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Analogue patients' self-reported engagement and psychophysiological arousal in a video-vignettes design: Patients versus disease-naïve individuals

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ABSTRACT

Objectives: The ecological validity of video-vignettes design investigating patient-provider communication hinges on the engagement of analogue patients (APs) with the vignette. The present study aimed to compare engagement in two commonly utilized groups of APs, patients and disease-naïve individuals. Engagement was assessed by self-report and in the form of physiological arousal.
Methods: Cancer patients (N = 22) and disease-naïve individuals (N = 24) were recruited as APs. APs completed the Video Engagement Scale after watching a vignette of a oncologic bad news consultation. Electrodermal and cardiovascular activity were assessed continuously during watching the vignette, and cortisol levels were assessed in four saliva samples.
Results: Patients reported higher engagement with the vignette than disease-naïve individuals ($t = 2.46$, $p < 0.05$) and showed a larger blood pressure response (systolic: $F = 5.87$, $p < 0.01$ and diastolic: $F = 4.00$, $p < 0.05$). However, these differences disappeared after adjusting for age. No group differences were found on other psychophysiological parameters.
Conclusions: Our results suggest that patients and disease-naïve individuals are equally engaged when viewing video vignettes. When group differences were found, older age turned out to be a more prominent predictor of engagement.
Practice implications: Researchers may consider other arguments besides APs' disease history when selecting an AP group.

1. Introduction

Researchers increasingly use video vignettes to systematically study the effects of patient-provider communication on patient outcomes [1–3]. Scripted video vignettes involve recordings of prewritten scenes in which actors mimic an interaction between patient and care provider, such as a doctor-patient consultation. Video-vignettes designs provide an ethical alternative to manipulating communication in real medical consultations. Moreover, they allow for standardization of material (e.g., provider characteristics, wording, intonation), thereby creating the opportunity to investigate causal relationships. In such research, different versions of a video vignette can be created of the same consultation, systemically varying only the specific elements of communication that are deemed of interest, e.g., the addition of a few empathic statements from the provider [4]. Consequently, the impact of specific elements of communication on outcomes can be investigated, such as participants' emotional distress [4,5] or recall of information [4,6].

Participants in patient-provider video-vignettes studies are called 'analogue patients' (APs). They can be either current or former patients [7–10] or disease-naïve ('healthy') individuals [4,11,12], who are instructed to imagine themselves in the situation of the patient observed in the video [1]. Although previous

Abbreviations: APs, analogue patients; SCL, skin conductance level; SCRs, skin conductance responses; SBP, systolic blood pressure; DBP, diastolic blood pressure; HR, heart rate; CO, cardiac output.

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research confirmed that the AP methodology is a valid approach to gathering data about patient-provider interaction [2,3,13], this research did not differentiate between patients and disease-naive individuals as APs. An assumption critical to the ecological validity of video-vignette designs, i.e., the extent to which the experience of APs resembles the experience of patients in real-life medical consultations, is that APs engage with the video vignette, and this engagement may differ between AP groups. We used the term 'video engagement', derived from the field of persuasive communication (for an example see Ref. [14]), to allude to a state in which APs view the video intently, immerse in the video vignette's story, imagine themselves being in the video patient's position, and experience emotions accordingly [15]. It seems reasonable to assume that patients might engage more readily than disease-naïve individuals because they can rely on experience. So far, only two patient-provider video-vignettes studies compared patient and disease-naïve APs. Both showed little difference between patients and disease-naïve individuals on various outcomes, such as consulting style preferences, satisfaction ratings [16], physician compassion and attribute ratings, state anxiety, treatment choices and information recall [17]. However, differences in engagement have not been tested, and this forms an important limitation to the current literature. Hence, it seems important to compare both participant groups on that ability.

To assess APs' engagement while viewing video vignettes, the 15-item self-report Video Engagement Scale (VES) has been developed and validated [15]. Although informative, relying on retrospective self-report only, might be prone to bias. Additionally, differences in the emotional component of APs' engagement could be investigated more objectively by measuring APs' physiological responses during the video vignette. The emotional response to a video vignette is an important component of video-vignette engagement, which would be an expected response during watching video vignettes with a (strong) emotional content (e.g. a bad-news consultation). Physiological activity varies as a function of psychological change and could therefore be used to make inferences about psychological processes, such as emotional arousal, during watching the video vignette [18]. For example, electrodermal activity (EDA), also known as skin conductance, is a sensitive marker of sympathetic nervous system activity, and therefore one of the most widely used psychophysiological parameters of emotional arousal [18]. As such, EDA has recently been successfully used in a video-vignettes study, showing that APs' emotional arousal after receiving bad news showed a stronger decrease with clinician's who used a more affective communication style [4]. However, it is often recommended to use more than one psychophysiological measure by monitoring additional physiological response systems [19]. Adding assessments of cardiovascular (e.g., heart rate) and hormonal (e.g., cortisol) activity, will provide a more comprehensive assessment of APs' physiological arousal, and thus emotional engagement during watching a patient-provider video vignette. Moreover, such a multi-parameter study design would provide us with information about the sensitivity of various psychophysiological parameters in a video-vignettes design using APs.

