It is a short version of the original 38-item tool designed to evaluate mental health status. The MHI-5 assesses an individual’s mood over the past month, evaluating both psychological wellbeing and the absence of psychological distress. Respondents are asked to indicate on a scale from 1 (*none of the time*) to 6 (*all of the time*) how often they have experienced emotions such as feeling downhearted or blue, or conversely, feeling calm and peaceful. Higher points on the scale indicate worse mental health. The measure demonstrated good internal consistency (Finland: $\omega = 0.86$; France: $\omega = 0.83$; Italy: $\omega = 0.83$; Germany: $\omega = 0.86$; Ireland: $\omega = 0.84$; Poland $\omega = 0.79$).

Happiness. To evaluate the positive dimension of mental health, we used the single item asking: “All things considered, how happy would you say you are?”. Happiness is inherently a very subjective experience and is often assessed as a global perception rather than a multi-faceted construct. Thus, a single-item measure aligns with this conceptualization and allows participants to evaluate their happiness holistically and subjectively across cultural contexts. This single-item measure has been widely used in research over the years and found to be an effective and reliable way to assess happiness, also in large-scale cross-national studies (Ballas & Thanis, 2022; Raudenská, 2023). Responses were indicated on a scale ranging from 1 (*extremely unhappy*) to 7 (*extremely happy*).

Sociodemographic control variables included gender, age, having a university degree, and current working status. Working status was included as a direct measure of participants’ life circumstances that could influence internet use patterns, and having a university degree may affect the purposes for which individuals engage with the internet. Moreover, individuals with higher education are more likely to have better digital skills, further impacting their behavior on the internet (Eurostat, 2024).

2.1.3. Statistical analyses

The analyses were conducted using Stata 17 statistical software (Stata Corp.). Descriptive statistics and inter-item correlations were computed. Given the skewed distributions of the outcome variable (addictive internet use) and the identification of heteroscedastic residuals while checking all the assumptions of ordinary least squares regression, as our multivariate method we opted for robust regression analysis using the robreg command (Jann, 2022) and employing mm estimation (Jann, 2012; Verardi & Croux, 2009). Independent variables were z-standardized, so they had a mean of 0 and a standard deviation of 1 which clarifies the interpretation and comparison of coefficients.

2.1.4. Results

According to the descriptive analyses (see Table 1), mean addictive internet use scores, measured by the BSMAS, were similar across the countries, Polish participants having a slightly higher mean score ($M_{BSMAS} = 11.66$) than the Irish ($M_{BSMAS} = 11.46$) and Italian ($M_{BSMAS} = 11.46$) participants, followed by Finnish ($M_{BSMAS} = 11.10$), German ($M_{BSMAS} = 10.80$), and French ($M_{BSMAS} = 10.77$) participants.

According to our robust regression analyses, involvement in online identity bubbles was positively associated with addictive internet use in all countries; Finland ($B = 1.67, p < .001$), France ($B = 1.95, p < .001$), Germany ($B = 1.77, p < .001$), Ireland ($B = 1.02, p < .001$), Italy ($B = 1.87, p < .001$), and Poland ($B = 2.19, p < .001$). Poorer mental health was also positively related to addictive internet use in all countries ($p < .001$ in every country). Happiness had a negative association with addictive internet use in each country (Finland: $B = -0.26, p = .025$; France: $B = -.41, p < .001$; Germany: $B = -0.25, p = .013$; Ireland: $B = -0.69, p < .001$; Italy: $B = -0.54, p < .001$; Poland: $B = -0.56, p < .001$). Of the covariates, younger age was statistically significantly related to internet addiction ($p < .001$ in each country) and female gender was associated with internet addiction in Finland and Ireland ($B = 0.36, p = .001$; $B = 0.28, p = .034$, respectively). See detailed results of the robust regression analyses in Table 2.

We further observed an interaction effect between online identity bubble involvement and happiness in all countries but Germany ($p = .584$), indicating that, as happiness increases, the strength of the connection between online identity bubbles on internet addiction decreases (Finland: $B = -0.27, p = .006$; France: $B = -0.45, p < .001$; Ireland: $B = -0.37, p = .013$; Italy: $B = -0.39, p < .001$; Poland: $B = -0.54, p < .001$). See Figs. 1–6 for the interaction effects in all countries.

