



# Factors associated with non-adherence to preventive measures among adolescents and young people (18 to 29 years) during the three epidemiological waves of the COVID-19 pandemic in Spain

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**Background:** Adherence to preventive measures was the primary strategy used by many countries to reduce the transmission of coronavirus disease 2019 (COVID-19) while diagnostics, vaccines and the development of medicines were taking place. However, during the first three waves of the COVID-19 pandemic in Spain, people aged 18 to 29 years reported higher prevalence of COVID-19 compared to other age groups. Reluctance to engage in preventive measures was suspected to be the main cause of infection in this group. This study aims to explore the social and psychological factors related with non-adherence to preventive measures in young people during the three epidemiological waves of the pandemic in Spain.

**Methods:** In the current study, an online cross-sectional survey was conducted to capture adherence to preventive measures in youth groups. The questions related to (I) sociodemographic and health factors; (II) COVID-19 preventive measures; (III) conspiracy theories (generic and specific); and (IV) motivations that enabled engagement in preventive measures. The data was collected from 100 participants aged between 18 to 29 years, 73% females and 27% males.

**Results:** A significant difference was found between adherence to preventive measures and gender in the study sample. Additionally, young people who believed in conspiracy theories were less likely to adhere to COVID-19 preventive measures. The majority of young people reported a lack of trust in the government. Additionally, adolescents and young people who engaged in more than two high-risk behaviours were more likely not to adhere to social distancing measures. Nevertheless, general adherence to preventive measures was high and young people felt social responsibility at this time.

**Conclusions:** Future public health interventions during mass epidemic events or pandemics should challenge beliefs in conspiracy theories, combat misinformation, improve community engagement and trust in the global and local emergency response and implement gender-specific interventions to increase adherence to preventive measures.

**Keywords:** Young people; coronavirus disease 2019 (COVID-19); preventive measures; non-adherence; Spain

Received: 08 November 2023; Accepted: 02 February 2024; Published online: 06 March 2024.

doi: 10.21037/jphe-23-145

View this article at: <https://dx.doi.org/10.21037/jphe-23-145>

## Introduction

### Background

The coronavirus disease 2019 (COVID-19) outbreak in the city of Wuhan, province of Hubei, China, on 31<sup>st</sup> December 2019 began with the identification of unknown severe pneumonia cases (1). As the public health measures implemented by the Chinese authorities were unsuccessful in controlling the virus, the new coronavirus [severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)] started spreading steadily and exponentially across the world. On 30<sup>th</sup> January 2020, the World Health Organization (WHO) declared it a public health emergency of international concern (PHEIC) and further declared it as a global pandemic on 11<sup>th</sup> March 2020 (2). Within four months of the COVID-19 outbreak, over one million individuals were infected across 200 territories, and as of 2<sup>nd</sup> November 2023, nearly 771.5 million cases, including more than 6.9 million deaths, have been confirmed worldwide (3).

From the beginning of the pandemic, various public health control measures such as travel restrictions, mandatory quarantine of affected or at-risk areas, social

distancing, and bio-security measures were implemented across different countries to mitigate SARS-CoV-2 transmission and avoid the collapse of health care services (4). The essential bio-security measures recommended were the use of masks, maintaining 1.5-meter physical distance, avoid touching the face, hand washing for 20 seconds or using hydroalcoholic gel (70%), and covering the mouth and nose with the elbow while sneezing or coughing (5,6). Additionally, indoor ventilation was advised to decrease the virus load in enclosed areas (7). Although COVID-19 vaccines are now considered part of the preventive measures and have effectively offered protection against the disease, the initial public health control measures are still in place in some countries to mitigate and limit exposure to SARS-CoV-2. For example, in Spain, mask use is still required to enter pharmacies, hospitals, and health care centers to mitigate the spread of the virus amongst vulnerable population groups. Notwithstanding the implementation of various measures aimed at mitigating the spread of the virus, instances of infection persisted among individuals. Therefore, the purpose of this study was to explore the factors associated with non-adherence to COVID-19 preventive measures.

