Treatment choice in the presence of conflicting information: The role of physician likeability in the choice of non-proven therapies against conventional treatment

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Research on why patients sometimes choose non-proven therapies (NPT) instead of conventional treatments is limited. We investigated how physician likeability influences the choice of NPT instead of conventional treatment. In an experiment with three medical scenarios, participants ($N = 384$) consulted two physicians who gave conflicting recommendations: The first physician recommended a conventional treatment and the second one recommended a NPT. We manipulated the likeability of the first physician, who was either likeable or unlikeable. Using mediation analyses, we explored how the effect of likeability was channelled and whether time pressure influenced treatment choice. Participants chose the NPT more often (OR = 1.43, 95% CI [1.03–2.00]), had more positive affective responses, and perceived more benefit from NPT when the conventional treatment was recommended by an unlikeable (vs. likeable) physician. Time pressure had no effect on treatment choice. Physicians' likeability might play an important role in treatment choice in the presence of conflicting information. Providers should be cognizant that poor communication might push patients to prefer the advice of more likeable physicians, even when they prescribe NPT instead of conventional treatment.

Statement of contribution

What is already known on this subject?

- Patients frequently use non-proven therapies (NPTs) – therapies or treatments whose benefit has not (yet) been demonstrated using scientific methods.
- NPTs can be harmful because they can make patients delay or deny effective conventional treatment.
- Research on why patients use NPTs is limited and comes mainly from survey research.

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What does this study add?
- Using the vignette methodology, this study experimentally investigated what factors may increase NPT use when patients receive conflicting treatment recommendations.
- Physician likeability influenced treatment choice: When conventional treatment was recommended by a physician perceived as unlikeable, participants chose the NPT more often.
- Simulated time pressure in the consultation had no effect on treatment choice.

Background

The term non-proven therapies (NPTs) refers to therapies or treatments whose benefit has not been demonstrated using scientific methods (Anlauf et al., 2015). The prevalence of the use of such therapies varies strongly across countries and health conditions (Eardley et al., 2012; Fischer et al., 2014). For instance, it is estimated that about 40% of surveyed cancer patients report using some NPT and that this use has increased in the past years (Horneber et al., 2012). The widespread use of NPT has made research into citizens' attitudes and needs regarding such therapies an important priority for the European Union (Fischer et al., 2014).

NPTs can be classified as such due to different reasons and include a large variety of therapies applied in diverse contexts, which can have different positive and/or negative implications for patient health. For instance, NPTs could include therapies for which there is yet no available (or high quality) evidence on which to judge their effectiveness. They can also include therapies that have demonstrated no measurable benefits despite a large scientific base testing their effectiveness. Hence, NPTs could include agents or activities that range from highly beneficial to simply innocuous or even dangerous.

Assuming no underlying effectiveness of NPTs, their use can be problematic for several reasons: Just as conventional treatments, they can cause adverse unwanted effects (Posadzki, Alotaibi, & Ernst, 2012), and due to their ineffectiveness, they can indirectly increase costs to health systems and economies (Ostermann, Reinhold, & Witt, 2015). Importantly, they can also make patients delay or deny conventional treatments with documented benefits (Johnson, Park, Gross, & Yu, 2018). Going back to the example of cancer, patients who reported using some NPT were more likely to refuse surgery, chemotherapy, and hormone therapy, and had poorer survival compared to patients who did not use such therapies, possibly because of their poorer adherence to conventional cancer treatments (Johnson et al., 2018; Risberg et al., 2003).

Here, an important distinction should be made between using NPTs as complementary or alternative therapies. Complementary therapies 'work alongside or in conjunction with orthodox medical treatment', whereas alternative therapies are those 'given in place of orthodox medical treatment' (BMA, 1993; Lambell, 2019). Thus, the implications of NPTs for patient health can be very different depending on whether they are taken in a complementary fashion or as an alternative treatment. In this research, we were specifically interested in the factors that influence the use of NPTs as alternative therapies. In other words, we focused solely on cases where NPTs serve as a (temporal or definitive) replacement of conventional therapies that are indicated as the first-line treatment for a specific condition.