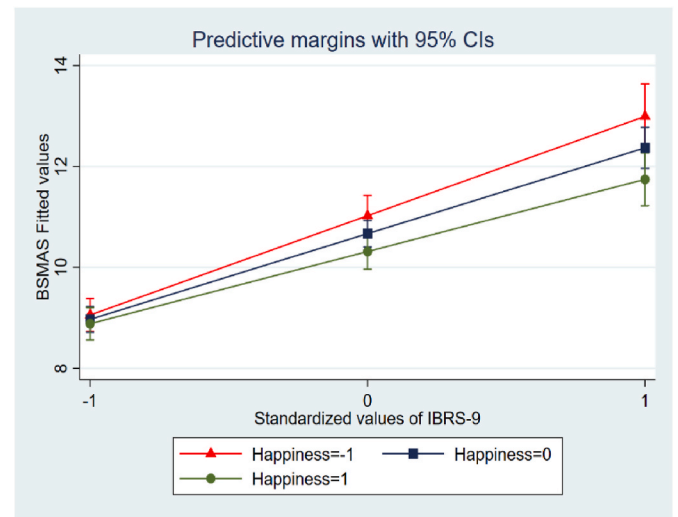


Fig. 1. Interaction effect of happiness and involvement in online identity bubbles on addictive internet use in Finland.**.

Statistical significance of the interactions is indicated with asterisks in the Figure titles, where * < 0.05, ** < 0.01, *** < 0.001.

3. Study 2

3.1. Methods

3.1.1. Participants and procedure

A survey investigating behaviors in the digital age was aimed for adults residing in mainland Finland. Initial data collection was carried out in April 2021 (T1) and included a total of 1530 participants aged from 18 to 75 ($M_{age} = 46.67, SD = 16.42$), with a gender distribution of 50.33% male, 49.41% female, and 0.26% identifying as other gender. The majority of participants (35.29%) were from the greater Helsinki-Uusimaa region. Approximately 25% of participants entered the study from Western Finland, 21.50% from Southern Finland, and 18.37% from Northern and Eastern Finland. We compared the sample characteristics with the Finnish population using population census figures provided by Statistics Finland. The sample closely resembled the Finnish population,

Table 2
Robust regression analyses of Study 1 predicting addictive internet use in six countries.

	Finland				France				Germany			
	B	SE	p	95% CI	B	SE	p	95% CI	B	SE	p	95% CI
Online identity bubbles	1.67	0.11	<0.001	1.46, 1.88	1.95	0.12	<0.001	1.71, 2.19	1.77	0.11	<0.001	1.55, 2.00
Mental distress	0.61	0.15	<0.001	0.32, 0.90	1.30	0.16	<0.001	0.99, 1.61	1.17	0.16	<0.001	0.85, 1.48
Happiness	-0.26	0.12	0.025	-0.50, -0.03	-0.41	0.11	<0.001	-0.62, -0.19	-0.25	0.10	0.013	-0.45, -0.05
Female	0.36	0.11	0.001	0.15, 0.58	-0.13	0.11	0.234	-0.34, 0.08	-0.07	0.10	0.509	-0.27, 0.13
Age	-1.48	0.13	<0.001	-1.74, -1.21	-1.11	0.13	<0.001	-1.37, -0.86	-0.83	0.13	<0.001	-1.09, -0.57
University degree	0.01	0.1	0.920	-0.19, 0.21	0.03	0.11	0.796	-0.19, 0.24	0.06	0.10	0.545	-0.14, 0.26
Works	-0.36	0.12	0.003	-0.60, -0.13	-0.21	0.12	0.066	-0.44, -0.14	-0.02	0.11	0.859	-0.20, 0.24
Model n	1526				1501				1474			
Pseudo R ²	0.26				0.27				0.22			
	Ireland				Italy				Poland			
	B	SE	p	95% CI	B	SE	p	95% CI	B	SE	p	95% CI
Online identity bubbles	1.02	0.17	<0.001	0.69, 1.36	1.87	0.11	<0.001	1.65, 2.08	2.19	0.12	<0.001	1.95, 2.42
Mental distress	1.17	0.15	<0.001	1.46, 2.03	1.25	0.14	<0.001	0.97, 1.54	1.26	0.16	<0.001	0.95, 1.57
Happiness	-0.69	0.15	<0.001	-0.99, -0.39	-0.54	0.11	<0.001	-0.76, -0.31	-0.56	0.12	<0.001	-0.80, -0.32
Female	0.28	0.13	0.034	0.20, 0.54	0.20	0.11	0.849	-0.20, 0.23	0.04	0.11	0.709	-0.18, 0.26
Age	-1.29	0.16	<0.001	-1.61, -0.97	-0.95	0.12	<0.001	-1.19, -0.72	-0.99	0.14	<0.001	-1.27, -0.72
University degree	0.17	0.13	0.190	-0.08, 0.42	0.02	0.11	0.825	-0.20, 0.25	0.06	0.12	0.577	-0.16, 0.29
Works	-0.20	0.14	0.185	-0.47, 0.09	-0.29	0.11	0.011	-0.52, -0.07	-0.14	0.12	0.274	-0.38, 0.11
Model n	1099				1516				1514			
Pseudo R ²	0.28				0.26				0.28			