Indeed, Spain was one of the top fifteen countries highly affected by COVID-19, with over 11.7 million cases and 103,908 registered deaths (8). During the first wave (March–May 2020), with an epidemiological peak of 8,000 COVID-19 cases, the government of Spain declared ‘Estado de Alarma’ (state of alarm) across all national territories on 14<sup>th</sup> March 2020 (8). During this period of time, people could only circulate to shop for food, pharmaceutical/essential necessities, and seek medical assistance. Public places (restaurants, pubs, stadiums, and cinemas) were closed, masks were made compulsory in every setting, and educational institutions were maintained through online modality (9). By the end of the first wave (from 21<sup>st</sup> June 2020 onwards), the ‘new normality’ began, schools opened, smoking was banned in public places, and nightlife venues were closed (10). In response to the second wave (October–December 2020), with an epidemiological peak of 24,000 COVID-19 cases, the ‘state of alarm’ was re-established on 25<sup>th</sup> October 2020 (11). The Spanish government implemented regional perimeter closures, restricted night movement (curfew), and limited social gatherings to control the spread of the virus (11). The Ministry of Health in Spain was involved in instructing and implementing public health measures to control the spread of the virus (9). In particular, the curfew was implemented due to the risk of ‘botellones’, which consisted of mass celebrations with bottled beverages

### Highlight box

#### Key findings

- Lower adherence to coronavirus disease 2019 (COVID-19) among Spanish youth was associated to belief in conspiracy theories, engagement in two or more high-risk behaviours and gender differences.

#### What is known and what is new?

- The COVID-19 pandemic was a public health emergency of international concern. In response, countries across the world implemented a range of policies and measures to control the spread of the virus. However, the factors associated with non-adherence to preventive measures among the group with higher incidence of SARS-CoV-2 was unclear.
- Future public health interventions should challenge beliefs in conspiracy theories, combat misinformation and improve populations trust in the government and implement gender-specific interventions to increase adherence to preventive measures in young people and adolescents.

#### What is the implication, and what should change now?

- Promoting individual and collective responsibility and community engagement including adherence to preventive measures is necessary for community readiness and resilience for future epidemics and pandemics.
- Encouraging adherence to preventive measures helps in promoting individual and community resilience, health and wellbeing.

in outdoor areas; more predominant in younger age groups. This being one of the factors that determined our chosen age group for the study.

Likewise, the measures implemented to flatten the curve during the third wave (December 2020 to March 2021) remained similar, and the 'state of alarm' was extended until 9<sup>th</sup> May 2021. Notably, by the end of the third wave, individuals between 15 to 29 years represented 19.7% of COVID-19 cases compared to other groups [ $<2$  (1.2%); 2–4 (1.9%); 5–14 (9.6%), 30–39 (14.1%); 40–49 (17%); 50–59 (14.9%); 60–69 (9.4%); 70–79 (6.0%) and  $\geq 80$  (6.2%)] (12). Therefore, as young adults made up almost a fifth of COVID-19 cases in Spain, this study focused on the younger population group, with an aim to understand motivators and barriers to adherence of preventive measures.

High-risk behaviours are those that threaten the health and social wellbeing of an individual, these include smoking, drug use and alcohol consumption (13) and can also be attributed to non-adherence to public health preventive measures. Indeed, the engagement in high-risk behaviours (smoking, drug and alcohol use) increases SARS-CoV-2 exposure in social gatherings, leading to higher chances of contracting COVID-19. Research conducted by Gioia (14) suggests that peer identity is one factor which made individuals change behaviour in order to match the ones of the group (societal pressure), predominantly increasing during adolescence. Therefore, it may be that individuals who engage in high-risk behaviours are more susceptible to not adhering to the COVID-19 measures, this being influenced by their likelihood to be socially influenced. Additionally, individuals who have higher risk perception are more likely to perform healthy behaviours; this being an essential component in motivating protective health behaviours as part of community engagement (15). However, there is currently little evidence detailing how risky behaviours are associated with adherence to preventive measures during the COVID-19 pandemic.

Gender may also influence adherence to public health preventive measures. For example, Cantero (16) found that women reported higher levels of social responsibility and high-risk perception to SARS-CoV-2 than men (17). This observation was attributed to the context of the COVID-19 pandemic, where women demonstrated a greater sense of societal obligation and heightened awareness of the potential risks posed by the virus. Women of all ages were more likely to adhere to all four areas of prevention than men: social distancing, traveling safety, hand washing, and mask-wearing (18). In addition, gender role, femininity,

and gender psychology may influence engagement in preventive measures. Indeed, there were multidimensional factors that led to increased adherence in both males and females. Further research stated that younger men were more prone to non-compliance to preventive measures than younger women, 15.97% and 5.97%, respectively (19). Additionally, women reported higher engagement in biosecurity measures compared to men due to the more pronounced commitment to practices aimed at mitigating the spread of the virus (20). However, it is still unclear how gender is associated with young people's adherence to preventive measures in Spain.

