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Greater Experience of Negative Non-Target Emotions by Patients with Neurodegenerative Diseases Is Related to Lower Emotional Well-Being in Caregivers

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Abstract

Background—Behavioral symptoms in patients with neurodegenerative diseases can be particularly challenging for caregivers. Previously, we reported that patients with frontotemporal dementia (FTD) and Alzheimer’s disease (AD) experienced emotions that were atypical or incongruent with a given situation (i.e., non-target emotions).

Aim—We tested the hypothesis that greater experience of non-target emotions by patients is associated with lower caregiver emotional well-being.

Methods—178 patients with FTD, AD, or other neurodegenerative diseases and 35 healthy individuals watched three films designed to induce amusement, sadness, and disgust, and then reported their emotions during the films. Caregivers of the patients reported their own emotional well-being on the Medical Outcomes Study 36-item Short-Form Health Survey.

Results—In response to the amusement and sadness (but not disgust) films, greater experience of non-target emotions by patients was related to lower caregiver emotional well-being. These effects were specific to patients’ experience of negative non-target emotions (i.e., not found for positive non-target emotions or for negative or positive target emotions).

Conclusion—The findings reveal a previously unstudied patient behavior that is related to worse caregiver emotional well-being. Future research and clinical assessment may benefit from evaluating non-target emotions in patients.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

Keywords

non-target emotion; subjective emotional experience; caregiver well-being; neurodegenerative disease; frontotemporal dementia; Alzheimer's disease

INTRODUCTION

Given the increasing prevalence of dementia and other forms of neurodegenerative diseases, caregiving is becoming an increasingly important consideration for a growing number of families [1]. Caring for a family member who is living with a debilitating, progressive disease can be highly burdensome, leading to declines in caregivers' emotional well-being along with a number of mental health problems such as depression and anxiety [2,3]. Recent findings suggest that these kinds of caregiver mental health problems may lead to greater patient mortality [4]. Importantly, caregivers differ in the extent of their vulnerability to the negative effects of caregiving [5]. Thus, identifying the factors that influence this vulnerability will be extremely important for improving health outcomes for both caregivers and patients.

A significant body of research has suggested that behavioral symptoms in patients may be particularly challenging for caregivers, even more so than cognitive and functional symptoms [6,7]. In our own work, we have found that neurodegenerative diseases can produce profound changes in patients' emotional behavior, including alterations in reactivity (generating emotional responses [8]), regulation (adjusting emotional responses [9]), and recognition (identifying emotions in others [10]). Importantly, we have found that deficits in patients' emotional functioning (i.e., less frequent use of visual avoidance from negative stimuli – a specific type of emotion dysregulation) are associated with adverse outcomes in caregivers (e.g., greater psychological distress [11]). In the present study, we examine the impact of deficits in patient *emotional reactivity* on caregiver well-being, with a particular focus on subjective emotional experience.

Alteration in subjective experience of emotion in neurodegenerative diseases

The subjective experience of emotion is critical for adapting to life's challenges and opportunities and for a broad range of social behaviors [12,13]. The "feelings" that accompany emotions provide valuable information that guide behaviors (e.g., approaching things that generate pleasant feelings), create links with memories of emotionally-similar events, and inform conspecifics of preferences and likely future actions [14]. In neurodegenerative diseases, when a patient's emotional experiences are atypical or incongruent with a given situation (e.g., becoming angry in response to a caregiver's act of kindness), it can be confusing and frustrating for caregivers. Over time, these occurrences can erode the quality of the patient-caregiver relationship, which can have negative effects on caregiver and patient well-being [15].

Patients with neurodegenerative diseases including Frontotemporal dementia (FTD) and Alzheimer's disease (AD) undergo atrophy in large-scale neural networks [16] that underlie various aspects of emotional processing, including the production of subjective emotional

experience. For example, we found that patients with FTD experienced less disgust (the target emotion) when exposed to films that portrayed filth and contamination [8]. In a recent study, we found that patients with FTD and AD reported experiencing more atypical or non-target emotions than patients with other neurodegenerative diseases and healthy controls. To illustrate, patients in the study experienced anger in response to a slapstick comedy that primarily produced the target emotion of amusement in most viewers [17].