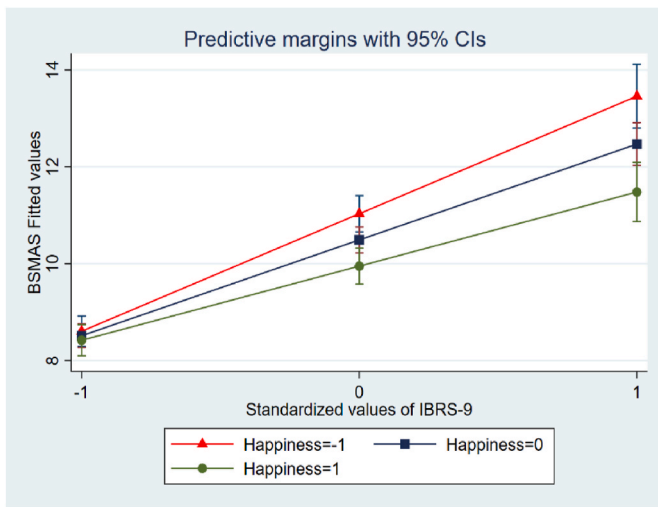


Fig. 2. Interaction effect of happiness and involvement in online identity bubbles on addictive internet use in France.***.

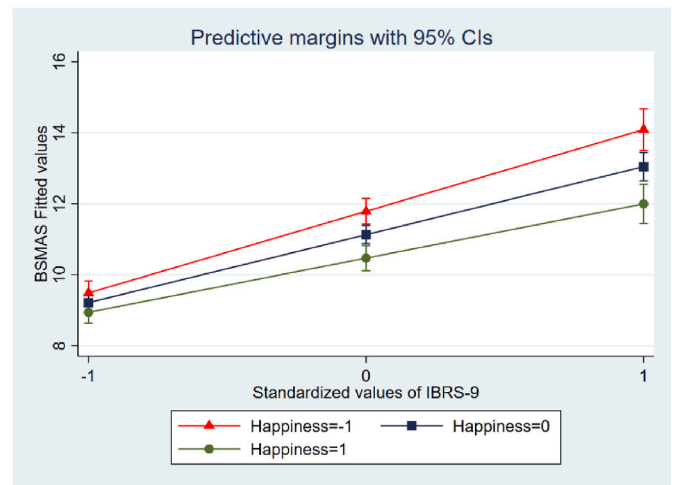


Fig. 5. Interaction effect of happiness and involvement in online identity bubbles on addictive internet use in Italy.***.

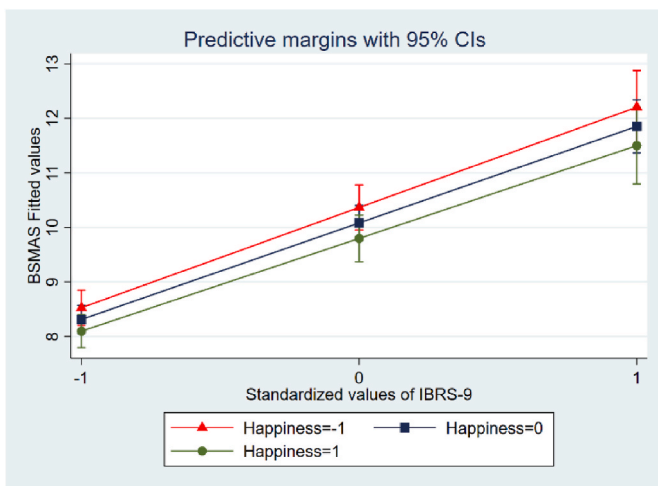


Fig. 3. Interaction effect of happiness and involvement in online identity bubbles on addictive internet use in Germany.

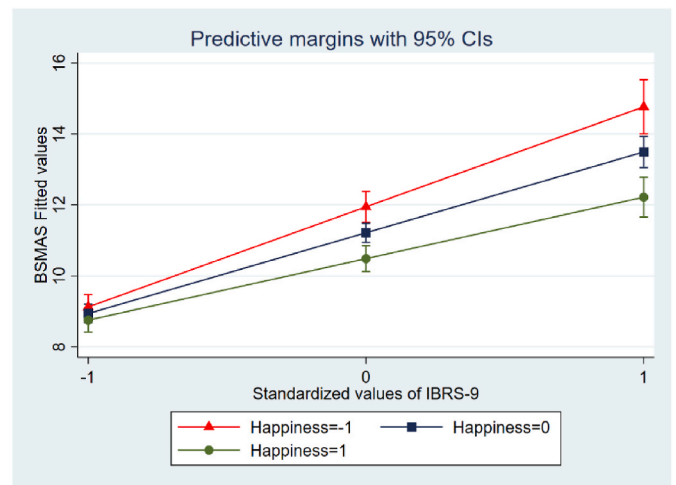


Fig. 6. Interaction effect of happiness and involvement in online identity bubbles on addictive internet use in Poland.***.

