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ORIGINAL RESEARCH

Perceptions of Risk, Benefit and Trust - A Comparative Assessment Between Healthcare Workers and the General Public Towards 3 Medical Technologies

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Background and Objective: While there is a substantial amount of research on risk perception, there has been less focus on the way medical technologies are perceived by experts as opposed to lay individuals. We investigated the factors that may influence the risk perception of healthcare workers (HCWs) and the general public regarding 3 distinct medical technologies: magnetic resonance imaging (MRI), laser-assisted in situ keratomileusis (LASIK) and the Covid-19 vaccine.

Methods: A cross-sectional study conducted in 2021 among 2 populations: HCWs employed at a general public hospital and a sample of outpatients and individuals who are not medical professionals. The participants completed an electronic questionnaire.

Results: In total, 739 respondents were included: 197 HCWs (26.7%) and 542 members of the public (73.3%). Most of the respondents (89.4%) reported being vaccinated against Covid-19, 43.8% had previously undergone an MRI but 90% had not undergone LASIK. Overall, all 3 technologies assessed in the study were rated by the respondents as having a high benefit and low risk. HCWs and the public showed statistically significant differences in perceived risk towards MRI and LASIK, as well as in some of the risk perception characteristics of each technology. In contrast, no differences in risk perception towards the Covid-19 vaccine were found between HCWs and the public. Both study populations showed a significant negative correlation between trust in the MoH and the perceived risk towards MRI and the Covid-19 vaccine. Both study populations regarded information provided by medical sources as the most reliable for decision-making.

Conclusion: The perceptions and concerns towards medical technologies influence individuals' behavior and acceptance of technologies. They are also essential for risk communication. The study contributes to the understanding of attitudes towards various medical technologies, including risk perception, risk characteristics, trust and sources of information pertaining to each of the technologies, by examining the differences between HCWs and the general public.

Keywords: healthcare workers, medical technologies, risk perception. trust, information source

Introduction

Innovative medical technologies have a significant impact on medical staff, patients, and the entire healthcare system. Generally, there is a prevailing enthusiasm for innovation and an anticipation for added advantages. At the same time, concerns and perceptions of patients and healthcare workers (HCWs) may impede the adoption and utilization of the technology. Different factors, such as perceived risk and benefit, and characteristics of the technology and the user, can influence the perceptions of medical technologies. The Covid-19 pandemic illustrated the importance of considering not only the effectiveness and safety of a new technology, namely the Covid-19 vaccine, but also individuals' own fears and perceptions. Understanding and addressing these concerns were crucial in overcoming hesitancy and promoting widespread immunization. Uniquely, this research examines personal perceptions of HCWs and the public towards medical technologies.

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Understanding risk perceptions associated with medical technologies is important given its influence on individuals' behavior and their willingness to accept and use the technology.[1] It is also essential for effective risk communication.[2] Many studies conducted over the years have investigated the various factors influencing the evaluation and perception of health risks by individuals. The psychometric paradigm has elucidated variations in perceptions of different risks and investigated factors associated with risk characteristics, such as severity, familiarity, freedom to choose the technology, and uncertainty.[1,3] Other studies have suggested that personal factors related to the "perceiver", such as demographic characteristics, knowledge, trust, worldview and belief, may also play a role.[1,4]

The rapid advancement of technology has led to the implementation and utilization of new technologies in the health system. However, comprehensive knowledge about potential health risks associated with their use sometimes remains limited, potentially influencing risk perceptions towards these technologies. Psychometric studies have indicated that activities or technologies are viewed as having greater risk when they are novel, relatively unknown, uncontrollable, or involuntary.[5–7] Greater uncertainty and a lack of scientific knowledge about a risk contribute to an elevated perception of that risk.[8,9] Moreover, technologies and behaviors that are perceived as having greater risk are associated with lower acceptance, whereas those with greater perceived benefits are more likely to be accepted.[10] A more comprehensive understanding of the mechanisms underlying a particular hazard allows more accurate assessments of the involved risk.[1] While the evaluation of risks and benefits is pivotal in deciding whether to accept or reject a certain medical technology or intervention, individuals, including HCWs, often lack accurate knowledge of the risk/benefit.[11] In the absence of knowledge, trust in authorities and experts becomes integral to assessing the benefits and the risks associated with the technology, potentially influencing its acceptance.[12] Several studies have found a negative correlation between trust and the perceived risk of technologies.[13,14] For example, individuals' trust in the government and in medical organizations/professions affected their health behavior and willingness to receive vaccinations for influenza and Covid-19.[15,16] Trust can also be extended to the sources of information that individuals rely on in relation to various risks,[17] and which sources can be considered reliable for communicating such risks.

It is essential to understand the perceptions of HCWs and the public regarding the risks and benefits associated with medicine and the use of medical technologies.[18] Patients' treatment choices, acceptance of vaccines or other medical procedures and compliance with treatment regimens are likely to be influenced by their perceptions of risks and benefits.[18,19] Both HCWs and patients may overestimate the benefits or underestimate the risks of tests, treatments, or procedures, potentially resulting in overutilization of some technologies if they are perceived to be safer than they are.[20] Conversely, they may overestimate the risk of a technology and refrain from using it even if it is essential for their health.[18,19,21] Therefore, understanding risk perception is crucial for effective risk communication and patient education. It can correct misconceptions among both HCWs and the public, reinforcing accurate beliefs.[22] This, in turn, serves to close the gap between their existing knowledge or perceived understanding of a risk and the necessary information, facilitating well-informed decisions.