Another potential influence on preventive measures are conspiracy theories, which usually emerges in societal crises. COVID-19 conspiracy theories multiplied among the population, including the virus originated in laboratories as biological weapons, the belief that 5G technology was spreading the virus and that the number of COVID-19 deaths were false (21,22). Similarly, the 2009 outbreak of H1N1 influenza led to emerging beliefs about the disease and mistrust of government authorities which originated from YouTube, social media platforms, and radio (23). People create theories in order to fulfil their need to find and understand the reason behind the occurrence of a societal crisis, making them feel safer and more secure (24). However, misinformation is a public health concern as it causes people to mistrust and reject preventive measures such as treatments, vaccines, and hygiene practices, affecting the community's health and safety (25). Pavela Banai *et al.* (26) and Hughes *et al.* (27) concluded that there was a negative relationship between belief in COVID-19 conspiracy beliefs and compliance with public health measures and recommendations. Bierwiazzonek *et al.* (28) also demonstrated that people who believed in these theories were less likely to adhere to the social distancing measures during the pandemic due to the lack of credibility of authorities and institutions. Tsamakidis *et al.* (29) state that acceptance of conspiracy theories have been highly attributed to younger age groups. One possible explanation could be that conspiracy theories are more abundant in social media and the internet where young people are more exposed to it. In addition, Jolley *et al.* (30) found that adolescents preferred to get information about the broader social world through social media platforms. The authors also suggested that the feelings of mistrust in young population groups were interrelated to beliefs in conspiracy theories. Therefore, conspiracy theory beliefs in young people should be considered as a potential factor

associated with non-adherence to preventive measures.

Motivation is an essential component that guides individuals to engage in the implementation of preventive measures. Motivation to adhere to social distancing measures during the pandemic could be attributed to intrinsic and extrinsic factors such as unwillingness to get sick (personal autonomy) (86%) and not wanting to infect others (social responsibility) (84%) (31). Research suggests that adolescents and young adults' adherence to preventive measures may also be associated with high-risk perception; linked to protecting family members and friends who are at risk and high self-vulnerability to severe illness (32), including not wanting to be judged (33,34). However, more research is needed to understand the link between young people's motivations and adherence to public health measures to inform future public health prevention strategies and implement social behaviour change for positive youth development.

High-risk behaviours, gender, belief in conspiracy theories and motivations may be related to adherence to preventive measures. However, it is unclear how these factors specifically influenced adherence to preventive measures in young people (aged 18 to 29 years) during the three epidemiological waves of the COVID-19 pandemic in Spain. Therefore, this study aimed to determine the factors associated with non-adherence to COVID-19 preventive measures among adolescents and young people in Spain. The results may help to design effective and appropriate communication and social behaviour change strategies which may increase adherence among young people for future epidemics/pandemics with similar characteristics to those of COVID-19. We present this article in accordance with the STROBE reporting checklist (35) (available at <https://jphpe.amegroups.com/article/view/10.21037/jphe-23-145/rc>).

## Methods

The data collection tool utilised for this study was an online cross-sectional survey distributed through Facebook, Twitter and Instagram. The target population, recruited using convenience sampling, comprised of individuals aged between 18 to 29 years, residing in Spain for at least a month during the three waves of the COVID-19 pandemic (March 2020–March 2021). The sample selection criteria were chosen based on statistics, which demonstrated that this age group (15 to 29 years) had higher incidence rates of COVID-19 by the end of the third wave (19.7%) compared to other groups (17). Data was collected, stored, and processed in compliance with the 'Ley Orgánica 3/2018', ensuring that the research information collected from the

participants remained anonymous and confidential (36). The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by Edge Hill University by the Undergraduate Faculty of Health, Social Care and Medicine Ethics Subcommittee (Ref: UGRAD 228) and informed consent was obtained from all individual participants.

## Data collection/measures

The survey design was based on literature, developed in Spanish and was peer-reviewed by three participants representative of the target population aged 18, 22 and 29 years. The online cross-sectional survey was divided into four sections with all questions being mandatory. Please see the appendix for the full survey.

## Sociographic and health factors

The survey collected participants' age, gender, nationality, geographical location, highest educational qualification, occupational and socio-economic status, and household composition from March 2020 to March 2021. In addition, it gathered information on whether participants or someone in their household had any underlying medical conditions or morbidities which increased the risk of severe COVID-19, if they ever tested positive for COVID-19, if someone in their household received the vaccine during the three waves of the pandemic and if they had received the COVID-19 vaccine. Engagement in high-risk behaviours, including smoking, alcohol and drug consumption was also measured to determine the relationship between adherence to preventive measures during the three waves of the COVID-19 pandemic and high-risk behaviours.