In light of the preceding discussion, the present video-vignettes study aimed to determine which AP group shows most engagement by answering the following research questions: (1) Does self-reported engagement differ between APs who are (former) patients versus disease-naïve individuals?; (2) Do the psychophysiological responses to the vignette, i.e., increases in electrodermal, cardiovascular and hormonal activity, differ between these APs groups?

2. Methods

2.1. Design and ethics statement

This experimental video vignettes study is part of a research line that aims to understand and improve provider-patient information transfer in oncology. Accordingly, the video vignette used involved a medical consultation with a cancer patient. The Academic Medical Center's Medical Ethics Committee approved the study protocol and participants provided written informed consent.

2.1.1. Development of video vignettes

A detailed description of video-vignettes development is provided in Appendix A. In brief, following published recommendations [1], the bad-news consultation script was developed first, which involved an oncological surgeon and a patient with advanced oesophageal cancer. The consultation included two phases: a discussion of the cancer diagnosis and prognosis (the bad news phase or P1), followed by the provision of additional information about treatment options and side-effects (the information phase or P2). After inviting and incorporating feedback from experts on the script and a pilot video recording of the script, the final video vignettes were determined and recorded. A voice-over introduction was added to the video vignette, showing the patient in the waiting room. Excluding the 50 s introduction, video duration was 6 min and 26 s (male video patient) and 6 min and 19 s (female video patient).

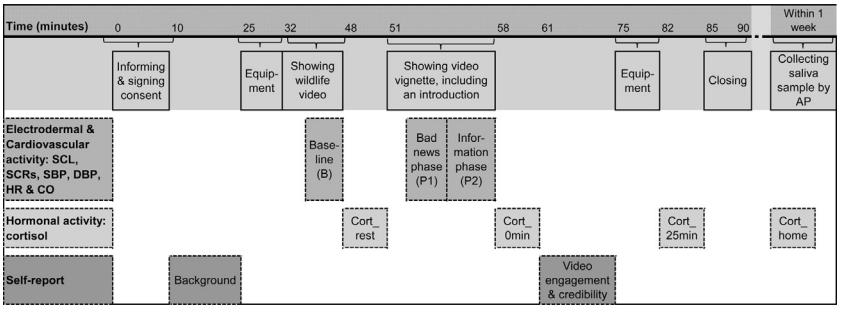

Fig. 1. Overview of experimental procedures.
Notes. On average the experiment lasted for 90 min. Electrodermal and cardiovascular activity were measured continuously during three periods of interest: a baseline period (B) and two successive phases of the video vignette (P1: the bad news phase, and P2: the information phase). SCL = skin conductance level; SCRs = skin conductance responses; SBP = systolic blood pressure; DBP = diastolic blood pressure; HR = heart rate; CO = cardiac output. Hormonal activity was assessed by measuring cortisol levels in saliva, sampled at four points in time: three samples were collected by the investigator during the experiment and one sample was collected by the analogue patient (AP) within one week after the experiment. Analogue patients completed a background questionnaire before watching the video's and afterwards they reported on their level of engagement (by means of the Video Engagement Scale) and their perceived credibility of the video vignette.

2.2. Analogue patients

Two groups of APs were recruited. The patient group consisted of cancer patients or survivors recruited via announcements on patient organizations' websites, Facebook pages, and the website of the Academic Medical Center (AMC). The disease-naïve individuals group consisted of disease-free and cancer-naïve persons recruited via announcements on the AMC website, a website which connects volunteers for research and researchers, and via snowball sampling.

Inclusion criteria for the patient group were a diagnosis of cancer (any type of cancer with the exception of esophageal cancer); being diagnosed relatively recent (approximately 1–5 years ago); currently not under active chemo or radiation therapy. Inclusion criteria for the disease-naïve group were never being diagnosed with cancer and currently not under treatment by any medical specialist. Exclusion criteria for both groups were: suffering from cardiovascular disease, hypertension or endocrine disorders (to prevent interference with psychophysiological measures); smoking >20 cigarettes per week or using corticosteroid containing medication (to prevent interference with cortisol measures); illiteracy in Dutch; age <18 years.

2.3. Experimental procedures

Fig. 1 presents an overview of experimental procedures. APs who signed up for participation were invited to come to the research location. Experiments took place between 12 noon and 7 pm, circumventing variability due to the steep morning decline in cortisol. APs first completed a questionnaire on background characteristics, after which they were attached to the psychophysiological equipment. They then watched a calm wildlife documentary for 16 min. Two minutes near the end were used to determine resting baseline values for electrodermal and cardiovascular activity. Next, APs were instructed to 'try to imagine themselves being the video-patient' and shown the video vignette on a computer screen. Psychophysiological assessment took place continuously during watching the bad news and the information phase of the vignette. Immediately afterwards, APs' engagement and perceived credibility of the vignette were assessed. To assess cortisol levels, we collected saliva samples at three points during the experiment and APs were instructed to collect one additional sample at home and send it back by post. APs received a small compensation (25€ in cash) for their participation.

2.4. Measures

2.4.1. Sample characteristics

APs' socio-demographics assessed included age, gender and educational level. The patient group also reported on medical characteristics including type of cancer, time since cancer diagnosis and treatment received. All self-reported data were collected digitally.