The present study

The present study examined the relationship between subjective experience of non-target emotions in patients with various forms of neurodegenerative diseases and emotional well-being in their caregivers. The patients self-rated their emotional experiences after watching three films designed to induce target emotions of amusement, sadness, and disgust. Caregiver emotional well-being and physical functioning (included as a control measure to ensure that the observed effects did not extend to other non-emotional domains) were measured using the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36; [18]). We hypothesized that greater patient experience of non-target emotions would be associated with lower caregiver emotional well-being.

METHODS

Participants

Participants were recruited through the Memory and Aging Center at the University of California, San Francisco (UCSF), and included 178 patients with FTD, AD, or other neurodegenerative diseases (OND) that primarily impact motor functioning (e.g., corticobasal syndrome, progressive supranuclear palsy, amyotrophic lateral sclerosis without frontotemporal degeneration), and their caregivers. Patients were diagnosed based on current consensus criteria [19–24]. Caregivers¹ were either spouses or domestic partners (84.8%), parents (0.6%), siblings (7.3%), adult children (6.2%), or friends (0.6%) who identified themselves as playing a primary role in providing care for the patient. Additionally, 35 neurologically healthy control individuals (HC) and their spouses (82.9%), children (5.7%), or friends (11.4%) were recruited from the community. Demographic characteristics of all participants are shown in Table 1.

Procedure

After being assessed at UCSF, patients and caregivers came to the Berkeley Psychophysiology Laboratory for a comprehensive day-long assessment of emotional functioning [25]². Informed consent was obtained from both patients and caregivers upon

¹Information regarding the relationship to patient was missing for one caregiver. To ensure that the effects found in this study did not simply reflect differences in caregivers' relationship to the patient (e.g., spousal caregivers had lower emotional well-being than non-spousal caregivers), we performed additional analyses similar to that for Table 4 that included spousal relationship as an additional covariate (1=spousal; 0=non-spousal). These analyses revealed similar results, with greater patient experience of negative non-target emotions in the amusement ($p=.03$) and sadness ($p=.04$) films associated with lower caregiver emotional well-being.

²In addition to the three films used in the present study, the assessments [25] included other stimuli and situations that produce emotional responses (e.g., sing a song), tasks where patients try to regulate their emotional responses, tasks involving emotion recognition, and a task where patients and caregivers have a 10-minute unrehearsed conversation about an area of disagreement in their relationship.

their arrival. All procedures were approved by the Institutional Review Board of the University of California, Berkeley.

Patient emotional assessment—The present study focused on the part of the assessment in which participants (patients and controls) viewed three films (in a fixed order) that had been previously found to elicit one of three target emotions in neurologically healthy adults [17,26,27]: amusement (*I Love Lucy*), sadness (*The Champ*), and disgust (*Fear Factor*). Participants rested for 60 seconds before watching each film. Film lengths were between 87 to 106 seconds. After watching each film, participants answered the following questions³ regarding their experience while watching the film: (a) an open-ended question where they indicated the emotion they felt most strongly; (b) a valence question where they rated the valence of their overall experience (i.e., “good,” “neutral,” or “bad”); and (c) specific emotion questions where they rated their subjective experience of ten emotions in a fixed order (i.e., affection, fear, amusement, anger, shame, disgust, embarrassment, enthusiasm, pride, sadness) on a three-point scale (0=not at all; 1=a little; 2=a lot). The ten emotions included four positively-valenced emotions (affection, amusement, enthusiasm, pride) and six negatively-valenced emotions (anger, disgust, embarrassment, fear, sadness, shame).

