Sun Exposure and Skin Cancer: An Examination of Communications for Prevention on Instagram in a High-Risk Context

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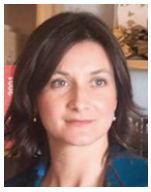

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Abstract

Young people are increasingly affected by skin cancer in industrialized countries around the world, such as Spain, in Europe. The incidence of skin cancer is expected to continue to increase in the coming years if adequate photoprotection habits are not implemented. Social media have been previously studied as a tool with great potential for skin cancer awareness and prevention in the young population (**Falzone *et al.***, 2017), so it is necessary to know and deepen the communication in these media to contribute to prevention. This paper explores these aspects in the context of the high prevalence of skin cancer in Spain. It aims to analyze the content of strategic communication of primary prevention or photoprevention disseminated on Instagram –the social media most used by young people (**IAB Spain**, 2023)– through the agenda-setting theory and the health belief model. As a result of the analysis of publications issued during the prevention campaign season in 2022, data were obtained regarding the first-level agenda, with a prevalence of content on photoprotection (40.9%), and the second-level agenda, with a majority framing focused on the causes of skin cancer (58.1%). Likewise, the publications showed a low frequency of the health belief model elements related to skin cancer prevention, except for the action signal (49.5%).

Keywords

Strategic Communication, Health Communication, Agenda-setting, Health Belief Model, Social Media, Instagram, Health, Cancer, Skin Cancer, Prevention, Photoprotection.

1. Introduction

According to the Spanish Association of Dermatology and Venereology (**Asociación Española de Dermatología y Venerología**, 2022), skin cancer accounts for one third of all cancers in society, a disease that has become a public

health and societal problem due to its increase in recent years (**Chen *et al.***, 2021). The World Health Organization (World Health Organization, 2022) reports that more than 1.5 million cases of skin cancer and 120,000 associated deaths were reported worldwide in 2020. Melanoma is the most potentially deadly type of skin cancer. About 325,000 cases were diagnosed in 2020 (**World Health Organization**, 2022), and it is estimated that by 2040 it will rank as the second most common cancer worldwide (**Asociación Española de Dermatología y Venerología**, 2022). Non-melanoma skin cancers, such as basal cell and squamous cell carcinomas, have become one of the most frequent cancers with almost 1.2 million cases, however, they are less lethal and have a better prognosis for a cure (**World Health Organization**, 2022).

In Europe, the rate of melanoma cases continues to increase (**Tejera-Vaquerizo *et al.***, 2016). Spain is the European country that receives the highest level of solar radiation. This radiation is accentuated with maximum values during the summer months on the Mediterranean coast, in the southern and southeastern regions (**Sancho *et al.***, 2012). Due to its climatic characteristics as a sun and beach tourist destination, Spain has become a high-risk context for skin cancer in its inhabitants and the large number of tourists, mainly European, that it receives each year. According to the (**Asociación Española de Dermatología y Venerología**, 2022), more than 78,000 new cases of skin cancer are already diagnosed in the country each year, 95% of which are non-melanoma skin cancer.

> “Melanoma is the most potentially deadly type of skin cancer.”

Cancers commonly appear at older ages; however, studies show that melanoma is among the cancers that begin to appear between the ages of 15 and 24 (**Bernal *et al.***, 2011), being the second most diagnosed cancer among young people (**Heckman *et al.***, 2016). Research in Spain suggests that young people are more intensely exposed to the risks of sun exposure motivated by the tanning culture, the time they spend outdoors, low parental control, and their limited fear that they will get skin cancer (**Fernández-Morano *et al.***, 2016).

Experts insist that skin cancer is preventable and the best method for prevention is to educate people on photoprotection habits (**de Troya Martín *et al.***, 2019). Prevention campaigns through technology and social media show encouraging potential to reduce the risk of skin cancer, especially in the young population, the most active segment on social media (**Falzone *et al.***, 2017). In Spain, according to data from the Annual Social Media Study (**IAB Spain**, 2023), young people between 18 and 24 years old are the generation that makes the most use of social media, choosing Instagram as their preferred social media. Entertainment, interaction, and information are the main actions used by young people on Instagram. However, social media and the audience that selects and viralizes content, also become a source of misinformation, including the promotion of risk behaviors related to cancer **(McCloud; Kohler; Viswanath,** 2017), especially among young people, who have increased their use of these platforms due to the COVID-19 pandemic (**Kompani *et al.***, 2022). Several studies demonstrate the high coverage of tanning and sunbed content on Instagram and how it directly relates to an increased lack of risk perception among young people **(Willoughby; Myrick, 2019; Banerjee *et al.***, 2018; **Ricklefs *et al.***, 2016). Misinformation increases if the data are provided by non-official sources (**Gomaa; Walsh-Buhi; Funk**, 2022). Health communication has the role of stopping the flow of incorrect information and correcting individuals' misinformation. Social media is an effective and low-cost tool to counter misinformation and disseminate correct information (**Rafferty; O'Connor; Murphy**, 2021).

Despite its geographical risk in terms of its high level of solar radiation and high incidence and mortality rates, Spain does not have well-orchestrated skin cancer prevention communication by its national health systems (**Alonso-Belmonte *et al.***, 2022). The opposite is the case in Australia with its SunSmart program (***Tabbakh et al.***, 2019), where scientific institutions and nonprofit patient associations are the main issuers of skin cancer prevention communication. These organizations run online and offline campaigns through different media and platforms. They are usually individual campaigns for each organization and often focus exclusively on certain times of the year. This is the only existing prevention communication in the country and the only intentionally preventive and regular communication about skin cancer found on social media.