2.4.2. Video-vignette credibility

The perceived credibility of the video vignettes was assessed by measuring: (1) perceived realism of the vignette asking APs how realistic and credible they thought the events in the video vignette were (3 items); (2) credibility of the video-patient's behaviour and appearance (2 items); (3) credibility of the oncologist's behaviour and appearance (2 items); and 4) credibility of the medical consultation room (1 item). All items were answered on a 7-point Likert scale (1 = 'completely disagree' to 7 = 'completely agree'). Mean scores were calculated for each of the four credibility measures.

2.4.3. Self-reported engagement

Engagement with the video vignette was assessed using the 15-item Video Engagement Scale (VES) [15]. This scale encompasses items about experiencing emotions evoked by the video, empathizing with the video character, adopting the video-character's identity and attentional focus on the video. All items were answered on a 7-point Likert scale (1 = 'completely disagree' to 7 = 'completely agree'). Mean scores were calculated. Internal consistency of the scale in the present sample was excellent ($\alpha = 0.93$).

2.4.4. Electrodermal activity

EDA was measured using a wireless Bionomadix module from Biopac with two disposable electrodes attached to the index and middle finger of APs' right hand [18]. The mean level of EDA, from now referred to as Skin Conductance Level (SCL), was calculated in micro Siemens (μS) for three periods of interest: baseline, the bad news phase and the information phase of the vignette. Skin conductance responses (SCRs) were identified, i.e., phasic increases ($0.05\,\mu S$) in skin conductance [18]. The frequency of SCRs was calculated, reflecting the mean number of SCRs per minute, for the three periods of interest mentioned above. See Appendix B for more details.

2.4.5. Cardiovascular activity

Cardiovascular activity was assessed as systolic blood pressure (SBP, in mm/Hg), diastolic blood pressure (DBP, in mm/Hg), cardiac output (CO, in L/minute) and heart rate (HR, in beats per minute (BPM)), and measured using a Finometer Pro (Finapres Medical Systems) connected to the Biopac system. The Finometer Pro cuff was connected to the ring finger of APs' left hand. Mean SBP, DBP, CO and HR was calculated over the three periods of interest mentioned above. See Appendix B for more details.

2.4.6. Hormonal activity

Samples were collected with salivettes (Sarstedt, Rommelsdorf, Germany). Salivary cortisol was determined using a luminescence immunoassay (IBL, Hamburg, Germany). Four salivary cortisol samples were collected (see Fig. 1): Cort_rest) a baseline sample, obtained just prior to watching the video vignette; Cort_0 min) a response sample, obtained immediately after watching the video vignette; Cort_25 min) a response sample, obtained approximately 25 min after the end of the video vignette; Cort_home) a second baseline sample, obtained by the subject at home within one week after the experiment. Cortisol data (in nmol/L) was log-transformed prior to statistical analysis. See Appendix B for more details.

2.5. Data-analyses

All analyses were performed using IBM SPSS Statistics 21.0. The 0.05 probability level was used as a criterion of statistical significance. Partial eta-squared ($\eta^2_{partial}$) is reported as a measure of effect size.

2.5.1. Preliminary analyses

To test for gender and age differences between AP groups, we respectively used the Chi-square test statistic with Yates continuity correction and an independent samples *t*-test. If age and/or gender differences were found between APs groups, main analyses were adjusted for age and/or gender in secondary analyses (using ANCOVA), but only if gender and/or age were also related to the dependent variables. Therefore, these relationships were tested, using a *t*-test and Pearson's correlation coefficient with regard to self-reported engagement scores and repeated measures ANOVA's

with regard to psychophysiological activity over time. Pearson's correlation coefficient was used to investigate associations between self-reported engagement and the various psychophysiological responses to the vignette (determined as the mean physiological activity during vignette minus mean physiological activity during baseline). To verify if any group differences appeared in video-vignette credibility scores, *t*-tests were performed.

2.5.2. Main analyses

Self-reported engagement scores were compared between the groups (research question 1) using an independent *t*-test. Electrodermal and cardiovascular responses were compared between the groups (research question 2), using a 3×2 repeated measures MANOVA with data of the six electrodermal and cardiovascular parameters (SCL, SCRs, SBP, DBP, HR and CO) as dependent variables, the three time periods (baseline, bad news phase and information phase) as within-subject variables and 'group' as a between-subjects variable. After testing the overall effects, we checked the significance of post-hoc univariate test results for the individual electrodermal and cardiovascular parameters. To compare cortisol responses (research question 2), we performed a 4×2 repeated measures ANOVA, using cortisol data from the four time points (Cort_rest, Cort_0 min, Cort_25 min and Cort_home).

3. Results

3.1. Sample characteristics and group differences

Sample characteristics of patients and disease-naïve individuals are shown in Table 1. APs in the patient group (N = 22) were older than APs in the disease-naïve group (N = 24) ($t(41.8) = 3.34$, $p = 0.002$). The patient group contained more women than the disease-naïve group, which bordered on statistical significance ($\chi^2(1, n = 45) = 3.816$, $p = 0.051$).