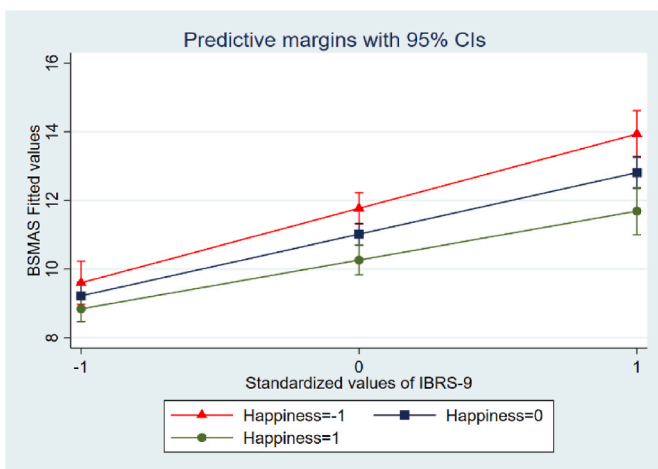


Fig. 4. Interaction effect of happiness and involvement in online identity bubbles on addictive internet use in Ireland.*.

with a gender distribution of 50.33% male among 18- to 75-year-olds, compared to 50.20% male in the general population. Additionally, the sample mirrored the age distribution of the 18- to 75 age group, with a mean age of 46.67 compared to 46.89 in the Finnish population. First follow up survey was collected in October–November 2021 (T2: $n = 1,198$, response rate 78.30% of T1 respondents), the second follow-up in April–May 2022 (T3: $n = 1,095$, response rate 71.57% of T1), the third follow-up in October–November 2022 (T4: $n = 1004$, response rate 65.62% of T1 respondents), the fourth follow-up in April–May 2023 (T5: $n = 934$, response rate 61.05% of T1), and the fifth follow-up in October–November 2023 (T6: $n = 889$, response rate 58% of T1 respondents). Analyses were based on data on all respondents who took part in at least two waves. This totaled 6632 observations from 1530 participants across the six timepoints.

Before commencing data collection in April 2021, the data quality protocol was archived in the Open Science Framework records (<https://osf.io/4mzk5>). A series of data quality checks were implemented, involving attention checks and assessments for rapid, patterned, and nonsensical responses. Furthermore, open-ended comments provided by participants were scrutinized to enhance the recognition of potentially biased motives behind participation. Like in Study 1, participants were recruited from the online participant panels

administered by Norstat. The study protocol underwent assessment by the Ethics Committee of the Tampere Region before implementation which affirmed the study did not involve any ethical concerns. Participation in the study was entirely voluntary, and participants were informed of their right to withdraw at any point without facing consequences. Completion of the survey online signified participants' consent to participate.

3.1.2. Measures

Addictive internet use was the dependent variable. It was assessed by utilizing the Compulsive Internet Use scale (CIUS; Meerkerk et al., 2009), comprising 14 items. The scale is designed to assess various aspects of compulsive or addictive behavior related to internet use, including issues such as loss of control, preoccupation, and withdrawal symptoms (e.g., "How often do you find it difficult to stop using the Internet when you are online?"). Respondents rated their responses on a 5-point scale, ranging from 0 (*never*) to 4 (*very often*), with higher scores indicating a higher degree of compulsive internet use. The total scores in the sample ranged from 0 to 53, and the scale demonstrated excellent internal consistency across measurement points (T1: $\omega = 0.95$; T2: $\omega = 0.95$; T3: $\omega = 0.95$; T4: $\omega = 0.95$; T5: $\omega = 0.95$; T6: $\omega = 0.95$).

Online identity bubble involvement. Like in Study 1, Study 2 used the Identity Bubble Reinforcement Scale (IBRS-9; Kaakinen et al., 2020) to assess involvement in online identity bubbles. The scale had excellent internal consistency in the sample across the six measurement points (T1: $\omega = 0.90$; T2: $\omega = 0.91$; T3: $\omega = 0.91$; T4: $\omega = 0.91$; T5: $\omega = 0.92$; T6: $\omega = 0.91$).

Problem gambling. We utilized the Problem Gambling Severity Index (PGSI; Currie et al., 2010; Ferris & Wynne, 2001) to assess problem gambling. Comprising nine items, the PGSI screens for various aspects of problematic gambling and associated harm. The measure inquires about gambling behaviors and experienced harms, for example, "Thinking about the last six months, have you bet more than you could really afford to lose?" Participants responded with choices ranging from 0 (*never*) to 3 (*almost always*). Higher scores indicate experiencing greater gambling-related issues. The scale demonstrated excellent internal consistency in the sample (T1: $\omega = 0.94$; T2: $\omega = 0.93$; T3: $\omega = 0.94$; T4: $\omega = 0.94$; T5: $\omega = 0.94$; T6: $\omega = 0.94$).