Caregiver assessment⁴—While patients completed the assessment of emotional functioning, caregivers completed the SF-36, which assessed their emotional well-being and physical functioning.

Measures

Patient subjective emotion experience—The three films were selected to elicit target emotions of amusement, sadness, and disgust. For the analyses, we created scores for: (a) positive non-target emotions, and (b) negative non-target emotions by averaging the ratings of the remaining emotions in each category. For example, for the sadness film, the target emotion was sadness; the positive non-target emotion score was the averaged ratings for affection, amusement, enthusiasm and pride; and the negative non-target emotion score was the averaged ratings for anger, disgust, embarrassment, fear, and shame.

Patient dementia severity—Clinicians at UCSF assessed patients’ dementia severity using the Clinical Dementia Rating Scale (CDR; Table 1 [29]). Two CDR scores were obtained: total score (CDR-Total; range=0–3) and sum of boxes (CDR-Box; range=0–18); for both, higher scores indicate greater dementia severity. For healthy controls, the CDR scores were coded as zero. In data analyses, we used CDR-Box as a covariate because it provides potentially greater sensitivity (i.e., larger range) to variations in patient impairment.

Patient emotion rating deficit—Self-report of emotional experiences may be compromised in patients with neurodegenerative disease due to language dysfunction or

³The patients also answered other questions including how calm they were while watching the film and whether they remembered particular details about the film; these data are not reported here.

⁴Caregivers also completed the Symptom Checklist-90-R (SCL-90-R) [28], which assesses nine domains of psychopathology. Because the SCL-90-R does not assess physical functioning, we used the SF-36 for the present study.

difficulty in using rating scales [8,17]. To account for this, we quantified inconsistencies between the valence of a participant's answers to the open-ended questions and the valence that the participant endorsed in the following question. For example, if the participant reported, "*I felt sad*" to the open-ended question but then reported that this feeling was "*good*" in the follow-up question, this would suggest problems in understanding the meaning of "sadness" or in rating the valence of emotional experience using the scale. The number of inconsistencies was calculated for each participant.

Caregiver emotional well-being and physical functioning—Caregiver emotional well-being and physical functioning were assessed using the SF-36 [18], a self-report questionnaire assessing eight health domains including emotional well-being (e.g., "Have you been a very nervous person?" "Have you felt downhearted and blue?" "Have you been a happy person?") and physical functioning (e.g., "Does your health now limit you in walking more than a mile?")⁵. For the complete list of items, see Supplemental Table 1.

Data analyses

We examined the associations between patient experience of positive and negative non-target emotions (predictors) and caregiver emotional well-being and physical functioning (dependent variables). Based on previous research [17], we accounted for a set of covariates⁶ that may affect these key study variables, including: patient age, sex, disease status (i.e., patient vs. controls), dementia severity (CDR-Box), and patient emotion rating deficit. Additionally, we included patient report of the target emotion as a covariate to account for individual differences in emotional reactivity [30].

Preliminary analyses included analyses of variance (ANOVA) and Pearson's correlations to examine between-group differences and correlations between the predictors and dependent variables. Primary analyses included multiple regressions conducted separately for each film, in which we entered covariates in the first step and patient experiences of positive and negative non-target emotions in the second step to predict either caregiver emotional well-being or physical functioning.

To rule out the possibility that the observed effects simply reflected diagnostic differences, we performed similar regression analyses replacing "disease status" and "dementia severity" covariates with three dummy variables (yes=1; no=0) for specific diagnosis: FTD, AD, and OND. Supplemental Tables 3–4 present these results.

⁵Other health domains assessed in SF-36 included: (a) role limitations due to physical health; (b) role limitations due to emotional problems; (c) energy/fatigue; (d) social functioning; (e) pain, and (f) general health.

