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Gender Effects of Social Network Use Among Secondary School Adolescents in Spain: Extremist and Pro-Violence Attitudes

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Abstract

This paper presents the results of a questionnaire-based study of adolescents in secondary schools in Almería and Madrid (n = 1135), Spain. Based on scales developed and tested by Ozer and Bertelsen (2018), we investigate whether social media use correlates with self-reported extremist and pro-violence attitudes. We analyze the results of a moderation analysis on the rates of extremism and pro-violence, as well as illegal acts, in relation to social media use. We find that boys use social media more than girls, and that greater social media use does not correlate with adolescents being more extremist, but rather more pro-violence.

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In March 2023, the Commission on the Status of Women, sixty-seventh session, recognized that adolescent girls are part of the most digitally connected generation in history. They may also disproportionately face discrimination and violence that occurs through or is amplified by the use of technology, which may prevent them from accessing the full benefits of digital technologies and meaningful participation in society, and may create and exacerbate inequalities (Commission on the Status of Women, 2023, p. 5). Likewise, in Session III of the United Nations (UN) High-Level Counter-Terrorism Conference (United Nations, 2018), participants highlighted the need to include women and youth in efforts to prevent violent extremism, arguing that new technologies have enormous potential to help address the root causes and drivers of violent extremism. To improve youth resilience to violent extremism, they suggest working in education to prevent the misuse of information technologies by violent extremist groups and to identify early signs of radicalization and called for the development of international instruments to counter violent extremism in cyberspace (United Nations, 2018, pp. 15–16). The United Nations Educational, Scientific and Cultural Organization (UNESCO) has also expressed its commitment to empowering educators to prevent violent extremist attitudes and counter hate speech (UNESCO, 2016). One of the products of this effort is the first UNESCO guide entitled 'Teacher's Guide on the Prevention of Violent Extremism through Education'. The document was produced in direct response to the needs of Member States, as expressed in the historic decision 197/EX 46 adopted by the UNESCO Executive Board in October 2015. This guide is intended to serve as a tool for the prevention and transformation of attitudes related to violent extremism. There is an adaptation of this guide to the Spanish context and specifically to Almería (Rodríguez Martínez et al., 2022b).

UN Women (2022) highlights some technical risks that arise when working on and developing the prevention of violent extremism. The first has to do with terminology. UN agencies and civil society have reported for years on the poorly defined terms such as 'extremism' and 'radicalization'. When these terms are ambiguous, they are prone to political misuse and can create harmful biases against certain communities, for example by increasing the focus on coercion, surveillance and threats to partners and colleagues. Second, UN Women asserts that frameworks for analysis and policy must focus on the unique vulnerability of women and girls to extremist ideas; the impact of extremism on women and girls; how women can exercise their agency to resist extremism; and what capacities are needed. Third, the lack of data on violent extremism complicates prevention because it is partial and therefore may incompletely capture the security needs of communities. As violent extremism is often based on stereotypes, children/minors are lumped together, even though girls' and boys' experiences of violent extremism

differ according to gender and age. The research can also be criticized for focusing only on contexts with Muslim populations and not addressing white supremacists.

To meet these challenges, we will present some research results on attitudes towards violent extremism developed in five secondary schools in Almería and Madrid (Spain). Although we are currently developing an intervention program dedicated to transforming violent extremist attitudes (Rodríguez Góngora & Rodríguez Rodríguez, 2023), we will focus on some of the results obtained from a survey we conducted among 1170 adolescents (aged 12–19) to measure pro-violence and extremist attitudes and the use of social media (Rodríguez Martínez et al., 2022a).

In particular, we focus on the association between violent extremist attitudes and social media use. We also try to show how this association differs between boys and girls. Among other objectives, the study sought to understand the role of social media as a channel for violent extremism through girls' and boys' participation in polymedia. Polymedia is understood in this study as the everyday conditions of abundant media resources (Medianou & Miller, 2012). Within this framework, we aim to contribute towards a proactive framework for the prevention of violent extremism, as proposed by UN Women.

Defining Key Terms

Violent radicalization involves two processes. The first is attitudinal and the second is behavioral. Davies (2009) refers to the first process by a definition of extremist attitudes by Archbishop Desmond Tutu who, in 2006, defined it as "when you do not allow for a different point of view; when you hold your own views as being quite exclusive, when you don't allow for the possibility of difference". Davies refers to a second process that has to do with violent attitudes –and even behaviors-when he adds to this definition "and when you want to impose this view on others using violence if necessary" (Davies, 2009, p. 185). Therefore, *violent extremist attitudes* can be defined as attitudes that "encourage, endorse, condone, justify, or support the commission of a violent criminal act to achieve political, ideological, religious, social, or economic goals"(International Association of Chiefs of Police, 2014; Nivette et al., 2017, p. 758). The processes that Davies refers to combine two aspects: the endorsement of extremism and the acceptance of violent means. Radicalization can be broadly understood as the process of acceptance of extremist ideology and violent action. Moreover, this definition can be applied to contexts with Muslim populations and to growing phenomena such as white supremacy.

It is not possible to say in advance that people's attitudes will necessarily translate into behaviors (Schuman & Johnson, 1976), although attitudes often precede behaviors. Behavioral radicalization refers to the illegitimate use of violence in our societies and is fortunately a relatively rare occurrence. The same is not true of cognitive radicalization. Cognitive radicalization refers to the justification of extreme ideas, to the cognitive commitment of an individual to violent action. Now, for cognitive radicalization to occur, it is not necessary for the individual to become or act

like a terrorist, but it is sufficient to advocate, identify or defend terrorist actions (Sageman, 2017). As Wolfowicz and colleagues point out (Wolfowicz et al., 2021), we must agree that, fortunately, most people who hold radical views will never resort to violence. Indeed, programs aimed at preventing violent extremist attitudes primarily focus on reducing these attitudes to prevent subsequent violent extremist behavior.

Literature Review and Hypothesis

Cognitive violent extremism –which is the subject of this article-should be analyzed taking into account that its development in social contexts where other types of violence (cultural, structural, and direct physical) are produced and reproduced. In fact, if we follow Galtung's typology of violence (Galtung, 1990), cognitive radicalization constitutes cultural violence (which takes the form of a fundamentalist vision of religion, ideology, or language) that is used to justify structural violence (social inequalities) and, even physical violence (physical/psychological aggression). Cognitive radicalization related to violent extremism can take advantage of the existence of other direct violence.