However, there is a knowledge gap regarding the appropriateness of their content in social media. Previous studies in the national and international literature have focused on journalistic coverage of skin cancer in print media (**Heneghan *et al.***, 2007; **Cokkinides *et al.***, 2012; **Dixon *et al.***, 2014; **McWhirter; Hoffman-Goetz**, 2015; **Scully; Wakefield; Dixon,** 2008; **Cho *et al.***, 2010), digital press (**Sanchez**, 2018) and social media coverage (**Basch *et al.***, 2015; **Guidry *et al.***, 2019; **Gomaa *et al.***, 2022; **Merten; King; Dedrick**, 2022; **Cho *et al.***, 2018; **Tang; Park**, 2017). This study is part of the COMPREV(P)CANCER research project (**Comunicancer**, 2021) funded by the Spanish Ministry of Science and Innovation and the Spanish State Research Agency, the goal of which is to optimize photoprevention communication for young people through the specialized national organizations that disseminate skin cancer preventive communication.

With this purpose, the present study aims to provide insights regarding the appropriateness of the contents of these nonprofit entities on Instagram, complementing previous studies in the framework of the project that explore the object of study on Facebook (**Jiménez-Sánchez; Moreno; Zeler**, 2023) and Twitter (**Jiménez-Sánchez; Moreno**, 2023)

through first and second level of agenda-setting.

This paper replicates the study by **Tang and Park** (2017), as the most comprehensive systematic review to date on skin cancer prevention in social media. The theoretical framework has incorporated a systematic review of the current literature and the Spanish context. In addition, adaptations have been made to the methodology and greater complexity has been introduced in the type of statistical analysis —from bivariate to multivariate.

> Health communication has the role of stopping the flow of incorrect information and correcting individuals' misinformation.

Based on the premise of the positive influence that social media can have on health prevention communication, this paper analyzes the strategic communication of solar photoprevention carried out by issuers of strategic communication for the prevention of skin cancer on Instagram in Spain. Content analysis is used, applying the agenda-setting theory —first and second level—and the health belief model.

2. Literature Review

2.1 Agenda-Setting

The use of the agenda-setting perspective to study health communication has grown considerably, with cancer being one of the most common topics in the literature (**Guenther; Gaertner; Zeitz**, 2021). **McCombs; Shaw, and Weaver** (2014) substantiated that "agenda setting is the transfer of an issue's prominence from the media to the public agenda". Nowadays, the Internet and social media exert an enormous influence on the construction of the media agenda (**López-López; Martínez; Oñate**, 2022). Several social media studies on major health issues support the influence of social media in agenda-setting (**Matthews *et al.***, 2023; **Gao *et al.***, 2022). Likewise, international studies on skin cancer content on social media reveal the most frequent topics. **Gomaa *et al.*** (2022) reported that among the top 10 hashtags on Twitter related to skin cancer was melanoma, followed by skin cancer. **Basch *et al.*** (2015) compared the content disseminated by consumers and professionals on YouTube and found that melanoma and cancer, in general, were the most frequent topics among professionals, receiving much more attention than basal cell and squamous cell carcinomas. **Tang and Park** (2017) highlighted the insufficient information in non-melanoma skin cancer versus melanoma posts on Pinterest. Overexposure or lack of exposure to any of the different types of skin cancer can be a problem, as they have different mortality and morbidity rates. Previous studies under the project **Comunicancer** (2021) exploring intentionally preventive skin cancer communication on Twitter and Facebook **(Jiménez-Sánchez *et al.*, 2023; Jiménez-Sánchez; Moreno**, 2023) corroborate the lack of coverage of non-melanoma skin cancers.

Media credibility influences the transfer of the thematic agenda to the public agenda (**Luo *et al.***, 2019); factors such as reliability, quality, and usefulness are determinants (**Wang; Shi; Kong**, 2021). Studies on social media demonstrate the weight of political and governmental sources in setting the public agenda (**Matthews *et al.***, 2023). In Spain, there is no government communication on skin cancer on social media. The only study on skin cancer content in the digital press revealed that newspapers used organizations such as the Spanish Association Against Cancer (AECC), the Spanish Association of Dermatology and Venereology (AEDV), and the Association of Melanoma Sufferers of Spain (AAME) as their main sources of information to create skin cancer news (**Sánchez Ballestero**, 2018). **Comunicancer** (2021) has identified these and other associations as strategic issuers of skin cancer prevention at the national level, currently also working on prevention through their social media profiles. Based on the above literature, the first research question and hypothesis are posed:

RQ1: What is the thematic coverage of the strategic skin cancer prevention communication of the main issuers on Instagram in Spain?

RH1: Melanoma is the most prominent topic in strategic skin cancer prevention communication on Instagram in Spain.

> Overexposure or lack of exposure to any of the different types of skin cancer can be a problem.

The second-level agenda refers to how society, influenced by the media, thinks about certain topics **(Wanta; Alkazemi**, 2017); the media not only establishes what topics society will talk about but what it will think about those topics (**Ardèvol-Abreu; de Zúñiga; McCombs**, 2020). **Tang and Park** (2017) point out two framings in the context of health communication: cause framing and solution framing. Cause framing refers to the fact that if the media treats a disease —e.g., skin cancer— as being caused by controllable risk factors —e.g., tanning—, the public will be more likely to think in those terms about the disease, and behavior change will be more feasible. According to the Spanish Society of Medical Oncology (**Sociedad Española de Oncología Médica**, 2018), the major cause of skin cancer is ultraviolet radiation received through exposure to the sun or artificial light, such as UVA booths. Solution framing encompasses prevention and treatment; the best option to avoid and reduce the risk of skin cancer in the population is primary prevention through photoprotection (**Sociedad Española de Oncología Médica**, 2018); screening (secondary prevention) and early treatment also influence the level of risk (**Basch *et al.***, 2015).