As experts are more likely to have greater knowledge about risks due to their training and experience, lay people and experts often differ in their perceptions of the risks and benefits of various technologies.[17] Several reasons were proposed to explain the difference between experts and the public in terms of their perception of risk level. These include different risk definitions, where experts prioritize the probability of risk whereas the public tends to focus on consequences, perceived control, familiarity, professional roles, trust in industry, and authority.[23]

While there is a substantial amount of research on risk perception, there has been less focus on the way medical technologies are perceived by experts as opposed to lay individuals. In this study we investigated the factors that may influence the risk perception of "experts" (represented by HCWs) and "lay individuals" (the general public) regarding 3 distinct medical technologies that are utilized in the healthcare system, but still have limited accurate knowledge about potential health risks associated with their use: magnetic resonance imaging (MRI), laser-assisted in situ keratomileusis (LASIK)[24] and the Covid-19 vaccine - in terms of their indication, level of necessity and extent of patient freedom in choosing to use the technology. These technologies also represent different perspectives of health interventions: MRI is used for immediate diagnosis, LASIK is an invasive therapeutic intervention with short-term benefits, and vaccines are a means of promoting long-term health. Examining personal attitudes and perceptions towards these technologies among HCWs compared to the general public has not been reported in the literature to the best of our knowledge. Since our

study was conducted only 3 months after the beginning of the national Covid-19 vaccination campaign, when available information on the effectiveness and safety of the Covid-19 vaccine, including its adverse effects was scarce, it was a unique opportunity to compare perceptions towards the new vaccine with two technologies that have different levels of innovation: MRI which is an established and well-known technology and LASIK which is a technology with a specific and narrow specialization intended for a more limited target population. This comparative examination, is innovative and important for the existing research information on the Covid-19 vaccine.

Materials and Methods

Setting and Participants

The study was a cross-sectional survey that included 2 populations. The first consisted of HCWs employed at a general, government-run, public 900-bed hospital located in central Israel. The study questionnaire was distributed via Email to a distribution list consisting of 690 physicians, 1120 nurses, 30 radiology technicians and 800 management and administration professionals. The second population comprised a sample of individuals from the public. These participants were recruited to the study through 2 methods: (1) via Email using the snowball method and (2) by selecting a random sample of 600 ambulatory patients out of a total of 6041 who visited the outpatient clinics at the Medical Center for consultation for chronic conditions between 1.1.21–31.3.21. Therefore, they represent the general public rather than individuals with acute medical conditions. The selected patients were contacted by phone and interviewed in their native language (Hebrew or Arabic). The survey was distributed in March 2021. The questionnaires were completed by the respondents in a manner that assured anonymity. The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Ethics Committee of Shamir Medical Center (approval number ASF-0039-21, 9 February 2021). Informed consent was obtained from all subjects involved in the study.

Study Tool

The study team developed the electronic questionnaire by drawing upon a literature review on risk perception, particularly according to the psychometric paradigm.[3,25,26] The initial questionnaire was completed by 15 respondents and some of the items were modified after receiving their feedback. The final questionnaire consisted of 6 sections: (1) Risk perception and risk characteristics relating to MRI, LASIK and the Covid-19 vaccine. (2) Trust in the Ministry of Health (MoH)'s evaluation of the technology. (3) Effect of information sources on decision-making. (4) Health and environmental accountability. (5) Experience in utilizing or undergoing procedures with the 3 technologies (6) Sociodemographic questions (age, gender, marital status, number of children, education, profession, nationality, level of religiosity, and income level). The participants were also asked to rate their health. Most of the questions were on a 10-point Likert scale from 1 (to a very small extent) to 10 (to a very large extent).

Statistical Analysis

Statistical analysis was performed using SPSS version 28. The study populations' characteristics and variables were summarized using descriptive statistics. The Kolmogorov–Smirnov test was used to determine whether the research variables were normally distributed. Since the risk perception variable was not normally distributed, a non-parametric test was used. The Mann–Whitney *U*-test was used to compare HCWs and the public within each technology. Spearman correlations were performed to determine the correlation between independent variables and the perceived risk associated with the technologies. To create a general trust variable, a mean value was calculated for 5 items relating to trust in the MoH (Cronbach's alpha=0.938). A p-value lower than 0.05 was considered statistically significant.

Results

The study population included 739 respondents: 197 HCWs (26.7%) and 542 members of the public (73.3%). The response rate was 197/2640 (11.9%) among HCWs and 203/600 (33.8%) among outpatients. A total of 339 participants answered the survey using the snowball method (due to the nature of questionnaire dissemination, it was not possible to measure the response rate of this subpopulation).

Sociodemographic Characteristics of the Study Population

The participants' sociodemographic characteristics are summarized in Table 1. The participants' mean age was 44.4 ± 14.9 years (range: 18–81). Two-thirds of respondents were women (65.8%), and most (75.1%) were married or living together with a partner. Most participants (69.9%) had an academic education. The mean level of income was 6.1 ± 2.3 (out of a possible 10). Most of the respondents (89.3%) reported being vaccinated against Covid-19 and 43.8% of them had previously undergone an MRI examination. Most of the respondents (90%) reported that they had not undergone LASIK. The population of HCWs was statistically significantly older than the population comprising members of the public, had a greater percentage of women, a higher percentage of individuals that were married or living with a partner, fewer children on average, a higher percentage of secular individuals, a higher percentage of Jewish respondents, and a higher mean level of income (Table 1).

