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Multi-Symptom Relief for Cough & Cold: Benefits of Adding Vicks VapoRub to the Treatment Regimen

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Abstract

Background: The common cold is inarguably a multi-symptom syndrome. Thus, patients commonly use several medicinal products simultaneously to treat a range of co-existing clinical manifestations. Topical ointments with medicated vapours are a popular and effective treatment for the relief of various respiratory tract symptoms. Vicks VapoRub (VVR), a paraffin-based therapeutic ointment containing levomenthol, eucalyptus oil, turpentine oil and camphor, is frequently combined with other cough and cold treatments. However, little is known about which medications are commonly taken together and how patients experience the combined efficacy. **Methods:** A 20-question online survey to assess habits and beliefs amongst cold sufferers was conducted using the Toluna Start platform. A total of 1513 adults that had suffered from a cold or mild COVID-19 infection in the preceding 12 months were recruited from five European countries. **Results:** Most cold sufferers combined VVR with other cold medicines, such as paracetamol (75.9%), multi-symptom relief (MSR) products (64.0%) or nasal decongestants (57.0%) to treat their symptoms. VVR was mainly used topically, at night, and on days 3 - 4 of the disease. The addition of VVR to the treatment regimen was perceived as highly effective at relieving multiple cold symptoms. Furthermore, improved sleep and a free breathing sensation were attributed to VVR when used in combination with other cold remedies. Statements on VVR regarding effectiveness, sleep, sleep + effectiveness, speed of action and user satisfaction were agreed upon by a total of 74.8% to 88.3% of panellists. **Conclusion:** Our survey confirms that in Europe, VVR is commonly used as part of a regimen to manage cold symptoms, and contributes to better overall perceived relief as part of a multi-facetted treatment approach. Prospective clinical data are needed to further confirm these results.

Keywords

Common Cold, Vicks VapoRub, Therapeutic Ointment, Survey, Multi-Symptom Relief

1. Introduction

Acute upper respiratory tract infections (URTIs), colloquially referred to as the common cold, are usually mild and transient upper airway diseases, caused by more than 200 different viruses [1] [2]. Rhinoviruses are the major causative agent of colds, followed by influenza and coronaviruses [3] [4]. Over the course of an infection, different clinical manifestations co-exist and typically persist for seven to ten days [1]. Contrary to popular belief, common cold symptoms are not due to damage caused by the virus; instead, they are reactions to the mix of proinflammatory cytokines and mediators (e.g., bradykinin, and prostaglandins) produced by the body to fight the infection [5] [6]. The nose, nasopharynx and paranasal sinuses are primarily affected [7] [8]. A common cold typically starts with a scratchy sore throat and progresses to other symptoms such as nasal congestion, runny nose, sneezing, cough, headache, etc. [9]. Sleep disturbances including mild, short-term insomnia, also frequently occur and negatively impact the patient's quality of life [10] [11].

Varied as the symptoms of URTIs may be, they are easy to recognise and are therefore commonly self-diagnosed and self-treated. A multitude of over-the-counter (OTC) products are available to relieve bothersome symptoms, including complementary and alternative medicines [1] [12]. Popular treatments include analgesics/antipyretics, nasal or oral decongestants, antitussives, first-generation H_1-antihistamines, expectorants/mucolytics, anticholinergics, herbal remedies, and essential oils [13] [14]. As symptom severity and clinical expressions change over the course of the illness, effective therapies aim at relieving multiple symptoms [5].

Therapeutic ointments containing plant-derived essential oils have a well-established place in URTI symptom relief. They are inhaled as vapours emitted by chest rubs or dissolved in hot water. Typical ingredients include menthol, eucalyptus, camphor, or turpentine. The benefits of therapeutic ointments have been investigated in controlled studies and include a sensation of improved nasal airflow, reduced cough frequency, and improved sleep quality [13] [15] [16].

Since the common cold produces multiple symptoms, multi-component cough and cold preparations have been created to simultaneously treat a range of co-existing clinical manifestations. These multi-symptom relief (MSR) products commonly contain two to four active ingredients [12]. According to a 2005 report of the World Health Organization (WHO), fixed-dose combinations have potential advantages over single-ingredient medicinal products, including better

patient adherence, lower cost, simplified procurement and distribution logistics, and convenience for patients [17].

The various options allow cold sufferers to select treatments that are relevant to their individual needs [18]. Tailored treatment is often made after consulting a pharmacist [19]. This is important, since taking several medications concomitantly potentially increases the risk of drug interactions, especially in elderly patients [20]. It is therefore crucial to select drugs with no or low risk of interactions.

Therapeutic ointments can be used with other OTC preparations, but limited data are available to show which medication combinations are preferred and how patients experience the combined efficacy. To address this, we conducted an online survey to generate data on consumer habits for using Vicks VapoRub (VVR), a paraffin-based therapeutic ointment containing eucalyptus, camphor, levomenthol, and turpentine in addition to their usual cough and cold products. Moreover, we wanted to gain insights on whether the use of VVR on top of the consumer's usual treatment regime provides additional benefits versus using their usual treatment products alone.

2. Methods

2.1. Study Population

Adults from five countries chosen to be representative of Europe (Germany, France, the United Kingdom [UK], Spain and Poland) were recruited. Eligible participants were at least 18 years old, representing the primary decision maker and purchaser of health care products in their household, and had suffered from a cold within the past 12 months for which they used the therapeutic ointment VVR in combination with OTC cold medicines (*i.e.*, paracetamol, oral multi-symptom relief products, or nasal decongestants). Persons involved in the pharmaceutical industry, in manufacturing or developing health care products, in marketing consumer, pharmaceutical or health care products, or working in market research, in an advertising agency, or for a public relations agency were excluded. Furthermore, while COVID-19 patients with severe symptoms requiring hospital treatment were excluded, those with mild symptoms who did not require hospital treatment were included. Within this publication, the population surveyed including cold and mild COVID-19 patients is summarised by the colloquial term "cold sufferers". No questions regarding present health status were asked. The intent was to recruit at least 300 adults from each country, with a natural ratio of females to males.