Internet gaming disorder was measured using the Ten Item Internet Gaming Disorder Test (IGDT-10; Király et al., 2017). Items on the instrument align with the criteria outlined in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013). The test assesses a range of gaming behaviors and negative outcomes associated with excessive gaming. Participants were asked to reflect on potentially harmful gaming habits (e.g., "When you were not playing, how often have you fantasized about gaming, thought of previous gaming sessions, and/or anticipated the next game?") over a six-month recall period. Responses were provided on a scale ranging from 0 to 2 (*never, sometimes, often*), with higher scores indicating greater gaming-related issues. The scale has demonstrated robust psychometric properties across various studies and languages (Király et al., 2019; Männikkö et al., 2019), and had good internal consistency in the present sample (T1: $\omega = 0.88$; T2: $\omega = 0.89$; T3: $\omega = 0.88$; T4: $\omega = 0.89$; T5: $\omega = 0.89$; T6: $\omega = 0.89$).

Mental health. As in Study 1, mental health was assessed using the five item Mental Health Inventory (MHI-5; Berwick et al., 1991; Cuijpers et al., 2009). The MHI-5 demonstrated robust internal consistency across all time points (T1: $\omega = 0.89$; T2: $\omega = 0.88$; T3: $\omega = 0.87$; T4: $\omega = 0.88$; T5: $\omega = 0.89$; T6: $\omega = 0.87$).

Sociodemographic control variables included in the models were gender, age, having a university degree, and current working status. Because of the limited number of participants who signified their gender as "other" ($n = 4$ across the timepoints), these individuals were excluded from the analyses, resulting in gender being treated as a binary variable (1 = male and 0 = female).

3.1.3. Hybrid multilevel modeling analyses

We calculated descriptive statistics for all time points (see Table 3) and zero-order correlations for all study variables at Time 1 (Table 4). We employed the `xthybrid` command (Schunck & Perales, 2017) in Stata version 17 statistical software (Stata Corp) to analyze the impact of online identity bubble involvement and mental health factors on addictive internet use over time. Hybrid multilevel regression modeling allows for a more precise examination of the relationships between target variables as it produces within-person effects while simultaneously separating between-person effects. Such an approach integrates both random-effects and fixed-effects approaches (Twisk & de Vente, 2019), and is well-suited for the analysis of panel data. We tested all assumptions of multilevel regression and, although no multicollinearity was present, heteroscedastic residuals were observed. To address this issue, we employed robust standard errors through hybrid regression. Additionally, tests of the random effects assumption were violated. To address this, we incorporated a command for correlated random effects. This adjustment accounts for correlations between random effects, allowing the model to accommodate nonequivalence of random effects across groups. The models utilize all available data from 1530 participants, equaling 6632 observations. The hybrid multilevel models account for missingness through their ability to model within- and between-person variation using all available data. Throughout the data collections, younger participants were more likely to drop out due to several unobserved factors. However, the data constitute a representative sample of the population of interest and, even after six time-points, still closely matches the Finnish adult population, making the approach sufficient for drawing valid conclusions. We include age as a covariate in the model to further account for missingness by the observed data.

We z-standardized all independent variables of the main analyses for more meaningful comparison and report regression estimates (B), robust standard errors (SE), confidence intervals (CI) at the 95% level, and p -values for statistical significance. In the within-person models, the within-person effect (B) signifies the change in the time-varying predictor variable relative to that individual's average, and its association with the outcome variables. Between-person effects (B) indicate the average change in the outcome variable associated with a one-unit increase in the predictor variable, holding all other variables constant.

We conducted additional sensitivity analyses using dynamic panel models with maximum likelihood estimation and structural equation modeling to verify the robustness of the results. Specifically, we used the `xtpdml` command in Stata, which employs full information maximum likelihood (FIML) to better handle missing data and provides goodness-of-fit measures to improve model specification (Allison et al., 2017; Williams et al., 2018). These results are reported in the Appendix.

3.1.4. Results

Descriptive analyses showed that mean addictive internet use, assessed using the CIUS, was highest at T1 (Spring 2021) with a mean score of 8.78. However, the average addictive internet use score remained rather consistent across the measuring points (Table 3). Mean differences were significant between T1 and T4 ($p = .039$), T1 and T5 ($p = .026$), and between T1 and T6. ($p = .011$)

We observed both within- and between-person effects of the predictor variables on the dependent variable. First, online identity bubble involvement had a positive within-person effect on addictive internet use ($B = 0.27$, $p = .006$). Thus, an increase in involvement in online identity bubbles over time predicted higher CIUS score. Mental distress also had a positive relationship with addictive internet use ($B = 0.67$, $p < .001$), thus, as mental distress increased, so did CIUS score. A within-person effect of problem gambling was observed ($B = 1.41$, $p < .001$), suggesting that within individuals over time, an increase in problem gambling is associated with an increase in addictive internet use. Similarly, internet gaming disorder had a positive within-person effect on addictive internet use ($B = 2.20$, $p < .001$), increased gaming

Table 3
Descriptive statistics of the Study 2 variables.