Table 1 Respondents' Sociodemographic Characteristics and Experience in Using the Technologies

Characteristic	HCWs N=197	Public N=542	All N=739	P value
Age, years, mean (SD)	46.2 (12.1)	43.7 (15.6)	44.4 (14.9)	<0.001
Gender, n (%)				
Male	51 (25.9%)	202 (37.3%)	253 (34.2%)	0.002
Female	146 (74.1%)	340 (62.7%)	486 (65.8%)	
Marital status, n (%)				<0.001
Married/living with a partner	163 (83.6%)	385(72%)	548 (75.1%)	
Single	16 (8.2%)	101 (18.9%)	117 (16%)	
Divorced	15 (7.7%)	29 (5.4%)	44 (6%)	
Widowed	1 (0.5%)	20 (3.7%)	21 (2.9%)	
Number of children, mean (SD)	2.3 (1.3)	3.0 (1.8)	2.8 (1.7)	<0.001
Religion, n (%)				<0.001
Jewish	174 (88.3%)	436 (80.4%)	610 (82.5%)	
Moslem	14 (7.1%)	85 (15.7%)	99 (13.4%)	
Christian	3 (1.5%)	20 (3.7%)	23 (3.1%)	
Other	6 (3%)	1 (0.2%)	7 (0.9%)	
Religiosity, n (%)				<0.001
Secular	123 (62.8%)	165 (35.9%)	288 (43.9%)	
Traditional	45 (23.0%)	107 (23.3%)	152 (23.2%)	
Religious	28 (14.3%)	169 (36.7%)	197 (30.0%)	
Orthodox-Jewish	0	19 (4.1%)	19 (2.9%)	
Education, n (%)				<0.001
Elementary School/High School	1 (0.5%)	134 (24.8%)	135 (18.3%)	
Higher education (non-academic)	7(3.6%)	80 (14.8%)	87 (11.8%)	
Bachelor's degree	59 (29.9%)	195 (36.1%)	254 (34.5%)	
Master's degree or higher	130 (66%)	131 (24.3%)	261 (35.4%)	
Profession, n (%)				
Physician	87 (11.8%)	NA	NA	
Nurse	110 (14.9%)			
Income, mean* (SD)	6.9 (1.5)	5.8 (2.5)	6.1 (2.3)	<0.001
Reported perceived health status, mean (SD)**	8.22 (1.28)	7.99 (1.77)	8.05 (1.66)	0.47
Received the Covid-19 vaccine	189 (95.9%)	471 (86.9%)	660 (89.3%)	<0.001
Had an MRI exam	89 (45.2%)	235 (43.4%)	324 (43.8%)	0.3
Had LASIK surgery	19 (9.6%)	55 (10.1%)	74 (10%)	0.4

Notes: *On a scale of 1 (very low) to 10 (very high). **On a scale of 1 (not good) to 10 (very good).
Abbreviations: HCWs, healthcare workers; LASIK, Laser-assisted in situ keratomileusis; MRI, magnetic resonance imaging; SD, standard deviation.

Risk Perception and Perceived Risk Characteristics

The differences between HCWs and the public in technology-related perceived risk and risk perception characteristics are shown in Table 2. Significant differences between HCWs and the public were found regarding the perceived risk and most risk characteristics of LASIK. HCWs perceived the health risk of LASIK significantly higher compared to the public. They also perceived lower knowledge of doctors regarding the technology, less freedom to choose LASIK technology and less trust the MOH's evaluation of the extent of risk regarding LASIK. The perceived risk, perceived benefit and perceived severity of health risk involved with MRI was higher among the public compared to HCWs. The public's perceived severity of health risk involved with Covid-19 vaccines was also higher than that of HCWs, whereas HCWs' perceived the benefit from Covid-19 vaccines higher than the benefit perceived by the public. HCW's subjective knowledge about the health risk of each of the 3 technologies and their familiarity was statistically significantly higher than that of the public.

The results shown in Table 3 demonstrate statistically significant correlations between most risk characteristics and the perception of risk of each of the technologies. These correlations were also tested separately for each population group. The correlation pattern among the groups was similar for all variables except for subjective knowledge. Among HCWs, a statistically significant negative correlation was observed between subjective knowledge and risk perception (r [540]=−.320, p<0.001), while among the public no such correlation was found. The difference between the correlations in the 2 population groups was statistically significantly different (z=3.3036, p=0.001). In contrast, among the public,

Table 2 Differences Between HCWs and the General Public in Technology-Related Perceived Risk and Risk Perception Characteristics

Characteristic	HCWs N=197 Mean (SD)	Mean Rank	Public N=542 Mean (SD)	Mean Rank	Z	p-value
Covid-19 vaccine						
Risk perception	3.16 (2.20)	383.65	3.14 (2.38)	365.04	1.071	0.284
Benefit	9.45 (1.22)	407.63	8.90 (1.99)	356.32	3.395	<0.001
Subjective knowledge	7.07 (2.19)	467.7	5.38 (2.72)	334.49	7.548	<0.001
Familiarity	6.07 (2.41)	407.81	5.42 (2.66)	356.26	2.922	0.003
Severity	3.85 (1.95)	322.27	4.79 (2.75)	386.05	3.631	<0.001
Perceived objective scientific knowledge	6.36 (2.17)	354.84	6.54 (2.42)	375.51	1.174	0.24
Freedom to choose the technology	8.37 (2.25)	355.18	8.27 (2.69)	374.04	1.15	0.25
Trust in healthcare providers' evaluation	7.51 (2.08)	366.9	7.36 (2.52)	370.45	0.203	0.839
MRI						
Risk perception	2.49 (2.04)	305.18	3.27 (2.17)	393.56	5.089	<0.001
Benefit	8.04 (2.51)	288	9.27 (1.36)	399.8	7.071	<0.001
Subjective knowledge	7.39 (2.43)	495.34	4.99 (2.91)	324.44	9.676	<0.001
Familiarity	7.52 (2.46)	459.21	5.97 (2.80)	336.83	6.949	<0.001
Severity	3.02 (2.04)	260.79	4.82 (2.64)	409.69	8.462	<0.001
Perceived objective scientific knowledge	8.30 (1.91)	340.66	8.67 (1.61)	380.66	2.343	0.019
Freedom to choose the technology	8.50 (2.32)	367.01	8.67 (2.00)	371.09	0.246	0.805
Trust in healthcare providers' evaluation	8.48 (1.70)	361.16	8.46 (1.93)	373.21	0.705	0.481
LASIK						
Risk perception	4.52 (2.07)	414.58	3.96 (2.39)	353.8	3.455	<0.001
Benefit	6.61 (2.35)	353.95	6.78 (2.65)	375.83	1.243	0.214
Subjective knowledge	5.18 (2.65)	409.88	4.50 (2.79)	354.09	3.169	0.002
Familiarity	6.38 (2.55)	422.29	5.41 (2.83)	348.84	4.174	<0.001
Severity	5.61 (2.32)	345.14	6.01 (2.82)	377.7	1.85	0.064
Perceived objective scientific knowledge	7.48 (2.23)	312.84	8.22 (2.02)	390.78	4.493	<0.001
Freedom to choose the technology	5.50 (2.74)	334.19	6.13 (2.95)	383.02	2.767	0.006
Trust in healthcare providers' evaluation	7.23 (2.11)	331.65	7.61 (2.32)	383.94	2.988	0.003