In the secondary schools where we focused this study, direct peer violence has continued to increase in recent years. According to Myers and Cowie (2016), the culture of bullying and violence is growing in educational spaces, especially due to the increase of online life. Such violence, according to the authors, leads to low selfesteem and can jeopardize the academic life and well-being of students. According to Fundación ANAR and Fundación Mutua Madrileña (2022), the cases of harassment (be they bullying or cyberbullying) continue to increase in Spain. Interestingly, the number of group attacks has increased from 43.7% in 2018 and 2019 to more than 70% in 2020 and 2021. Furthermore, structural violence-derived from legal and labor inequality between Spaniards and immigrants-has also increased because of COVID-19 (Bacigalupe et al., 2022; González-Rábago et al., 2021; Mahía, 2020).

There is no single profile or predetermined pathway for youth to undergo a process of behavioral radicalization, and we cannot accurately predict the speed at which this process unfolds. Researchers suggest that there are macro-environmental factors (related to geopolitics or religiosity), micro-environmental factors (related to family dysfunction or being friends with radicalized individuals), and individual factors (psychological vulnerability, experiences of neglect, psychiatric conditions, personal insecurity, and perceived social injustice) that lead from a precipitating event to violent behavioral behavioral extremism (Campelo et al., 2018). Adolescence is a clear risk factor for participation in radicalization activities. The United Nations report *A Child-Resilience Approach to Preventing Violent Extremism. Office of the Special Representative of the Secretary-General on Violence against Children* (United Nations, 2020) points out that adolescents have not yet fully developed their cognitive control system, making it difficult for them to control their impulses or develop resistance to peer pressure. According to Assis & Avanci (2004), the formation of self-esteem takes place in childhood and is reinforced in adolescence. Therefore, low self-esteem is a

determining factor for feelings of discomfort and less resilience to peer pressure (Fortes et al., 2014, p. 237). In addition, rebelliousness and the desire to distinguish themselves from their parents as a way of asserting their own identity may lead them to develop extremist and/or violent attitudes. They may also develop violent extremist behaviors.

We understand pro-violence attitudes to be those that justify or actively promote "the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation" (WHO,1996). Pro-violence attitudes are not only related to what happens in the life cycle. Several studies in Spain show that the audiovisual diet offered in children's television programs in 2021 doubled the violence (psychological, against inanimate objects, physical, etc.) that men exercise against women and other men, compared to the violence that women exercise against men and other women (CIMA, 2023). These data are important if we consider that in 2021 Spain occupied the first position in hours of television consumption (219 minutes per day) compared to the rest of the countries of the European Union. In addition, the data on bullying and cyberbullying in childhood (12–16 years) show that in Spain there is a difference between boys and girls: the percentage of those who recognize themselves as aggressors is higher: 6.3% of boys have bullied another minor compared to 3.5% of girls. This difference persists when it comes to cyberbullying: 4.5% of boys have been cyber aggressors compared to 3% of girls (Save the Children, 2016). Donner et al. compared online and offline offending by 502 college students at a large southeastern university in the United States and concluded that it is useful to "conceptualize online offending as part of a more general repertoire of offending rather than as a specialty" (Donner et al., 2014). Therefore, it is expected that (first hypothesis),

H1: Girls will display less extremist and pro-violence attitudes than boys.

In Spain, the use of social media by young people has increased in recent years. According to the Interactive Advertising Bureau (2019), 85% of Spaniards over the age of 16 used social media. The profile of all users of global digital communication platforms is that of a woman, between 35 and 45 years old, with high school and university education, and employed. When age is taken into account, the youngest are the ones who spend more time on the networks. WhatsApp, Facebook, YouTube and Instagram are the most used platforms. Instagram and YouTube are preferred by young people. According to the V Study on the users of Facebook, Twitter, and Instagram in Spain (The Social Media Family, 2019), almost 70% of the total population of Almería has used social media. In the province of Almería with a total population of 754,444, there are 160,000 Facebook users and 120,000 Instagram users, with Instagram being the preferred network among young people, among whom other social media such as YouTube and TikTok are also spreading.

Social media offers young people the opportunity to participate in public life, reproducing gender, and creating new social dynamics. In terms of gender

reproduction, technological inequalities in the first gender gap (Calderón-Gómez, 2019; Newman et al., 1995) are giving way to a second digital divide, with a gendered use of different social media. In fact, studies show that women manage profile privacy more responsibly than men (Madden et al., 2013). Other authors have pointed out, for example, that in terms of discriminatory expressions used by boys and girls on social media such as Facebook, boys tend to post and share more messages, with more discriminatory content, focusing on discrimination against ethnic groups and cultural minorities. Girls tend to use reactive discrimination strategies, with less of a discriminatory component. Compared to boys, girls direct their discriminatory actions more towards physical appearance or socio-cultural status (Dueñas et al., 2016). Calvo & San Fabian (2018) in their study of 403 boys' and girls' selfies on Instagram demonstrate that boys and girls reproduce gender-related stereotypes. For example, in the selfies, girls smile sweetly and/or shyly, stare at the camera, and are groomed and made up; boys appear more serious, with stronger and bolder facial expressions, appear active, and show their chest or abdomen.

Social media also facilitates youth participation in public life, creating new social dynamics. As Boyd notes, "teens are passionate about finding their place in society. What is different because of social media is that teens' longstanding desire for social connection and autonomy is now expressed in networked publics" (Boyd, 2014, p. 8). As the author explains, boys and girls construct their own identities by identifying with different publics or imagined communities (political in nature or constructed around shared identities and/or social practices) because they want to be part of a larger world. In this process, the experiences of women and men or girls and boys on social media are quite different. While men and boys are more willing to express their opinions, women and girls are under the shadow of strong online violence that limits their experience and even encourages self-censorship (Poland, 2016). This allows us to formulate our second hypothesis:

H2: Gender socialization will have an impact on girls' and boys' use of social media

As Medianou and Miller (2012) show in their theory of polymedia, boys and girls use new media as a communicative environment of possibilities, rather than as a catalog of discrete technologies. This means that polymedia "is not simply the environment; it is how users exploit these possibilities to manage their emotions and relationships" (Medianou & Miller, 2012, p. 172). Indeed, the social dynamics in social media are influenced by the affordances of the platforms. In this line, we find the concept of *affordance* introduced by Boyd particularly interesting, as it points out that the features or properties of each environment "make possible—and, in some cases, are used to encourage—certain types of practices, even if they do not determine what practices will unfold" (Boyd, 2014, p. 10). When it comes to gender, this process is complex, as Zolides points out in his analysis of the nature of the content moderation policies and community guidelines of Twitch, a platform where 80% of users are male: "Twitch's moderation privileges masculine forms of self-performance with extra scrutiny toward

the bodies and sexual identities of women. Language in the community guidelines implicitly problematizes and sometimes sexualizes performances of femininity much more than masculinity with references to the chest, specific camera angles, and certain attires" (Zolides, 2021, p. 3002). According to Poland (2016), the internet is a space that has historically been constructed for male dominance. From its beginnings to the present, more men than women have held leadership positions in the field of technology (Natansohn, 2015).