Previous reviews indicate that data on why patients choose NPTs as alternative treatments are limited and often come from poorly reported research (Eardley et al., 2012; Fischer et al., 2014; Verhoef, Balneaves, Boon, & Vroegindewey, 2005). To contribute to this literature, in this study we used the well-accepted vignette methodology (Evans et al., 2015) to experimentally investigate the mechanisms that may lead to patients choosing a

NPT as an alternative treatment to conventional therapy. In particular, we focused on situations where there are conflicting physician recommendations regarding conventional therapy versus NPT, to capture situations where patients are first offered a conventional therapy and then a NPT to replace this conventional therapy.

Although we know from the literature that patients often receive conflicting health information from health care professionals (Carpenter et al., 2016), little research has addressed how such information influences choice of NPTs. In the presence of conflicting health information, patients might increase reliance on heuristics (Carpenter et al., 2016), being forced to decide who seems more trustworthy based on external cues. For instance, many NPTs are offered in private practices or outside of the traditional health care system, where medical professionals tend to have more time to dedicate personalized attention to the individual patient. In contrast, many public health care professionals are overworked and can only dedicate several minutes to each patient (Irving et al., 2017; Wilson & Childs, 2002). This may make physicians seem inattentive and clinical encounters unsatisfactory, thus increasing the attractiveness of NPTs offered by more attentive professionals (Wilson & Childs, 2002). Put differently, in a situation of information conflict, the *absence* of likeability in physicians offering conventional treatment (which can be the result of, e.g., the scarcity of time that a physician has for each patient [Howe, Hardebeck, Leibowitz, & Crum, 2019; Stepanikova, 2012; Wilson & Childs, 2002]) and the presence of a more positive demeanour in health care practitioners offering NPT may become a reason to choose the NPT. The aim of this study was to empirically test this possibility, and in particular, to what extent physician (un)likeability influences patients' choice of NPT instead of conventional treatment in the presence of conflicting physician recommendations.

Secondary aims included investigating the influence of time pressure on treatment choice and the possible mechanisms that drive patients' choices in the presence of conflicting information. As an alternative factor that could influence NPT adoption by patients, we manipulated individuals' time to make a decision, creating a situation with time pressure for some participants. This could either increase adoption of conventional treatment (if patients treat this as the default treatment) or increase reliance on physician demeanour (if patients rely more on the physician's demeanour when making a decision, consistent with research showing an increased reliance on feelings when processing capacity is lower [Siemer & Reisenzein, 1998]). Finally, we performed mediation analyses to investigate the mechanisms through which the effects in question might work.

Method

We designed an experiment to simulate the characteristics of a clinical situation which might influence the attractiveness of a NPT compared to a conventional treatment (Anlauf et al., 2015). In particular, many alternative NPTs do not have the adverse effects or inconveniences associated with conventional treatments, possibly making them more attractive for patients (Anlauf et al., 2015). Thus, in our experiment, the conventional treatments offered to patients had undesirable effects, which encouraged patients to look for an alternative treatment, whereas for the NPT no such effects were mentioned. Also, as already mentioned, the short clinical encounters and large workload of health professionals, especially for those working in the public health system, can result in circumstances that may make clinical encounters less satisfactory and result in negative perceptions of physicians. Thus, to simulate these characteristics, in our experiment we

manipulated the perceived likeability of the physician offering the conventional treatment and the presence of time pressure in the consultation.

Design

The study had a 2 (first physician likeability: low vs. high) $\times$ 2 (time pressure: present vs. absent) between-subjects design. Participants were randomly allocated to one of the four conditions. Physician likability was only manipulated for the first physician offering the conventional treatment; the second physician offering the NPT was always presented as likeable (full scenario descriptions are available on OSF: https://doi.org/10.17605/OSF.IO/N5DPH).

Following previous work, physician likeability was operationalized as a general positive perception of good communicativeness, warmth, and perceived competence in the physician–patient interaction described in the vignettes (Haskard Zolnierek & DiMatteo, 2009; Howe, Goyer, & Crum, 2017). In particular, in the high likeability condition, the first physician was described as communicative, warm, and competent, whereas in the low likeability condition the physician was described as uncommunicative, cold, and incompetent. For each scenario in the high likeability condition, participants read the following: 'The doctor that saw you was nice – he was a good listener and patiently answered your questions. He explained your current condition well and gave arguments regarding why the treatment he suggested was the best. Overall, you had the impression that he was an organized and competent professional', whereas in the low likeability condition participants read the following: 'The doctor that saw you wasn't very nice – he was not a good listener and did not bother to answer your questions in much detail. He seemed distracted and insisted that you take the treatment he suggested without much explanation. Overall, you had the impression that he was unorganized and incompetent'. The second physician offering the NPT was always described as: 'This second doctor was nice – he was a good listener and patiently answered your questions. He explained your current condition well and gave arguments regarding why the treatment he suggested was the best. Overall, you had the impression that he was an organized and competent professional'.