Toluna Start, a global online platform that provides access to more than 40 million consumers across 70 markets, was used for this study. Participants were recruited from Toluna online panels using sample targeting techniques to ensure that the sample composition reflected the total population according to country census data. Consent was obtained from online panellists upon sign-up. All panellists were assured of confidentiality and anonymity.

2.2. Measurements

Between March and April 2022, a 20-minute online quantitative questionnaire was conducted in each country in accordance with standard local market research practices. The questionnaire comprised 20 questions covering inclusion and exclusion criteria, demographics, habits, experience with using VVR concomitantly with an OTC cold remedy, and statements requiring participants to rate their agreement on a 5-point Likert scale ("strongly agree", "agree", "neither agree or disagree", "disagree", "strongly disagree"). A total of 18 such statements related to effectiveness (statements 1 - 9), sleep (statements 10 - 12), sleep + effectiveness (statements 13 - 14), speed of action (statements 15 - 16) and user satisfaction (statements 17 - 18) were surveyed in Germany, France, the United Kingdom, and Spain. In Poland, two statements (11 and 12) from the sleep panel were omitted because of differences in the locally authorised indications of VVR. To avoid bias due to closely related statements, statement order was randomised. An overview of the statements is presented in **Figure 1**.

2.3. Quality Checks

Multiple quality checks were conducted throughout the process, including 1) the questionnaire phase (design and compliance with local product information of VVR in each country) to ensure that the language was consumer friendly and the logic of the questionnaire was correct, 2) the online survey link to ensure the link was functional and there were no technical errors, and 3) the data tables, to check for accuracy of survey logic, as well as applying category knowledge checks.

2.4. Statistical Analysis

Demographic data from all participants who completed the questionnaire were analysed using descriptive statistics. Top 2 Box (T2B) scores, the percentages associated with the top 2 scale responses (e.g., "strongly agree" and "agree"), were calculated from the 5-point Likert scale survey questions by country and across all countries. To provide bounds on the estimates of the true T2B percentages, 95% Wilson Score confidence intervals [21] were calculated with JMP v. 16.1.

3. Results

3.1. Participant Demographics

A total of 2662 participants completed the questionnaire. Of those, 1149 participants did not meet all requirements for inclusion. The test population included in the analysis consisted of 1513 respondents across Europe, 301 in Germany, 304 in France, 300 in the United Kingdom, 308 in Spain and 300 in Poland.

Basic demographics are presented in **Table 1**. Overall, 896 (59.2%) females and 615 (40.6%) males were included in the analysis. The most prevalent age group was 35 to 49 years, followed by the age groups 50 to 65 years, 19 to 34

years and ≥66 years. Country-specific differences regarding age group distribution were present in Germany, where most survey participants were 50 to 65 years old, and in Spain and Poland, where 19- to 34-year-olds were more prevalent than those aged 50 to 65 years.

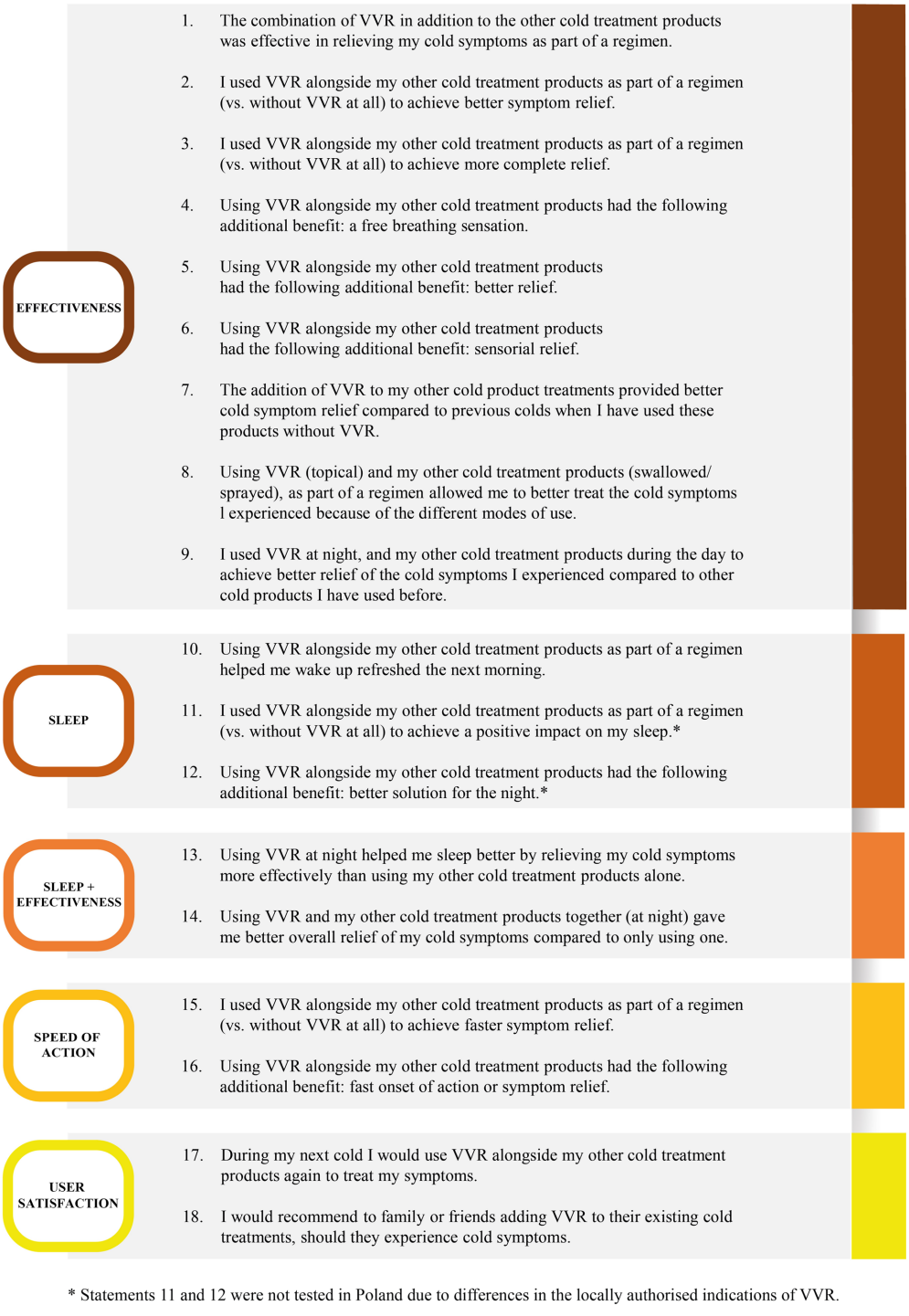

Figure 1. Statements surveyed for agreement. Statements are grouped by affiliation to an overall topic. Numbers are assigned for reference throughout this publication and are not related to the random order of questions in the survey.