In Spain, violent extremism seems more common in male-dominated platforms such as YouTube, Twitch, Twitter, or Telegram (Méndez-García, 2022). The EU's Radicalization Awareness Network (RAN) has published several topical documents highlighting that in some cases violent extremists have been inspired by online gaming platforms such as "Twitch" or "Discord" through in-game chat or communication platforms adjacent to these environments (Radicalisation Awareness Network, 2020; 2021). The qualitative study by Koehler et al. shows "the importance of online and offline factor interaction, especially regarding the role of familiar criminogenic factors, as well as the social-emotional bonding between potential recruits and extremist gamers created through shared gaming experiences that lead to high intensity extremist radicalization aimed at offline behavioral changes" (Koehler et al., 2023, p. 419). This allows us to formulate our third hypothesis:

H3: The kind of App used daily moderates the relationship between extremism and pro-violence for both boys and girls.

Method

To test the three hypotheses listed above, we used a survey methodology with adolescents in public and state-funded private secondary schools located in Almería (4) and Madrid (1) in May 2022. The questionnaire included sociodemographic questions and questions about the social media they use, their perceptions of discrimination and violence, their attitudes toward violence and the use of violence, and two scales pertaining to the endorsement of extremism and acceptance of violence and/or illegal means (Ozer & Bertelsen, 2018). The adolescents completed the questionnaire in their classrooms, with the prior consent of the school councils of the centers. Members of the research team explained the general guidelines of the questionnaire and assured the adolescents that their answers would be treated anonymously. To complete the questionnaire, the research team provided the adolescents with a QR code, which they used to complete the questionnaire on their cell phones for approximately 30 minutes.

Participants

Our study's convenience sample included 1170 students from five secondary schools. After excluding incomplete questionnaires, the sample consisted of 1135 participants

aged between 12 and 19 years. The mean age was 15.6 years, with a standard deviation of 1.5. In our sample, 554 were boys (48.8%) and 581 were girls (51.2%). The database, together with the questionnaire and a methodological note, is available in the repository of the University of Almería (Rodríguez Martínez et al., 2022a).

Variables of this Study

The independent variables we used to conduct this study are the following: gender (male/female); daily use of Instagram, TikTok, Twitch, YouTube, Discord, Twitter, Snapchat, WhatsApp and Facebook; and the total number of Apps used daily (hereinafter collectively labeled as Apps in this article). The dependent variables are the Extremist Scale (ES) and the Pro-violence and Illegal Acts in Relation to Extremist Scale (PIARES). Both scales range from (1) strongly disagree to (7) strongly agree. These scales were created and tested with high school students from Denmark and the United States, and showed consistent results according to Ozer and Bertelsen (2018). The extremism scale was developed to measure attitudes toward comprehensive sociocultural change and intolerance towards others through group dynamics. The first component included lifestyle and culture, socioeconomic foundations, and the system of government, while the second component was related to the us-them distinction, devaluation of others, breakdown of deliberation, and inability to coexist. PIARES was designed to measure attitudes toward violence and acceptance of the use of illegal means in relation to extremism, focusing on various domains such as society, a higher cause, family and friends, and the group. The Extremism Scale consisted of 14 items, and the Pro-violence and Illegal Acts in Relation to Extremism Scale included 6 items related to acceptance of the use of violence and 6 items related to acceptance of the use of illegal means. Both scales confirmed the distinction we made earlier between extremist attitudes and pro-violence attitudes related to extremism.

In order to apply the scales to Spanish adolescents, a direct translation (English-Spanish) was done by a translator who was part of the research group, and an indirect translation (Spanish-English) was done by an external translator, with both translations being compared (Beaton et al., 2000). After data collection, Confirmatory Factor Analysis (CFA) was carried out for both scales, with the result of a good fit in the case of ES and the need for changes in the case of PIARES. In the second case, an Exploratory Factor Analysis (EFA) was conducted, eliminating four items and re-running the CFA, which confirmed the good fit of both scales to the sample used. Table 1 shows the final items of the two scales included in our analysis (ES and PIARES), together with the goodness of fit indices resulting from our confirmatory analysis.

A multi-group (gender) CFA was then conducted to test the measurement invariance of both scales. Comparisons of the proposed models were made, testing configural invariance for males and females, metric (factor loading restriction), scalar (intercept restriction), and strict (residuals restriction) (Table 2).

Table 1. Goodness-of-fit Indices (Confirmatory Factor Analysis) of the Extremism Scale (ES) and Pro-violence and Illegal Acts in Relation to Extremist Scale (PIARES) Adapted From Ozer and Bertelsen (2018).