Age was positively related to self-reported engagement ($r = 0.30$, $p = 0.041$). There was also an age-dependent response for SBP and DBP, yielding a significant age*time interaction effect ($p < 0.001$ and $p = 0.019$, respectively), but not for the other physiological parameters. Gender was not associated with self-reported engagement ($p = 0.412$), nor with either one of the psychophysiological measures (p-values ≥ 0.10). Therefore, when investigating group differences in self-reported engagement, as well as SBP and DBP, we performed secondary statistical analyses adjusting for age.

3.2. Associations between self-reported engagement and psychophysiological responses

Self-reported engagement was positively correlated with APs' blood pressure responses during the bad news phase of the vignette, showing associations with both SBP ($r = 0.36$, $p = 0.023$) and DBP ($r = 0.38$, $p = 0.015$). Self-reported engagement was not

Table 2
Video vignette credibility check.

	N	M	SD	T-test
Realism of the vignette[a]				
Patient group	21	5.70	0.80	$t = 0.225$,
Disease-naïve group	24	5.64	0.95	$p = 0.823$
Credibility of video-patient[a]				
Patient group	21	5.31	1.54	$t = -0.108$,
Disease-naïve group	24	5.35	1.25	$p = 0.915$
Credibility of oncologist[a]				
Patient group	21	5.76	0.87	$t = 0.446$,
Disease-naïve group	24	5.63	1.14	$p = 0.658$
Credibility of consultation room[a]				
Patient group	21	5.71	1.27	$t = 0.855$,
Disease-naïve group	24	5.38	1.38	$p = 0.398$

[a] Possible range: 1–7, higher is more realistic or more credible.

Table 1
Sample characteristics of the analogue patient groups.

	Patient group (N = 22)		Disease-naïve group (N = 24)	
	M	SD	M	SD
Age in years (Range)	55 (31–79)	12	41 (23–81)	17
Time since diagnosis in months (Range)	33.5 (11–79)	20.8		
	n	%	n	%
Gender				
Male	4	18.2	12	50
Female	18	81.8	12	50
Educational level				
Lower level vocational education	1	4.6	4	16.7
General secondary education	7	31.8	6	25
Higher level vocational education/University	14	63.6	14	58.3
Type of cancer				
Breast	11	50		
Gynaecologic	2	9		
Blood (e.g. lymphoma and leukaemia)	6	27		
Urological	2	9		
Skin	1	5		
Other	1	5		
Received cancer treatment				
Surgery	16	72.7		
Radiation therapy	9	40.9		
Chemo therapy	11	50		
Hormonal therapy	8	36.4		
Watchful waiting	3	13.6		
Stem cell transplantation	2	9.1		

correlated with the responses of the other physiological parameters.

3.3. Video-vignette credibility check

APs gave an average score >5 on all four credibility measures (see Table 2). They perceived the video vignette, the video patient, the oncologist and the medical consultation room as realistic and credible. No differences were shown between AP groups.

3.4. Self-reported engagement

The patient group reported higher engagement with the vignette than the disease-naïve group ($t(44) = 2.462$, $p = 0.018$), with mean scores of respectively 5.4 (SD = 1.0) and 4.6 (SD = 1.1). However, after adjusting for age, the difference between the two groups in self-reported engagement disappeared ($F(1, 43) = 2.87$, $p = 0.098$, $\eta^2_{partial} = 0.06$). Yet, in this ANCOVA model, age was also not significantly associated with self-reported engagement ($F(1, 43) = 1.37$, $p = 0.248$, $\eta^2_{partial} = 0.031$).

3.5. Psychophysiological arousal

Data inspection verified with researchers' logged observations led to the exclusion of electrodermal and cardiovascular data from six APs (three from each group), because of signal disruptions or equipment failure. Two APs (one of each group) did not return the Cort_home saliva sample and were therefore excluded from cortisol analyses. Mean and standard deviations of electrodermal and cardiovascular parameters are presented in Table 3 and of cortisol levels in Table 4.

First, it was important to demonstrate that APs responded to the vignette with an increase in psychophysiological activity compared to baseline levels. A substantial multivariate main effect of time was shown for electrodermal and cardiovascular parameters (Wilks' Lambda = 0.12, $F(12, 27) = 17.15$, $p < 0.001$, $\eta^2_{partial} = 0.88$). Univariate testing for each of the psychophysiological parameters separately, showed substantial changes in mean activity over time for most, but not all, measures (see Table 3). For the parameters that showed a main effect, different response patterns emerged (see Fig. 2): in both groups, SCL, SBP and DBP increased from baseline (B) to the bad news phase (P1), followed by a decrease from P1 to the information phase (P2). However, while SCRs showed an increase from B to P1, there was no significant decrease from P1 to P2. Further, HR continues to increase, whereby the difference was significant between B and P2 only (see 'significant differences over time' in Table 3). For CO, no effects were found. Likewise, no changes in APs' log-transformed cortisol levels were found over the four time points (see Table 4).

To address group differences in responses, a multivariate time*group interaction was shown (Wilks' Lambda = 0.48, $F(12, 27) = 2.48$, $p = 0.024$, $\eta^2_{partial} = 0.52$), indicating group differences in electrodermal and cardiovascular responses to the vignette. However, when the results for these psychophysiological variables were considered separately, the time*group interaction was significant for SBP and DBP only, whereby patients showed a stronger increase from baseline to the bad news phase of the vignette than the disease-naïve APs (see Table 3). For both SBP and

Table 3
Electrodermal and cardiovascular activity: a comparison between groups and over time periods.