Table 1. Demographics.

	Total	Germany	France	UK	Spain	Poland
BASE: total respondents	1513	301	304	300	308	300
Demographics (Frequency/Percentage)						
Age 19 to 34 years	384 25.4%	50 16.6%	62 20.4%	71 23.7%	91 29.5%	110 36.7%
Age 35 to 49 years	617 40.8%	106 35.2%	124 40.8%	119 39.7%	147 47.7%	121 40.3%
Age 50 to 65 years	465 30.7%	125 41.5%	118 38.8%	91 30.3%	70 22.7%	61 20.3%
Age ≥ 66 years	47 3.1%	20 6.6%	0 0.0%	19 6.3%	0 0.0%	8 2.7%
Male	615 40.6%	135 44.9%	113 37.2%	107 35.7%	153 49.7%	107 35.7%
Female	896 59.2%	166 55.1%	190 62.5%	192 64.0%	155 50.3%	193 64.3%
Other	2 0.1%	0 0.0%	1 0.3%	1 0.3%	0 0.0%	0 0.0%
Symptoms experienced in previous 12 months (Frequency/Percentage)						
Common cold	1227 81.1%	244 81.1%	257 84.5%	249 83.0%	254 82.5%	223 74.3%
Mild COVID-19	286 18.9%	57 18.9%	47 15.5%	51 17.0%	54 17.5%	77 25.7%

During the past 12 months, about one-fifth of the study population reported mild COVID-19 symptoms without hospitalisation (total, 18.9%; min, 15.5% in France; max, 26.7% in Poland), while the majority of participants experienced common cold symptoms (Table 1). The participants self-evaluated the perceived intensity of their symptoms on a 6-point scale from "none" to "severe". Overall, as shown in Table 2, symptom severity was most often experienced as "moderate to severe" or "severe" for blocked nose (n = 1081; 71%), runny nose (n = 1036; 68%), cough (n = 868; 57%); sneezing (n = 843; 56%), sore throat (n = 842; 56%), headache (n = 837; 55%), muscle pain (n = 689; 46%) and "none" or "very mild" for fever (n = 683; 45%). Across all symptoms, about one-fifth of total respondents reported "mild to moderate" or "moderate" severity.

3.2. Most Cold Sufferers Combined VVR with Other Cold Medicines to Treat Their Symptoms

To get more insights regarding treatment combinations, participants were asked if they used VVR together with other products. Of 1565 panellists who used VVR, 52 (3.3%) used VVR as a single treatment due to its effectiveness, the natural ingredients, pre-existing health conditions, or to limit potential drug interactions. These patients were excluded from the rest of the survey.

All cold sufferers who used treatment combinations were provided three mul-

tiple choice options when asked for the concomitantly used products: paracetamol, MSR products and nasal decongestants. Results for the total population are shown in Figure 2(a); detailed results are summarised in Table 3. A total of 1513 cold sufferers (96.7%) used VVR in combination with other cold medicines: 1148 (75.9%) with paracetamol, 969 (64.0%) with MSR products and 862 (57.0%) with nasal decongestants. Cold sufferers were also asked to indicate which product they most frequently combined with VVR (see Figure 2(b) for total population, and Table 3 for detailed results). In France, the UK and Spain, the preferred choices were paracetamol (66.1%, 52.7%, and 50.3%, respectively) and MSR products (20.1%, 32.7%, and 33.1%, respectively); in Germany and Poland, VVR was mainly combined with MSR products (38.9%, and 57.3%, respectively) followed by nasal decongestants in Germany (33.2%) and paracetamol in Poland (26.3%).

Table 2. Overall symptom severity as perceived during the last cold episode.

SYMPTOM	Blocked nose	Runny nose	Cough	Sneezing	Sore throat	Headache	Muscle pain	Fever
BASE:	total respondents: 1513							
Severity (Frequency/Percentage)								
Moderate to severe + severe	1081 71%	1036 68%	868 57%	843 56%	842 56%	837 55%	689 46%	509 34%
Mild to moderate + moderate	251 17%	283 19%	321 21%	387 26%	321 21%	329 22%	333 22%	321 21%
None + very mild	181 12%	194 13%	324 21%	283 19%	350 23%	347 23%	491 32%	683 45%

Table 3. Medicinal products that were concomitantly used with VVR.

	Total	Germany	France	UK	Spain	Poland
BASE: total respondents	1513	301	304	300	308	300
Concomitant products (Frequency/Percentage)						
Paracetamol	1148 75.9%	176 58.5%	264 86.8%	233 77.7%	254 82.5%	221 73.7%
MSR	969 64.0%	201 66.8%	156 51.3%	168 56.0%	173 56.2%	271 90.3%
Nasal decongestants	862 57.0%	208 69.1%	129 42.4%	143 47.7%	151 49.0%	231 77.0%
Most frequently used concomitant product (Frequency/Percentage)						
Paracetamol	677 44.7%	84 27.9%	201 66.1%	158 52.7%	155 50.3%	79 26.3%
MSR	550 36.4%	117 38.9%	61 20.1%	98 32.7%	102 33.1%	172 57.3%
Nasal decongestants	286 18.9%	100 33.2%	42 13.8%	44 14.7%	51 16.6%	49 16.3%