A. Items of extremism scale (ES)[a]
1. Most people in this country have a lifestyle and culture that is necessary to change totally.
2. If one can´t live with the majority´s lifestyle and culture, it is necessary to create a totally different lifestyle and culture for oneself and ones like-minded
3. It is necessary to totally change the economic system that is the basis of society
4. Those who think like me have to thoroughly change the foundation of our own life (economy, job, consumption, well-being). The rest of the society can do what they want.
5. It is necessary to do away with the democratic form of government if we want to have a decent society.
6. Just let the rest of the society choose democracy – I, and those who think like me, work to establish up a different system in our own milieu.
7. I, and those who think like me, in fact share nothing with the rest of the society.
8. There is only one way to live the good and correct life.
9. If one doesn´t live in agreement with the good and correct life, then one has chosen to withdraw from the community.
10. Those groups in the society that don´t support the good and correct life should be deprived of their rights.
11. It is a waste of time to try to find common solutions with those whose thoughts about life are completely different than ours.
12. It is wrong to make compromises with what oneself stands for.
13. It is wrong and immoral to live peacefully side by side with people who don´t live the good and correct life.
14. In the end, there must be a confrontation – one can´t forever live peacefully, side by side with people who live a completely different life than they are obligated to live

B. Items of pro-violence and illegal acts in relation to extremist scale (PIARES)[a]

B.1. Pro-violence Subscale
1. Using physical violence is the only thing that really works when it is a matter of creating proper conditions for those with whom one feels a solidarity.
2. Using physical violence is the only thing that really works when it is a matter of creating a new and better society.
3. Using physical violence is the only thing that really works when it is a matter of creating proper conditions for those one is closely connected to.
4. Using physical violence is the only thing that really works when it is a matter of creating respect for one's own rights and security

B.2. Illegal acts Subscale
5. Breaking the law is the only thing that really works when it is a matter of creating a new and better society.
6. Breaking the law is the only thing that really works when it is a matter of creating proper conditions for those one is closely connected to.

(continued)

Table 1. (continued)

7. Breaking the law is the only thing that really works when it is a matter of creating respect for one's own rights and security.			
8. Breaking the law is the only thing that really works when it is a matter of preventing repression and assault of my people			
Goodness-of-fit-indices CFA (confirmatory factor analysis)	ES	PIARES	Cutoff value (Hu & Bentler, 1999; Thakkar, 2020)
Absolute fit indices			
Root mean square Error of Approximation (RMSEA)	.050	.050	Excellent fit <.05 Good fit <.08
Incremental fit index			
Comparative fit index (CFI)	.934	.990	Good fit ≥.90
Tucker-Lewis index (TLI)	.919	.985	Good fit ≥.90
Normed fit index (NFI)	.918	.990	Good fit ≥.90

[a]Likert Scale 1: Totally disagree. 7: Completely agree.

Table 2. ES and PIARES Factorial Invariance with Respect to the Gender Variable (boys and girls).

Measurement model invariance	Scale	CFI	ΔCFI	RMSEA (CI95%)	ΔRMSEA	TLI
M1. Configural invariance	PIARES	.979		.053 (.046-.065)		.961
	ES	.953		.036 (.031-.041)		.935
M2. Metric invariance -weak-(M2 vs. M1)	PIARES	.978	.001	.052 (.043-.061)	.001	.966
	ES	.954	.001	.035 (.030-.039)	.001	.939
M3. Scalar invariance -strong-(M3 vs. M2)	PIARES	.963	.015	.061 (.054-.069)	.009	.953
	ES	.943	.011	.036 (.032-.041)	.001	.932
M4. Strict invariance (M4 vs. M3)	PIARES	.926	.037	.075 (.069-.082)	.014	.929
	ES	.927	.016	.038 (.033-.042)	.002	.928

There were no significant variations in CFI (ΔCFI <.01) or RMSEA (ΔRMSEA <.015). Therefore, we can affirm that the proposed models for the two scales adequately explain the differences between boys and girls.

Measures

An indicator of extremism (ES) and an indicator of justification of violence (PIARES) with four categories (low (P_0-P_{39}), medium (P_{40}-P_{69}), high (P_{70}-P_{89}) and very high (P_{90}-P_{100})) were elaborated from the participants' percentile scores (P) on the two scales. The direct reference scores for the ES scale are 14–23 (low), 24-49 (medium),

50-77 (high), and 78-98 (very high). For the PIARES scale, the reference scores are 8–9 (low), 10-19 (medium), 20-34 (high), and 35-56 (very high).

Regarding social media use, we asked about the frequency of use of TikTok, Twitch, YouTube, Discord, Twitter, Snapchat, WhatsApp and Facebook (every day, a few times a week, a few times a month, and never or almost never). An indicator of daily use of social media (Apps) was developed, with four categories: low (P_0-P_{29}), medium (P_{30}-P_{59}), high (P_{60}-P_{89}) and very high (P_{90}-P_{100}), which implies a daily use of zero–2 Apps for a low indicator, 3 Apps for medium, 4 for high and 5-9 for very high (Table 3).

Analysis

To assess the significance of the gender differences in the scores for the ES and PIARES scales [H1], and daily use of different Apps [H2], a mean comparison analysis was performed using the Mann-Whitney U test.

Means were also compared (Mann-Whitney U) to evaluate the differences between each of the Apps in relation to ES and PIARES. Discriminant functions were calculated for each of the Apps whose daily use significantly influenced the variables ES and PIARES, in order to assess the weight of each of them on ES and PIARES.

To identify which Apps moderated the relationship between ES and PIARES for boys and for girls [H3], binomial logistic regression analysis was performed with PIARES as the dependent variable and the total number of Apps used daily, daily use of Instagram, TikTok, Twitch, YouTube, Discord, Twitter, Snapchat, WhatsApp and Facebook as independent variables. For the Apps that were found to be significant, moderation analysis was performed using the PROCESSv4.2 algorithm (Hayes, 2022), with generalized least squares estimation (does not assume normality), and

Table 3. Indicators of Extremism Scale (ES), Pro-violence and Illegal Acts in Relation to Extremist Scale (PIARES), and daily use of APPs.

Indicators	Levels	Percentile	Direct scores
Extremism scale (ES)	Low	P_0-P_{39}	14–23
	Medium	P_{40}-P_{69}	24–49
	High	P_{70}-P_{89}	50–77
	Very high	P_{90}-P_{100}	78–98
Pro-violence and illegal acts in relation ES (PIARES)	Low	P_0-P_{39}	8–9
	Medium	P_{40}-P_{69}	10–19
	High	P_{70}-P_{89}	20–34
	Very high	P_{90}-P_{100}	35–56
Daily use social networks-Apps (No. SN-Apps/day)	Low	P_0-P_{29}	0–2
	Medium	P_{30}-P_{59}	3
	High	P_{60}-P_{89}	4
	Very high	P_{90}-P_{100}	5–9

10,000 sample simulation (bootstrap) to improve the predictive value of the significance of indirect effects.