In the time pressure present condition, we created time pressure by reminding the patient that the consultation time is over, the next patient is already knocking on the door, and they have to decide now. A clock was also counting down from 7 s to remind participants that they needed to decide quickly and remained on screen showing '0 seconds left' once the time was up. The time limit was based on the median decision duration in a pilot study ($N = 91$) conducted for the purpose. In the time pressure absent condition, participants were only told to make a decision.

Participants

Data were collected via Mechanical Turk (Chandler & Shapiro, 2016). The inclusion criteria for the study were as follows: a 99% or higher Human Intelligence Task (HIT) completion rate, completion of more than 1,000 HITs, and residency in the United States. Moreover, to avoid automated respondents, participants had to pass a CAPTCHA task prior to the experiment. We had one exclusion criterion: We excluded inattentive participants that did not pass a single-choice test question, in which they had to select the three medical scenarios used in the survey.

A pilot study determined that we needed 385 participants to reach 95% power to detect a 10 percentage-point increase in NPT choice at $\alpha = .05$ (calculated for the scenario where the choice of NPT was the most common). We estimated that 10% of participants will not meet a quality (attention) check and thus decided to collect data from 428 participants (385/.9) to account for the planned exclusion.

Instruments

Each participant read and responded to three vignettes about three different medical problems and their associated treatments, that is, (1) cancer (radiotherapy vs. diet), (2) a severe cold with bacterial infection (antibiotics vs. homoeopathy), and (3) obesity (diet and exercise vs. diet pill). The radiotherapy, antibiotics, and diet with exercise were the conventional treatments offered by the first physician in each respective scenario. The diet, homoeopathy, and diet pill, respectively, were the alternative NPTs suggested by the second physician to take instead of the conventional treatment. These therapies were chosen because they are considered to have limited effectiveness in each respective context and/or are considered risky due to lack of evidence (Anlauf et al., 2015; Food & Drug Administration, 2015; Johnson et al., 2018; National Health & Medical Research Council, 2015; Risberg et al., 2003). Hence, each scenario simulated a situation where due to the patient's current health condition an effective treatment was urgently needed and choosing to undergo the NPT instead of the conventional treatment could lead to worsening of the patient's health (e.g., taking a non-effective homoeopathic pill instead of antibiotics can lead to the worsening of a bacterial infection). The scenarios were critically reviewed by a physician for credibility and pre-tested in the pilot study.

Participants read each vignette describing the condition they were suffering from and their journey through the health care system. In particular, participants read that they consulted one doctor regarding a treatment for their condition. However, the treatment proposed (i.e., the conventional treatment) did not appeal to them for several reasons, and thus, they decided to look for a second opinion and consulted another physician. This second physician recommended an alternative treatment (i.e., the NPT) that did not have the inconvenience or adverse effects of the conventional treatment. Participants were then asked to choose one of the treatments and stated how confident they were when making their decision (1 = *not at all confident*, 2 = *moderately confident*, 3 = *very confident*).

After choosing the preferred treatment in each vignette, participants assessed (on a scale of 1 to 7, where 1 = *not at all*, 7 = *extremely*) the harm and benefit related to each treatment, and how they felt about each treatment using the short form of the Berlin Emotional Responses to Risk Scale (Petrova, Garcia-Retamero, & Cokely, 2015), consisting of six adjectives (*assured, hopeful, relieved, anxious, afraid, worried*).

Finally, as a manipulation check for the likeability manipulation, participants rated each physician using eight adjectives (e.g., likeable, pleasant, nice) (Jayanti & Whipple, 2008). As a manipulation check for the time pressure manipulation, participants answered two questions (*I felt I had enough time to make a decision regarding the choice of treatment*; *I felt I could take my time to make a decision regarding the choice of treatment*) on a scale of 1 (*completely disagree*) to 5 (*completely agree*).

The order of presentation of the medical scenarios was counterbalanced. Details of respondents' age and sex were collected at the end of the survey. Additionally, we asked participants whether they had any of the medical conditions described in the study, and what form of medical insurance they had (if any).