Continuous variables	Range	T1, <i>M (SD)</i>	T2, <i>M (SD)</i>	T3, <i>M (SD)</i>	T4, <i>M (SD)</i>	T5, <i>M (SD)</i>	T6, <i>M (SD)</i>
Addictive internet use	0–53	8.78 (9.65)	8.26 (9.64)	8.17 (9.53)	7.98 (9.41)	7.90 (9.40)	7.76 (9.42)
Online identity bubbles	9–63	30.38 (10.75)	30.42 (11.43)	30.21 (11.30)	29.91 (11.30)	30.10 (11.70)	29.46 (11.14)
Mental distress	5–30	12.40 (4.72)	12.26 (4.53)	12.40 (4.50)	12.27 (4.50)	12.00 (4.62)	12.01 (4.43)
Problem gambling	0–27	1.31 (3.33)	1.18 (3.15)	1.18 (3.19)	1.06 (2.93)	1.00 (2.81)	0.90 (2.63)
Internet gaming	0–20	1.34 (2.63)	1.26 (2.58)	1.17 (2.40)	1.20 (2.50)	1.12 (2.40)	1.05 (2.34)
Age (at T1)	18–75	49.50 (15.85)					
Categorical variables		T1, <i>n (%)</i>	T2, <i>n (%)</i>	T3, <i>n (%)</i>	T4, <i>n (%)</i>	T5, <i>n (%)</i>	T6, <i>n (%)</i>
6. Male		768 (50.29)	606 (50.71)	546 (50.00)	504 (50.35)	470 (50.48)	445 (50.23)
7. Female		755 (49.44)	589 (49.29)	546 (50.00)	497 (49.65)	461 (49.52)	441 (49.77)
8. Other		4 (0.29)	0	0	0	0	0
9. Works		804 (52.65)	628 (52.55)	586 (53.66)	533 (53.25)	503 (54.03)	464 (52.37)
10. University degree (at T1)		587 (38.44)					

Table 4
Correlations of Study 2 variables at T1.

	1	2	3	4	5	6	7	8
1. Addictive internet use	1							
2. Online identity bubbles	0.24***	1						
3. Mental distress	0.44***	0.06*	1					
4. Problem gambling	0.34***	0.08**	0.23***	1				
5. Internet gaming	0.53***	0.14***	0.31***	0.53***	1			
6. Age	-0.46***	-0.24***	-0.30***	-0.16***	-0.32***	1		
7. Male	-0.05*	-0.04	-0.07**	0.11***	0.13***	-0.03	1	
8. Works	0.00	0.08**	-0.05	0.03	-0.05	-0.27***	0.04	1
9. University degree	-0.01	0.02	0.00	-0.06*	-0.04	0.01	0.06*	0.16***

problems being associated with higher addictive use of the internet. We further observed significant between-person effects of online identity bubbles, mental distress, problem gambling, and internet gaming on addictive internet use. These effects were positive for online identity bubble involvement ($B = 1.17, p < .001$), mental distress ($B = 1.76, p < .001$), and internet gaming disorder ($B = 1.96, p < .001$). Problem gambling, however, had a negative between-person effect on addictive internet use ($B = -1.45, p = .001$), indicating that those who, on average, have higher levels of problem gambling also tend to have lower levels of internet addiction. Of the sociodemographic covariates, younger age and female gender were associated with addictive internet use. See Table 5 for all the results.

Our sensitivity analyses, based on dynamic panel models with full information maximum likelihood and structural equation modeling, showed that IBRS had a positive within-person effect on CIUS. When controlling all other independent variables (mental distress, problem gambling, and problem gaming) the effect was no longer statistically significant ($p = .080$, see Appendix).

Table 5
Hybrid multilevel regression analyses of Study 2 predicting addictive internet use.

	<i>B</i>	<i>SE</i>	<i>p</i>	<i>95% CI</i>
Within-person effects				
Online identity bubbles	0.27	0.10	0.006	0.07, 0.50
Mental distress	0.67	0.13	<0.001	0.42, 0.93
Problem gambling	1.41	0.25	<0.001	0.93, 1.90
Internet gaming	2.20	0.23	<0.001	1.73, 2.67
Between-person effects				
Online identity bubble	1.17	0.22	<0.001	0.75, 1.60
Mental distress	1.76	0.27	<0.001	1.22, 2.95
Problem gambling	-1.45	0.33	0.001	-1.80, -0.49
Internet gaming	1.96	0.37	<0.001	1.24, 2.68
Covariates				
Age	-1.18	0.20	<0.001	-2.24, -1.46
Gender (male)	-1.08	0.16	<0.001	-1.40, -0.76
University degree	0.15	0.20	0.444	-0.23, 0.53
Works	-0.20	0.13	0.110	-0.45, 0.05