	N	B		P1		P2		Main effect Time	Significant differences over time[a]	Interaction effect Time*Group	Main effect Group
		M	SD	M	SD	M	SD				
SCL (μS)											
Patient group	19	3.4	2.4	4.9	2.5	4.5	2.4	$F = 55.20$, $p < 0.001$, partial eta sq. = 0.59	P1 > P0, P1 > P2, P2 > P0	$F = 1.24$, $p = 0.297$, partial eta sq. = 0.03	$F = 0.19$, $p = 0.667$, partial eta sq. = 0.01
Disease-naïve group	21	3.4	2.2	5.3	2.7	5.0	2.6				
SCR (spikes/min)											
Patient group	19	1.4	1.7	3.8	2.9	2.9	2.5	$F = 33.64$, $p < 0.001$, partial eta sq.= 0.47	P1 > P0, P2 > P0	$F = 1.77$, $p = 0.239$, partial eta sq. = .04	$F = 1.28$, $p = 0.265$, partial eta sq. = 0.03
Disease-naïve group	21	0.9	1.2	2.6	2.2	2.5	2.0				
SBP (mm/Hg)											
Patient group	19	120.8	13.7	134.1	15.2	129.5	16.4	$F = 36.44$, $p < 0.001$, partial eta sq. = 0.49	P1 > P0, P1 > P2, P2 > P0	$F = 5.87$, $p = 0.008$, partial eta sq. = .13	$F = 1.65$, $p = 0.207$, partial eta sq. = 0.04
Disease-naïve group	21	119.6	11.9	125.4	14.2	122.8	13.9				
DBP (mm/Hg)											
Patient group	19	68.5	7.6	74.8	8.1	73.1	8.2	$F = 70.01$, $p < 0.001$, partial eta sq. = 0.65	P1 > P0, P1 > P2, P2 > P0	$F = 4.00$, $p = 0.036$, partial eta sq. = .10	$F = 0.05$, $p = 0.820$, partial eta sq. = 0.00
Disease-naïve group	21	69.3	7.7	73.1	8.5	72.2	8.4				
CO (L/min)											
Patient group	19	5.3	1.4	5.4	1.3	5.4	1.3	$F = 0.36$, $p = 0.65$, partial eta sq. = 0.01		$F = 0.13$, $p = 0.824$, partial eta sq. = 0.00	$F = 0.06$, $p = 0.804$ partial eta sq. = 0.00
Disease-naïve group	21	5.4	1.4	5.5	1.6	5.5	1.6				
HR (BPM)											
Patient group	19	73.2	10.6	74.9	11.6	75.1	11.2	$F = 5.98$, $p = 0.006$, partial eta sq. = 0.14	P2 > P0	$F = 0.63$, $p = 0.510$, partial eta sq. = 0.02	$F = 1.36$, $p = 0.252$, partial eta sq. = 0.03
Disease-naïve group	21	68.9	15.6	69.5	14.0	70.6	13.7				

Notes. B = baseline period, P1 = the bad news phase of the vignette, and P2 = the information phase of the vignette. SCL = skin conductance level; SCRs = skin conductance responses; SBP = systolic blood pressure; DBP = diastolic blood pressure; HR = heart rate; CO = cardiac output. Suggested norms for partial eta squared: small = 0.01, medium = 0.06, large = 0.14.

[a] Adjustment for multiple comparisons: Bonferroni.

Table 4
Hormonal activity: a comparison between groups and over time periods.

	N	Cort_rest		Cort_0 min		Cort_25 min		Cort_home		Main effect Time[a]	Interaction effect Time*Group[a]	Main effect Group[a]
		M	SD	M	SD	M	SD	M	SD			
Cortisol (nmol/L)												
Patient group	21	8.6	4.6	8.3	4.7	8.1	4.6	8.4	4.1	$F = 2.40$, $p = 0.082$, partial eta sq. = 0.15	$F = 0.79$, $p = 0.506$, partial eta sq. = 0.06	$F = 2.02$, $p = 0.163$, partial eta sq. = 0.05
Disease-naïve group	23	11.2	5.1	10.9	6.1	10.6	9.3	10.0	9.0			

[a] Logarithms of the original nmol/L-values were uses in the repeated measures ANOVA. Suggested norms for partial eta squared: small = 0.01, medium = 0.06, large = 0.14.

DBP, this time*group interaction disappeared after adjusting for age. In the age-adjusted model for SBP, a time*age interaction became apparent, with older APs responding stronger to the video vignette than younger APs (Wilks' Lambda = 0.83, $F(2, 36) = 3.65$, $p = 0.036$, $\eta^2_{partial} = 0.17$). The age-adjusted model for DBP only showed a main effect of age ($F(1, 37) = 4.18$, $p = 0.048$, $\eta^2_{partial} = 0.10$), whereby a higher age was associated with higher diastolic blood pressure values regardless of time or group. Regarding SCL, SCRs, CO and HR no interactions or main effects of group were found (see Table 3). Likewise, no differences between groups were found in hormonal activity (see Table 4).