⁶To verify the selection of these covariates, we performed Pearson's correlations and found that all covariates except emotion rating deficit and self-reported experience of target emotions were significantly correlated with caregiver emotional well-being ($p < .01$). In addition, all covariates except patient sex were significantly correlated with patient experience of either positive or negative non-target emotions in at least one of the three films ($p < .05$). These correlations are presented in Supplemental Table 2.

RESULTS

Preliminary analyses

Table 2 presents results for analyses of diagnostic group differences in the predictors and dependent variables. Results revealed significant group effects in caregiver emotional well-being, $F(3, 209)=8.10, p<.001$. *Post hoc* comparisons (Bonferroni-corrected) indicated that caregivers of FTD patients had significantly lower emotional well-being than partners of HC ($p<.001$). Caregivers of AD ($p=.067$) and OND ($p=.061$) patients also had lower emotional well-being than partners of HC at trend levels. As reported previously [17], results also revealed significant group effects in self-reported non-target emotions in all three films, $F_s>4.25, p_s<.006$. *Post hoc* comparisons (Bonferroni-corrected) revealed that patients with FTD reported greater experience of negative non-target emotions in all three films and greater experience of positive non-target emotions in the amusement and disgust films, compared to at least one of the other three groups ($p_s<.05$). Patients with AD reported greater experience of positive non-target emotions than the OND and HC groups in the amusement and sadness films ($p_s<.05$), Table 2.

Table 3 presents the Pearson's correlations between the predictors and dependent variables. These revealed that greater patient experience of positive and negative non-target emotions in response to the amusement and sadness films was associated with lower caregiver emotional well-being (r_s between $-.15$ and $-.22$; $p_s<.032$), but not physical functioning ($p_s>.186$). These effects were not found for the disgust film.

Patient experience of non-target emotions and caregiver emotional well-being

As shown in Table 4, after accounting for the covariates, greater patient experience of *negative* non-target emotions in response to the amusement ($\beta=-.17, t=2.50, p=.01$) and sadness films ($\beta=-.15, t=2.05, p=.04$) was significantly associated with lower caregiver emotional well-being. This relationship was not found for the disgust film ($\beta=-.08, t=1.12, p=.26$). There were no significant relationships between patient experience of *positive* non-target emotions in response to any of the films and caregiver emotional well-being ($t_s<0.67, p_s>.50$). Results from the additional regression analyses controlling for patient diagnosis revealed the same pattern of findings, although the results for the sadness film now only approached significance (amusement film: $\beta=-.16, t=2.25, p=.025$; sadness film: $\beta=-.13, t=1.77, p=.079$; Supplemental Table 3).

It is worthwhile to note that although the experience of the target emotions was entered as a covariate, it did not predict caregiver emotional well-being in either step of the model for any of the films ($t_s<.87, p_s>.38$; Table 4).

Patient experience of non-target emotions and caregiver physical functioning

As shown in Table 5, after accounting for the covariates, patient experience of non-target emotions did not significantly predict caregiver physical functioning ($t_s<1.35, p_s>.17$). The additional regression analyses accounting for patient diagnosis revealed similar results ($t_s<1.33, p_s>.18$; Supplemental Table 4).

DISCUSSION

The present study found that greater experience of negative non-target emotions by patients with neurodegenerative disease is related to lower emotional well-being in their caregivers. These effects were found for the amusement and sadness films, but not for the disgust film, and were specific to patients' experience of *negative non-target* emotions, but not *positive non-target* emotions or *target* emotions. These effects were also specific to caregiver emotional well-being, but not caregiver physical functioning.

Patient experience of negative non-target emotions: The cost for caregivers

Subjective emotional experience plays a critical role in facilitating adaptive behaviors and social communication [12,13]. The experience of negative non-target emotions can be particularly challenging in the interactions between patients and caregivers. Imagine a patient experiencing hostility and anger in response to affectionate behaviors expressed by the caregiver and behaving accordingly. Confronted with this, the caregiver would likely feel misunderstood and frustrated. Similar events, repeated with increasing frequency as the disease progresses, may erode the quality of the patient-caregiver relationship and lead to declines in caregivers' emotional well-being.