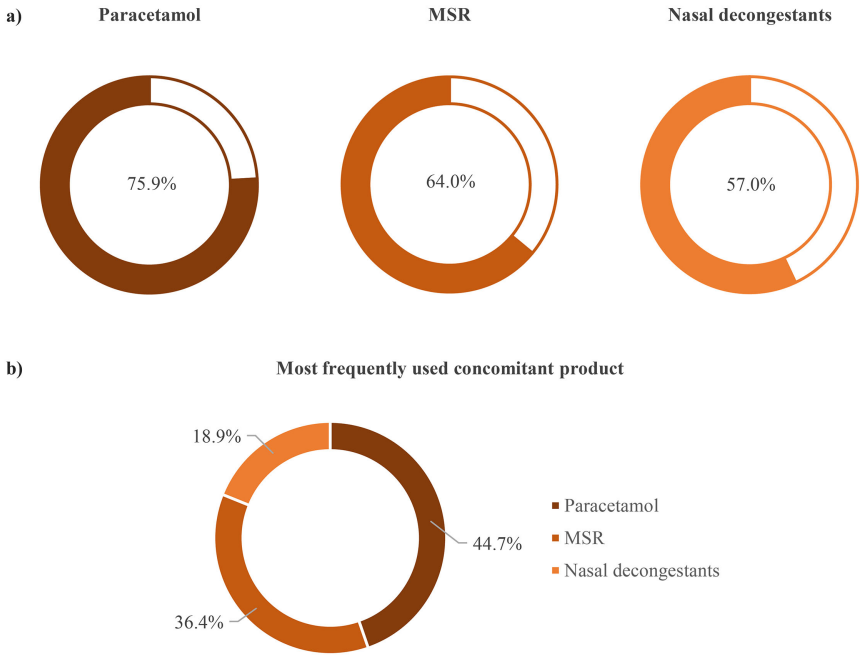

Figure 2. Medicinal products concomitantly used with VVR in the total population. (a) Concomitant products and frequencies of use in the total population. (b) Most frequently used concomitant product in the total population. Data are shown as mean percentages.

3.3. VVR Was Mainly Used Topically, at Night, and on Disease Days 3 - 4

To gain more insight into treatment habits, cold sufferers were asked when, regarding daytime and days of disease, and how they administered VVR. Detailed results are presented in **Table 4**. VVR was mainly used in the evening across the five countries (total; n = 1347; 89.0%, see **Figure 3(a)**; range across countries 82.3% to 93.0%) while paracetamol, MSR and nasal decongestants were predominantly used in both mornings and evenings (data not shown). In general, a lower frequency of VVR and cold medicine use occurred during the afternoon (total; n = 328; 21.7%; range 14.6% to 31.0%; data not shown for paracetamol, MSR and nasal decongestants).

As shown in **Figure 3(c)**, most of the cold sufferers applied VVR topically (total; n = 1055; 69.7%), followed by combined topical and inhalation use (total; n = 319; 21.1%). Inhalation use alone was the least frequent mode of application (total; n = 131; 6.7%). Of note, in Poland, none of the respondents inhaled VVR vapours, which is in line with the local product information since inhalation via water bath is not authorised in this country.

Across the five countries, VVR was most commonly used on days 3 - 4 of disease (total; n = 1136; 75.1%, see **Figure 3(b)**; range across countries 69.7% to 79.7%). Disease days 5 - 6 were associated with the lowest frequency of VVR use in all countries except France, where least frequent use was reported for the first five days of disease (15.8% on days 1 - 2 vs. 18.1% on days 5 - 6). See **Table 4** for detailed results.

Table 4. VVR treatment habits.

	Total	Germany	France	UK	Spain	Poland
BASE: total respondents	1513	301	304	300	308	300
Application time (Frequency/Percentage)						
Morning	504 33.3%	109 36.2%	142 46.7%	82 27.3%	53 17.2%	118 39.3%
Afternoon	328 21.7%	56 18.6%	78 25.7%	56 18.7%	45 14.6%	93 31.0%
Evening	1,347 89.0%	272 90.4%	265 87.2%	279 93.0%	284 92.2%	247 82.3%
Method of administration (Frequency/Percentage)						
Topical/External	1055 69.7%	197 65.4%	167 54.9%	181 60.3%	218 70.8%	292 97.3%
Inhalation	131 8.7%	25 8.3%	45 14.8%	35 11.7%	26 8.4%	0 0.0%
Both topical and inhalation	319 21.1%	79 26.2%	92 30.3%	84 28.0%	64 20.8%	0 0.0%
Other	8 0.5%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	8 2.7%
Day of disease when VVR was used (Frequency/Percentage)						
Day 1 - 2	706 46.7%	167 55.5%	48 15.8%	150 50.0%	146 47.4%	195 65.0%
Day 3 - 4	1,136 75.1%	237 78.7%	212 69.7%	239 79.7%	222 72.1%	226 75.3%
Day 5 - 6	394 26.0%	97 32.2%	55 18.1%	102 34.0%	54 17.5%	86 28.7%

3.4. Cold Sufferers Found That Their Sleep Improved When Adding VVR to the Treatment Regimen

We also wanted to investigate the influence of VVR use on sleep quality. Therefore, cold sufferers were asked to rate their sleep during their last cold episode, when cold medication was used in combination with VVR, compared to their sleep without VVR as a treatment component. As shown in Figure 4 and Table 5, a total of 1171 respondents (77.4%) reported improved sleep when VVR was used [T2B; intercountry range 70.8% to 82.5%]. Of those, 693 participants (45.8%) reported that their sleep quality "much improved" and 478 respondents (31.6%) reported that their sleep "improved". In all countries except France, the most frequently chosen answer was "much improved" (see Table 5).

Impact of VVR use on sleep was also surveyed by specific statements (see Figure 1) that had to be answered using a 5-point Likert scale ranging from "strongly agree" to "strongly disagree". Results are shown in Table 6, where T2B scores and 95% Wilson Score confidence intervals are indicated.

