Cancer-related fatigue in a couples' context
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Chapter 7

General discussion
The aim of the current thesis was to increase our understanding of how daily cognitions and partner behaviors can impact patients’ symptom outcomes as well as relationship outcomes in couples coping with post-treatment cancer-related fatigue. In the upcoming paragraphs, the findings of our studies are integrated following the four guiding research questions presented in chapter 1. Next, our findings will be placed into the broader context of the literature on dyadic coping with cancer. Further, methodological considerations as well as challenges and promises of the diary method applied to research in couples will be examined. Lastly, clinical implications of our findings are outlined.

1. How do cancer-related fatigue and its interfering effects develop longitudinally and in daily life? (Chapters 2 & 5)

Cancer-related fatigue is a persistent and interfering symptom in a substantial number of patients. That is, one quarter of the patients experienced severe, clinically relevant levels of fatigue that persisted from diagnosis until 18 months later (Chapter 2). High levels of fatigue co-occurred with the disturbance of patients’ goals, particularly concrete goals that are pursued on a daily level, such as gardening or spending time with the grandchildren. By applying the diary method, we assessed variations in levels of fatigue and interferences within individuals at a daily level (Chapter 5). Fatigue interference is a construct similar to concrete goal disturbance as it captures the degree to which patients felt that their fatigue interfered with their daily life activities. Results of the diary method revealed that, on a daily level, fatigue shows meaningful fluctuations within individuals which alter the effects of partner responses on fatigue interferences. Daily partner responses can relieve, but also worsen, the patients’ interferences due to fatigue, especially on days patients feel more fatigued. Together, these results indicate that, while fatigue is a persistent symptom across months for a substantial group of patients, on a daily level, fatigue varies meaningfully within individuals. Partner behaviors can impact the daily functioning in patients suffering from persistent symptoms. Understanding that fatigue fluctuates on a daily level can help attune partner responses to the current support needs of the patients.
2. Which intrapersonal cognitions can be targeted to benefit individual and relationship outcomes? (Chapters 4 & 6)
In line with previous longitudinal studies (Goedendorp, Gielissen, Verhagen, & Bleijenberg, 2013; Lukkahatai & Saligan, 2013), we found that catastrophizing thoughts played an important role in the perpetuation of fatigue. We demonstrated that this association also applies to daily within-person processes. Further, the daily reciprocal relationship between catastrophizing and fatigue was mediated by high negative affect, suggesting that increases in negative affect drive this reciprocal relationship (Chapter 4). This maladaptive process appears to unfold quickly in daily life. Additionally, also partners appeared to engage in catastrophizing thoughts about patient fatigue, which, in turn, predicted increases in patients’ fatigue within the day (Chapter 6). Hence, catastrophizing thoughts of both patients and their partners have maladaptive effects for patients’ fatigue outcomes. Targeting catastrophizing in both dyad members is expected to benefit patients’ fatigue outcomes.

3. Which interpersonal partner behaviors can be targeted to benefit individual and relationship outcomes? (Chapters 3, 5 & 6)
Our results indicate that living together is an important prerequisite for the beneficial effect of having a partner (Chapter 3). That is, living with a partner appeared to be related to better functioning in patients with multimorbidity. The finding that only patients who lived together with their partner seemed to experience this health benefit suggest that the way patient and partner interact with each other in their shared daily life might be key to explain this beneficial effect. Put differently, there might be important daily dyadic processes at play that explain the impact of having a partner on patients’ well-being; these processes might also apply to couples in which one partner suffers from cancer-related fatigue. Investigating daily partner behaviors in couples coping with cancer-related fatigue revealed that partners engage in behaviors that can benefit, but also harm, patient outcomes as well as the couples’ relationship (Chapters 5 & 6).

Two types of partner responses appeared to impact patients’ fatigue interference and their relationship satisfaction. That is, facilitative partner responses towards patients’ well-behavior were found to relieve patients’ fatigue burden while also benefitting patients’ relationship satisfaction. Hence, facilitative responses ap-
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peared to be adaptive for both patient outcomes. Daily solicitous responses towards fatigue-behavior were accompanied by an adjustment trade-off, that is, improved relationship outcomes at the expense of worsened fatigue interference. Negative responses towards patients’ well-behavior were related to an increase in fatigue interference, but were unrelated to relationship satisfaction. Punishing responses towards fatigue-behavior were unrelated to fatigue interference, but were related to a decrease in relationship satisfaction (Chapter 5). Next to partner responses, the impact of co-rumination was studied. Both dyad members’ daily co-rumination was found to worsen patients’ fatigue severity, while it did not provide benefit for the couples’ relationship outcomes (Chapter 6).