## Generic and specific beliefs and ideas

Beliefs and ideas were measured in two ways. Firstly, using generic conspiracy theories (n=6) chosen from a validated and reliable questionnaire called Generic Conspiracist Belief (GCB) Scale (37) and secondly, using the most commonly reported conspiracy theories in the Spanish media (n=4) related to the COVID-19 pandemic in Spain. These included beliefs around the use of masks and vaccine ineffectiveness, origin, and transmission of SARS-CoV-2 (22).

## COVID-19 preventive measures

To determine individuals' level of engagement in preventive measures, participants had to rank twenty-one preventive measures on a Likert scale from 1 to 5 (never, rarely, sometimes, often and always), that had been adapted



for the population using the survey produced by El Instituto de Salud Carlos III (38). Adaptations included adherence to preventive measures when being around friends, this being related to attitudes and behaviours. In addition, strictness towards preventive measures such as wearing masks, following social distancing rules, protective ventilation practices and COVID-19 hygiene procedures were measured on a scale from 1 to 5 (never, rarely, sometimes, often and always).

### Motivations

This section of the survey was based on the Social Determination Theory to determine the motivations for engaging in preventive measures, the items (n=10) were obtained from Oosterhoff *et al.* study (34). From a list of 10 motivations, participants were able to choose all the reasons which enabled them to engage in the COVID-19 preventive measures, these included “*It is a social responsibility*”, “*I do not want others to get sick*”, “*My state/city is on lockdown*”, “*I do not want to personally get sick*”, “*My parents are making me*”, “*I prefer to stay at home anyway*”, “*There is nothing else going on*”, “*My friends told me I should*”, “*I do not want to be socially judged*”, and “*Others*”.

### Statistical analysis

The Statistical Package for the Social Sciences (SPSS, version 25, IBM Corp., Armonk, NY, USA) was utilised to analyse the quantitative data. Characteristics of the sample population (sociographic factors and medical conditions) were shown as frequencies (percentages) or mean  $\pm$  standard deviation/median  $\pm$  interquartile range depending on the distribution (normal or skewed respectively) of the variable (39). Due to non-parametric data, the Kruskal-Wallis test was used to compare women and men on the levels of engagement in preventive measures and motivations. The relationship between conspiracy theories, both generic and specific, and adherence to preventive measures was analysed using the Spearman’s correlation test. The Kruskal-Wallis test was used to compare high-risk behaviours and adherence to preventive measures. Statistical significance was accepted at  $P < 0.05$ .

## Results

### Characteristics of the sample

The study population involved 102 participants, out of which two were excluded due to their age not being in

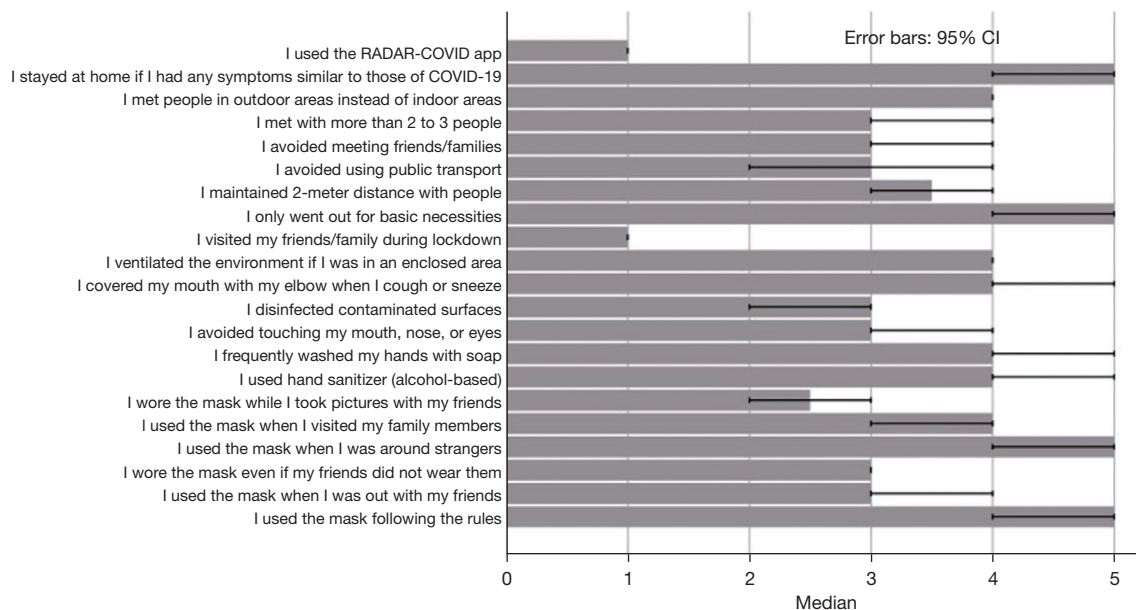
the range between 18 to 29 years. Characteristics of the sample were 73% (n=73) females, and 27% (n=27) males. Additionally, the median age of the participants was  $21.59 \pm 2.9$  years. During the three waves of the COVID-19 pandemic in Spain, most of the participants resided in Madrid (35%), followed by Castilla la Mancha (26%), Catalonia (10%), and others (10%). The majority of respondents had Spanish nationality (95%), followed by Italian (3%) and other (2%). A total of 39.0% had Título de Bachillerato (equivalent to A-levels) as their highest educational attainment compared to 4% having Secondary Education [equivalent to General Certificate of Secondary Education (GCSE)]. Studying only was predominant among the participants (59.0%) whereas 19% were working only and 17% were studying and working, the majority of which had an income of 500 to 999 euros per month. This suggests that this study was representative mainly of student population.