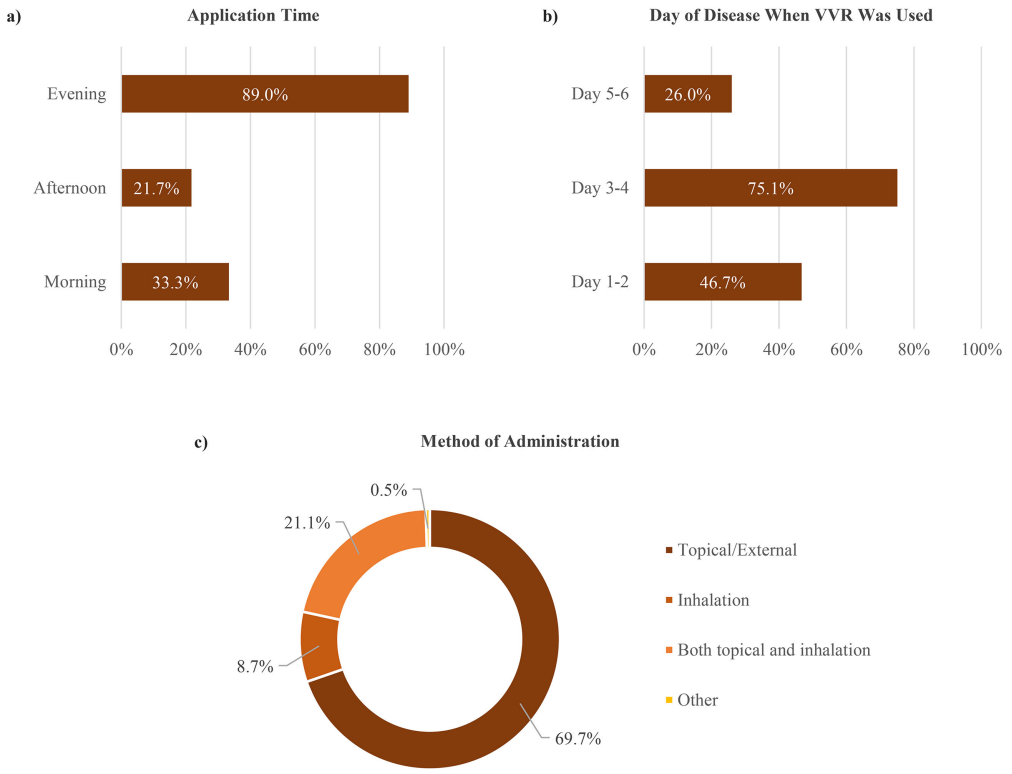

Figure 3. VVR treatment habits in the total population. a) Application time of VVR; b) day of disease when VVR was used; c) method of VVR administration in the total population. All data are shown as mean percentages.

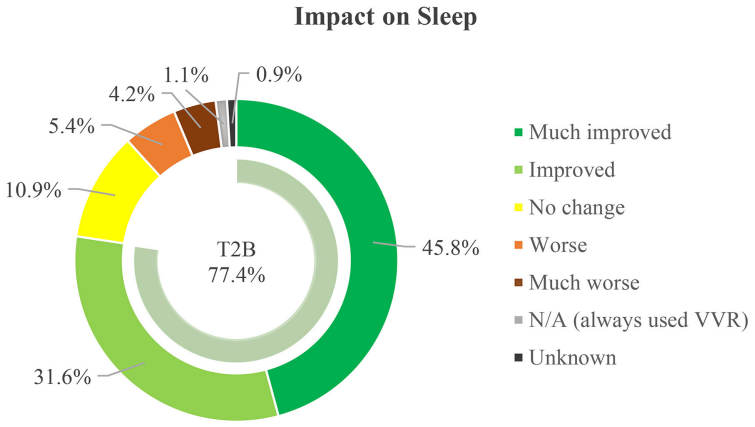

Figure 4. Impact of VVR use on sleep quality in the total population. Difference in sleep quality perception when VVR was added to the treatment regimen vs. without VVR as part of the regimen is shown. Mean percentage is indicated. T2B refers to the Top 2 Box score, the percentages associated with the top 2 scale responses ("much improved" and "improved").

In total, 86.4% (T2B; 95% CI, 84.4%, 88.2%) of cold sufferers agreed that VVR provided the additional benefit of a better solution for the night (statement 12). Of note, this statement was surveyed in all countries except Poland and had lower national T2B scores in Germany (84.4%) and France (84.2%). An equal

Table 5. Direct impact on sleep through treatment with VVR plus other cold treatment compared to no VVR treatment as part of the regimen.

	Total	Germany	France	UK	Spain	Poland
BASE: total respondents	1513	301	304	300	308	300
Impact on sleep (Frequency/Percentage)						
Much improved	693 45.8%	124 41.2%	119 39.1%	136 45.3%	158 51.3%	156 52.0%
Improved	478 31.6%	89 29.6%	130 42.8%	101 33.7%	96 31.2%	62 20.7%
Total improvement as T2B (Σ much improved and improved)	1171 77.4%	213 70.8%	249 81.9%	237 79.0%	254 82.5%	218 72.7%
No change	165 10.9%	41 13.6%	30 9.9%	31 10.3%	25 8.1%	38 12.7%
Worse	82 5.4%	15 5.0%	16 5.3%	14 4.7%	17 5.5%	20 6.7%
Much worse	64 4.2%	26 8.6%	4 1.3%	11 3.7%	9 2.9%	14 4.7%
N/A (always used VVR)	17 1.1%	4 1.3%	3 1.0%	5 1.7%	1 0.3%	4 1.3%
Unknown	14 0.9%	2 0.7%	2 0.7%	2 0.7%	2 0.6%	6 2.0%

Table 6. Consumer perception regarding impact of using VVR as part of a regimen on sleep.