This research was approved by the Ethics Committee of the Poznań University of Economics and Business, Poznań, in Poland. The study was pre-registered at: https://aspredicted.org/w8mj7.pdf. Data and materials are available at: https://doi.org/10.17605/OSF.IO/N5DPH

Statistical analysis

The main dependent variable was the choice of treatment, with the choice of the treatment suggested by the first physician (conventional treatment) coded as 0, and the choice of the treatment offered by the second physician (NPT) coded as 1.

As an alternative secondary dependent variable, we created a variable that combines participants' choice and confidence ratings (Białek, Muda, Stewart, Niszczota, & Pieńkosz, 2020). The alternative dependent variable ranged from 1 (when the conventional therapy was chosen and the participant stated that she/he was very confident) to 6 (when the NPT was chosen and the participant stated they she/he was very confident).

To test whether there is a general effect of physician likeability across medical scenarios, we performed a mixed logistic regression (as random effects we entered intercepts for medical problems and subjects). As a follow-up analysis, we conducted separate logistic regressions for each of the medical problems. The likeability of the first physician was the independent variable of interest. Besides testing the effect of physician likeability, to test the effect of time pressure on decisions we included in the models a time pressure binary variable and its interaction with likeability, and controlled for participants' age, gender, and experience with the condition.

In addition to the main hypothesis test, we planned a series of exploratory analyses, to better understand the mechanisms that could drive the effect. More specifically, we tested whether the effect of physician likeability on treatment choice was mediated by affective reactions (positive and negative) and perceptions (benefits and harms) of the available treatment options. To do this, from participants' responses to each scenario we computed difference scores for the affective reactions and perceptions of both treatments by subtracting the scores referring to the conventional treatment from the NPT. Thus, higher difference scores indicated stronger affective reactions and higher perceptions of harms/benefits for the NPT relative to the conventional treatment. We then used the Process SPSS Macro (Hayes, 2017) to test serial mediation models for each scenario, in which positive (negative) affective reactions were assumed to affect perceptions of benefit or harm, respectively (Petrova, Garcia-Retamero, Catena, & van der Pligt, 2016; Petrova et al., 2015), which in turn affect choice. To test for mediation, we estimated significant indirect effects based on 95% bias-corrected confidence intervals (CI) and considered an indirect effect significant if the 95% CI excluded 0.

Results

Demographic characteristics, manipulation checks, and treatment choice

The mean age of participants in our sample was 42.4 years ($\pm$ 13.7), 63% were female, and 88% of them had some form of medical insurance. More detailed characteristics of the sample are presented in Table 1.

Consistent with expectations, participants in the high likeability condition rated the first physician significantly more positively than participants in the low likeability condition, ($p <$ .001 for all adjectives and all medical scenarios).

Table 1. Demographic characteristics of participants (*N* = 384)

	% (N)	Conventional treatment M (SD)	Non-proven therapy M (SD)
Gender			
Female	63.0% (242)		
Male	37.0% (142)		
Availability of medical insurance			
Private insurance	57.6% (221)		
Medicaid	15.4% (59)		
Medicare	15.1% (58)		
None	12.0% (46)		
Pre-existing conditions			
Cancer	4.2% (16)		
Serious cold	25.0% (96)		
Obesity	22.9% (88)		
Perceived benefit			
Cancer		4.90 (1.55)	4.79 (1.80)
Cold		5.35 (1.50)	4.53 (1.94)
Obesity		6.19 (1.09)	4.22 (1.84)
Perceived harm			
Cancer		5.48 (1.35)	2.72 (1.74)
Cold		4.41 (1.68)	2.61 (1.70)
Obesity		2.65 (1.65)	4.84 (1.71)

Based on the mean rating of two items measuring time pressure, participants felt more pressured in the time-pressure condition (*M* = 4.36) compared to the no-time-pressure condition (*M* = 2.88; *t* = 12.7, *p* < .001), as expected.

In Figure 1, we present how often participants chose the NPT when the first physician was likeable (reference condition) and unlikeable (test condition). When the first physician was unlikeable, participants chose NPT more often in the cold (64.0% vs. 52.7%) and obesity (30.0% vs. 20.6%) scenarios, but not in the cancer scenario (66.5% vs. 65.8%).

Main analysis

The results of the mixed logistic regression analysis showed that in the presence of conflicting recommendations low likeability of the physician offering a conventional treatment leads to a higher probability of choosing a NPT recommended by a subsequent, more likeable physician (*OR* 1.43, 95% *CI* [1.03, 2.00], *p* = .030). Time pressure did not have a main effect on treatment choice (*OR* 1.02, 95% *CI* [0.74, 1.42], *p* = .890). The results of the logistic regressions are summarized in the top part of Table 2.