Most of the participants (93%) had no pre-existing medical conditions (co-morbidities) that made them at higher risk and vulnerable to COVID-19; however, 42% had someone in their household with underlying health conditions that increased the severe risk of COVID-19. Additionally, 88% of respondents were vaccinated; and, lastly 56% of the participants had previously tested positive for COVID-19. In relation to high-risk behaviours, 21% of participants were smokers and 6% consumed non-medical drugs (for example, cocaine, marihuana, and cannabis); 85% consumed alcohol but mainly less than five times a month.

### Adherence to preventive measures

Figure 1 represents the distribution of preventive measures adopted by adolescents and young people during the first three waves of the coronavirus pandemic in Spain.

The most common measures adhered to ‘always’ were staying at home if they presented similar symptoms to those of COVID-19 (57%), only going out for basic necessities (47%), covering their mouth with the elbow while coughing or sneezing (47%), wearing masks around strangers (61%) and wearing the masks following government guidelines (61%). On the other hand, meeting with more than two or three people, restricting family/friends’ reunion, avoiding public transport, disinfecting contaminated surfaces, avoiding touching nose, mouth, and eyes, wearing masks while with friends and wearing the mask while taking pictures (selfies with others) were the least common preventive measures. In addition, 70% of the sample



**Figure 1** Median (95% CIs) scores for adherence to preventive measures from 1 (never) to 5 (always). COVID-19, coronavirus disease 2019; CI, confidence interval.

**Table 1** Adherence to overarching preventive measures. Participants were asked to rate how much they adhere to each measure from 1 (never) to 5 (always)

Preventive measures	All (n=100), median [IQR]	Males (n=27), median [IQR]	Females (n=73), median [IQR]
Mask wearing	3.5 [1.5]	3.5 [1.5]	4 [1.5]
Following social distancing rules	3 [1.5]	3 [0.5]	3.25 [1.5]
Following protective ventilation measures*	4 [1]	3.5 [1.5]	4 [1]
Following hygiene measures (handwashing and disinfecting contaminated surfaces)	4 [2]	3 [1]	4 [1.5]

\*, significant difference between genders (P<0.05). IQR, interquartile range.

population did not use the COVID-19 Radar App.

As observed in *Table 1*, across all genders, the results suggest that there was high adherence to ventilation practices and hygiene procedures, followed by mask-wearing and social distancing rules. However, there is considerable variability in adherence to these measures, particularly mask-wearing and hygiene practices.