		Total	Germany	France	UK	Spain	Poland
BASE: total respondents		1513	301	304	300	308	300
ID & Statement (Sorted from highest to lowest T2B in total population)		**Percentage of respondents who strongly agreed or agreed (T2B)** (95% Wilson Score confidence intervals)					
12	Using VVR alongside my other cold treatment products had the following additional benefit: better solution for the night.	**86.4%** (*84.4%, 88.2%*)	**84.4%** (*79.9%, 88.0%*)	**84.2%** (*79.7%, 87.9%*)	**89.7%** (*85.7%, 92.6%*)	**87.3%** (*83.2%, 90.6%*)	**n.a.**
13	Using VVR at night helped me sleep better by relieving my cold symptoms more effectively than using my other cold treatment products alone.	**86.4%** (*84.6%, 88.0%*)	**81.7%** (*77.0%, 85.7%*)	**88.2%** (*84.0%, 91.3%*)	**85.3%** (*80.8%, 88.9%*)	**87.7%** (*83.5%, 90.9%*)	**89.0%** (*85.0%, 92.1%*)
14	Using VVR and my other cold treatment products together (at night) gave me better overall relief of my cold symptoms compared to only using one product.	**85.8%** (*83.9%, 87.5%*)	**81.0%** (*76.2%, 85.0%*)	**87.8%** (*83.6%, 91.0%*)	**88.9%** (*84.8%, 92.0%*)	**85.7%** (*81.3%, 89.1%*)	**85.7%** (*81.2%, 89.2%*)
11	I used VVR alongside my other cold treatment products as part of a regimen (versus without VVR at all) to achieve a positive impact on my sleep.	**83.9%** (*81.8%, 85.9%*)	**82.1%** (*77.3%, 86.0%*)	**83.9%** (*79.3%, 87.6%*)	**87.3%** (*83.1%, 90.6%*)	**82.5%** (*77.8%, 86.3%*)	**n.a.**
10	Using VVR alongside my other cold treatment products as part of a regimen helped me wake up refreshed the next morning.	**74.8%** (*72.5%, 76.9%*)	**70.8%** (*65.4%, 75.6%*)	**72.7%** (*67.4%, 77.4%*)	**67.7%** (*62.2%, 72.7%*)	**79.9%** (*75.0%, 84.0%*)	**82.7%** (*78.0%, 86.5%*)

total T2B score was retrieved for statement 13 related to the topic sleep + effectiveness and regarding better sleep as a result of more effective cold symptom relief by VVR (T2B, 86.4%; 95% CI, 84.6%, 88.0%). Also, the second statement related to the sleep + effectiveness topic, *i.e.*, statement 14 regarding better overall relief of cold symptoms when VVR was used at night, reached a T2B score of 85.8% (95% CI, 83.9%, 87.5%). On a national level, these two statements reached T2B scores > 85% in all countries except Germany.

Statement 11, claiming that VVR was used to achieve a positive impact on sleep, reached a national T2B score of 87.3% in the UK, but scores in the other countries surveyed, *i.e.*, Germany, France, and Spain, and overall were slightly lower (total T2B, 83.9%; 95% CI, 81.8%, 85.9%). Statement 10, regarding an impact of VVR on waking up refreshed the next morning, had the lowest total T2B score of all statements surveyed (T2B, 74.8%; 95% CI, 72.5%, 76.9%) and the largest span of national T2B scores, ranging from 67.7% (95% CI, 62.2%, 72.7%) in the UK to 82.7% (95% CI, 78.0%, 86.5%) in Poland.

3.5. Consumers Perceived Using VVR with Other Cold Remedies as Part of a Regimen as Satisfying and Highly Effective in Relieving Cold Symptoms and Providing a Free Breathing Sensation

Apart from its impact on sleep, we wanted to learn about consumer perception regarding effectiveness, speed of action and satisfaction of VVR treatment combined with other cold remedies as part of a treatment regimen. This was surveyed by specific statements that had to be answered using a 5-point Likert scale ranging from "strongly agree" to "strongly disagree".

All statements except for those concerning the topics of sleep and sleep + effectiveness, are summarised in Table 7. These thirteen statements reached total T2B scores ≥ 81.8%. The statements with the highest total level of agreement were statement 18 with a T2B of 88.3% (95% CI, 86.6%, 89.8%), claiming that the respondent would recommend the addition of VVR to the existing cold treatment to family or friends, followed by statement 1 (T2B, 87.9%; 95% CI, 86.2%, 89.5%), concerning the effectiveness of VVR in relieving cold symptoms as part of a regimen, and statement 4 (T2B, 87.6%; 95% CI, 85.9%, 89.2%), claiming the additional benefit of a free breathing sensation. These top three statements also reached national T2B scores > 85% in all five countries surveyed.

In total, more than 87.6% of cold sufferers (95% CI, 85.8%, 89.1%) agreed that they would use VVR again alongside other cold treatment products. National T2B scores ≥ 85.7% for this statement (statement 17) were retrieved from all countries except France (T2B, 82.9%; 95% CI, 78.3%, 86.7%). Statement 5, claiming an additional benefit of VVR for better relief was agreed by a total of 86.2% of cold sufferers (95% CI, 84.4%, 87.8%), national T2B scores ranged from 83.3% in the UK (95% CI, 78.7%, 87.1%) to 90.3% in Poland (95% CI, 86.5%, 93.2%).

Statements 2 and 3, regarding use of VVR alongside to other cold treatment products to achieve better symptom relief, and a more complete relief, respectively,

Table 7. Consumer perception on using VVR with other cold remedies as part of a regimen.