Notes: The characteristics were assessed on a 10-point Likert scale from 1 (to a very small extent) to 10 (to a very large extent).
Abbreviations: HCWs, healthcare workers; LASIK, Laser-assisted in situ keratomileusis; SD, standard deviation.

Table 3 Correlation Between Risk Characteristics and Risk Perception (n=739)

Risk Characteristic	Covid-19 Vaccine	MRI	LASIK
Benefit	−0.424***	−0.188***	−0.264***
Subjective knowledge	−0.027	−1.182***	0.179***
Familiarity	−0.115**	−0.092*	0.064
Severity	0.419***	0.479***	0.352***
Perceived objective scientific knowledge	−0.412***	−0.250***	−0.261***
Freedom to choose the technology	−0.466***	−0.343***	−0.355***
Trust in healthcare providers' evaluation	−0.438***	−0.292***	−0.253***
Trust in MoH-Total	−0.331***	−0.175***	−197***

Note: *p<0.05 **p<0.01 ***p<0.001.
Abbreviations: LASIK, Laser-assisted in situ keratomileusis; MRI, magnetic resonance imaging.

a statistically significant positive correlation was observed between subjective knowledge and risk perception (r[538] =.240, p<0.001), while no correlation was found between these variables among HCWs (Table 3). The difference between the correlations in the 2 population groups was statistically significantly different (z=2.026, p=0.043)).

Statistically significant negative correlations were found between trust in the MoH and the perceived risk towards each of the technologies. These correlations were also tested separately for each population group, but a statistically significant difference between HCWs and the public was observed only for LASIK (z=2.086, p=0.037). Among HCWS no correlation was found between trust in the MoH and the perceived risk towards LASIK, while among the public a statistically significant negative correlation was found (r[540]=−.240, p<0.001).

Influence of Information Source

Recommendation from a medical source was given the highest score for decision-making followed by personal experience, information from scientific articles and family/friends, media and recommendation from religious leaders. As shown in Figure 1, HCWs rated recommendation from a medical source the highest among all information sources for making decisions, followed by scientific articles and personal experience. Members of the public also rated recommendations from a medical source the highest, but gave higher scores to information from family or friends and personal experience than information from scientific articles. Recommendations from a religious leader or an authority figure were given the lowest score by both study populations.

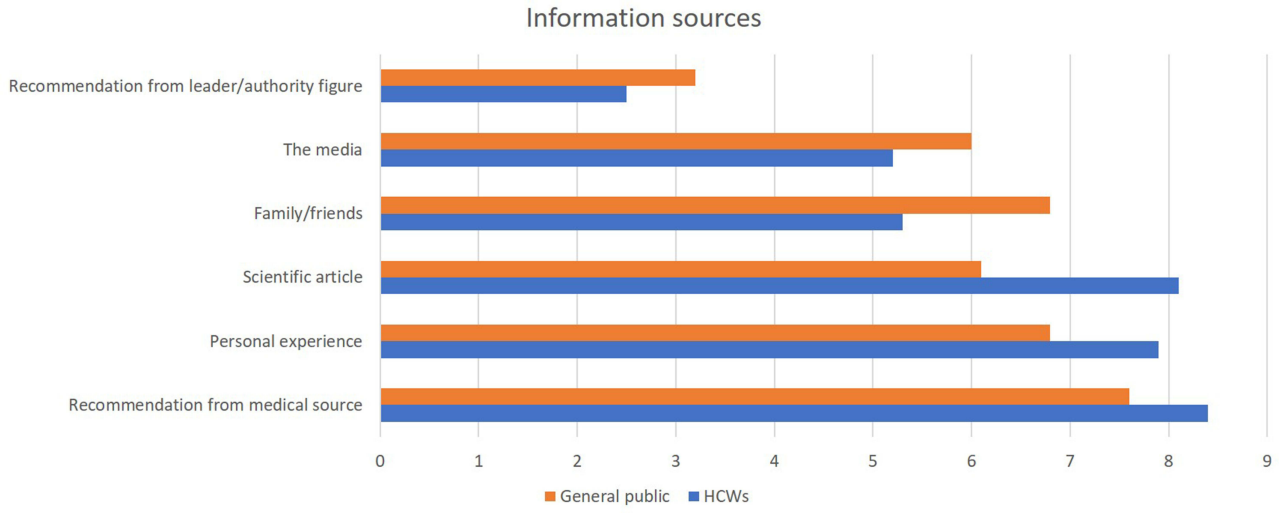

Figure 1 Influence of information sources on decision making of HCWs and the public. Significant differences between HCWs and general public. P<0.001 (Recommendations from a religious leader or an authority figure: p=0.02).

Table 4 Correlation Between Information Sources and Risk Perception (n=739)

Information Sources	Covid-19 Vaccine	MRI	LASIK
Family/Friends	−0.026	0.037	−0.131***
Personal experience	0.001	−0.130***	−0.012
The media	−0.062	0.043	−0.114**
Scientific articles	0.003	−0.143***	0.052
Recommendation from medical source	−0.151***	−0.249***	−0.022
Recommendations from a religious leader/authority figure	0.096	0.143***	0.131***

Note: **p<0.01 ***p<0.001.
Abbreviations: LASIK, Laser-assisted in situ keratomileusis; MRI, magnetic resonance imaging.