4. Discussion and conclusion

4.1. Discussion

To improve patient care, a clearer understanding of how provider communication might affect relevant patient outcomes is urgently needed. Experimental designs using video-vignettes have

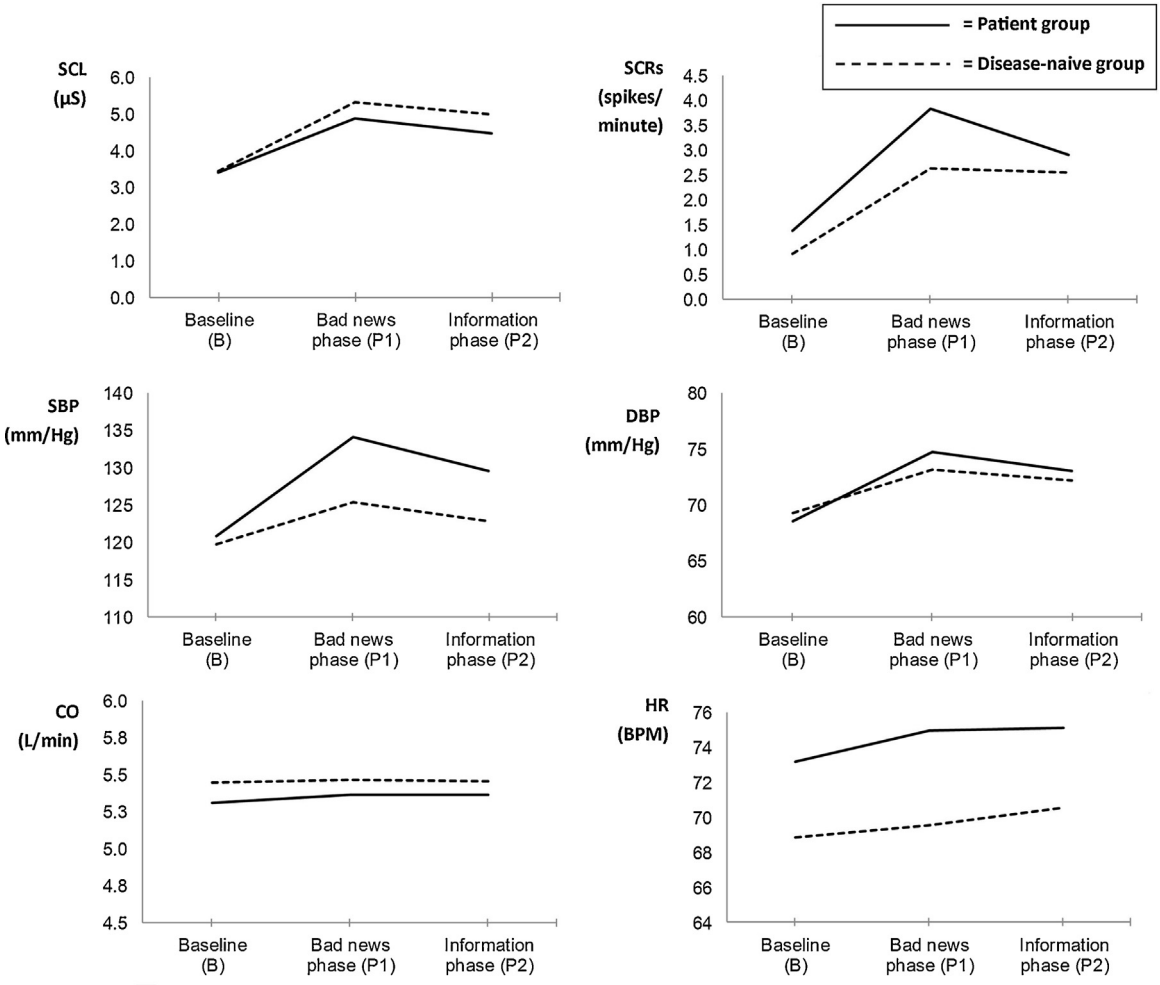

Fig. 2. Patterns of mean electrodermal and cardiovascular activity: patient versus disease-naïve group.
Notes. The six figures show patterns of mean psychophysiological activity, calculated separately for the patient group and the disease-naïve group over three periods of time: baseline(B), the bad news phase of the video vignette (P1), and the information phase of the video vignette (P2). SCL = skin conductance level; SCRs = skin conductance responses; SBP = systolic blood pressure; DBP = diastolic blood pressure; CO = cardiac ouput; HR = heart rate.

proven to be a highly valuable tool in disentangling complex associations in medical interactions. Yet, the ecological validity of a video-vignettes study hinges on analogue patients (APs) being engaged with the video vignette. Thus, selecting APs who exhibit stronger engagement could provide an important methodological improvement of the video-vignettes design. Differences in engagement between two common groups of APs, i.e., patients and disease-naïve individuals, were not studied previously. Hence, we compared a group of cancer patients with a group of disease-naïve individuals concerning their levels of engagement during viewing of a patient-provider video vignette. Engagement was operationalized by using a self-reported measure of engagement, and secondly, by assessing psychophysiological arousal in response the vignette.