Three effects were analyzed: that of the independent variable (ES) on the dependent variable (PIARES) [b1]; that of the moderator variable (M) on the dependent variable (PIARES) [b2]; and the interaction of the independent and moderator variables (ES*M) on the dependent variable (PIARES) [b3]. In order to evaluate the differences between schools, we carried out two multilevel analyses using the extremism index and the pro-violence index as dependent variables. In both cases, the null hypothesis could not be rejected, so we can say that there is no significant difference between the different schools in terms of extremist and pro-violence attitudes.

Results

Gender (boys/girls) is a predictor variable of ES. From the mean comparison analysis (Mann-Whitney U, *p-value* <.001), we concluded that the differences are significant, with a high/very high profile of social extremism for boys of 28.2%, of 18.7% for girls.

We could conclude the same for PIARES. Males presented a high/very high profile of PIARES (34.9%), significantly higher (Mann-Whitney U, *p-value* <.001) than girls (25.1%) (Table 4).

The number of Apps used daily by adolescents aged 12 and 19 years (Mean: 3.28; SD: 1.27), was similar for boys (Mean: 3.2; SD: 1.19) and girls (Mean: 3.3; SD: 1.45), with a *p-value* of .13 for Mann-Whitney U (non-significant difference).

However, the Apps used daily by boys and girls differed (Table 5). Girls used significantly more Instagram (82.1% girls, 69.3% boys), TikTok (79.0% girls, 59.2% boys), WhatsApp (91.9% girls, 87.5% boys), and Snapchat (5.3% girls, 2.0% boys). Boys were significantly more likely to use YouTube (30.8% girls, 61.2% boys), Discord (5.7% girls, 21.3% boys) and Twitch (2.9% girls, 13.7% boys).

From the moderation analysis of the number of Apps used daily on the relationship between ES and PIARES, we conclude that the number of Apps significantly influences PIARES (Figure 1). We found that for low-medium ES and daily use of two Apps, PIARES presents a coefficient of −1.63 (low-medium profile), with a probability of 0.16 (16.32%), for three Apps, the coefficient for PIARES is −1.48 (low-medium profile), with a probability of 0.18 (18.54%), and for four Apps, the PIARES coefficient is −1.32 (probability of 0.21; 20.98%).

For high to very high ES and daily use of two applications, PIARES shows a coefficient of 0.56 (high to very high), with a probability of 0.63 (63.69%), for three applications, the PIARES coefficient is 0.67, with a probability of 0.66 (66%), and for four applications, the PIARES coefficient is 0.68 (68.29%).

Even though the number of Apps used daily was very similar for boys and girls (vid. H2), it was observed that with the same number of Apps used daily and with similar extremism profiles, the coefficients of pro-violence and justification of violence were higher for boys than for girls (Figure 2).

Table 4. Mann-Whitney U mean comparison for ES and PIARES gender profiles.

		ES				PIARES			
		L	M	H	VH	L	M	H	VH
Gender	Boys	11.6% (64)	60.3% (334)	26.0% (144)	2.2% (12)	17.0% (94)	47.1% (261)	26.5% (147)	9.4% (52)
	Girls	13.6% (79)	67.6% (393)	17.7% (103)	1% (6)	24.4% (142)	50.4% (293)	21.3% (124)	3.8% (22)
Total		12.6% (143)	64.1% (727)	21.8% (247)	1.6% (18)	20.8% (236)	48.8% (554)	23.9% (271)	6.5% (74)

L: Low, M: Medium, H: High, VH: Very high.

Table 5. Gender comparison of means (Mann-Whitney U) on total number of daily social networks and daily use of each of the apps.

SN-Apps[a]	*p-value*		% Boys	% Girls	%Total	Order
No. SN-Apps/day	.130	H_0	$\bar{x}$:3.2	$\bar{x}$:3.3	$\bar{x}$:3.3	
Whatsapp	.015	H_1	87.5	91.9	89.9	1
Instagram	<.001	H_1	69.3	82.1	75.9	2
Tik-Tok	<.001	H_1	59.2	79.0	69.3	3
Youtube	<.001	H_1	61.2	30.8	45.6	4
Twitter	.42	H_0	18.4	20.3	19.4	5
Discord	<.001	H_1	21.3	5.7	13.3	6
Twitch	<.001	H_1	13.7	2.9	8.2	7
Snapchat	.003	H_1	2.0	5.3	3.7	8
Facebook	.11	H_0	2.2	3.8	3.0	9

[a] *p*-value Komogorov-Smirnov <0.001 (not normality); H_0: Non-significant differences; H_1: Yes-significant differences

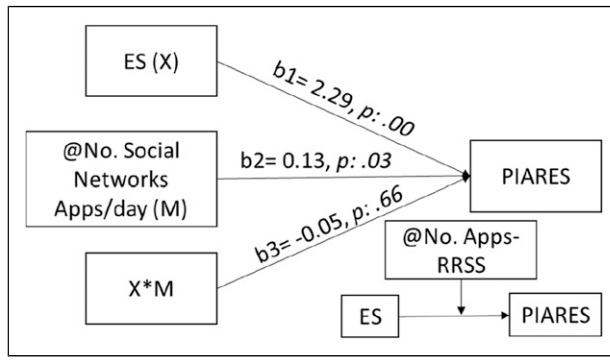

Figure 1. Moderation analysis No. SN-Apps in relation to ES-PIARES.

The mean difference study (Mann-Whitney U) for the relationship between the different Apps (independent variable), and ES and PIARES as dependent variables, showed that for ES, the daily use of Snapchat, WhatsApp, and Facebook were significant, while for PIARES, Instagram, YouTube, WhatsApp, and Facebook were significant (Table 6).

To determine whether a participant's estimated ES or PIARES profile of a participant is low-medium or high-very high, the value of the use of each pp (0: no daily use, 1: daily use) is substituted in the discriminant functions for each scale. The higher value of Y ($Y_{ES\sim PIARES\ low\text{-}\ medium}$ or $Y_{\ ES\sim PIARES\ high\ -very\ high}$) will indicate the ES profile, and similarly the PIARES profile.