		Total	Germany	France	UK	Spain	Poland
	BASE: total respondents	1513	301	304	300	308	300
	ID & Statement (Sorted from highest to lowest T2B in total population)	**Percentage of respondents who strongly agreed or agreed (T2B)** (95% Wilson Score confidence intervals)					
18	I would recommend to family or friends adding VVR to their existing cold treatments, should they experience cold symptoms.	**88.3%** (*86.6%, 89.8%*)	**86.4%** (*82.0%, 89.8%*)	**85.9%** (*81.5%, 89.3%*)	**88.7%** (*84.6%, 91.8%*)	**88.6%** (*84.6%, 91.7%*)	**92.0%** (*88.4%, 94.6%*)
1	The combination of VVR in addition to the other cold treatment products was effective in relieving my cold symptoms as part of a regimen.	**87.9%** (*86.2%, 89.5%*)	**85.4%** (*80.9%, 88.9%*)	**85.9%** (*81.5%, 89.3%*)	**88.0%** (*83.8%, 91.2%*)	**90.3%** (*86.4%, 93.1%*)	**90.0%** (*86.1%, 92.9%*)
4	Using VVR alongside my other cold treatment products had the following additional benefit: a free breathing sensation.	**87.6%** (*85.9%, 89.2%*)	**88.0%** (*83.9%, 91.2%*)	**85.2%** (*80.8%, 88.7%*)	**86.7%** (*82.4%, 90.1%*)	**85.1%** (*80.7%, 88.6%*)	**93.3%** (*89.9%, 95.6%*)
17	During my next cold I would use VVR alongside my other cold treatment products again to treat my symptoms.	**87.6%** (*85.8%, 89.1%*)	**85.7%** (*81.3%, 89.2%*)	**82.9%** (*78.3%, 86.7%*)	**91.0%** (*87.2%, 93.7%*)	**88.0%** (*83.9%, 91.2%*)	**90.3%** (*86.5%, 93.2%*)
5	Using VVR alongside my other cold treatment products had the following additional benefit: better relief.	**86.2%** (*84.4%, 87.8%*)	**84.7%** (*80.2%, 88.3%*)	**85.9%** (*81.5%, 89.3%*)	**83.3%** (*78.7%, 87.1%*)	**86.7%** (*82.4%, 90.0%*)	**90.3%** (*86.5%, 93.2%*)
2	I used VVR alongside my other cold treatment products as part of a regimen (versus without VVR at all) to achieve better symptom relief.	**86.1%** (*84.1%, 87.7%*)	**82.1%** (*77.3%, 86.0%*)	**80.9%** (*76.1%, 84.9%*)	**88.3%** (*84.2%, 91.5%*)	**86.7%** (*82.4%, 90.0%*)	**92.3%** (*88.8%, 94.8%*)
3	I used VVR alongside my other cold treatment products as part of a regimen (versus without VVR at all) to achieve more complete relief.	**85.7%** (*83.8%, 87.3%*)	**80.7%** (*75.9%, 84.8%*)	**84.9%** (*80.4%, 88.5%*)	**85.3%** (*80.9%, 88.9%*)	**85.1%** (*80.7%, 88.6%*)	**92.3%** (*88.8%, 94.8%*)
7	The addition of VVR to my other cold product treatments provided better cold symptom relief compared to previous colds when I have used these products without VVR.	**84.7%** (*82.8%, 86.5%*)	**80.3%** (*75.5%, 84.4%*)	**87.7%** (*83.6%, 91.0%*)	**80.1%** (*75.2%, 84.3%*)	**87.3%** (*83.2%, 90.6%*)	**88.0%** (*83.8%, 91.2%*)
15	I used VVR alongside my other cold treatment products as part of a regimen (versus without VVR at all) to achieve faster symptom relief.	**84.7%** (*82.8%, 86.5%*)	**82.7%** (*78.0%, 86.6%*)	**82.2%** (*77.5%, 86.1%*)	**85.0%** (*80.5%, 88.6%*)	**84.7%** (*80.3%, 88.3%*)	**89.0%** (*85.0%, 92.1%*)
8	Using VVR (applied as a topical rub) and my other cold treatment products (swallowed/ sprayed), as part of a regimen allowed me to better treat the cold symptoms I experienced because of the different modes of use.	**84.6%** (*82.7%, 86.3%*)	**83.2%** (*78.6%, 87.0%*)	**83.6%** (*79.0%, 87.3%*)	**82.9%** (*78.3%, 86.8%*)	**85.0%** (*80.6%, 88.6%*)	**88.3%** (*84.2%, 91.5%*)
16	Using VVR alongside my other cold treatment products had the following additional benefit: fast onset of action or symptom relief.	**84.6%** (*82.7%, 86.3%*)	**80.1%** (*75.2%, 84.2%*)	**87.5%** (*83.3%, 90.8%*)	**80.0%** (*75.1%, 84.1%*)	**84.1%** (*79.6%, 87.8%*)	**91.3%** (*87.6%, 94.0%*)
6	Using VVR alongside my other cold treatment products had the following additional benefit: sensorial relief.	**82.0%** (*80.0%, 83.9%*)	**74.1%** (*68.9%, 78.7%*)	**81.9%** (*77.2%, 85.8%*)	**80.7%** (*75.8%, 84.7%*)	**87.0%** (*82.8%, 90.3%*)	**86.3%** (*82.0%, 89.8%*)
9	I used VVR at night, and my other cold treatment products during the day to achieve better relief of the cold symptoms I experienced compared to other cold products I have used before.	**81.8%** (*79.8%, 83.7%*)	**78.0%** (*73.0%, 82.3%*)	**82.8%** (*78.1%, 86.6%*)	**77.6%** (*72.5%, 82.0%*)	**85.7%** (*81.3%, 89.1%*)	**84.9%** (*80.5%, 88.6%*)

reached a total T2B of 86.1% (95% CI, 84.1%, 87.7%) and 85.7% (95% CI, 83.8%, 87.3%) and T2B scores > 85% in all countries except Germany and the UK with T2Bs of 82.1% and 80.9% for better symptom relief and 80.7% and 84.9% for more complete relief.

The remaining statements, *i.e.*, 6 - 9, 15 and 16, including both statements on speed of action and four of nine statements regarding effectiveness, reached total T2B scores between 81.8% and 84.7%. Interestingly, in Poland, all questions surveyed except statement 9 concerning the topic of effectiveness and statement 10 concerning the topic of sleep (see **Table 6** and **Table 7**) reached a T2B score > 85%. Although being ranked third-last overall, statement 16 regarding the additional benefit of fast onset of action or symptom relief reached a national T2B score of 91.3% (95% CI, 87.6%, 94.0%) in Poland, which is within the top five of all national T2B scores reported.

4. Discussion

This survey of 1513 participants across five European countries generated data on participant's beliefs and habits for using VVR and its perceived benefit in addition to other cough & cold treatments.

4.1. Combining VVR with Other Treatments & Usage Time

The results indicate that VVR is commonly combined with other cold medicines to treat symptoms (approx. 97%). Country-specific differences offer new insights into consumer perception on using VVR with other cold treatments: France, UK, and Spain combine VVR mainly with paracetamol. Paracetamol is one of the most used drugs for relief of pain and fever—both symptoms typically associated with a common cold [22] [23]. It is also frequently included in combination products [24].

MSR products are particularly popular in Germany and Poland, according to our results. A survey of 1000 people conducted by the German Medicines Manufacturer's Association in 2020 found that 77% of participants say that fixed combination products have always or most of the time helped them. When asked why they took fixed combination products, 57% of the respondents said that they had chosen a MSR preparation because they had previous good experiences with them [25].