Awareness of risk factors and preventive behaviors for skin cancer is limited in society (**Dawson *et al.***, 2011), especially among young people vulnerable to imitating risky behaviors they see on social media, such as tanning (**De La Garza; Maymone; Vashi**, 2021). Several studies have tested that media literacy on social media about risk factors –causes– of skin cancer causes changes in attitudes toward tanning in young university students **(Myrick *et al.*, 2022; Mingoia *et al.***, 2019; 2020). The early age of adolescents and young adults makes risk behaviors with regard to sun exposure and tanning potentially modifiable through preventive education interventions (**Dessinioti; Stratigos**, 2022). Communicative strategies to encourage the adoption of preventive behaviors regarding skin cancer are viable on social media **(Dawson *et al.***, 2011) and particularly on Instagram (**Buller *et al.***, 2021); even equally or more effective than in non-digital media (**Niu; Bhurosy; Heckman,** 2022).

The most current studies on social media (**Merten *et al.***, 2022; **Tang; Park**, 2017) and Instagram (**Cho *et al.***, 2018) that yield conclusive information about cause and solution framing indicate that risk factors, prevention, and treatments, are infrequently addressed in skin cancer content. In this regard, it is relevant to highlight the results of preceding studies (**Jiménez-Sánchez *et al.***, 2023; **Jiménez-Sánchez; Moreno**, 2023), in which they detected a gap in the coverage of the risks involved in the use of tanning booths and the absence of preventive measures to avoid using them.

O'Kane *et al.* (2022) reported the existence of positive and negative framing in health promotion posts on Instagram, finding a majority with a positive framing that can achieve greater persuasion with health content.

> "Communicative strategies to encourage the adoption of preventive behaviors regarding skin cancer are viable on social media."

After reviewing the literature on the subject, we posed the following research question and hypotheses:
RQ2: What is the framing of the strategic skin cancer prevention communication of the main issuers on Instagram in Spain?

RH2: The thematic coverage of strategic communication of skin cancer prevention on Instagram in Spain does not present a cause framing.

RH3: The thematic coverage of strategic communication of skin cancer prevention on Instagram in Spain does not present a solution framing.

2.2 Health Belief Model

The health belief model (HBM) is one of the most widely used in prevention campaigns to change individual health behaviors (**Sharifikia *et al.***, 2019), as it allows for explaining and predicting them (**Merten *et al.***, 2022). According to this model, behavior change occurs when a person believes that he or she is at risk of disease, that there is an effective action to prevent it, and that he or she is capable of acting (**Rosenstock; Strecher; Becker**, 1988). The HBM contains psychological elements or variables that influence the adoption of preventive behavior (**Champion; Skinner**, 2008). "Susceptibility" is the individual's perception of vulnerability to contracting a disease; "severity" refers to the personal and social consequences of the disease; "benefits" refers to the belief in the effectiveness of the preventive action; "barriers" refers to difficulties in adopting the preventive behavior; "cue to action" is a stimulus that incites behavior change; and "self-efficacy" is the belief that a subject can successfully perform the required action to achieve a given outcome (**Champion; Skinner**, 2008; **Rosenstock *et al.***, 1988).

Focusing on perceptions of susceptibility and severity is the key to modifying preventive health behaviors in young people (**Luquis; Kensinger**, 2019). After analyzing young people's health beliefs about sun risk behaviors and preventive measures, several studies have concluded that young people have low perceptions of susceptibility, severity, and frequency of preventive behaviors (**Buchanan Lunsford *et al.***, 2018; **Davati *et al.***, 2013; **Julian; Thorburn; Geldhof**, 2020). Knowing young people's beliefs, behaviors, and attitudes toward tanning provides valuable information for conducting health prevention campaigns (**Støle; Nilsen; Joranger**, 2019). Empirical studies have supported the positive effect of skin cancer educational interventions based on the HBM (**Dillard; Ferrer; Welch**, 2018; **Jeihooni; Rakhshani**, 2019; **Moradhaseli *et al.***, 2019), finding a significant increase in knowledge, preventive behaviors, and HBM constructs in individuals.

The media and social media have an important role in the construction of health beliefs and behaviors. **Meppelink *et al.*** (2022) verified its influence on reducing COVID-19 misperceptions and increasing susceptibility, severity, and benefit beliefs. The HBM has been adapted to analyze health content on social media. According to **Merten *et al.*** (2022), their constructs show great utility for analyzing skin cancer prevention content broadcast on social media. Adapting this model to analyze health (**Guidry *et al.***, 2019; **Briones *et al.***, 2012) and skin cancer prevention (**Merten *et al.***, 2022; **Tang; Park**, 2017) content on social media, studies have found a low frequency of the HBM constructs in the content and a high influence of content that included all concepts. The literature review yields the following research question and hypothesis.

RQ3: What elements of the HBM appear in the contents of the strategic skin cancer prevention communication of the main issuers on Instagram in Spain?

RH4: The thematic coverage of strategic skin cancer prevention communication on Instagram in Spain does not focus on the susceptibility and severity variables contemplated in the HBM.

> "The media and social media have an important role in the construction of health beliefs and behaviors."

3. Methods

A quantitative methodology was employed using content analysis of the publications of strategic issuers of skin cancer prevention in Spain on Instagram.

3.1. Sampling

First, it took the previous identification of the Comunicancer project (**Comunicancer**, 2021) of the main national issuers of strategic communication in sun photoprevention against skin cancer in Spain: Asociación Española de Dermatología y Venerología (AEDV); Asociación Española Contra el Cáncer (AECC); Área Hospitalaria Costa del Sol (AHCS); Soludable; Centro Nacional de Investigaciones Oncológicas (CNIO); Melanoma España, and Grupo Español Multidisciplinar de Melanoma (GEM). Their profiles were identified on Instagram -Table 1-, discarding in the process the issuers Melanoma España and GEM for not having an official Instagram account.

All publications from the previous year were tracked and a higher production of skin cancer prevention content was identified from the months of April through July. April is the month when the campaigns of the various organizations in Spain begin, due to the increase in temperatures and solar radiation, which coincide with the main holiday periods in the country and with the World Skin Cancer and Melanoma days. Computerized data capture was performed from CrowdTangle. This platform tracks public content on Instagram pages. Headlines, texts, and links to embedded videos, images, or articles accompanying the publications are retrieved from here. This process is exhaustive and follows the procedures outlined in **Cárcamo-Ulloa *et al.*** (2022), allowing a precise and organized data extraction. Finally, 458 publications issued between April and July 2022 were collected.