The use of recommendations from medical sources for decision-making was negatively and significantly correlated with the perceived risk towards the Covid-19 vaccine (Table 4). The use of recommendations from medical sources and family or friends, and the use of information from scientific articles were all negatively and significantly correlated with the perceived risk towards MRI. Similarly, information from family/ friends and from the media were negatively and positively correlated with the perceived risk towards LASIK. The perceived risk towards MRI and LASIK were both positively correlated with recommendations from a religious leader or an authority figure.

Effect of Gender on Risk Perception

A statistically significant difference in risk perception of the Covid-19 vaccine and LASIK was found between men and women (z=−2823, p=0.005, and z= −2.299, p=0.022, respectively). Specifically, risk perception was higher among women compared to men.

Effect of Willingness to Get Vaccinated Against Influenza and Risk Perception

A statistically significant negative correlation was found between willingness to get vaccinated against influenza and perceived risk towards the Covid-19 vaccine (r[736]=−.195, p<0.001) and MRI (r[736]=−.126, p<0.001).

Discussion

The results of the study provide a broad overview of the risk perception of HCWs and the public towards different medical technologies including risk characteristics (perceived benefit, severity, familiarity, freedom of choice and scientific knowledge), trust and information sources. Despite a large number of studies done on risk perception, including studies that examined risk perceptions toward various risks including drugs, medical procedures and technologies, and non-medical risks,[19,25] the research is unique in examining and focusing on attitudes and risk perceptions towards various medical technologies, including a new vaccine. A comparative examination of the attitudes towards the Covid-19 vaccine compared to new medical technologies, is innovative and important for the existing research information on the vaccine. Especially due to the fact that the study was conducted only 3 months after the beginning of the Israeli national vaccination campaign, when available information on the effectiveness and safety of the vaccine, including its adverse effects were limited.

Overall, all 3 technologies assessed in the study were rated by the respondents as having a high benefit and low risk. This finding corroborates previous studies on perceived risk-benefit, where technologies that were viewed as beneficial were associated with lower perceived risks than technologies that were not considered beneficial.[11] Surveys conducted in several countries demonstrated that the public generally viewed medications and/or medical devices as having high benefits and low risks.[19,22,25]

Differences Between HCWs and the General Public in Perceived Risk and Risk Perception Characteristics Related to the Technologies

HCWs and the general public showed statistically significant differences in perceived risk towards MRI and LASIK, as well as in some of the risk perception characteristics of each technology. In contrast, no differences in risk perception

towards the Covid-19 vaccine were found between HCWs and the general public. These results are in line with previous studies on other hazards or technologies which also found differences and similarities in experts' and laypeople's risk perceptions.[17,25] As expected, HCWs' subjective knowledge of the technologies' health risks and their familiarity was significantly higher than those of the general public. Their confidence in their perceived knowledge and familiarity with possible risks pertaining to the use of the 3 medical technologies can be explained by their profession, as physicians and nurses are more familiar with medical technologies and generally more aware of risks emerging during treatment. It should be noted that HCWs' subjective knowledge does not necessarily reflect their actual knowledge. Research has shown that people overestimate their knowledge even in contexts in which they are not professionally engaged.[27] Therefore, although we made an effort to estimate the respondents' objective knowledge, we refer to their perceived knowledge. The perceived health risk of LASIK was rated higher by HCWs compared to the public. In addition, the perceived extent of knowledge that doctors have about this risk, the extent of freedom of choice and perceived trust in healthcare providers' evaluation of the risk were all rated lower by HCWs compared to the public. These results indicate that HCWs have lower confidence in LASIK compared to the other technologies. This may be explained by the nature of the technology as an invasive surgery and its level of necessity. Individuals often undergo LASIK for aesthetic purposes rather than medical ones, therefore, the medical necessity for undergoing such surgery is relatively low. Additionally, although LASIK is one of the most performed kerato-refractive surgeries globally and there is a general agreement that it is safe and effective, the procedure is invasive, involving pain and a recovery process. Higher future risk to damage the cornea by minor trauma following the procedure was widely discussed, and in general, loss of sight is considered a remarkable disability. Indeed, it has been shown that technologies that are in prolonged or close contact with the body are regarded as having greater risk.[28]

Furthermore, although it is expected that their training and experience renders HCWs as experts who should be more familiar or knowledgeable about medical technologies, and therefore perceive them as less risky compared to the public,[29] it depends on their field of expertise.[30] It is possible that in the context of LASIK, HCWs should not be treated as knowledgeable "experts". Unlike MRI, which is a familiar technology in daily use and we can assume HCWs perceive it as having a lower risk compared to the the public, LASIK is a narrower specialty of ophthalmologists. Hence, HCWs' perceptions emerge from individual fears rather from than their professional position and knowledge. This is underscored by the fact that HCWs were asked how they personally perceive the technologies' extent of risk (rather than how they perceive the risk to their patients).

When individuals do not have information on hazards of activities or technologies, they tend to rely on assumptions or intuitive judgments that are based on simplified decision-making, otherwise known as heuristics.[17,31] For example, individuals may judge a technology/medical treatment as having high benefits and low risks if their feelings about it are positive, and vice versa. Accordingly, it is plausible that the greater perceived risk of LASIK compared to that of the other technologies may arise from the negative feelings related to the use of technology.