Our findings stress that daily partner behaviors can have dual effects on patient and relationship outcomes. Yet, on a group level, patients who live with their partner reported better functioning than patients who do not (Chapter 3). This finding seems to suggest that the adaptive effects of daily partner behaviors on patient outcomes might outperform their maladaptive effects. Understanding dyads’ daily coping efforts can facilitate adjustment, also in terms of the couples’ relationship. Interventions that encourage facilitative responses and discourage other response types and co-rumination might foster both partners broader well-being.

4. What can we learn from the integration of an intrapersonal and interpersonal perspective to study cancer-related fatigue? (Chapters 4, 5 & 6)

Integrating an intrapersonal and interpersonal perspective increased our understanding of the predictor and outcome variables on both levels. First, catastrophizing appears to exert its maladaptive effect on patient outcomes on an intrapersonal and interpersonal level. On an intrapersonal level (Chapter 4), patients’ catastrophizing thoughts, fueled by negative affect, appeared to perpetuate fatigue. On an interpersonal level (Chapter 6), patient and partner cognitions translate into co-rumination, which in turn, perpetuates fatigue. This is an important finding as it demonstrates that intrapersonal cognitions and interpersonal partner behaviors are intertwined. This finding also stresses that partners’ negative cognitions contribute to the patients’ symptom development.

Catastrophizing thoughts in both dyad members might not only translate into heightened symptoms via maladaptive co-rumination, but also via maladap-
tive partner responses. Applying Sullivan’s *communal coping model* (Sullivan et al., 2001; Sullivan, 2012) to the field of fatigue suggests that patients high in catastrophizing engage in excessive display of fatigue-behavior to elicit support from their partners. In turn, partners high in catastrophizing might be highly susceptible to the patients’ display of fatigue and, hence, might respond solicitously aiming to reduce the patients’ discomfort (Sullivan, Martel, Tripp, Savard, & Crombez, 2006; Sullivan, 2012). Solicitous responses, however, worsen rather than relieve symptom outcomes (Chapter 5). Put differently, high catastrophizing couples in which patients extensively display fatigue-behavior and partners are susceptible to detect and solicitously respond to this fatigue-behavior might be at risk to inadvertently worsen patients’ fatigue. Sullivan’s assumption about the intentionality of catastrophizers illness-behavior to elicit support (Sullivan et al., 2001; Sullivan, 2012) is challenging to test empirically and has been subject to debate (Severeijns, Vlaeyen, & van den Hout, 2004). Yet, relying instead on the conceptualization of catastrophizing as cognition (i.e., threat appraisal; Severeijns et al., 2004) avoids the assumption of intentionality but allows the same prediction to be made about the translation of dyads’ catastrophizing into patients’ symptom outcomes via partner responses. This second dyadic pathway should be empirically tested, as it would provide further evidence that dyad members’ cognitions and partner behaviors are intertwined. As such, targeting both dyad members’ catastrophizing thoughts might benefit the patients’ symptom development on an intrapersonal and interpersonal level.

Second, by combining an intrapersonal and interpersonal perspective, we derived insights into the dual effects of partner behaviors (Chapter 5). Partner responses, even though specific to illness- and well-behavior, impact patients’ intrapersonal outcomes and relationship satisfaction. Co-rumination appeared to impact patients’ symptom outcomes only (Chapter 6). Insights into the divergent effects of some partner responses help explain why partners act in a way that has been shown to be maladaptive for patients’ symptom outcomes. That is, partner behaviors that reinforce patients’ fatigue (i.e., solicitous responses towards fatigue-behavior) might be sustained as they benefit the couple’s relationship. Couples might need education on the divergent effects of solicitous responses. That is, even though these responses might be well-intended and benefit the patients’ relationship satisfaction, they contribute to their fatigue burden.
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Dyadic coping with cancer
Research that investigated the interdependence of patients’ and partners’ adjustment to cancer provided important insights into the impact of dyadic coping on patient, partner and relationship outcomes (Regan et al., 2015). The current thesis focused on two dyadic coping strategies that were expected to play an important role in couples’ daily adjustment to cancer-related fatigue.

First, partner responses towards patients’ fatigue- and well-behavior were investigated. Partner responses have received much research attention in the prediction of symptom outcomes, especially in the field of pain. While the operant model importantly contributed to acknowledging the impact of partner behaviors on symptom outcomes, it is increasingly evident that an operant model is not sufficient to understand the outcomes of dyadic coping with interfering symptoms (Cano & Goubert, 2017; Newton-John, 2002; Prenevost & Reme, 2017). Our findings support this notion. Importantly, partner responses can be conceptualized within an intimacy framework (Reis & Shaver, 1988), which results in clinical recommendations that are different from those derived from the operant model alone. That is, solicitous responses do not only have the function of reinforcing illness-behavior, these responses also communicate responsiveness and thus create intimacy between partners. As such, simply following operant recommendations to discourage solicitous responses without providing alternative ways to preserve the couple’s relationship (e.g., facilitative responses) might be maladaptive. The same rationale applies to punishing responses, which, in a purely operant tradition, should be encouraged. This recommendation, however, might result in decreases in patients’ relationship satisfaction and hence to the erosion of an important coping resource. Of theoretical relevance, these results stress the benefit of conceptualizing partner behaviors based on complementary theoretical models as well as integrating an intrapersonal and interpersonal perceptive to understand patients’ symptom adjustment.