The units of analysis were the Instagram posts of national strategic issuers of skin cancer prevention in Spain. The unit for this analysis was taken as the set of text, links, videos, and images that make up each publication or post.

Table 1: Issuers Analysed on Instagram.

Issuers	Nº Followers
Soludable	475
Área Hospitalaria Costa del Sol	3884
Asociación Española Contra el Cáncer	108579
Centro Nacional de Investigaciones Oncológicas	4071
Asociación Española de Dermatología y Venerología	6878

3.2. Codification

The coding of the collected publications is divided into five sections. These five sections are summarised at end of the section -Table 3-.

3.2.1. Relevance of the Publication

After finding 458 publications, a relevance criterion filter was carried out applying. Publications were removed which, although posted by the main national issuers of skin cancer communication, were not relevant for the analysis of this study because the content did not include information related to skin cancer and/or photoprotection, for example, publications informing about types of cancer other than skin cancer, organisational milestones, services, etc.

Thus, if the publication was not relevant to skin cancer and/or photoprotection, it was discarded for the next level of coding. This process allowed determining a total sample of 93 relevant publications for the subject of study, distributed as follows:

Table 2: Sample Distribution.

Issuers	Nº Publications
Soludable	39
AEDV	30
AHCS	11
CNIO	7
AECC	6
Total	**93**

3.2.2. General Information

Basic information was recorded for each publication, which included the identification number of the publication, the day and month of the publication, and the goal of the publication in terms of information—the goal aims to inform without inciting behavior change; persuasion—the goal explicitly aims to change behavior; or commercial—the goal

aims to promote events, services, products, fundraising, registrations related to photoprotection and/or skin cancer.

Metrics of impact of the publications were also recorded, such as the number of likes and comments, as well as the number of views in the case of videos.

3.2.3. First level of Agenda-setting

The sample underwent a third level of coding to determine the first level of agenda-setting. The main topics of the publications were identified. Five topics were established: skin cancer in general; melanoma; squamous cell carcinoma; basal cell carcinoma; and photoprotection. Photoprotection is a very important part of skin cancer prevention communication in Spain, so it is necessary to include it and analyze the publications in which it is most prominently addressed. When a publication mentioned skin cancer without specifying or more than one of the topics, it was coded as skin cancer in general. When it focused exclusively on one of the topics, it was coded as the specific topic.

3.2.4. Second Level of Agenda-setting

The sample underwent a fourth level of coding to determine the second level of agenda-setting in terms of cause and solution framings (Tang; Park, 2017). The following variables were coded:

- **Cause:** This refers to the presence or absence of skin cancer causes. If present, it was coded which of these causes were addressed: sun exposure; tanning booths; and other causes like genetics. The categories were not exclusive.
- **Prevention:** Prevention refers to primary and secondary prevention methods. First, the publications were coded according to whether they contained information on primary prevention, and if prevention was present, the methods mentioned were coded. The methods were not mutually exclusive, so a single publication could contain several. Tang and Park's (2017) primary prevention methods were supplemented to include all recommended solar radiation protection behaviors (**Soludable**, 2021; **World Health Organization**, 2022): avoid tanning booths; avoid outside at peak hours; remain in the shade at peak hours; wear protective clothing (long pants and sleeves); wear brimmed hats; wear sunglasses; apply sunscreen. Secondly, we proceeded in the same way with secondary prevention—if prevention was present, those methods mentioned were coded: visit the doctor; self-checking; warning signs (ABCD).
- **Treatment:** This refers to the presence or absence of skin cancer treatments. If present, it was coded which of these treatments were mentioned: established biomedical treatments—radiotherapy, chemotherapy, immunology, etc.; alternative treatments—herbs, foods, etc.; and unspecified general treatments. The categories were not exclusive.
- **Tone:** This variable, not contemplated by **Tang and Park** (2017), was included to enrich the second level of agenda-setting, according to the categories developed by **Scully *et al.*** (2008) and **Tsuda *et al.*** (2016). Each publication was coded according to language tone: positive tone, if the content focuses on the benefits of prevention; negative tone, when the content focuses on the risks and adverse effects of the disease or sun exposure; and neutral tone, if there is no emphasis on risks or benefits or if there is a balance between benefits and risks. These three categories are mutually exclusive.

3.2.5. Health Belief Model

The sample underwent a fifth level of analysis. The following variables were coded based on the application of the HBM to the analysis of media content as well as the analysis of skin cancer content on social media (**Tang; Park**, 2017):

- **Susceptibility:** The publications were coded according to whether the prevalence of skin cancer was present or absent—e.g., in Spain, in the world—or the possibility of someone developing it –e.g., young people, athletes–.
- **Severity:** The publications were coded according to whether the severity of skin cancer was present or absent, whether in medical terms —e.g., deaths, case rate—, financial terms, or other consequences.
- **Barriers:** This refers to the presence or absence of impairments related to photoprevention, detection, and treatment. If present, it was coded which of the barriers were addressed: barriers to photoprevention; barriers to detection; and barriers to treatment. The same publication could contain several types of barriers, so the categories are not exclusive.
- **Benefits:** Refers to the presence or absence of benefits involved in photoprevention, detection, and treatment. If present, it was coded which of these benefits were addressed: benefits of photoprevention; benefits of detection; and benefits of treatment. The same publication could contain several types of benefits, so the categories are not exclusive.
- **Cue to Action:** This variable was coded to analyze whether explicit suggestions and appeals for behavior change were present or absent –e.g., "protect yourself from the sun", or "apply sunscreen."–.
- **Self-Efficacy:** Self-efficacy was coded as present when it was suggested that the action required to achieve a certain outcome could be done successfully or explicitly encouraged to do so –e.g., phrases such as "The ABCD of skin cancer prevention," demonstrations or instructions–.