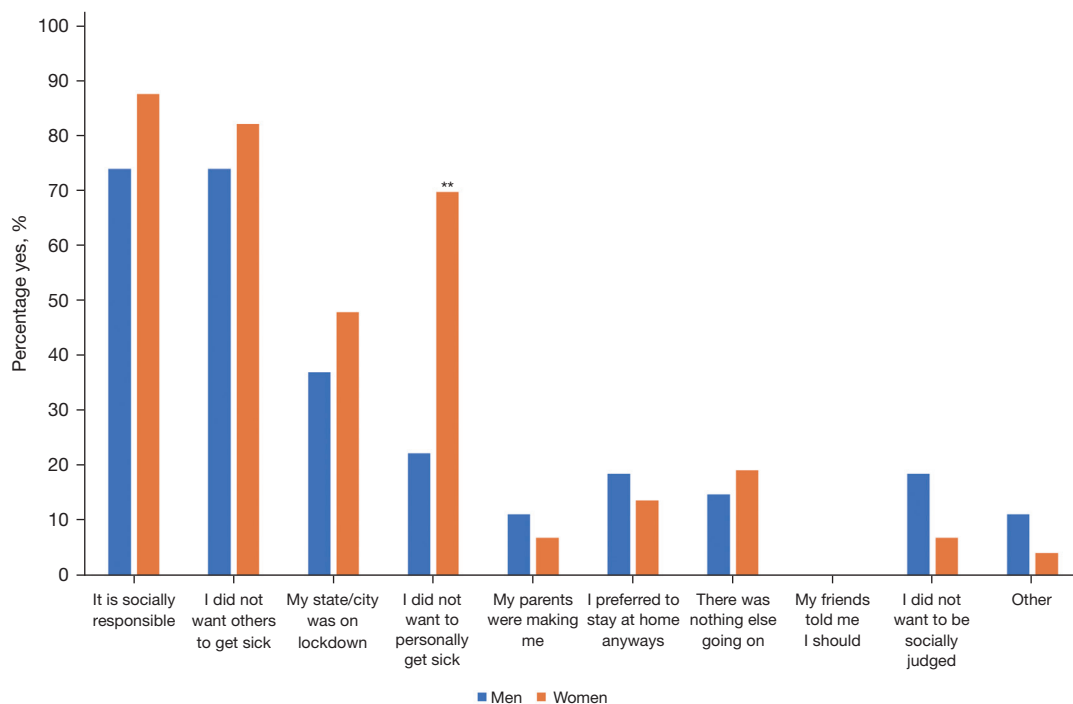
**Gender analysis**

There were no differences in mask (P=0.064), social distancing (P=0.194) and hygiene practices (P=0.113) between males and females. However, there was significant differences in ventilation (P=0.026) practices between both

genders. Females were more likely to adhere to ventilation measures than males (P<0.05).

**Motivations**

The most common motivations which enabled participants engagement to COVID-19 preventive measures were as follows, “a social responsibility” (84%), “not wanting others to get sick” (80%), “not wanting to personally get sick” (57%) and because of the lockdown of their autonomous communities in Spain (45%). On the other hand, only 8% were adhering to COVID-19 measures because “parents were making me”, 15% preferred to stay at home anyway and 18% of participants were engaging to COVID-19 preventive



**Figure 2** Motivators for following COVID-19 preventive measures grouped by gender. \*\*, significant differences between men and women ( $P < 0.001$ ). COVID-19, coronavirus disease 2019.

measures as “*there is nothing else going on*”. Conversely, none of them felt that they were adhering to the measures because of their friends. The only gender difference in relation to motivations was getting personally sick ( $P < 0.001$ , see *Figure 2*). Females (yes  $n=51$ ) associated more with this motivation than males (yes  $n=6$ ).

### High-risk behaviours

Based on the Kruskal-Wallis test to compare different groups of high-risk behaviours (no risk, one risk, two risks) and COVID-19 preventive measures, the results showed that there was no significant difference to mask-wearing ( $P=0.077$ ), hygiene practices ( $P=0.421$ ) and ventilation measures ( $P=0.819$ ) between risk groups. Conversely, there were significant differences in adherence between risk groups in social distancing ( $P=0.029$ ). *Post hoc* analysis using Mann-Whitney *U* to test each comparison showed that there was no difference in social distancing between no risk and one risk behaviour. However, those who engaged in two risk behaviours were more likely not to adhere to social distancing measures than no risk and one risk.

### Conspiracy theories/beliefs

According to the results gathered from the Generic Conspiracy Beliefs scale, indicated in *Table 2*, it is observed that the population sample does not trust the government or social media. The statements agreed included: the government withholds information about diseases and treatments from the general public (29%), they manipulate evidence to support government policy (28%), they keep important secrets from the public (classifying information) (35%) and they believe that the media ensures that certain information is made known to the public (32%). Additionally, they believe that some viruses and/or diseases that people were infected with were created in laboratories as bioweapons (33%). Whereas, the majority of the sample population (45%) was unsure whether experiments regarding new drugs were carried out in the general public without their consent/knowledge or not and whether COVID-19 originated from the laboratory (36%). On the other hand, the majority of participants did believe the effectiveness of the COVID-19 vaccine (50%) and the masks (46%) and that 5G mobile network was not responsible for the spread of the virus (75%).