Our findings suggest that there are considerable differences in the effect across scenarios, with evidence of an effect in the cold and obesity scenario (*OR* 1.55, 95% CI [1.03, 2.35]; 1.60, 95% *CI* [0.99, 2.56]), but no effect in the case of the cancer scenario (*OR* 1.05, 95% *CI* [0.68, 1.60]). A complementary mixed logistic regression contrasted the non-cancer scenarios with the cancer scenario, suggesting that low physician likeability has an effect in non-cancer scenarios (single term in interaction: *OR* 1.71, 95% *CI* [1.17, 2.53], *p* = .006), and there is a difference in the strength of the effect, although it is only marginally statistically significant (interaction term, *p* = .075).
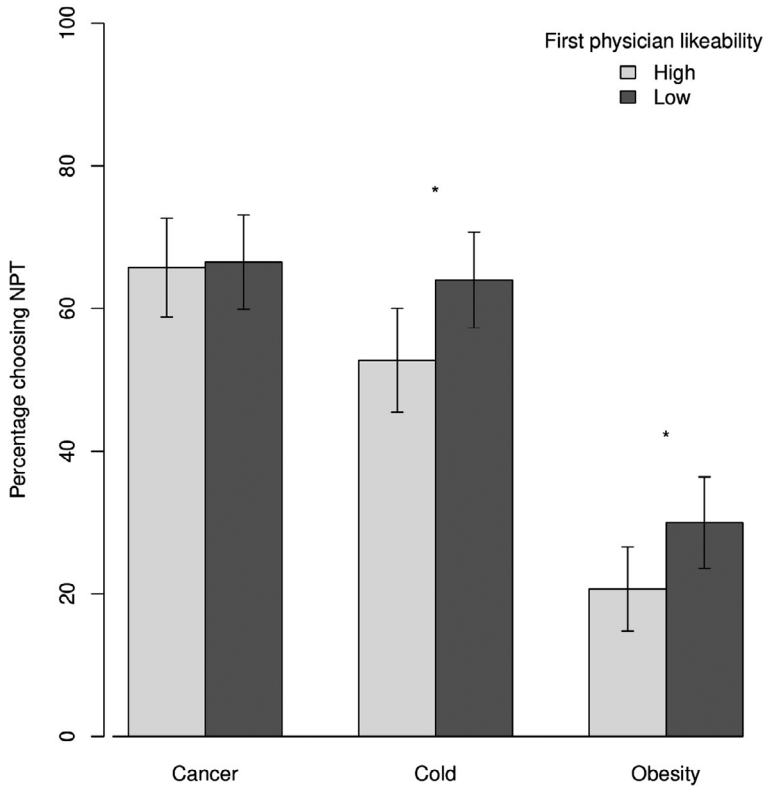
Figure 1. Choice of non-proven therapy: influence of likeability of the first physician. *Notes:* Error bars indicate 95% confidence intervals. * indicates $p < .05$ in χ^2 test.

Regressions performed on the alternative dependent variable that took the confidence of responses into account yielded similar results (see bottom part of Table 2).

Mediation analyses

In all analyses, we controlled for the effects of gender, age, previous diagnosis of the condition, and the time pressure condition. The main findings are summarized in Figure 2, and detailed results can be found on OSF (https://doi.org/10.17605/OSF.IO/N5DPH).

In the cancer scenario, there was a significant indirect effect of low likeability on choice both via positive affect alone, unstandardized indirect effect, $UIE = .77$ [.17, 1.52], and via positive affect and perceived benefit sequentially, $UIE = .45$ [.12, .91]. The McFadden R^2 in the regression on choice was .64, showing that the variables explained a substantial amount of variance in choice. There were no significant indirect effects via negative affect or perceived harm.

In the cold scenario, there was a significant indirect effect of low likeability on choice both via positive affect alone, $UIE = .97$ [.16, 1.89], and via positive affect and perceived benefit sequentially, $UIE = .35$, [.04, .90]. The McFadden R^2 in the regression on choice was .69. Similarly, there were no significant indirect effects via negative affect or perceived harm.