Table 3: Relationship of Coding Levels with Their Variables and Coding Categories

Level of Codification	Variable	Categories of Codification
Relevance of the Publication	Relevance	1. Relevant to skin cancer 2. Relevant to photoprotection 3. Relevant to skin cancer and photoprotection 4. Not relevant to skin cancer and photoprotection
General Information	ID Publication	
	Day	
	Month	1. April 2. May 3. June 4. July
	Goal	1. Informative 2. Persuasive 3. Commercial
	Nº likes	
	Nº comments	
	Nº views	
First Level of Agenda-setting	Topic of the publication	1. Skin cancer in general 2. Melanoma 3. Squamous cell carcinoma 4. Basal cell carcinoma 5. Photoprotection
Second Level of Agenda-setting	Cause	1. No 2. Yes
	Type of cause	3. Sun exposure 4. Tanning booths 5. Other causes like genetics
	Primary prevention	1. No 2. Yes
	Primary prevention methods	1. Avoid tanning booths 2. Avoid outside at peak hours 3. Remain in the shade at peak hours 4. Wear protective clothing (long pants and sleeves) 5. Wear brimmed hats 6. Wear sunglasses 7. Apply sunscreen
	Secundary prevention	1. No 2. Yes
	Secundary prevention methods	1. Visit the doctor 2. Self-checking 3. Warning signs (ABCD)
	Treatment	1. No 2. Yes
	Type of treatment	1. Established biomedical treatments 2. Alternative treatments 3. Unspecified general treatments
	Tone	1. Positive 2. Negative 3. Neutral
Health Belief Model	HBM variables	1. Susceptibility 2. Severity 3. Barriers 4. Benefits 5. Cue to Action 6. Self-Efficacy

Source: Based on **Scully *et al.*** (2008), **Tsuda *et al.*** (2016) and **Tang and Park** (2017).

3.3. Intercoder Reliability

Before coding, coder training was conducted on the codebook. The reliability of the coding process (intercoder) was calculated on 10% (n = 10) of the entire sample (n = 93). Reliability was calculated using Holsti's Reliability Coefficient (RC), yielding a value of RC = .7685. An acceptable result was when RC = 1 total agreement.

3.4. Data Analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 28 software. Univariate analyses of frequency distribution, bivariate contingency tables with Chi-square, and one-sample t-test were performed, as well as multivariate analysis of one-factor ANOVA and correspondence.

4. Results

4.1. Impact of the Publications

This study focused on the content analysis of issuers' publications disseminated between April and July 2022. As shown

in Figure 1, the month of May accounts for 53.8% (n = 7790) of total interactions with content on photoprevention and skin cancer, followed by June (26.9%, n = 3902). These higher impact rates of publications drop to July (10.81%, n = 1564), where the levels are almost equal to the initial volume of interactions in April (8.29%, n = 1199).

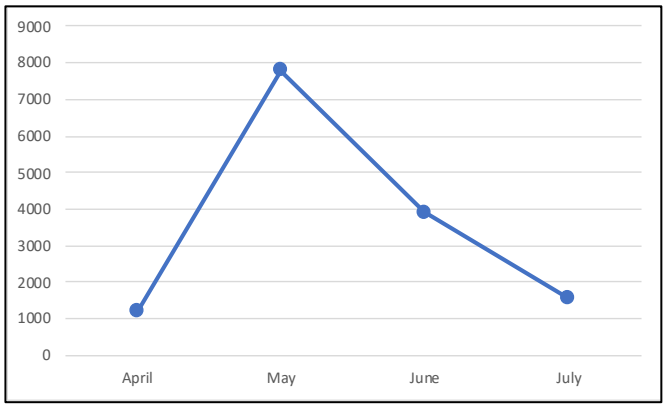

Figure 1: Interaction Rate Per Month.
Note: Interactions Equals the Sum of Likes, Comments and Views.

4.2. Agenda of Issuers

RQ1 explored the thematic coverage of strategic communication on skin cancer prevention and photoprevention on Instagram. Photoprotection (n = 38, 40.9%), skin cancer in general (n = 31, 33.3%), and melanoma (n = 20, 21.5%) were the most frequent topics, while basal cell carcinomas (n = 4, 4.3%) and squamous cell carcinomas (n = 0, 0%) were the least frequently used. Following the results of the frequency distribution analyses, RH1, which hypothesized that melanoma is the most prominent topic in strategic skin cancer prevention communication on Instagram in Spain, is rejected. The results show that photoprotection is the central topic of strategic communication.

Table 4: One-sample T-test Results on the Framing Variables.

Framing Variables	YES%	NO%	*p*
Cause	58.1	41.9	< .001*
Solar exposition	55.9	44.1	< .001*
Tanning booths	2.2	97.8	< .001*
Other causes	1.1	98.9	< .001*
Primary prevention	43	57	< .001*
Sunscreen	28	72	< .001*
Brimmed hat	18.3	81.7	< .001*
Sunglasses	12.9	87.1	< .001*
Avoid outside	7.5	92.5	< .001*
Remain in the shade	7.5	92.5	< .001*
Protective clothing	6.5	93.5	< .001*
Avoid tanning booths	3.2	96.8	< .001*
Secondary prevention	32.3	67.7	< .001*
Visit the doctor	30.1	69.9	< .001*
Self-examination	5.4	94.6	< .001*
Warning signs	2.2	97.8	< .001*
Treatment	5.4	94.6	< .001*
Biomedical	5.4	94.6	< .001*
Alternative	0	0	
Unspecified	0	0	