**Table 2** Generic ideas and beliefs regarding conspiracy theories

Conspiracist belief scale items	Definitely not true	Probably not true	Not sure/cannot decide	Probably true	Definitely true
<i>Some viruses and/or diseases that many people are infected with were created in laboratories as bioweapons</i>	10 (10%)	20 (20%)	23 (23%)	33 (33%)	14 (14%)
<i>The government keeps many important secrets from the public</i>	1 (1%)	8 (8%)	22 (22%)	35 (35%)	34 (34%)
<i>Experiments involving new drugs are carried out to the general public without their knowledge or consent</i>	18 (18%)	22 (22%)	45 (45%)	10 (10%)	5 (5%)
<i>The media ensures that only certain information is made known to the public</i>	3 (3%)	8 (8%)	24 (24%)	32 (32%)	33 (33%)
<i>Government funded scientists manipulate evidence in order to support government policy</i>	15 (15%)	13 (13%)	27 (27%)	28 (28%)	17 (17%)
<i>A lot of information about diseases and treatment is withheld by the government</i>	6 (6%)	10 (10%)	26 (26%)	29 (29%)	29 (29%)
<i>The masks are ineffective, even dangerous</i>	46 (46%)	33 (33%)	16 (16%)	3 (3%)	2 (2%)
<i>5G is to be blamed for the spread of the virus</i>	75 (75%)	18 (18%)	6 (6%)	1 (1%)	–
<i>The vaccine is ineffective</i>	50 (50%)	28 (28%)	14 (14%)	7 (7%)	1 (1%)
<i>The virus was originated from the laboratory</i>	19 (19%)	20 (20%)	36 (36%)	11 (11%)	14 (14%)

Spearman's correlation test was used to test the relationship between conspiracy theories and preventive measures. According to the results, the stronger adherence to mask wearing, hygiene, ventilation, and social distancing measures the lower the belief in "*masks are dangerous*". In particular the stronger adherence to social distancing, the lower the belief scored for "*experiments involving new drugs are carried out on the general public without their knowledge or consent*" and "*the vaccine is ineffective*". Similarly, the stronger adherence to hygiene measures, the lower the belief in "*the vaccine is ineffective*".

## Discussion

The key findings from this research study suggest that the sample was socially responsible and wanted to stop others from getting sick. Further findings suggested that those who engaged in two high-risk behaviours, either smoking, drinking, or drug consumption, were more likely not to adhere to social distancing measures than those who did not engaged in risky behaviours or those who engaged in only one. Therefore, it appears that lower levels of risky behaviours were not linked to non-adherence.

The current study investigated factors associated with non-adherence to preventive measures among adolescents

and young people during the first three epidemiological waves of COVID-19 in Spain. The data was gathered from 100 individuals aged between 18 to 29 years who lived in Spain for at least a month from March 2020 to March 2021. The characteristics of the study population demonstrated that 88% of the sample size was fully vaccinated, demonstrating compliance with COVID-19 guidelines for preventive measures. The results indicated that women were more likely to adhere to COVID-19 preventive measures than men. These findings were consistent with (18,19) studies that found observable gender differences when relating it to compliance with preventive measures. Gender adherence differences may have also been related to women having higher perceived levels of negative perceptions about the pandemic on health (risk-averse) than men (40).

Considering conspiracy theories, the majority of young people did not trust social media or the government. However, they trusted the use of science and were less likely to believe in more extreme conspiracy theories; this may be linked to the high educational status of the research population. However, the results also suggest that beliefs in conspiracy theories lowered or even prevented adolescents and young people from adhering to COVID-19 measures. That precisely, young people and adolescents with stronger adherence to mask-wearing, hygiene, ventilation, and



social distancing measures were less likely to believe the masks are dangerous. Similarly, the stronger adherence to social distancing, the lower the belief scored for “*experiments involving new drugs are carried out on the general public without their knowledge or consent*”, and “*the vaccine is ineffective*”. Lastly, the results also suggest that adolescents and young people practising good hygiene measures are less likely to believe the vaccine is ineffective. Pavela Banai *et al.*'s (26) and Bierwiazzonek *et al.* (28) reported a negative correlation between conspiracy theories and adherence to preventive measures. On the one hand, Bierwiazzonek *et al.* (28) noted that people endorsing in conspiracy theories are predisposed to disregard government restrictions and adherence to public safety guidance due to feelings of powerlessness or lack of control or perceptions of external threats to their nation. On the other hand, Pavela Banai *et al.*'s (26) reported that non-compliance to COVID-19 preventive measures was linked to trust in government officials as a result of conspiracy theories. The authors presented findings suggested that people disregarded or were reluctant to public health advice because of disbelief or doubt in authorities.