4. Discussion

In this study, we examined the role of online identity bubble involvement in addictive internet use, utilizing cross-national data from six European countries and a three-year longitudinal study of Finnish adults. The results consistently showed that online identity bubble involvement was associated with addictive internet use, assessed with the BSMAS, across the European countries. Longitudinal analyses further revealed that an increase in online identity bubble involvement over time was linked to addictive internet use pertaining to a higher score on the CIUS measure. In terms of mental health, we found that higher distress and being unhappy were associated with addictive internet use. Notably, the cross-national examination indicated that happiness buffered the influence of identity bubble involvement on addictive internet use in all countries except Germany. Overall, the findings suggest that identity-driven internet use contributes to addictive usage patterns. Individuals who have poorer mental health are more prone to addictive internet use, whereas happier individuals are less likely to develop addictive internet use, even if they are involved in online identity bubbles. Thus, the results suggest that online identity bubbles are a risk factor for addictive internet use particularly among individuals with mental health issues.

The results are in line with prior research which has associated online identity bubbles with risky behaviors (Oksanen et al., 2021; Savolainen et al., 2020; Sirola et al., 2021; Vepsäläinen et al., 2024; Zych et al., 2023). Online identity bubbles are a result of selective online behavior and algorithms that curate content based on users' selected networks, preferences, and interactions with content (Kaakinen et al., 2020; Keipi et al., 2017), leading to a highly personalized online environment where individuals are consistently exposed to content that aligns with their existing beliefs and interests. This constant reinforcement is likely to contribute to a heightened engagement within online platforms, as users feel validated and understood by their bubble network. The personalized and validating nature of online identity bubbles can further foster an emotional and psychological dependency on the online network. It is feasible that the sense of community and

belonging provided by the online bubble become so meaningful that users end up spending excessive amounts of time online, ultimately leading to addictive use. Moreover, as users become more rooted in their identity bubbles, they may find it increasingly difficult to engage with content outside of their immediate online community or detach from it overall. This can create an increased reliance on the bubble for information and social interaction, reinforcing patterns of addictive internet use, especially if users rely on the bubble as their primary source of social resources.

An important discussion point is that online social networks have the potential to increase individuals' social capital, provide support, and boost well-being (e.g., as described by the concept of bonding social capital; Putnam, 2000; Williams, 2006). Prior research has shown that online networks can nurture and cultivate strong social ties, foster trust, emotional support, and a sense of belonging (Latikka et al., 2022). However, our findings highlight that not all online interactions are equally beneficial. The results of this study emphasize the importance of examining both the quality and characteristics of online networks, especially given that online identity bubbles are shaped by a combination of social media platforms' algorithms and users' self-selecting behavior, reinforcing identity formation and perceived homophily. Future research and practical interventions should thus focus on promoting more critical and intentional online communication in order to maximize the positive aspects of online social capital while mitigating the risks associated with online identity bubble involvement, such as problematic use.

The observed differences in addictive internet use and mental health predictors might be due to varying coping strategies and levels of resilience among individuals. Happier people might not necessarily use social media less, but according to the results gained here, they seem generally less likely to become addicted to it. This suggests that happier individuals might engage with the internet and social media in healthier ways. They likely possess higher levels of resilience and prefer functional coping strategies in stressful situations, rather than resorting to intensive or addictive internet use as an escape. Given that addictive social media use often derives from a need to cope with one's negative emotions (Brailovskaia & Margraf, 2020), it is plausible that happy individuals are not driven by this need and may thus be protected against problematic social media and internet use tendencies. Moreover, happy individuals are likely to have a more positive mindset and orientation in their social media use, such as a sense of control and agency, and tendency to use social media as a tool to pursue personally meaningful activities (Lee & Hancock, 2024). In contrast, negative mindsets such as depressive thoughts can reduce a user's sense of control (Lee & Hancock, 2024) and make them more likely to engage in maladaptive online behaviors such as negative social comparison (Feinstein et al., 2013) and doom scrolling (Kartol et al., 2023) which can manifest in problematic and addictive social media use. Therefore, happy individuals seem to be better off even if they use the internet and social media frequently and are involved in online identity bubbles. Subsequently, happy individuals' online identity bubbles might even represent a positive online environment to them.