As it is likely that partner responses do not occur in isolation within daily life, future research should investigate their co-occurrence to study the interaction of their dual effects on patient and relationship outcomes. For example, solicitous responses towards fatigue-behavior might co-occur with negative responses towards well-behavior. The implications of such co-occurrence for individual and relationship outcomes need to be understood. Cross-sectional evidence
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among couples coping with diabetes suggests that the negative effect of maladaptive partner behavior (i.e., protective buffering) on relationship satisfaction can be mitigated when it co-occurs with adaptive behavior (i.e., active engagement; Schokker et al., 2010). Conversely, in a non-clinical sample, ambivalent partner behaviors (i.e., the co-occurrence of positive and negative partner behaviors) have been associated with worse relationship outcomes (Birmingham, Uchino, Smith, Light, & Butner, 2015). More research is needed to understand the interaction of partner behaviors and their dual effects on both individual as well as relationship outcomes. Relatedly, studies dedicated to understanding the motives for partners’ daily support provision (i.e., autonomous versus controlled motivation; Kindt, Vansteenkiste, Loeys, & Goubert, 2016) might further our understanding of when partner behaviors have a (mal-)adaptive effect on patient, partner and relationship outcomes. In line with our finding that the intrapersonal process of partners’ catastrophizing can worsen patients’ symptom outcomes via the interpersonal process of co-rumination (Chapter 6), partners’ controlled helping motivation might be another intrapersonal process that worsens patients’ symptom outcomes via the interpersonal process of maladaptive support provision (Kindt et al., 2016).

Second, the concept of co-rumination was applied to the dyadic cancer literature and identified as a communication pattern that is maladaptive for patients’ symptom outcomes. Even though couples’ communication received considerable attention in the dyadic coping literature, much of its effects remain poorly understood. As such, treatment recommendations for adaptive dyadic communication in the context of cancer remain rather nonspecific (Badr, 2017). Evidence such as that hiding ones worries and emotions is maladaptive for patient and relationship outcomes (i.e., protective buffering; Regan et al., 2015) has led to the generic recommendation to foster dyads’ open communication (Badr, 2017). Our study, however, suggests that this recommendation might bear some risks, as extensively dwelling on worries and emotions (i.e., co-rumination) might arise, which is also maladaptive (Chapter 6). Importantly, co-rumination appears to originate in both dyad members’ catastrophizing thoughts. This finding stresses that also partner cognitions contribute to the patient’s symptom experience and provides a dyadic pathway in which a well-known risk factor for adverse symptom outcomes operates in daily life. From a theoretical perspective, this finding demonstrates that cognitions and behaviors are intertwined. Further, the mediating effect of co-
rumination was solely revealed by also studying the partners’ perspective, which stresses the importance of including both dyad members into research. Hence, a truly dyadic approach reaches beyond including an interpersonal predictor and outcome; both partners should report on their cognitions and behaviors and their interdependence and intra- and interpersonal influences should be investigated. From a clinical perspective, targeting catastrophizing might aid couples to share their feelings in a more adaptive way. **Mutual constructive communication** (i.e., mutual discussions of cancer-related problems, sharing feelings, and perceiving that the problem is resolved; Manne et al., 2006) appears to be such an adaptive communication pattern that fosters patients’, partners’ as well as couples’ adjustment to cancer (Badr & Carmack Taylor, 2009; Manne, Badr, Zaider, Nelson, & Kissane, 2010; Manne et al., 2006). The key difference between dyad’s communications that are ruminative versus mutual constructive might be that the first entails an extensive focus on negative feelings and thoughts, while the latter entails constructively talking about plans to cope together with fatigue (e.g., being active together, doing household chores sitting not standing). In line with our finding that current fatigue severity intensifies the effect of partner responses (Chapter 5), fostering couples’ mutual constructive communication might be most beneficial in patients with a high symptom burden (Manne et al., 2006). Future research should investigate whether reductions in both dyad members’ catastrophizing lead to better patient, partner and relationship outcomes via decreases in co-rumination and increases in mutual constructive communication.