4.1.1. Self-reported engagement

In primary analysis, patients reported significantly more engagement while viewing the video vignette than the disease-naïve APs. However, after adjusting for age, this difference disappeared, suggesting that the higher levels of reported engagement in the patient group were at least in part due to their higher age. Cancer is a disease that is more prevalent in older age: in the Netherlands only 7% of newly diagnosed cancer patients are younger than 45 years [20]. Therefore, it might have been more difficult for the younger participants to imagine themselves receiving a cancer diagnosis. A second explanation might be that the video patient was closer in age with the group of cancer patients than with the group of disease-naïve individuals, possibly making it more likely for the first to identify with the video patient.

However, the present results do not completely rule out a possible influence of disease history on self-reported engagement. Age and group were not independent in our sample as age was related to both group and self-reported engagement. Consequently, analyses that adjusted for age also reduced the effect of group (i.e., group differences in engagement). Combined with a relatively small sample size this adjustment probably reduced the likelihood of obtaining a significant result for either group or age on self-reported engagement in the analysis of covariance.

It should be noted that the degree of self-reported engagement in the present study was high, in the patient group (M = 5.4) as well as the disease-naïve group (M = 4.6), as it was in other video-vignette studies in which students (M = 4.8) and a combination of (former) cancer patients and in age matching cancer-naïve individuals (M = 4.5) were used as APs [15].

4.1.2. Psychophysiological responses

Results suggest that being a patient or not is not a major determinant of APs' psychophysiological responses to a patient-provider video vignette. For skin conductance level (SCL), skin conductance responses (SCRs) and heart rate (HR) the response pattern and magnitude was the same across groups. On these parameters, APs responded with a substantial increase in psychophysiological activity to the bad news vignette, suggesting that APs were emotionally aroused when watching with the vignette.

Analyses of systolic (SBP) and diastolic blood pressure (DBP) responses showed these differed by group: the patient group responded with a larger increase in blood pressure to the vignette. However, after adjusting for age these differences disappeared again. Instead, significant effects of age appeared, whereby a higher age was associated with higher overall and a larger increase in blood pressure. For this age effect similar explanations may apply as above, when addressing the observed age differences in self-reported engagement. Age-related differences in blood pressure may also reflect a normal physiological difference in cardiovascular responding to stress, as shown in a meta-analysis [21].

No effects were found on cardiac output (CO) and cortisol: these measures were neither influenced by AP watching the vignette nor by AP group. Thus, CO and cortisol seem to be less sensitive to detect APs emotional state while watching a patient-provider video vignette. Regarding cortisol, this is in line with results from a meta-analysis on stressors and cortisol responses, showing that passive, emotion induction tasks, such as APs viewing video vignettes, were not associated with increases in cortisol levels [22].

4.1.3. Strengths and limitations

A first strength of the present study is that it operationalized engagement by using both self-reported and physiological data. Psychophysiological measures can provide a more objective way to measure APs engagement. Moreover, such measures allow emotional arousal, an important component of APs engagement, to be assessed continuously during watching. Self-reported engagement and psychophysiological responses showed a modest association in our data. This observation supports the use of psychophysiological measures to operationalize emotional engagement. APs' psychophysiological responses to the vignette might not be restricted to the sympathetic branch of the autonomic nervous system, but may manifest in parasympathetic activity or hormonal activity as well. Therefore, a further strength of the present study is the broad range of psychophysiological measures used, which provided a comprehensive picture and the opportunity to examine sensitivity and replicability across measures.

A limitation of this study was the age difference between AP groups. Although we intended to match groups in age and gender, it turned out to be difficult to recruit disease-naïve participants, matching the cancer patients in age. Therefore, comparing a group of relatively older cancer patients as APs to a group of younger healthy individuals (including students), might even be a better reflection of actual researchers' reality when recruiting APs. Nevertheless, as age was only related to self-reported engagement and blood pressure in our sample, we decided to control for age in secondary analyses of those measures, while keeping in mind that this probably reduced the likelihood of obtaining a significant result as explained above.

4.2. Conclusion

This study provides evidence that APs' engagement while viewing a bad news patient-provider video vignette does not depend on APs being patients or disease-naïve individuals. Although the patient group reported to have been more engaged than the disease-naïve group, and the first also showed a larger blood pressure response to the vignette, these group differences disappeared after adjusting for age, suggesting that the higher levels of engagement were at least partly due to the fact that the cancer patients were significantly older.

4.3. Practice implications

Results from the present study do not indicate any difference in ecological validity between (former) patients and disease-naive individuals as APs in a patient-provider communication video-vignettes design. The results further suggest that matching the video-patient's age and the plausibility of video-vignette's story with the age of the AP group, could be a way to further optimize APs' engagement and therefore ecological validity of the design. Moreover, researchers may consider other arguments besides APs' disease history when making the choice for one of both AP groups. For example, convenience might be an important consideration when selecting an AP group. Also, from an ethical standpoint, it might not be necessary to burden patients.

Conflict of interest

None.

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Appendix A.