Specificity of findings

Negative but not positive non-target emotional experience—We found that greater experience of negative, but not positive, non-target emotions was related to lower caregiver emotional well-being. Unexpected negative emotional reactions from patients with neurodegenerative diseases may be particularly difficult for caregivers, who are already experiencing a great deal of stress and burden [2,3]. This may be further compounded when patients indicate distress and unhappiness in situations where the caregiver might have been expecting positive reactions. Positive emotions calm, soothe, and “undo” the effect of negative emotions [31], and have been linked to building social ties, prosocial behaviors, and better mental health outcomes [32]. For this reason, patients' experience of positive non-target emotions, albeit unexpected, may be less stressful for caregivers.

Target emotional experience—Interestingly, we did not find patient experience of target emotions to be associated with caregiver emotional well-being. On the surface, this appears to be inconsistent with findings that emotional blunting or apathy are associated with increased caregiver burden and psychiatric symptoms [33]. However, considering both target and non-target emotions can reveal additional complexities regarding emotional responding. For example, in our previous research, we found that patients with FTD reported less experience of target emotions (which is consistent with emotional blunting), but also greater experience of negative non-target emotions (which is not consistent with emotional blunting) compared to patients with other neurodegenerative diseases (including AD) and healthy controls [17]. In the present study, our findings suggest that caregivers are less affected by patients' decreased experience of target emotions than by their increased experience of negative non-target emotions. These findings have important implications for future research on emotional responding, suggesting that assessing non-target emotions might be particularly useful for distinguishing between types of neurodegenerative disease and for

identifying emotional behaviors in patients that are associated with adverse caregiver outcomes.

Amusement and sadness films but not disgust—The link between greater negative non-target emotional experience in patients and lower emotional well-being in caregivers was found for the amusement and sadness films, but not for the disgust film. This may reflect the fact that the type of disgust film used in this study elicits a range of emotional responses [17]. For example, watching someone being compelled to eat something revolting can cause viewers to feel anger at the person compelling the action, sad for the person having to comply, or amused at one's own responses. For this reason, non-target emotions in response to disgusting situations may be more expected and less salient, and thus less jarring and disturbing to caregivers than negative non-target emotions in response to amusing or sad situations.

Emotional well-being but not physical functioning—The link between greater patient non-target emotional experience and lower caregiver emotional well-being did not extend to caregiver physical functioning. We suspect that the impacts of this problematic patient behavior on caregiver physical health and physical functioning will take longer to develop. For example, in a recently completed 20-year longitudinal study, we found that links between negative emotions and physical health problems in neurologically healthy couples only appeared after more than a decade [34].

Implications

There are a number of implications of these findings. As mentioned earlier, assessments of patient emotional functioning in both research and clinical contexts may benefit from including patient experience of non-target emotions as well as target emotions. Our findings may also help identify caregivers who are at heightened risk for declines in emotional well-being and help identify targets for interventions designed to protect caregivers from the adverse effects of problematic patient behaviors.

Strengths, limitations, and future directions

This is the first study to our knowledge that examined the association between patients' experience of non-target emotions and caregiver emotional well-being. Strengths included: (a) relatively large sample size, (b) heterogeneous sample (a wide-range of neurodegenerative diseases were included), (c) generalizability across multiple emotion-eliciting stimuli (i.e., amusement and sadness), and (d) evaluating specificity as to aspects of patient behavior (negative non-target but not positive non-target or target emotions), aspects of caregiver functioning (emotional well-being but not physical functioning), and types of emotion-eliciting stimuli (amusement and sadness but not disgust).

Limitations included: (a) the cross-sectional design limited inferences about the direction of causal influences, and (b) other caregiver characteristics that may moderate observed effects (e.g., personality traits [35]) were not examined. Future studies should address these limitations and explore the mechanisms that link patient negative non-target emotional experience to lower caregiver emotional well-being over time.