$Y_{\text{ES low-medium}} = 9.95$ (@WhatsApp) + 0.55 (@ Facebook) + 0.37 (@Snapchat) + (−5.23)

$Y_{\text{ES high-very high}} = 9.33$ (@WhatsApp) + 1.31 (@ Facebook) + 1.17 (@Snapchat) + (−4.76)

$Y_{\text{PIARES low-medium}} = 2.89$ (@Instagram) + 2.02 (@YouTube) + 9.24 (@WhatsApp) + (−0.73) (@Facebook) + (−6.42)

$Y_{\text{PIARES high-very high}} = 3.26$ (@Instagram) + 2.31(@YouTube) +8.65 (@WhatsApp) + 1.29 (Facebook) + (-6.36)

As an example, for a participant who uses WhatsApp and Instagram on a daily basis, we would have:

$Y_{\text{ES low-medium}} = 9.95\ (1) + 0.55\ (0) + 0.37\ (0) + (-5.23) = 4.72$

$Y_{\text{ES high-very high}} = 9.33\ (1) + 1.31\ (0) + 1.17\ (0) + (-4.76) = 4.57$

$4.72 > 4.57 \rightarrow$ Low-medium ES profile

$Y_{\text{PIARES low- medium}} = 2.89\ (1) + 2.02\ (0) + 9.24\ (1) + (-0.73)\ (0) + (-6.42) = 5.71$

$Y_{\text{PIARES high-very high}} = 3.26\ (1) + 2.31(0) + 8.65\ (1) + 1.29\ (0) + (-6.36) = 5.55$

$5.71 > 5.55 \rightarrow$ Low-medium PIARES profile

In the case of ES, significant differences were found between the coefficients for Facebook (0.55 low-medium and 1.31 high-very high) and Snapchat (0.37 low-medium and 1.17 high-very high), and for PIARES Instagram (2.89 low-medium

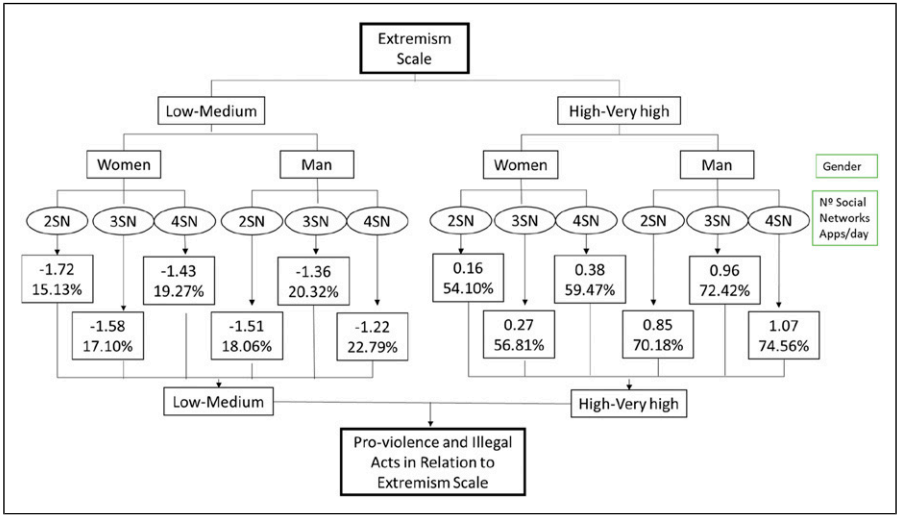

Figure 2. Moderation analysis of No.SN-Apps used daily between ES y PIARES, in relation to gender.

and 3.26 high-very high) and, above all, Facebook with sign change (−0.73 low-very low, and 1.29 high-very high).

The binomial logistic regression analysis, with the dependent variable PIARES and independent variables of the different Apps (Instagram, TikTok, Twitch, YouTube, Discord, Discord, Twitter, Snapchat, WhatsApp and Facebook), reduces the Apps whose daily use had a significant impact on PIARES to Instagram (*p-value*: .034) and Facebook (*p-value*: .003).

Daily Instagram use was found to moderate the relationship between ES and PIARES (Figure 3). For no daily Instagram use and low-medium ES, PIARES had a coefficient −1.62 (low-medium profile), with a probability of 0.16 (16.7%), and for

Table 6. Daily Social Networks-Apps (VI) and ES-PIARES (VD). Mean Comparison (Mann-Whitney U).

	Extremist Scale (ES)				Pro-violence and Illegal Acts in Relation to Extremist Scale (PIARES)				
SN-Apps	*p-value*		%L-M	%H-VH	*p-value*		%L-M	%H-VH	%T
Instagram	.626	H_0	75.5	77	.045	H_1	74.2	79.7	75.9
Tik-Tok	.081	H_0	67.9	73.6	.204	H_0	68.1	71.9	69.3
Twitch	.273	H_0	7.7	9.8	.113	H_0	7.3	10.1	8.2
Youtube	.257	H_0	44.7	48.7	.032	H_1	43.5	50.4	45.6
Discord	.439	H_0	12.9	14.7	.690	H_0	13.0	13.9	13.3
Twitter	.138	H_0	20.3	16.2	.610	H_0	19.0	20.3	19.4
Snapchat	.021	H_1	3.0	6.0	.148	H_0	3.2	4.9	3.7
Whatsapp	.011	H_1	91.0	85.7	.022	H_1	91.1	86.7	89.9
Facebook	.037	H_1	2.4	4.9	<.001	H_1	1.8	5.8	3.0

H_0: Non-significant differences; H_1: Yes-significant differences; L-M: Low-Medium, H-VH: High-very high.

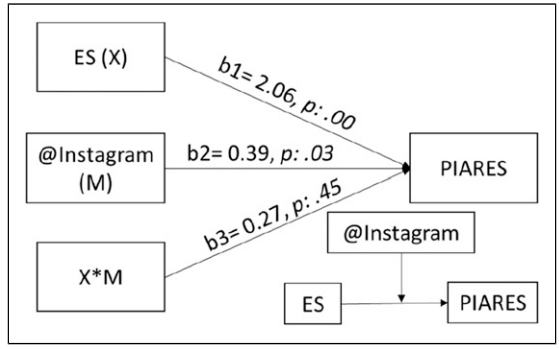

Figure 3. Instagram as moderator variable in the relationship ES-PIARES.

high to very high ES, the PIARES coefficient was 0.29 (high to very high profile) with a probability of 0.57 (57%). When Instagram was used daily, for low-medium ES, the PIARES coefficient was −1.37 (low to medium), and for high to very high ES, the PIARES coefficient was 0.83 (high-to-very high), with a probability of 0.69 (69%).