* Sig. < .05

RQ2 explored the framing employed in strategic communication regarding skin cancer prevention on Instagram in terms of causes, primary prevention, secondary prevention, and treatment. As shown in Table 4, the one-sample t-test results present highly significant differences ($p < .001$) across the different terms of causes, primary and secondary prevention, and treatments of skin cancer. Over half (58.1%, n = 54) of the publications included cause framing of skin cancer. Among the most referenced causes was sun exposure (55.9%, $p < .001$); in contrast, tanning booths (2.2%, $p < .001$) and other causes, including genetics (1.1%, $p < .001$), were the least discussed causes of skin cancer. Regarding prevention, primary prevention (43%, $p < .001$) and secondary prevention (32.3%, $p < .001$) were not overly employed framings. Among the primary prevention methods, the most commonly discussed were using sunscreen (28%, $p < .001$), wearing a brimmed hat (18.3%, $p < .001$), and wearing sunglasses (12.9%, $p < .001$), followed by avoiding being outside at peak hours (7.5%, $p < .001$), remaining in the shade at peak hours (7.5%, $p < .001$), wearing protective clothing (6.5%, $p < .001$), and avoiding tanning booths (3.2%, $p < .001$). In terms of secondary prevention, the most employed method was visiting the doctor (30.1%, $p < .001$), and only small percentages mentioned self-checking (5.4%, $p < .001$) and warning signs (ABCD) (2.2%, $p < .001$). The same publication could include more than one cause of risk and more than one method of primary and

secondary prevention. As for treatments, only 5.4% ($p < .001$) of the publications referred to established biomedical treatments; alternative therapies and unspecified general treatments were not included in any publication (0%, n = 0).

The one-factor ANOVA test also reveals highly significant differences ($p < .001$) when relating causes and primary and secondary prevention to the publication topic. As Table 5 shows, the terms of causes and primary and secondary prevention are strongly related to the topic of the publication. Publications mentioning sun exposure as a risk factor for skin cancer mostly have photoprotection as their key focus (38.7%, $p < .001$); the same is true for publications with a primary prevention framing, they are related to photoprotection (26.9%, p .001). As for publications with a secondary prevention framing, they are associated with skin cancer in general (18.3%, $p < .001$).

Table 5: Results of the One-factor ANOVA Test on the Framing Variables and Topic of Publications.

Framing Variables	Skin cancer	Melanoma	Non-melanoma	Photoprotection	*p*
Cause	10.7%	6.4%	2.1%	38.7%	< .001*
Solar exposition	9.6%	5.3%	2.1%	38.7%	< .001*
Tanning booths	1%	1%	0%	0%	.612
Other causes	1%	0%	0%	0%	.579
Primary prevention	7.5%	6.5%	2.2%	26.9%	.001*
Sunscreen	4.3%	4.3%	2.1%	17.2%	.755
Brimmed hat	3.2%	3.2%	0%	11.8%	.676
Sunglasses	0%	1%	0%	11.8%	.083
Avoid outside	2.1%	0%	0%	5.4%	.521
Remain in the shade	0%	1%	0%	6.4%	.476
Protective clothing	1%	1%	0%	4.3%	.949
Avoid tanning booths	2.1%	1%	0%	0%	.059
Secondary prevention	18.3%	8.6%	3.2%	2.2%	< .001*
Visit the doctor	17.2%	7.5%	3.2%	2.1%	.867
Self-examination	3.2%	1%	1%	0%	.801
Warning signs	1%	1%	0%	0%	.867
Treatment	2.1%	3.2%	0%	0%	.108
Biomedical	2.1%	3.2%	0%	0%	.108
Alternative	0%	0%	0%	0%	
Unspecified	0%	0%	0%	0%	

* Sig. < .05

Finally, to answer RQ2 more completely, the Chi-square test was performed between the tone and the target of the publications—see Table 6—and correspondence analysis, see figure 2. The results reveal that publications with an informative goal employed a positive tone (28%, $p < .001$), as did commercial publications (16.1%, $p < .001$). In contrast, publications with a persuasive goal used a mostly neutral tone (25.8%, $p < .001$).

Table 6: Chi-square Test Results on the Tone and Goal of Publications.

	Goal				
	Informative	**Persuasive**	**Advertisement**	**Total**	***p***
Tone					< .001*
Positive	28%	15.1%	16.1%	59.1%	
Negative	1.1%	3.2%	0%	4.3%	
Neutral	9.7%	25.8%	1.1%	36.6%	
Total	38.7%	44.1%	17.2%	100%	

* Sig. < .05

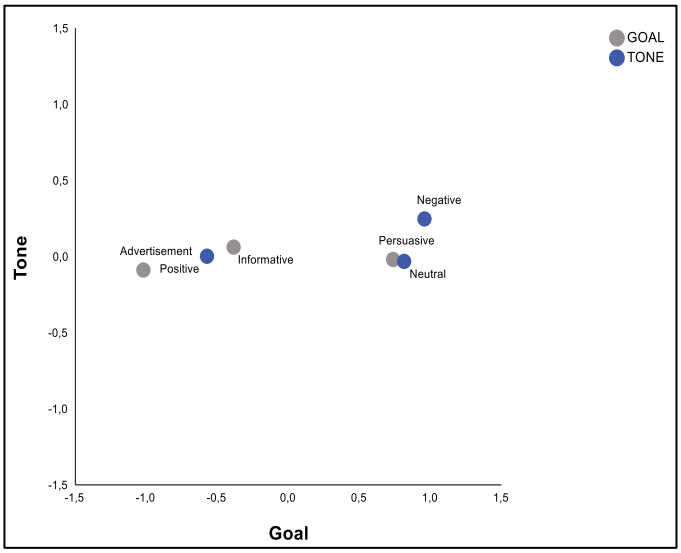

Figure 2: Results of The Correspondence Analysis on The Tone and Goal of The Publications.

Following the results of the analyses, RH2 related to the cause framing of strategic skin cancer prevention communication on Instagram in Spain is not confirmed. The results show that more than half of the publications have cause framing of skin cancer. However, RH3 related to the solution framing of strategic skin cancer prevention communication on Instagram in Spain is confirmed. The results show that less than half of the publications present solution framing of skin cancer.