The questionnaire used in our study did not specify or restrict MSR to double, triple, quadruple, etc. combination medicines. MSR medicines containing up to four or more active ingredients aim to relieve the various coexisting cold symptoms simultaneously. Dual combination treatments, such as the combination of an analgesic with a decongestant, are the most common MSR medicines for common cold treatment. Triple oral antihistamine-decongestant-analgesic combinations are preferentially used at night-time since first-generation antihistamines cause drowsiness which might aid sleep [14].

There is a bidirectional relationship between sleep and immunity [26]. Short

sleep duration is associated with lower resistance to rhinovirus infection [27]. Sleep affects immune parameters and is crucial for optimal immune competence [26]. Cold symptoms are experienced as more bothersome during the night, due to lack of distractions. Laying down also allows mucus to accumulate in the throat or sinuses, leading to coughing, nasal congestion and restless nights. In addition, immune system activity and resulting inflammation (causing fever, congestion, or sore throat) have a highly circadian rhythm. The immune system is most active at night: cortisol levels are at their lowest, therefore cytokine production and the inflammation responsible for cold symptoms are less suppressed [28].

A cold or flu negatively impacts the ability to sleep well, according to 46.1% of respondents in a global poll [29]. Inability to sleep is a major concern and an important reason for cold sufferers to medicate [7] [29]. In our study, night-time use of VVR was particularly popular, probably due to the perceived better overall relief of cold symptoms, which also improved sleep quality. This correlates well with the results of a clinical study in adult patients experiencing a common cold (n = 100), where treatment with VVR chest rub led to a perceived improvement in sleep quality [16]. Similarly, Paul (2010) found that children treated with VVR slept significantly better than those who received no treatment or petrolatum control, due to symptomatic relief of nocturnal cough and congestion [30].

4.2. Frequency of VVR Use over the Course of Infection

In our survey, more than two-thirds of patients rated their nasal symptom (*i.e.*, blocked or runny nose) intensity as moderate to severe. Cough, sneezing, sore throat, and headache intensity were also experienced as moderate to severe by more than half of the participants. Although we did not examine symptom severity changes over the course of the illness, it is well known that cold symptoms usually peak within two to three days [5], with worsening nasal congestion, onset of cough and difficulty sleeping. As symptoms become increasingly bothersome, patients may be more willing to take additional medication. This might explain why VVR was more commonly used during days 3 - 4 of cold symptoms, across all five countries. Only in Poland did participants claim to use VVR at a similar frequency from days 1 to 4 of their colds. Beliefs that using VVR in combination with other OTC medicines could speed up recovery and provide quicker relief might be responsible for the decision of Polish participants to start treatment with VVR early on (data not shown). The onset of action of therapeutic ointments is instinctively expected to be faster than oral medication [31]. A rapid clinical effect of VVR was confirmed by a clinical study in patients suffering from common colds and experiencing nasal symptoms [31]. During days 5 - 6, VVR is used less often. A possible explanation could be that symptoms gradually decreased at this stage, but further information would be needed to draw firm conclusions.

4.3. Free Breathing Sensation

Our study showed that combining VVR with other cold treatments had the additional benefit of a free breathing sensation. Inhalation of camphor, eucalyptus or menthol vapour causes a subjective nasal decongestant effect, experienced as a cold sensation in the nose and the sensation of improved airflow. Interestingly, this does not correlate with any objective decongestant effect such as nasal airway resistance. It is believed that eucalyptus and menthol stimulate TRPM8 "cold" receptors (also called CMR1) served by the trigeminal nerve in the nose [32] [33]. Menthol, in particular, provides symptomatic relief from nasal congestion associated with rhinitis due to its specific interaction with a "cold air" receptor on trigeminal nerve endings in the nose [34]. VVR was shown to produce a sensation of nasal cooling within 12 seconds and nasal decongestion within 62 seconds [31].

4.4. Study Limitations & Strengths

The conducted survey aimed to investigate the consumer usage of VVR in addition to other common cold medicines but without allocation to intervention.

Study limitations include the potential for recall bias given the retrospective nature of the self-reports. The population surveyed included common cold and mild COVID-19 patients. It was not ascertained whether patients had a physician diagnosis, and no attempt was made to distinguish treatment effects, if any, from those of the underlying cause.

Differences in local practices and legal constraints on the availability of OTC medicines may have influenced responses. The availability of OTC medicines varies significantly in the studied countries. Pharmacist-only, pharmacy-only, and unrestricted consumer choice represent the main modes of availability. This will have influenced some of the responses particularly in the UK (mainly unrestricted consumer choice) and Germany (mainly pharmacy-only).

This online survey sheds light on VVR usage in combination with other cold treatments from the patient's perspective. Due to the study design, in which the role of decision-maker in the purchase of health products was crucial for inclusion, the distribution of age groups and gender is not homogeneous between countries. This, however, provided the opportunity to analyse consumer-reported outcomes in a real-world setting from the patient perspective. We therefore gained insights into patient-decision making. Symptomatic relief perceived by the individual patient is considered beneficial for wellbeing, stress reduction, and sleep quality. Future research should be conducted to confirm our results in a prospective observational study.

5. Conclusions

This multi-national European retrospective study provides insights into how Vicks VapoRub (VVR) is used in addition to consumers' usual treatment regimens, and generated data on consumer habits and beliefs for combining VVR with other cold products.

Cold sufferers frequently used MSR products to treat their simultaneous cold symptoms. VVR was experienced as an effective treatment for relieving cold symptoms as part of a regimen. A free breathing sensation was an additional benefit of using VVR alongside other cold treatment products.

While between-country VVR use experiences differ in some respects, there are many shared aspects including:

- Using VVR alongside other cold products had the additional benefit of a free breathing sensation.
- VVR was effective in relieving multiple cold symptoms as part of a regimen.
- VVR was mainly used at night, probably because:
  - using VVR at night helped cold sufferers sleep better by relieving cold symptoms more effectively than using other cold products alone;
  - using VVR and other cold treatment products together at night gave a better overall relief of cold symptoms than using only one product.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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