Video-vignettes development

Following recommendations by Hillen et al. [1], we first developed a valid script for an oncologist-patient bad news consultation concerning advanced oesophageal cancer. Advanced oesophageal cancer is a gender neutral condition with big emotional impact, making a psychophysiological response likely. Audio-recordings were made of a sample of real cancer bad news consultations, involving different oncologists. Based on these recordings and recordings made for previous studies, a realistic script was written. The script includes a discussion of the diagnosis and prognosis (the bad news phase or P1) followed by the provision of additional information about treatment options and side-effects (the information phase or P2). To assess the fidelity of the script, it was read by experts (three oncologists, one patient, two doctor-patient communication researchers and two professional film makers). Based on their comments a few minor adjustments were made. Next, we made video recordings of the script, using professional actors as oncologist (male) and patient. A test recording was made first to make a feedback round possible. We asked experts (three oncologists, one patient, five doctor-patient communication researchers and one professional film maker) to comment on the authenticity of the setting, characters, content and editing of the test recording. Their comments led to changes to improve authenticity of the medical consultation room setting and the oncologist's appearance. Moreover, we decided to use alternating camera viewpoints to show more of the video-patient's emotional reactions to the bad news. Next, we recorded the final video vignette. To stimulate APs' ability to identify with the video patient, two identical versions were created, one with a male actor and one with a female actor as video patient.

Appendix B.

Psychophysiological assessment

All experiments took place in a special lab room in which room temperature (21.5° Celsius) and arrangement (lights, chair, desk, monitor and headphones) were kept the same for all analogue patients (APs). Before attaching APs to the psychophysiological equipment, APs were asked to remove all jewellery from their hands and wrists, to clean their hands with water and to dry them carefully. The wildlife documentary and the video vignette were presented to APs via a 22-in. monitor connected to a Windows 7 operating PC running stimulus presentation software named SuperLab 4.5 (Cedrus). The PC running the SuperLab software was linked to the Biopac MP150 system, which in turn was connected to a second Windows 7 operating PC, running the data acquisition software Acqknowledge 4.3 (Biopac). The link between SuperLab and Acqknowledge was used to synchronize video presentation with the physiological activity registrations. Digital event markers programmed in SuperLab were automatically generated during each experiment and because of the connection with Biopac all periods of interest (e.g., the bad news phase of the vignette) were indicated in Acqknowledge on separate waveforms. Using a webcam and the media-record function of Acqknowledge, APs were videotaped synchronously to the registration of physiological activity. Consequently, using playback afterwards, investigators could check for e.g. movement or sneezing as causes of artefacts in the physiological registrations. The occurrence of random responses due to movement or talking was minimized by having APs watch the video alone and by instructing them to sit as still as possible.

Electrodermal activity

Electrodermal activity (EDA) was measured using a Biopac MP150 system connected to the PC running Acqknowledge 4.3. The wireless BioNomadix EDA system (BN-PPGED) was used to measure EDA at 1000 Hz with two disposable electrodes, pre-gelled with isotonic gel (type: EL507, Biopac), attached to the middle phalanx of the index and middle finger of the right hand (a Finometer Pro cuff, see below, was connected to the left hand). After EDA data acquisition, a low pass filter fixed at 1 Hz was used to eliminate any high frequency noise from the EDA signal. Acqknowledge was used to calculate skin conductance level (SCL) and skin conductance responses (SCRs) over the three periods of interest.

Cardiovascular activity

Cardiovascular activity was measured using a Finometer Pro (Finapres Medical Systems) connected to the Biopac MP150 system. The Finometer Pro cuff was connected to the ring finger of APs' left hand. The values of systolic blood pressure (SBP), diastolic blood pressure (DBP) and cardiac output (CO) were generated per heartbeat by the Finometer Pro, while taking into account APs' age, gender, height and weight, and filtered by Acqknowledge with a low pass filter fixed at 35 Hz. Acqknowledge was used to calculate heart rate (HR) from the filtered blood pressure signal and to calculate mean SBP, DBP, CO and HR over the three periods of interest.

Hormonal activity

Salivary cortisol was chosen as a measure of adrenocortical activity as the concentration of cortisol in saliva correlates highly with the amount of unbound cortisol in serum or plasma samples [23]. Saliva samples were collected with salivettes (Sarstedt, Rommelsdorf, Germany) and stored in tubes at $\leq 20^{\circ}$ C until shipment to the Technical University in Dresden (Germany) for analyses.

Per AP, four salivary cortisol samples were obtained (see Fig. 1): Cort_rest) a baseline saliva sample, obtained approximately 45 min after entering the experiment, just prior to watching the video vignette. By doing so, APs logically refrained from eating, smoking, drinking coffee and alcohol and intensive physical activity for about 45 min and cortisol levels could return to baseline levels after any anticipatory stress from entering the experiment; Cort_0 min) a response sample was collected immediately after

watching the video vignette, about seven to ten minutes after the start of the video vignette; Cort_25 min) a response sample was obtained approximately 25 min after the end of the vignette, or about 30–35 min after the start of the video vignette, since the peak in cortisol response occurs 21–40 min from onset of an acute psychological stressor [22]; Cort_home) a second baseline sample was collected by the AP at home within one week after the experiment. APs were instructed to collect the sample between 1 and 7 pm after refraining from eating, smoking, drinking coffee and alcohol and intensive physical activity for at least 30 min.

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