Table 2. Choice of non-proven therapy: regression results for the effect of physician likeability (1 = first physician unlikeable, 0 = first physician likeable)

Dependent variable [0-1]
=1 when non-proven therapy chosen
=0 when conventional treatment chosen

	OR	95% CI	*p*
All scenarios	1.43*	[1.03, 2.00]	.030
Cancer	1.05	[0.68, 1.60]	.828
Cold	1.55*	[1.03, 2.35]	.038
Obesity	1.60†	[0.99, 2.56]	.053
Non-cancer versus cancer scenarios			
Non-cancer	1.71**	[1.17, 2.53]	.006
Cancer (interaction term)	0.60†	[0.34, 1.06]	.075

Alternative dependent variable [1-6]
=6 when non-proven therapy chosen with high confidence
=1 when conventional treatment chosen with high confidence

	b (SE)	95% CI	*p*
All scenarios	0.33* (0.14)	[0.06, 0.60]	.017
Cancer	0.20 (0.19)	[−1.18, 0.58]	.300
Cold	0.45* (0.21)	[0.03, 0.86]	.037
Obesity	0.35† (0.18)	[−0.01, 0.71]	.056
Non-cancer versus cancer scenarios			
Non-cancer	0.41** (0.16)	[0.11, 0.71]	.008
Difference between non-cancer and cancer	−0.24 (0.21)	[0.52, 1.19]	.255

Notes. The independent variable = 1 when the first physician has low perceived communicativeness, warmth and competence, and =0 otherwise. All regressions adjust for age, sex, experience with the condition, and time pressure.
**$p <.01$; *$p < .05$; $^{\dagger}p < .10$.

Finally, in the obesity scenario, there was a significant indirect effect of low likeability on choice both via positive affect alone, *UIE* = .83 [.27, 1.59], and via positive affect and perceived benefit sequentially, *UIE* = .41 [.14, .79] (McFadden R^2 = .60). In addition, there was a significant indirect effect of likeability on choice both via negative affect alone, *UIE* = .45 [.16, .82], and via positive affect and perceived benefit sequentially, *UIE* = .17 [.06, .31] (McFadden R^2 = .33).

In summary, there were consistent results in all three scenarios, such that when the first physician recommending the conventional treatment was unlikeable, participants reported stronger positive affective responses and more perceived benefits for the NPT recommended by the second physician, and were more likely to choose this NPT over the conventional treatment. Results were slightly different in the obesity scenario, where the effect of physician likeability was also mediated by negative affect and perceived harm: When the first physician recommending the conventional treatment was unlikeable, participants also reported less negative affect and less perceived harm for the NPT recommended by the second physician, and were more likely to choose the NPT over the conventional treatment. The effects of negative affect and perceived harm on choice were, however, smaller.
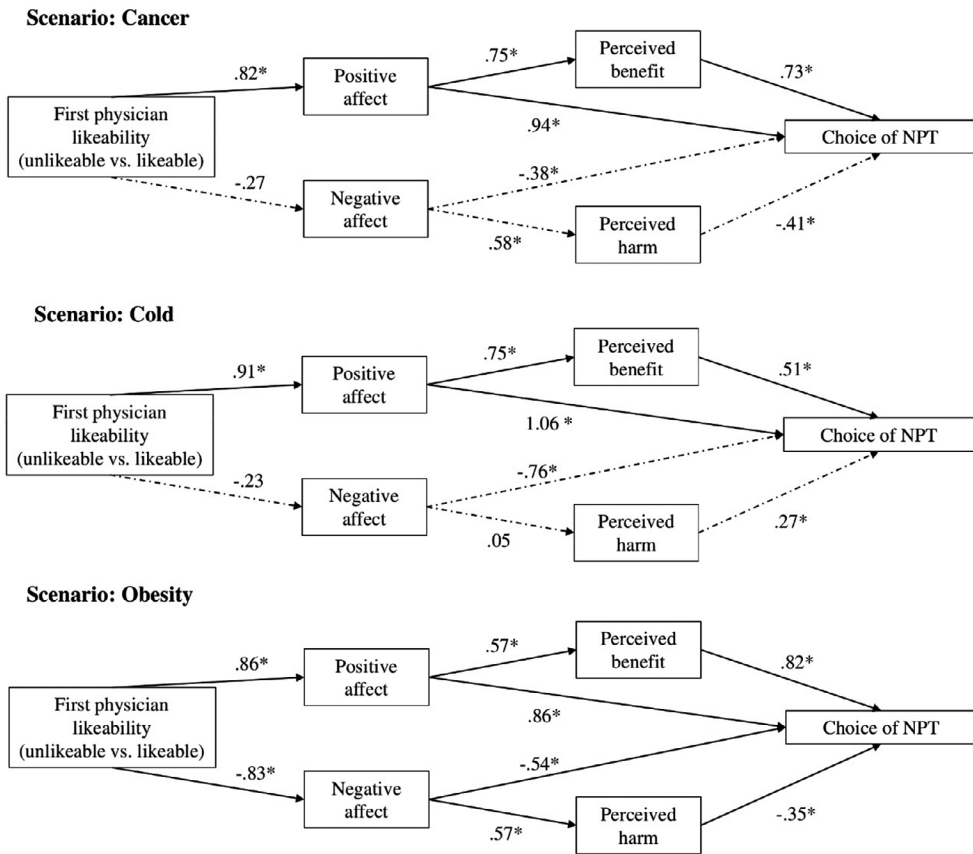
Figure 2. Results of the mediation analyses. *Notes*: Dashed lines indicate the absence of significant indirect effects of physician likeability on choice. Values for the mediators (positive affect, negative affect, perceived benefit, and perceived harm) are difference scores derived from the ratings of the two therapies (i.e., rating of non-proven therapy minus rating of conventional treatment), such that higher scores designate higher affect or perceptions for the non-proven therapy relative to the conventional treatment. NPT = non-proven therapy. *p < .05.