The perceived risk and benefit, and the perceived severity of health risks associated with MRI were higher among the public compared to HCWs. Used for disease detection, diagnosis, and treatment monitoring,[32] MRI is generally considered a safe technology[33] compared to diagnostic tools utilizing ionizing radiation, such as computed tomography (CT), for which the harmful effects on human health, such as DNA damage, are well established. The available data on possible health effects of MRI are not sufficient to draw any conclusions.[34] A high perceived benefit of MRI was reported in other studies and could be attributed to its non-invasive nature and wide use for diagnosis.[19] Furthermore, radiation exposure during medical interventions is generally accepted.[35] As the potential benefits associated with the exposure outweigh the accompanying risks. However, the public also perceived the technology as having a higher health risk compared to HCWs, probably because the public had limited and different knowledge than that of HCWs. Additionally, negative feelings like fear of closed places or an unpleasant personal experience can affect their risk assessment.

Interestingly, no difference was found in risk perception towards the Covid-19 vaccine between HCWs and the general public. In Israel, as of March 2021, the rate of immunization with the Pfizer-BioNTech mRNA vaccine was one of the highest in the world.[36] The current study was conducted only 3 months after the beginning of the national vaccination campaign, when available information on the effectiveness and safety of the vaccine, including its adverse effects were limited. Vaccines are usually perceived as having low risks and high benefit.[9] However, Covid-19 vaccine

hesitation was observed among both HCWs and the public, probably due to the short development time of the vaccine, and concerns about its claimed safety and effectiveness. It was suggested that when a risk is relevant and concrete, like the Covid-19 pandemic, HCWs may behave like the general population.[37] Studies on Covid-19 vaccination among HCWs demonstrated concerns about the vaccine's fast development and approval, safety, and effectiveness.[38,39] In such cases, it was suggested to treat HCWs as complex individuals with personal lives, values, and opinions that impact their attitudes, hesitancy, and behaviors towards disease prevention interventions and not only as an extension of healthcare systems.[40] At the same time, it can be assumed that as HCWs were more exposed to patients with Covid-19 and to the mortality caused by the disease, they had a higher perceived fear of the disease and higher perceived benefit of the vaccine compared to the general public.

Correlation Between Risk Characteristics and the Perception of Risk

Our analysis showed a correlation between most risk characteristics and risk perception. Characteristics such as benefit, familiarity, freedom to choose the technology, and knowledge have been previously associated with risk perception.[4] All correlation variables, except for subjective knowledge, showed similar patterns in both study populations. Among the public, higher subjective knowledge on LASIK was correlated with higher risk perception and vice versa, but no such correlation was observed among HCWs. Other studies have reported mixed findings on the relationship between subjective knowledge and risk perception.[41] The public's subjective knowledge may be influenced by the information they gather from the media or friends, which may increase their concerns or negative feelings towards LASIK. Among HCWs a statistically significant negative correlation between subjective knowledge and risk perception was found for the Covid-19 vaccine, while such correlation was not found among the public. Professionals' knowledge about health risks may decrease their risk perception.

Trust

Both study populations showed a significant negative correlation between trust in the MoH and the perceived risk towards MRI and the Covid-19 vaccine, corroborating findings of other studies.[12,28] For example, people perceive radiation-based or chemical-based medical technologies as having greater benefit and less risk compared to industrial technologies. This difference was attributed to the high level of trust in the doctors in charge of the technology, which contributes to its acceptance.[42] However, among HCWs no correlation was found between trust in the MoH and the perceived risk towards LASIK. This could be attributed to the differences in the level of personal knowledge between HCWs and the public regarding LASIK. When there is no personal knowledge about a risk, lay individuals rely on trust for judging risk-benefit. In contrast, when people were knowledgeable about risks, no significant correlations between social trust and judged risks and benefits were found,[11] therefore we assume that HCWs perceived their knowledge as adequate to assess the risks of LASIK without relying on the MoH.

Influence of Information Source

Our results showed that HCWs seek information from scientific articles regarding medical technology, which is reasonable given their professional field. Other studies that examined the use of information sources for decision-making on prescription medicines[22] and health risks[25] also reported that individuals rely more on medical sources compared to the media. Differences between HCWs and the general public in rating the information sources are also in line with the literature,[25] Both groups rated recommendation from a medical source the highest among all information sources for making decisions followed by scientific articles and personal experience for HCWs, and information from family or friends and personal experience for the public.

A negative correlation was found between relying on recommendations from medical sources for making decisions and the perceived risk towards the Covid-19 vaccine and MRI. Information from scientific articles and family/friends were also negatively correlated with the perceived risk of MRI. This emphasizes the importance of HCWs in communicating risks and minimizing hesitancy to the Covid-19 vaccine and undergoing MRI. As for LASIK, the results showed the influence of information from family/friends and the media as these were negatively correlated with the perceived risk. When evaluating technologies, lay people often use mental shortcuts (heuristics) in order to assess the frequency or

probability of an event. For example, they may have low risk perception of LASIK if they have family and friends with positive experiences with this technology.

Recommendations from a religious leader or an authoritative figure were positively correlated with the perceived risk. A possible explanation for this could be that people turn to religious leaders or authoritative figures due to a high perceived risk towards the technology. In accordance with the literature, we have found that women perceived risk higher than men.[19] A significant negative correlation was also found between individuals who tended to get vaccinated against influenza and the perceived risk towards the Covid-19 vaccine. This is also in line with other studies that reported a correlation between influenza vaccination and Covid-19 vaccine acceptance.[43,44]

Strength and Limitations

The study's strength lies in its comparative analysis of attitudes and risk perceptions towards 3 different medical technologies (MRI, LASIK and the Covid-19 vaccine) and between 2 populations in a large sample in Israel.