With daily use of Instagram for similar ES profiles, boys obtained significantly higher PIARES coefficients than girls, highlighting that in the case of girls with the high or very high profile of extremism, not using Instagram daily means increasing the likelihood of a low or medium profile of justification of violence-illegal acts (Figure 4). The differences between the PIARES coefficients for using Instagram daily and not using it were 0.3 for a low or medium profile of ES (no difference between boys and girls), and in the case of the high or very high profile of ES, the difference was 0.62 for girls and 0.22 for boys. Daily use of Instagram has a high discriminatory power in the case of girls with a high or very high ES profile.

Daily use of Facebook significantly influenced ES and PIARES. The moderation analysis showed that, for similar ES profiles, daily use of this App led to very high differences compared to no daily use for PIARES profiles. For low or medium profiles, 1.02 for girls, and 1.03 for boys, and for high/very high profiles, 2.00 for girls and 1.98 for boys (Figure 5).

In the case of presenting a high or very high ES profile and using neither Facebook nor Instagram, the PIARES coefficient was 0.29 (57.38% probability). When Instagram was used and Facebook was not, the coefficient increased to 0.75 (68.06%). If Instagram was not used but Facebook was, it increased to 2.02 (88.34% probability). In addition, when both applications were used, the coefficient reached 2.49 (92.31% probability of PIARES).

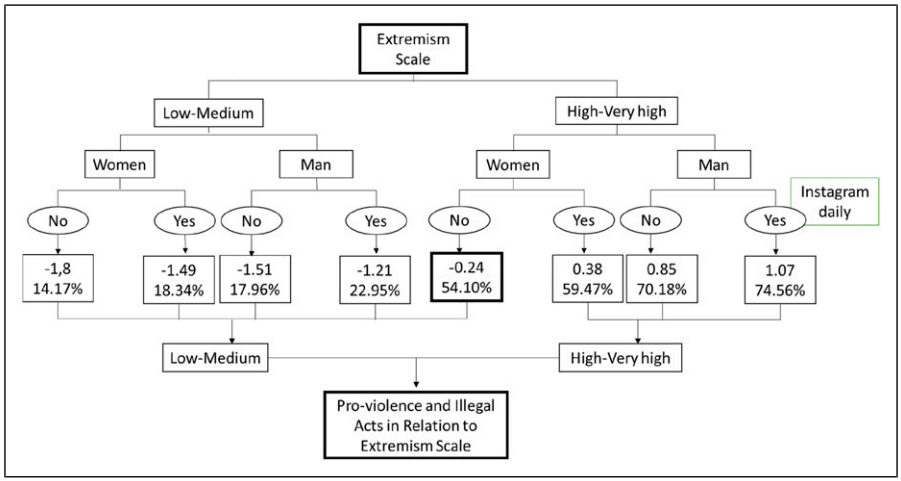

Figure 4. Moderation analysis of the daily use of Instagram between ES y PIARES, in relation to gender.

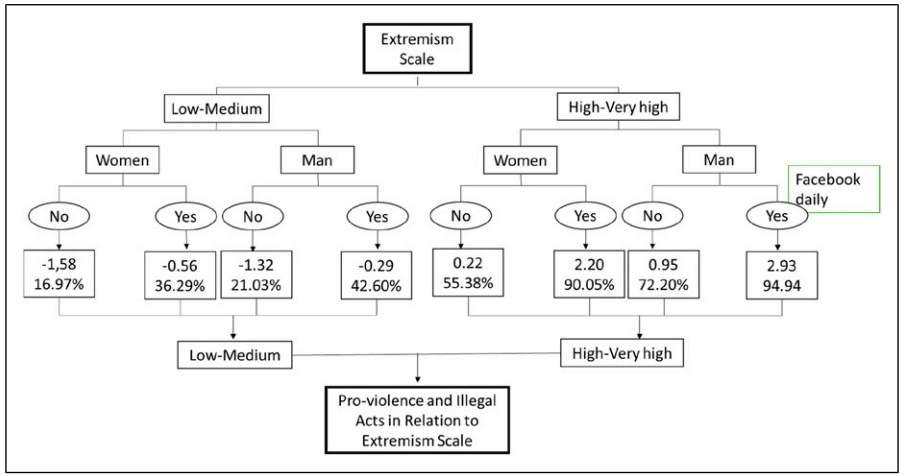

Figure 5. Moderation analysis of the daily use of Facebook between ES y PIARES, in relation to gender.

Discussion

In this paper, we set out to address some technical risks in research on violent extremism, as suggested by UN Women (UN Women, 2022). Regarding the definition of violent extremism, we emphasized the need to distinguish between behavior and attitudes. Moreover, with regard to attitudes, to distinguish extremist attitudes and pro-violence attitudes and illegal acts (associated with extremism). The scales created and validated by Ozer and Bertelsen (2018) with students from Denmark and the United States have been validated in Spanish allowing measurement of violent extremism in Spain.

UN Women (2022) also highlighted the need to explore impact of new technologies on development of violent extremist attitudes among boys and girls. From data collected in the questionnaire validated in Spanish, we have attempted to explore the influence of extremist and pro-violence attitudes among boys and girls in Spain.

Most adolescents between the ages of 12 and 19 do not have extremist and pro-violence attitudes, in line with the findings of Nivette et al. (2022), despite experiencing adolescence. The hypothesis presented in *A Child-Resilience Approach to preventing Violent Extremism. Office of the Special Representative of the Secretary-General on Violence against Children* (United Nations, 2020) that the developing cognitive control system of adolescents prevents them from controlling their impulses cannot be supported by the results of this study. Most adolescents - boys and girls - do not develop extremist attitudes or pro-violence attitudes and illegal acts associated with extremism. However, since our results refer only to adolescents, the survey will need to be administered to adult populations to test these hypotheses across age groups.

In our study, gender (boys/girls) is a significant predictor variable for those with extremist and pro-violence attitudes. Boys have higher profiles of high/very high extremism (28.2%) than girls (18.7%), and also of acceptance of the use of violent illegal acts (34.9% boys and 25.1% girls). This difference could be explained by differences in gender socialization (Natansohn, 2015; Poland, 2016). The division between public and private, which is still established in socialization processes, could explain the differences in terms of extremism (Parker & Reckdenwald, 2008; Richards et al., 2011). It would suggest that when it comes to public activities related to business, politics, law, and government, boys will have stronger opinions than girls, although it should be noted that the distinction between the public and private spheres is increasingly blurred in digital spaces (Bajohr, 2023; Quintas-Mendes & Paiva, 2023). In addition, the use of violence by boys, both in the real world and in the media, such as television, could lead boys to develop pro-violence attitudes and partake in illegal acts more than girls in the digital space (CIMA, 2023; Donner et al., 2014; Save the Children 2016), as conceptualized under the umbrella term Technology-Facilitated Abuse (TFA) (Powell & Flynn, 2023).