Discussion

Extant research suggests that the motives for use of NPT in general can be found, on one hand, in the physician–patient relationship and the conditions of the health system, and on the other hand, in patients' needs and perceptions. In particular, among the main reasons reported for NPT-use are dissatisfaction with conventional treatments or the doctor prescribing it, having a better relationship with the practitioner recommending the NPT, not wanting to take medicines with associated side effects, and perceiving benefit from the therapy in question (Eardley et al., 2012; Fischer et al., 2014; Verhoef et al., 2005).

We present the first, to our knowledge, experimental study that tests physician likeability and time pressure as factors that could influence the choice of NPT as an alternative to conventional treatment. We tested three medical scenarios – regarding cancer, serious cold, and obesity – that covered conditions differing in prevalence and

severity. Despite some differences between the scenarios, a general pattern of results emerged: Low perceived likeability of the physician offering the conventional treatment increased the choice of NPT (on average by about 40% across scenarios).

These results are in line with non-experimental research showing that patients often choose NPT because of dissatisfaction with the doctor prescribing the conventional treatment, or due to a better relationship with the practitioner recommending or delivering the NPT (Eardley et al., 2012; Fischer et al., 2014; Verhoef et al., 2005). Our findings are also consistent with the conflicting information literature, showing that when people receive conflicting information regarding medications or treatments, they use heuristics such as likeability to make decisions. Note that conflicting health information situations emerge quite often: Carpenter et al. (2016) report that 18% to 80% of patients receive conflicting information concerning medication use, while 50% to 75% receive conflicting information concerning cancer-screening.

Our exploratory analysis showed that there is an indirect effect of likeability on therapy choice across all scenarios via positive affect and perceived benefit. This reveals the potential mechanisms through which physician likeability influences therapy choice. In particular, a likeable physician seems to make the positive aspects of the proposed treatment more prominent and the treatment more beneficial than the alternative, which influences therapy choice. It is also in line with patients reporting perceiving benefit from NPT as a reason to choose them (Eardley et al., 2012; Fischer et al., 2014; Verhoef et al., 2005).

The findings highlight just how important it is for physicians to be seen as warm and competent by the patient (Fiske, Cuddy, & Glick, 2007). It is clear that attempts of being likeable (Howe et al., 2017), communicative (Haskard Zolnierek & DiMatteo, 2009), being a good listener (van Dulmen, 2017), and willing to address emotions during consultations (Danzi et al., 2018) might seem equally as important as offering advice that is based on evidence-based medicine. For instance, recent studies showed that physicians' demeanour can affect how patients perceive the length of the consultation (Howe et al., 2019), while physicians' humility had a range of positive effects on patients (Huynh & Dicke-Bohmann, 2020). While the former study demonstrated that a *positive* demeanour can lead to a favourable outcome (the perception that the consultation was longer), our study shows that a *negative* demeanour can lead to an unfavourable outcome (higher adoption of a NPT instead of a conventional one when the recommendations of two physicians are in conflict).