The study's novelty lies in examining risk perception towards 3 different medical technologies in comparison between HCWs and the general public. The study also adds to the existing knowledge about the new Covid-19 vaccine, by comparing perceptions towards the vaccine with two other medical technologies. Moreover, the study sheds light on the perceived familiarity of both - HCWs and the general public and their perceived trust in healthcare providers' evaluation of the risk. The study also has some limitations. First, the general population was represented by a convenience sample. In addition, outpatients (which also represented part of the general public in this study) and the HCWs were recruited from a single medical center. Therefore, the study results may not be generalizable to the entire Israeli population or to all HCWs. Second, due to the cross-sectional design, inferences about causality cannot be drawn. Third, although we had intended to examine objective knowledge regarding the health risk involved in the use of technologies, the respondents' answers were not satisfactory and it was not possible to gain any conclusions from them.

Conclusions

This study contributes to the understanding of the factors that influence risk perception towards various medical technologies, including risk characteristics, trust and sources of information pertaining to each of the technologies assessed by examining the differences between HCWs and the general public.

The perceptions and concerns towards medical technologies have important clinical implications as they influence individuals' behavior and acceptance of technologies affecting healthcare. They are also essential for risk communication.

Although all the medical technologies were perceived as having a high benefit and low risk, differences in perceptions between HCWs and the public were observed regarding MRI and LASIK. These differences may be attributed to the profession and knowledge gaps. Therefore, it is important to provide accurate information about the risks involved in medical technologies, which should be adapted to the population in question. HCWs must be given accurate information about the risks of MRI, including the involved radiation, to enable them to make an informed decision about themselves and their patients.

Individuals' decision to use certain medical technologies reflects their freedom of choice which was found to be correlated with risk perception.

The study also showed that HCWs may have concerns regarding the use of medical technologies, such as a new vaccine or surgical procedure, that are not necessarily related to their professional knowledge. Identifying concerns or other barriers to the use of medical technologies is especially important due to HCWs' role in influencing patients' decision-making. This influence was highlighted by the fact that both study populations regarded information provided by medical sources as the most reliable for decision-making.

Importantly, the perceived risk towards the 3 medical technologies was dramatically reduced with increased trust towards the MoH. Therefore, providing true and accurate information and strengthening trust in the MoH may also reduce perceived risk towards medical technologies, and help people make an informed decision about using them properly.

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Disclosure

The authors declare no conflicts of interest.

References

1. Siegrist M, Arvai J. Risk perception: reflections on 40 years of research. *Risk Anal*. 2020;40(S1):2191–2206. doi:10.1111/risa.13599
2. Jenkins SC, Harris AJL, Osman M. What drives risk perceptions? Revisiting public perceptions of food hazards associated with production and consumption. *J Risk Res*. 2021;1–15. doi:10.1080/13669877.2020.1871057
3. Fischhoff B, Slovic P, Lichtenstein S, Read S, Combs B. How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. *Policy Sci*. 1978;9(2):127–152. doi:10.1007/BF00143739
4. Visschers V, Siegrist M. Differences in risk perception between hazards and between individuals. In: Raue M, Lermer E, Streicher B, editors. *Psychological Perspectives on Risk and Risk Analysis: Theory, Models, and Applications*. Cham, Switzerland: Springer International Publishing AG; 2018:63–80.
5. Slovic P, Fischhoff B, Lichtenstein S. Why Study Risk Perception? *Risk Anal*. 1982;2(2):83–93. doi:10.1111/j.1539-6924.1982.tb01369.x
6. Frewer L. Public risk perceptions and risk communication. In: Bennett P, Calman K, editors. *Risk Communication and Public Health*. Oxford: Oxford University Press; 1999.
7. Li C, Li Y. Factors influencing public risk perception of emerging technologies: a meta-analysis. *Sustainability*. 2023;15(5):3939.
8. Slovic P. Perception of risk. *Science*. 1987;236(4799):280–285. doi:10.1126/science.3563507
9. Slovic P. Perception of risk: reflections on the psychometric paradigm. In: Krimsky S, Golding D, editors. *Social Theories of Risk*. Praeger; 1992:117–152.
10. Visschers VHM, Feck V, Herrmann A. Knowledge, social influences, perceived risks and benefits, and cultural values explain the public's decisions related to prudent antibiotic use. *Risk Anal*. 2022;42(7):1488–1503. doi:10.1111/risa.13851
11. Siegrist M, Cvetkovich G. Perception of hazards: the role of social trust and knowledge. *Risk Anal*. 2000;20(5):713–720. doi:10.1111/0272-4332.205064
12. Siegrist M. Trust and risk perception: a critical review of the literature. *Risk Anal*. 2021;41(3):480–490. doi:10.1111/risa.13325
13. Siegrist M. The influence of trust and perceptions of risks and benefits on the acceptance of gene technology. *Risk Anal*. 2000;20(2):195–203. doi:10.1111/0272-4332.202020
14. Siegrist M, Earle TC, Gutscher H, Keller C. Perception of mobile phone and base station risks. *Risk Anal*. 2005;25(5):1253–1264. doi:10.1111/j.1539-6924.2005.00672.x
15. Siegrist M, Luchsinger L, Bearth A. The impact of trust and risk perception on the acceptance of measures to reduce COVID-19 cases. *Risk Anal*. 2021;41(5):787–800. doi:10.1111/risa.13675
16. Joshi A, Kaur M, Kaur R, Grover A, Nash D, El-Mohandes A. Predictors of COVID-19 vaccine acceptance, intention, and hesitancy: a scoping review. *Front Public Health*. 2021;9:698111. doi:10.3389/fpubh.2021.698111
17. Savadori L, Savio S, Nicotra E, Rumiati R, Finucane M, Slovic P. Expert and public perception of risk from biotechnology. *Risk Anal*. 2004;24(5):1289–1299. doi:10.1111/j.0272-4332.2004.00526.x
18. Hanoch Y, Rolison J, Freund AM. Reaping the benefits and avoiding the risks: unrealistic optimism in the health domain. *Risk Anal*. 2019;39(4):792–804. doi:10.1111/risa.13204
19. Slovic P, Peters E, Grana J, Berger S, Dieck GS. Risk perception of prescription drugs: results of a national survey. *Drug Inf J*. 2007;41(1):81–100. doi:10.1177/009286150704100110
20. Hoffmann TC, Del Mar C. Clinicians' expectations of the benefits and harms of treatments, screening, and tests: a systematic review. *JAMA Intern Med*. 2017;177(3):407–419. doi:10.1001/jamainternmed.2016.8254
21. Vertinsky IB, Wehrung DA. Risk perception and drug safety evaluation. *Health Safe Environ*. 1991;2:181–311.
22. Balog-Way DH, Evensen D, Löfstedt RE. Pharmaceutical benefit–risk perception and age differences in the USA and Germany. *Drug Saf*. 2020;43:1141–1156.
23. Sjöberg L. Risk perception by the public and by experts: a dilemma in risk management. *Hum Ecol Rev*. 1999;6(2):1–9.
24. Lawless M, Hodge C. LASIK. *Int Ophthalmol Clin*. 2013;53(1):111–128. doi:10.1097/IIO.0b013e318271346e
25. Krewski D, Turner MC, Lemyre L, Lee JEC. Expert vs. public perception of population health risks in Canada. *J Risk Res*. 2012;15(6):601–625. doi:10.1080/13669877.2011.649297
26. Zakay D. Perceived risk in the presence of real traumatic threat: risk perception, obedient behavior and situational anxiety of Israeli youth during the Gulf War. *Megamot*. 1994;35(4):325–343.
27. Stasiuk K, Polak M, Dolinski D, Maciuszek J. The credibility of health information sources as predictors of attitudes toward vaccination-the results from a longitudinal study in Poland. *Vaccines (Basel)*. 2021;9(8):3.
28. Capon A, Gillespie J, Rolfe M, Smith W. Perceptions of risk from nanotechnologies and trust in stakeholders: a cross sectional study of public, academic, government and business attitudes. *BMC Public Health*. 2015;15:424. doi:10.1186/s12889-015-1795-1
29. Kamarulzaman NA, Lee KE, Siow KS, Mokhtar M. Public benefit and risk perceptions of nanotechnology development: psychological and sociological aspects. *Technol Soc*. 2020;62:101329. doi:10.1016/j.techsoc.2020.101329
30. Lee DH, Mehta MD, James PD. Differences in the perception of blood transfusion risk between laypeople and physicians. *Transfusion*. 2003;43(6):772–778. doi:10.1046/j.1537-2995.2003.00401.x