In general, it can be said that young people between the ages of 12 and 19 are regular users of social media (Borum & Patterson, 2019). The use of Apps is an essential part of their lives, showing relationships of shared belonging with certain applications that they make part of their identity (Boyd, 2014; Ernst, 2015).

The number of Apps used daily by adolescents aged 12 to 19 is similar for boys and girls, which can be interpreted as an indicator of the narrowing of the gender digital divide in the intensity of ICT use by women (Castaño et al., 2011) at least in Almería and Madrid (Spain). However, the preferences of boys and girls are not the same, which confirms the approach of Medianou and Miller (2012) regarding polymedia.

Boys and girls prefer different applications. Girls were significantly more likely to use Instagram, TikTok, WhatsApp, and Snapchat. Boys were significantly more likely to use Youtube, Discord, and Twitch. In contrast to Espinoza-Guillén & Chávez-Vera's (2021) findings for young people aged 15-24, participants in our sample are not regular Facebook users (2.2% boys and 3.8% girls). These data need to be complemented with qualitative analyses that help to understand the behavior of boys and girls on social media and asses if it varies across different samples. It seems that girls are present in applications where they connect with people they know (WhatsApp) or audiences they are close to (Instagram, TikTok and Snapchat). Boys prefer social networks that are linked to the world of video games (Discord, Twitch) or that are more anonymous (YouTube).

In our sample, the number of Apps used daily influences the relationship between extremism and justification of violent illegal acts. That is, pro-violence attitudes and illegal acts are associated with extremist attitudes (especially when adolescents score high on extremism). However, our analysis shows that in such cases they are exacerbated when teens are heavy users of social media. As a corollary, programs should be developed to make young people aware that misuse of social media can expose them to the development of violent attitudes.

Although the number of Apps used daily was very similar for boys and girls (vid. H2), it was observed that for the same number of Apps used daily and with similar extremism profiles, the coefficients of pro-violence were higher for boys than for girls. As mentioned above, boys tend to use social media such as Discord, Twitch or YouTube more, where a greater dissemination of violent extremist ideas has been observed (Radicalisation Awareness Network, 2020; 2021; Zolides, 2021; Méndez-García, 2022).

The analysis of each of the networks highlighted that daily use of Snapchat, WhatsApp and Facebook was significant for the high extremism profile. Daily use of Instagram, YouTube, WhatsApp and Facebook was significant for acceptance of violence and illegal acts related to extremism.

In our sample, daily use of Instagram and Facebook are predictive indicators of the relationship between extremism and acceptance of violence for boys and girls. In addition, for daily use of Instagram, males obtained significantly higher coefficients of PIARES than females for similar ES profiles. It should be noted that for females with a high/very high extremism profile, not using Instagram daily decreases the likelihood of having a high/very high acceptance of violence profile.

Despite the fact that Facebook is not an application habitually used by many young people between the ages of 12 and 19 in our sample, it is a relevant indicator because almost all regular Facebook users in our sample present a high profile of extremism and acceptance of violent illegal acts, which is particularly significant in the case of males. That is, users with a high or very high profile of extremism who are regular users of Instagram and Facebook tend to have a high or very high profile of acceptance of violence-illegal acts (92.31%). Daily Facebook use is an indicator of pro-violent extremism among males aged 12–19 years, in line with the findings of Abdalla et al. (2021) on the use of Facebook as a medium used by out groups for perceived threat socialization.

In contrast, daily Instagram use by girls between the ages of 12 and 19 with a high/very high extremism profile is indicative of pro-violence. Problematic and habitual Instagram use is associated with the need for approval from others (Sciara et al., 2021) and has a more negative impact on girls than boys (Gestdottir et al., 2018; Yurdagül et al., 2021).

Limitations

Among the limitations of this study, those related to the selection of the sample (of convenience) stand out. It had its origin in the research project "Diagnosis and intervention in adolescents at risk of violent radicalization in the area of western Almería: towards a culture of peace", UAL-ERDF, code: UAL2020-SEJ-C1947. In order to be more representative, it would be necessary to have a stratified and more diverse sample, which would also allow comparisons to be made between age groups.

Another limitation of this study has to do with the questions asked in the questionnaire. Although we asked about the frequency of use of each of the applications (daily, a few times a week, monthly, or never or almost never), we did not ask about the amount of time they were connected to each of the applications. Knowing the total

amount of time each of the adolescents used each social media would have given us a better indication of their preferences. While the questionnaire included socio-demographic variables such as family income, nationality of fathers and mothers, religious practice, etc., we focused only on gender. Including them in this analysis would not have clearly highlighted the gender differences essential as a first step.

We have made progress in understanding the impact of exposure to different social media on the development of extremist and violent attitudes. However, the findings related to each of the Apps are not generalizable, as the use of the Apps may vary over time and space. The need to develop qualitative work in this area should be emphasized. We need to know better what each social network means to boys and girls, what they communicate and with whom, in order to develop pro-violent attitudes. The results of these analyses would allow us to better interpret the results obtained in this study.

In addition, the use of self-reported survey data does not allow us to identify the specific mechanisms that lead to the development of violent extremist behavior. New lines of research emerge from this work, such as differences based on where one lives, where one comes from, and whether there are changes in the extremist positions of young people during their maturation process. And, above all, whether these changes also involve changes in the view of violence as a means of achieving individual and collective goals.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical Statement

Informed Consent

This research was approved by the bioethics committee of the University of Almería (https://www.ual.es/universidad/otrosorganos/comisionbioetica). In addition, the data were collected -totally anonymized-during school hours, with a teacher from the secondary school present in the classrooms. In order to be carried out in the classrooms, it was approved by the school council of each of the centers, where parents approved the questionnaire as it was carried out. Before starting to fill in the questionnaires, the objectives of the research were explained to the adolescents and, once again, their consent was requested.

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Data Availability Statement

The data that support the findings of this study are openly available in https://repositorio.ual.es/handle/10835/14093.

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