Conclusion

The present study revealed a previously unstudied patient emotional behavior, greater negative non-target emotional experience, that is related to lower caregiver emotional well-being. Given the increasing rates of neurodegenerative diseases and associated caregiving, there is an urgent need to identify particular factors that influence vulnerability to the negative effects of caregiving. Aggregating the present findings with our previous findings on the association between visual avoidance in patients and mental health in caregivers [11], we suggest that a comprehensive (e.g., emotion reactivity, regulation, and recognition) and detailed (e.g., target and non-target emotions) assessment of patient emotional functioning will be helpful in developing a more complete understanding of associations between particular patient behaviors and particular adverse caregiver outcomes, which may benefit both the caregivers and patients [4].

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Demographic characteristics of caregivers and patients.

	FTD (n = 96)	AD (n = 44)	OND (n = 38)	HC (n = 35)
Caregiver				
Sex	55 F; 41 M	27 F; 17 M	22 F; 16 M	19 F; 16 M
Age	60.53 (1.04)	60.52 (1.19)	62.95 (1.58)	63.03 (1.78)
Patient				
Sex	39 F; 57 M	21 F; 23 M	18 F; 20 M	21 F; 14 M
Age	63.39 (0.79)	62.16 (1.38)	66.66 (1.21)	66.91 (1.38)
Dementia Severity: CDR-Total	0.93 (0.06)	0.84 (0.06)	0.77 (0.10)	0 (0.00)
Dementia Severity: CDR-Box	4.96 (0.34)	4.27 (0.33)	4.73 (0.52)	0 (0.00)

Mean (SE). FTD= Frontotemporal dementia. AD= Alzheimer's disease. OND= Other neurodegenerative diseases. HC= Healthy controls. CDR= Clinical Dementia Rating Scale. M=Male. F=Female.

Table 2

Statistics for key study variables including predictor (patient) and dependent (caregiver) variables.

	FTD		AD		OND		HC		F	P	Post hoc comparisons ^a
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)					
Caregiver											
	Emotional well-being	69.52 (1.87)	75.93 (2.44)	75.47 (3.10)	85.71 (1.50)	8.10	<0.001	FTD<HC [†] , AD<HC [†] , OND<HC [†]			
	Physical functioning	85.84 (1.86)	88.64 (1.92)	86.71 (3.35)	88.69 (2.55)	0.39	0.76				
Patient											
	<u>Amusement Film</u>										
	Positive non-target emotions	0.78 (0.07)	0.92 (0.09)	0.32 (0.07)	0.45 (0.08)	9.58	<0.001	FTD>OND ^{***} , FTD>HC [*] , AD>OND ^{***} , AD>HC ^{**}			
	Negative non-target emotions	0.24 (0.04)	0.09 (0.03)	0.07 (0.02)	0.11 (0.04)	4.36	0.005	FTD>AD [†] , FTD>OND [*]			
	<u>Sadness Film</u>										
	Positive non-target emotions	0.43 (0.05)	0.52 (0.07)	0.24 (0.05)	0.24 (0.04)	4.91	0.003	AD>OND [*] , AD>HC [*]			
	Negative non-target emotions	0.47 (0.05)	0.33 (0.07)	0.21 (0.05)	0.28 (0.06)	4.26	0.006	FTD>OND ^{**}			
	<u>Disgust Film</u>										
	Positive non-target emotions	0.37 (0.05)	0.25 (0.04)	0.08 (0.02)	0.15 (0.04)	6.78	<0.001	FTD>OND ^{***} , FTD>HC [*]			
	Negative non-target emotions	0.66 (0.06)	0.34 (0.07)	0.36 (0.07)	0.43 (0.07)	6.13	<0.001	FTD>AD ^{**} , FTD>OND [*]			

FTD= Frontotemporal dementia. AD= Alzheimer's disease. OND= Other neurodegenerative diseases. HC= Healthy controls.