In terms of our control variables in the longitudinal model, problem gambling had a positive within-person effect but a negative between-person effect on addictive internet use. This discrepancy is somewhat surprising but indicates there are complex dynamics at play when it comes to these behaviors. It is possible that within individuals, short-term fluctuations in problem gambling may lead to increased internet addiction, while between individuals, those who have consistently high levels of problem gambling, have adapted in different ways that may mitigate addictive internet use. The results may further indicate that gambling activities are viewed as separate parts of internet use, also considering that gambling can be engaged in offline as well. Internet gaming disorder was associated with addictive internet use. This was evident in both within- and between-person effects. Gambling and internet gaming are well-established in previous research to contribute

to problematic internet behaviors, often leading to addictive patterns of use (Baggio, Dupuis et al., 2016; Baggio, Gainsbury et al., 2016) and online identity bubbles have been found to relate to both gambling and gaming in previous studies (Savolainen et al., 2020; Sirola et al., 2021; Vepsäläinen et al., 2024). In the current two studies, we found robust cross-national and longitudinal evidence on the role of online identity bubbles in addictive internet use itself. Even after accounting for gambling and internet gaming activities, the association between online identity bubbles and internet addiction remained significant. This finding highlights the unique and independent influence of online identity bubbles.

Some limitations should be considered. Even though we used large-scale data sets containing both cross-national and longitudinal approaches, the measures were based on self-reports and involve questions that might be sensitive to social desirability bias. Future research could benefit from utilizing objective measures of internet use and its related behaviors, such as data based on digital tracking. The samples, although diverse including several European countries, do not represent the global population. Cultural differences might play a role in how online identity bubbles and internet addiction manifest in other parts of the world, and future research should explore these dynamics in a broader range of cultural contexts to enhance generalizability. Further research on other populations and using different methods and measurements can also help explain the cross-national differences found in the current research. Similarly, analyzing longitudinal data using alternative statistical approaches such as time-series analyses or latent growth modeling could offer valuable additional insights about the relationship between the variables. These approaches should be applied in future studies. As the current study focused on investigating relationships between the predictors and outcome variables over time, rather than comparing mean levels across time points, examining scalar invariance was not necessary, however, future studies using alternative modeling should test for measurement invariance.

An additional potential limitation of this study is that we conceptualized social media use as part of a broader phenomenon of addictive internet behaviors. This was consistent with our focus on general internet addiction; however, we recognize that platform-specific differences warrant further investigation as such features may result in distinct psychological and behavioral outcomes. Another limitation is our use of a single-item measure of happiness which can lack psychometric depth. Future research should utilize multi-dimensional measures to improve precision and gain a more nuanced exploration of happiness.

While the dual-factor model of mental health provided a meaningful framework for our investigation, other widely established models, taking a broader view of subjective well-being, should be considered in future studies. Incorporating these models could offer a more comprehensive understanding of how identity bubbles and mental well-being link to online addictions. Lastly, even though we controlled for gambling and internet gaming in the analyses, there are other potentially confounding internet activities, such as content creation, shopping, or dating app use that were not accounted for, but which could play a role in addictive internet use. Future research should expand to include a wider range of problematic digital behaviors to provide a more comprehensive understanding of their interplay with online identity bubbles and mental health outcomes. Despite these limitations, our study provides valuable insights into the role of online identity bubbles in predicting addictive internet use. The findings underscore the importance of considering the unique influence of identity-driven online engagement on addictive behavior.

Recognizing that online use can be identity-driven and acknowledging that when using the online realm, it is easy to become "bubbled" in one-sided, homophilic social online environments, can help individuals become more aware of their online interactions and consumption patterns. This awareness is crucial for recognizing how online interactions and consumption patterns may contribute to addictive

internet use. Through this understanding, individuals can cultivate a more mindful approach to their online behavior, promoting healthier and more intentional engagement with the digital realm. The current study extends our understanding of how online behavior can manifest in individual-level outcomes in the real world and underscores the relevance of online identity bubbles for broader audiences, including policymakers, mental health professionals, and the general public. The results highlight the theoretical connections between identity bubbles, addictive internet use, and mental health but also their practical and societal implications. These findings emphasize the need to recognize the power of the online world in shaping us and promote balanced and intentional online interactions. Building online networks based on bonding rather than perceived similarities, as a means to reduce risks, could promote mental health, and support well-being in an increasingly digital society.

CRedit authorship contribution statement

Ina Savolainen: Writing – review & editing, Writing – original draft, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Julia Brailovskaia:** Writing – review & editing, Writing – original draft, Investigation, Conceptualization. **Anu Sirola:** Writing – review & editing, Writing – original draft, Investigation, Conceptualization. **Magdalena Celuch:** Writing – review & editing, Writing – original draft, Investigation, Conceptualization. **Atte Oksanen:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Declaration of competing interest

The Authors of this manuscript declare that they have no financial or personal interest that could affect their objectivity. They have no competing interests. This work was supported by the Finnish Foundation for Alcohol Studies (Gambling in the Digital Age -Project, 2021–2024, PI: Prof. Atte Oksanen) and by Tampere University (internal project funding 2022–2024, PI: Atte Oksanen).

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.chb.2025.108555>.

Data availability

Data will be made available on request.

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