> "The number of publications mentioning carcinomas is practically nonexistent."

4.3 HBM Constructs in Communication

RQ3 explored the susceptibility, severity, benefits, barriers, cues to action, and self-efficacy variables of the health belief model employed in strategic skin cancer prevention communication content on Instagram. As shown in Table 7, the one-sample t-test results present highly significant differences ($p < .001$) in the various constructs of the HBM. Cue to action was the most frequently employed variable, 49.5% ($p < .001$) of the publications contained stimuli that incited behavior change, followed by self-efficacy, in which 24.7% ($p < .001$) contained elements to convey that preventive action could be easily performed. In terms of skin cancer threat, individuals' susceptibility to contracting the disease was mentioned in 23.7% ($p < .001$) of the publications and severity in 20.4% ($p < .001$). As for the rest of the variables, benefits were included in only 9.7% ($p < .001$) of the publications. Among them, prevention benefits (6.5%, $p < .001$) were the most treated, followed by treatment benefits (2.2%, $p < .001$) and diagnostic benefits (1.1%, $p < .001$). Finally, barriers to behavior change were mentioned by 5.4% ($p < .001$), with prevention barriers (5.4%, $p < .001$), diagnostic barriers (5.4%, $p < .001$), and treatment barriers (5.4%, $p < .001$) being addressed in the same publications. The same publication could include more than one type of benefit and/or barrier.

Table 7: One-Sample T-test Results on HBM Variables.

HBM Variables	YES%	NO%	*p*
Cue to action	49.5	50.5	< .001*
Self-efficacy	24.7	75.3	< .001*
Susceptibility	23.7	76.3	< .001*
Severity	20.4	79.6	< .001*
Benefits	9.7	90.3	< .001*
Prevention benefits	6.5	93.5	< .001*
Treatment benefits	2.2	97.8	< .001*
Diagnostic benefits	1.1	98.9	< .001*
Barriers	5.4	94.6	< .001*
Prevention barriers	5.4	94.6	< .001*
Diagnostic barriers	5.4	94.6	< .001*
Treatment barriers	5.4	94.6	< .001*
* Sig. < .05			

The one-factor ANOVA test also presents a significant difference ($p < .05$) when relating HBM variables to the publication topic. As Table 8 shows, the benefits of prevention are strongly related to the topic of the publication. Publications mentioning the benefits of adopting skin cancer preventive behavior mostly have photoprotection as topical (5.4%, p .016).

Table 8. Results of the One-Factor ANOVA on The HBM Variables and Goal of The Publications.

HBM Variables	Skin Cancer	Melanoma	Non-melanoma	Photoprotection	*p*
Cue to action	21.5%	10.7%	3.2%	14%	.060
Self-efficacy	10.3%	5.7%	2.2%	41.6%	.545
Susceptibility	9.6%	4.3%	0%	9.6%	.608
Severity	9.6%	3.2%	0%	7.5%	.419
Benefits	2.1%	2.1%	0%	5.4%	.732
Prevention benefits	0%	1.1%	0%	5.4%	.016*
Treatment benefits	2.1%	0%	0%	0%	
Diagnostic benefits	0%	1.1%	0%	5.4%	.178
Barriers	1.1%	0%	0%	4.3%	.313
Prevention barriers	1.1%	0%	0%	4.3%	
Diagnostic barriers	1.1%	0%	0%	4.3%	
Treatment barriers	1.1%	0%	0%	4.3%	
Note: * Sig. < .05					

Following the results of the analyses, RH4 related to the HBM susceptibility and severity variables contemplated in the strategic communication of skin cancer prevention on Instagram in Spain is confirmed. The results show the low frequency of susceptibility and severity elements in publications.

5. Discussion and Conclusions

From the point of view of the impact of publications on skin cancer and photoprotection, it is necessary to highlight that, out of a corpus of 458 publications in the profiles of issuers specialized in skin cancer prevention, only 20% refer

to skin cancer. This finding highlights the low presence of professionalised and intentional preventive communication against skin cancer on social media in Spain (**Alonso-Belmonte *et al.***, 2022). Also noteworthy is the increase in the number of interactions in publications between the months of May and June. The significant difference in the number of interactions is due to campaigns such as Euromelanoma 2022 by the AEDV's Healthy Skin Foundation and the AEDV's One Skin Collection campaign, both online since May, in which the public is encouraged to visit the dermatologist to check their skin. As already mentioned in the methodology chapter, the frequency of solar photoprevention content increases in Spain between the months of April and July due to the increase in temperatures and solar radiation, which coincide with the main holiday periods in the country and with 23 May, World Melanoma Day, and 13 June, World Cancer Day. The campaigns around these days increase the volume of content posted on Instagram in a considered manner. These months become the high point for prevention communication.

In terms of agenda-setting, photoprevention has been the topic that has received the most coverage among publications, rejecting the hypothesis posited within the theoretical framework. However, although melanoma has not been the central topic of the communication, the number of publications mentioning carcinomas is practically nonexistent. The latter corroborates findings from previous research on skin cancer coverage on social media in which non-melanoma skin cancer is scarcely discussed (**Jiménez-Sánchez *et al.***, 2023; **Jiménez-Sánchez; Moreno**, 2023; **Basch *et al.***, 2015). According to the first-level agenda, the media set the thematic agenda for the public. It would be expected, then, that greater coverage of non-melanoma skin cancers on Instagram would generate greater awareness among social media users of these lesser-known types of cancers. Carcinomas exhibit greater morbidity rates, but lower mortality rates compared to melanomas (**Tang; Park**, 2017).

> "Prevention and treatment framings have proven to be scarce."