[†] $p<.10$;

^{*} $p<.05$;

^{**} $p<.01$;

^{***} $p<.001$.

^a Level of significance corrected using the *Bonferroni* method for multiple comparisons.

Table 3

Correlations between key study variables.

Patient		Caregiver	
		Emotional Well-being	Physical Functioning
	<i>Amusement Film</i>		
	Positive non-target emotions	-.15*	.04
	Negative non-target emotions	-.18*	-.09
	<i>Sadness Film</i>		
	Positive non-target emotions	-.16*	.01
	Negative non-target emotions	-.22**	-.02
	<i>Disgust Film</i>		
	Positive non-target emotions	-.12	-.03
	Negative non-target emotions	-.05	-.06

*
 $p < .05$;**
 $p < .01$.

Patient experience of positive and negative non-target emotions as predictors for caregiver emotional well-being.

Table 4

	Caregiver Emotional Well-being					
	Amusement Film		Sadness Film		Disgust Film	
	Step 1 β	Step 2 β	Step 1 β	Step 2 β	Step 1 β	Step 2 β
<i>Patient</i>						
Sex ^a	0.16*	0.18**	0.17**	0.18**	0.16*	0.17*
Age	0.16*	0.17*	0.18**	0.16*	0.17*	0.17**
Disease status ^b	-0.16*	-0.16*	-0.17*	-0.17*	-0.17*	-0.16*
Dementia severity (CDR-Box)	-0.16*	-0.13	-0.14 [†]	-0.11	-0.17*	-0.15 [†]
Emotion rating deficit	0.01	0.03	0.04	0.04	-0.003	0.01
Target emotion	0.01	0.01	-0.01	0.01	-0.06	-0.04
Positive non-target emotions	-	-0.05	-	-0.03	-	-0.05
Negative non-target emotions	-	-0.17*	-	-0.15*	-	-0.08
R^2	0.16***	0.19***	0.16***	0.18***	0.16***	0.17***
R^2	0.16***	0.03***	0.16***	0.02 [†]	0.16***	0.01

^aSex: 1=Female, 0=Male.

^bDisease Status: 1=Patients, 0=Healthy participants. CDR-Box=Clinical Dementia Rating Scale box score.

[†] $p<.10$;

* $p<.05$;

** $p<.01$;

*** $p<.001$.

Patient experience of positive and negative non-target emotions as predictors for caregiver physical functioning.

Table 5

	Caregiver Physical Functioning					
	Amusement Film		Sadness Film		Disgust Film	
	Step 1 β	Step 2 β	Step 1 β	Step 2 β	Step 1 β	Step 2 β
<i>Patient</i>						
Sex ^a	0.05	0.05	0.07	0.07	0.07	0.07
Age	-0.13 [†]	-0.11	-0.13 [†]	-0.13 [†]	-0.12 [†]	-0.12 [†]
Disease status ^b	-0.003	-0.01	-0.01	-0.01	-0.01	-0.01
Dementia severity (CDR-Box)	-0.12	-0.11	-0.09	-0.09	-0.13	-0.12
Emotion rating deficit	0.06	0.06	-0.02	-0.02	0.04	0.05
Target emotion	<0.001	-0.02	-0.20 ^{**}	-0.20 ^{**}	-0.09	-0.08
Positive non-target emotions	-	0.07	-	-0.003	-	-0.02
Negative non-target emotions	-	-0.10	-	-0.005	-	-0.03
R^2	0.03	0.04	0.06 [†]	0.06	0.04	0.04
R^2	0.03	0.01	0.06 [†]	0.00	0.04	0.00

^aSex: 1=Female, 0=Male

^bDisease Status: 1=Patients, 0=Healthy participants. CDR-Box= Clinical Dementia Rating Scale box score.

[†] $p < .10$;

^{**} $p < .01$.