In addition, the results from the current study also identified that motivation was an essential component that enabled adherence to preventive measures in adolescents and young people. The most common motivations reported by the participants included “*It is a social responsibility*” (84%), “*I did not want others to get sick*” (80%), and “*I do not want to get sick personally*” (57%). These are consistent with Coroiu *et al.* (31) and Yang *et al.* (32) findings, showing that adolescents' and young people's motivations were mainly attributed to the desire to protect themselves and others and benefit the community (intrinsic and extrinsic factors). Additionally, adolescents and young adults' adherence to preventive measures was associated with perceptions of high-risk events, such as protecting family members and friends with increased vulnerability to getting the disease (32).

Overall, these results may have positive implications for future public health promotion and risk communication campaigns. These are an integral part of emergency preparedness and response interventions and programs (41). The in-depth understanding of the social and psychological factors in this study related to the behaviours and attitudes of adolescents and young people towards the pandemic could facilitate the development of appropriate and effective strategies that promote protective behaviours through risk communication, behaviour change and

community engagement readiness and promoting resilience interventions in these groups.

There were some limitations to this study. There was an uneven balance between gender response rates, with higher rates of female responses compared to males and the sample size was relatively low. This is acknowledged as a limitation and caution should be taken when applying these findings to practice. Another limitation was that the survey did not ask when the respondents had COVID-19. This would have provided an overview of a contributing factor related to non-adherence over time. A final limitation of the study was that some of the conspiracy belief items were not truly measures of conspiracies, due to the absence of a validated tool related to this variable, but perhaps also being linked to ‘beliefs in misinformation’.

Based on the findings of the current study, it is possible to tentatively suggest recommendations on the design of future public health interventions. The results of the current study suggests that public health interventions could be targeted differently to men and women. The implementation of gender-specific interventions may improve adherence in men based on the sociological and psychological factors that lowered adherence to COVID-19 preventive measures in this study. Furthermore, more research is required to increase the population's trust in the Spanish government, as without this, future public health prevention campaigns may reduce adherence. However, future preparedness and response to the pandemic, including participatory actions should acknowledge that young people have high levels of social responsibility (community engagement) which is likely to result in increased adherence to preventive measures.

## Conclusions

At the time of the study, Spain was one of the top fifteen countries mostly affected by the Coronavirus pandemic. Even though public health preventive measures were immediately implemented, people aged 18 to 29 years reported a higher prevalence of COVID-19 compared to other age groups. Reluctance to engage in the COVID-19 preventive measures was suggested to be the main cause of infection in this group. Findings from this study concluded that male participants and people who believed in conspiracy theories were less likely to adhere to the preventive measures. However, overall young people in Spain did adhere to the public health measures for positive collective reasons such as social responsibility and this

should be considered in future public health prevention campaigns initiatives to increase community engagement and readiness.

### Acknowledgments

We would like to acknowledge the efforts of the participants that took time to complete the survey; without their cooperation, this project would not have been effective. We would also like to thank the Faculty of Health, Social Care and Medicine at Edge Hill University.

*Funding:* None.

### Footnote

*Reporting Checklist:* The authors have completed the STROBE reporting checklist. Available at <https://jphe.amegroups.com/article/view/10.21037/jphe-23-145/rc>

*Data Sharing Statement:* Available at <https://jphe.amegroups.com/article/view/10.21037/jphe-23-145/dss>

*Peer Review File:* Available at <https://jphe.amegroups.com/article/view/10.21037/jphe-23-145/prf>

*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at <https://jphe.amegroups.com/article/view/10.21037/jphe-23-145/coif>). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by Edge Hill University by the Undergraduate Faculty of Health, Social Care and Medicine Ethics Sub-committee (Ref: UGRAD 228) and informed consent was obtained from all individual participants.

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doi: 10.21037/jphe-23-145

**Cite this article as:** Caravotta M, Caravotta J, Relph N. Factors associated with non-adherence to preventive measures among adolescents and young people (18 to 29 years) during the three epidemiological waves of the COVID-19 pandemic in Spain. *J Public Health Emerg* 2024;8:3.