31. Livock KJ, Swinbourne A, McShane C, Henderson D. Storm surges: exploring the role of experience and knowledge. *Int J Disaster Risk Reduct*. 2023;93:103781. doi:10.1016/j.ijdrr.2023.103781
32. NIBIB. Magnetic Resonance Imaging (MRI). National Institute of Biomedical Imaging and Bioengineering; 2022. Available from: https://www.nibib.nih.gov/sites/default/files/2022-05/Fact-Sheet-Magnetic-Resonance-Imaging-MRI.pdf. Accessed May 30, 2024.
33. Fatahi M, Reddig A, Friebe B, Reinhold D, Speck O. MRI and Genetic Damage: an Update. *Curr Radiol Rep*. 2017;5(6):20. doi:10.1007/s40134-017-0216-x
34. Hartwig V, Giovannetti G, Vanello N, Lombardi M, Landini L, Simi S. Biological effects and safety in magnetic resonance imaging: a review. *Int J Environ Res Public Health*. 2009;6(6):1778–1798. doi:10.3390/ijerph6061778
35. Hurlbert M, Shasko L, Neetz M. Addressing risk perceptions of low-dose radiation exposure. *Dose Res*. 2022;20(1):15593258221088428. doi:10.1177/15593258221088428
36. Rosen B, Waitzberg R, Israeli A. Israel's rapid rollout of vaccinations for COVID-19. *Israel J Health Policy Res*. 2021;10(1):6. doi:10.1186/s13584-021-00440-6
37. Gesser-Edelsburg A, Walter N, Green MS. Health care workers--part of the system or part of the public? Ambivalent risk perception in health care workers. *Am J Infect Control*. 2014;42(8):829–833. doi:10.1016/j.ajic.2014.04.012
38. Gesser-Edelsburg A, Badarna Keywan H. Physicians' perspective on vaccine-hesitancy at the beginning of israel's COVID-19 vaccination campaign and public's perceptions of physicians' knowledge when recommending the vaccine to their patients: a cross-sectional Study. *Front Public Health*. 2022;10:855468. doi:10.3389/fpubh.2022.855468
39. Peterson CJ, Lee B, Nugent K. COVID-19 vaccination hesitancy among healthcare workers-A review. *Vaccines*. 2022;10(6):2.
40. Gur-Arie R, Davidovitch N, Rosenthal A. Intervention hesitancy among healthcare personnel: conceptualizing beyond vaccine hesitancy. *Monash Bioeth Rev*. 2022;40(2):171–187. doi:10.1007/s40592-022-00152-w
41. Buratti S, Allwood CM. The effect of knowledge and ignorance assessments on perceived risk. *J Risk Res*. 2019;22(6):735–748. doi:10.1080/13669877.2018.1459795
42. Slovic P. Perceived risk, trust, and democracy. *Risk Anal*. 1993;13(6):675–682. doi:10.1111/j.1539-6924.1993.tb01329.x
43. Nindrea RD, Usman E, Katar Y, Sari NP. Acceptance of COVID-19 vaccination and correlated variables among global populations: a systematic review and meta-analysis. *Clin Epidemiol Glob Health*. 2021;12:100899. doi:10.1016/j.cegh.2021.100899
44. Baghani M, Fathalizade F, Loghman AH, et al. COVID-19 vaccine hesitancy worldwide and its associated factors: a systematic review and meta-analysis. Sci One Health. 2023;2:100048. doi:10.1016/j.soh.2023.100048