It is worth discussing two of our null findings. Firstly, the lack of the effect of likeability in the cancer scenario might be possibly due to the fact that the rate of choice of the NPT was already quite high (>60%) when the first physician was likeable and the conventional treatment was perceived as very harmful compared to that in the other scenarios. Secondly, even though the time pressure manipulation appeared to be successful, it had no important effects on treatment choice. It is possible that the manipulation and scenarios were not realistic or strong enough to generate an effect. It may also be that there are opposing effects (the tendency to choose conventional treatment versus the tendency to rely on one's feelings under time pressure) that cancelled each other out. Nevertheless, the effect of time pressure should be studied further because it is a relevant clinical factor.

There are several limitations of our study, as we only examined a specific clinical situation. In particular, the conventional treatment was always offered first, and the likeability of the physician offering the NPT was not manipulated (this physician was always described as likeable). In addition, the conventional treatment always had some

unpleasant effects, whereas no such effects were described for the NPTs presented as alternatives.

The likeability manipulation combined communicativeness, warmth, and competence, as physicians in our scenarios possessed (or lacked) all of the three traits. Thus, we did not consider a more elaborate experimental design where we could have examined the separate effects of the three underlying characteristics that constituted physician likeability in the current study (communicativeness, warmth, and competence). In future studies, it may be especially important to examine the unique effects of perceived physician competence on patient decision-making, because it may be a strong determinant of patient behaviour independent of perceived physician likability (e.g., a physician can be perceived as competent but unlikeable and vice versa).

We also did not manipulate other factors (e.g., likeability of the second physician) or investigate how the negative perception of the first physician impacts the probability that the patient will seek the opinion of another physician (e.g., Blanch-Hartigan et al., 2019); alternatively, the patient might just decide to not be treated at all. Moreover, participants in our experiment were forced to choose one treatment over the other, whereas in reality in many cases treatments could be combined.

Finally, the NPTs in the scenarios were not acknowledged or labelled as such, and thus, different results may have been obtained if that were the case. Future studies should also explore the effects of different types of NPTs, as people's perception and knowledge of the effectiveness of those may vary strongly. This study was intended as a first demonstration; the other possibilities should be investigated in future research. Future studies could also test novel circumstances in which physician characteristics might influence patient decision-making (e.g., deprescribing [Scott et al., 2015]).

Conclusions

The increased popularity of NPTs has made them an important public health topic. NPTs include a large variety of treatments, and their use should be studied within the specific context in which they occur. In this study, we aimed to address the circumstances in which a generally effective, conventional therapy is foregone for the sake of a NPT. This study demonstrated that the physician–patient relationship, and in particular perceived physician likeability, can influence the choice of NPT over conventional treatment. In particular, lower likeability of the physician offering the conventional treatment compared to the physician offering the NPT increased positive affective responses and perceived benefits of the NPT, thereby making it more likely to be chosen over the conventional treatment.

These results suggest that physician likeability can play a role in increasing the acceptance of NPTs as alternative treatments. They also suggest that developing a warm practitioner–patient relationship and offering personalized attention to patients are very important for patient choice. Providers should be cognizant that poor communication with the patient might decrease reliance on their advice in favour of the advice of other practitioners who appear more likeable but may offer NPTs as alternative treatments to conventional therapies. Unfortunately, the typical situation is that professionals in the public health system who prescribe conventional treatments according to clinical guidelines can usually only spend a limited amount of time with patients. This suggests that an overburdened health system can also indirectly contribute to the increasing attractiveness of some NPTs, when they are offered by practitioners who are perceived as

more involved with the patient (Eardley et al., 2012). These possibilities should be investigated in the future research.

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Conflicts of interest

All authors declare no conflict of interest.

Author contribution

Paweł Niszczota: Conceptualization (equal); Data curation (equal); Formal analysis (equal); Funding acquisition (equal); Investigation (equal); Methodology (equal); Project administration (equal); Resources (equal); Software (equal); Visualization (equal); Writing – original draft (equal); Writing – review & editing (equal). **Dafina Petrova:** Conceptualization (equal); Formal analysis (equal); Investigation (equal); Methodology (equal); Project administration (equal); Resources (equal); Software (equal); Visualization (equal); Writing – original draft (equal); Writing – review & editing (equal).

Data availability statement

The study was pre-registered. The pre-registration document, materials, and data for the experiment are available at OSF: https://doi.org/10.17605/OSF.IO/N5DPH.

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