Regarding the communication framing, a greater emphasis on the causes of the disease rather than solutions is highlighted. These results are at odds with findings from previous studies on social media in other contexts in which the causes of skin cancer were not reported (**Merten *et al.***, 2022; **Cho *et al.***, 2018; **Tang; Park**, 2017), and rejects the research hypothesis proposed. Sun exposure turns out to be the most frequent risk factor for skin cancer. However, the genetics and use of tanning booths as a cause of skin cancer is little discussed. These results supports previous insights from **Jiménez-Sánchez *et al.*** (2023), and **Jiménez-Sánchez and Moreno** (2023). UV radiation comes from natural light and artificial light, such as tanning booths (**Sociedad Española de Oncología Médica**, 2018). The lack of a focus on tanning booths as a risk factor for skin cancer on Instagram can be problematic. Regular users of Instagram are young people, a segment of the population vulnerable to imitating risky behaviors they see on social media, such as tanning (**De La Garza *et al.***, 2021).

> "Instagram does not often present the disease as a threat."

In terms of solutions, prevention and treatment framings have proven to be scarce, confirming the hypothesis posited at the beginning of the research. These findings agree with the results obtained by **Tang and Park** (2017), **Cho *et al.*** (2018), and **Merten *et al.*** (2022). The most commonly employed solution framing has been primary prevention and is directly related to content focused on photoprotection. This result is important because, as mentioned in previous literature, photoprevention is the most effective method to reduce the risk of skin cancer (**Sociedad Española de Oncología Médica**, 2018). However, not all primary prevention methods have received equal attention. Sunscreen, brimmed hats, and sunglasses were the most frequent photopreventive measures, followed by avoiding sun exposure, remaining in the shade, wearing protective clothing, and avoiding tanning booths. Following the agenda's approach, coverage of all primary prevention methods will lead to greater awareness of all the available measures and thus to greater prevention education. Secondary prevention has been discussed to a lesser extent than primary prevention and is directly related to skin cancer contents in general, referring in most cases to visiting the doctor. However, only 5.4% of the publications urge users to perform a self-check and 2.2% show the warning signs (ABCD) of skin cancer. In terms of treatment, it has been the least frequent solution framing, with only 5.4% of the publications referring to established biomedical treatments. Early diagnosis and treatment have been shown to reduce the morbidity and mortality rate of this type of cancer (**Basch *et al.***, 2015). According to the second-level of the agenda, greater exposure to skin cancer information focusing on risk factors, prevention, diagnosis and treatment could encourage the Instagram audience to think in those terms about the disease and change their behaviors.

The goal of the publications has been to be mostly persuasive, followed by informative. Persuasive publications are quite often neutral in tone due to a similar structure in which some alarming fact about skin cancer is reported and then followed by photoprotection advice to avoid it, thus establishing a balance between negative and positive aspects. The high number of publications with an informative purpose is due to events that took place during the months of the study, such as the National Congress of Dermatology and Venereology of the AEDV, which gave rise to informative content about them. This type of publication had a positive tone, as well as the commercial ones.

Concerning to the HBM, the scarce presence of its elements in the communication stands out. This finding corroborates previous studies (**Merten *et al.***, 2022; **Tang; Park**, 2017). Cue to action that incites behavioral change is the variable most

present in the contents. This result is consistent with the fact that the goal of the communication analyzed was mainly persuasive. However, regarding the susceptibility and severity of getting skin cancer, Instagram does not often present the disease as a threat, confirming the hypothesis posited within the theoretical framework. The perception of skin cancer as a threat is a very relevant factor in shaping preventive actions, especially among a high-risk population for skin cancer, such as the youth (**Luquis; Kensinger**, 2019). As for benefits and barriers, these are the variables least discussed. The benefits of acquiring preventive behavior against skin cancer are the most frequent type of benefit, especially when discussing photoprotection, and only 5.4% of the publications address barriers. Following the premise of the HBM, behavioral change occurs when the individual believes themselves to be at risk of a disease, that there is an effective action to prevent it and that they are capable of performing it. Thus, prevention communication should reinforce the perception of susceptibility to the disease among youth, as well as the benefits minus the barriers and self-efficacy of preventive actions to increase their effectiveness in this risk group.

> "Issuers responsible for skin cancer prevention communication have consolidated on Instagram in Spain an unbalanced agenda in terms of topics and framings."

The findings indicate that issuers responsible for skin cancer prevention communication have consolidated on Instagram in Spain an unbalanced agenda in terms of topics and framings. These nonprofit associations possess the credibility to disseminate prevention campaigns aimed at young people on Instagram. As audience studies and previous literature indicate, Instagram is the most popular social media among young Spanish audiences (**IAB Spain**, 2023), but it can also lead to the imitation of risky behaviors (**McCloud *et al.***, 2017). These features make Instagram a potential tool for skin cancer awareness and prevention.

This research presents the first study to identify and deepen the strategic communication of the prevention of skin cancer in Spain on Instagram through the organizations involved in its dissemination at the national level. Empirically, it contributes to the body of empirical work on strategic health prevention communication through the model of the first- and second-level agenda theories and the health belief model. These approaches complement the studies carried out regarding the digital press (**Zurro-Antón; Cárcamo-Ulloa; Moreno**, 2023), studies on general content in social media, and previous studies that focused on other social media platforms within the framework of the Comunicancer research project. The research questions posed at the beginning of the research have been answered. The most prominent theme in strategic skin cancer prevention communication on Instagram in Spain is photoprotection, with the majority framing focused on causes of cancer and a low overall presence of HBM constructs except for action signals. As for the professional application of the findings, the work aims to contribute to the strategic issuers of skin cancer prevention in Spain to optimize the effectiveness of their communications aimed at young audiences, as they are one of the populations at greatest risk in epidemiological studies.

Although the study focused on analyzing posts issued on Instagram, it would be valuable to contemplate a broader sample covering a group of different social media, as well as other national contexts. This would make it possible to identify and compare the communication disseminated in different social media and in different contexts of higher and lower risk to obtain more comprehensive results. This work is part of the COMPREV(P)CANCER research project, so there is the prospect that future works within the framework of the project will complement this first approach.

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