The dyadic coping literature provided theoretically and clinically important insights into the adjustment in couples in which one partner has been diagnosed with cancer. With the ongoing aging of the population, the field needs to address upcoming challenges. As one in three women and one in two men might be diagnosed with cancer within their lifetime (Hayat, Howlader, Reichman, & Edwards, 2007; Siegel et al., 2012), it will be increasingly common that both partners of a couple suffer from cancer-related symptoms and their adverse effects. To address the care needs of these **dual-cancer** couples, future studies should systematically investigate dyadic coping efforts and adjustment effects in couples in which both partners face a cancer diagnosis (or another morbidity). Given the expected increase in the prevalence of chronic morbidity in the aging population and the potential benefit of living with a partner to cope with its adverse effects (Chapter
3), it is surprising that this topic received only little research attention. However, there is some evidence suggesting that having a healthy partner is most beneficial in terms of receiving support and relationship satisfaction (Lewin, 2016). Hence, partner support might be eroded and dyadic coping efforts impeded in couples in which both partners face a cancer diagnosis. Further, research based on equity theory (Van Yperen & Buunk, 1990; Walster, Berscheid, & Walster, 1973; Walster, Walster, & Berscheid, 1978) suggests that a balance of support provision and reception is vital to maintain good personal and relationship outcomes (Kleiboer, Kuijer, Hox, Schreurs, & Bensing, 2006; Kuijer, Buunk, De Jong, Ybema, & Sanderman, 2004; Manne & Badr, 2008). This indicates that maintaining a supportive partner role despite being ill (i.e., having the patient role) is important for the couples’ adjustment. Disentangling role and gender effects might foster our understanding of dyadic coping efforts and individual’s adjustment in dual-cancer couples. There is some evidence that women are more distressed than men independent of their role (i.e., being the partner or the cancer patient; Hagedoorn, Sanderman, Bolks, Tuinstra, & Coyne, 2008). Also, women in non-cancer samples appear to be more likely to engage in catastrophizing (Sullivan et al., 2001) and to report higher levels of co-rumination (Spendelow, Simonds, & Avery, 2017) compared to men. Together, these findings suggest that females in dual-cancer couples might be at higher risk for poor adjustment. However, until present, it is difficult to draw firm conclusions about gender effects in couples coping with cancer, as gender and role are often confounded in these studies (e.g., breast cancer patients being over-represented; Hagedoorn et al., 2008). Dual-cancer couples might need guidance on how to maintain a mutually supportive and equal relationship in which both partners and their relationship adjust well. Studying both dyad members’ cognitions, their support exchanges as well as symptom and relationship outcomes in daily life might help identify the most effective strategies to guide and support their adjustment in dyadic interventions.

Methodological considerations

The results of the present thesis should be considered in light of some strengths and limitations. In general, the strengths of this thesis lies in the application of strong research designs, including a dyadic diary that allows studying daily processes as
they naturally occur in daily life, and the adoption of an intrapersonal as well as interpersonal perspective.

Chapter 2 describes results of a longitudinal study following cancer patients from shortly after diagnosis until 18 months later. Of note, few studies so far (e.g., Bødttcher et al., 2015; Goedendorp et al., 2013) followed patients from diagnosis, throughout treatment until early survivorship while assessing fatigue at these clinically meaningful stages of the cancer trajectory. By applying growth mixture modeling, subgroups of patients could be identified that showed differences in severity and development of their fatigue as well as goal disturbances. Norm values and evidence-based guidelines have been applied to identify subgroups of patients with clinically distinct trajectories of fatigue. The patients’ personal goals were assessed with qualitative interviews, which gives insights into the adverse effects of cancer from the patients’ perspective. A limitation of this design and analysis technique is that the directionality of the association between fatigue and goal disturbance could not clearly be investigated. Even though our research and that of others (Sohl, Levine, Case, Danhauer, & Avis, 2014; Stefanic, Caputi, & Iverson, 2014) indicate that fatigue triggers goal disturbances, goal disturbances might also perpetuate or worsen fatigue.

The same limitation applies to the results as presented in chapter 3 in which baseline data of a large, broadly representative cohort of Dutch middle-aged and older individuals were analyzed. By analyzing data of participants with single and multiple chronic morbidity, compared to a healthy control group, we could draw conclusions about the association between living together with a partner and patients’ well-being. However, due to the cross-sectional design, the directionality of this association could not clearly be investigated. It seems likely, however, that chronic conditions impair an individual’s physical health (Aarts et al., 2012; Kriegsman, Deeg, & Stalman, 2004; Stuck et al., 1999) and that support from a partner can be beneficial for an individual’s well-being (Soulsby & Bennett, 2015).

The dyadic diary design applied in chapter 4 to 6 has some unique strengths. In general, the diary method provides insights into fluctuations of the concepts of interest, is assumed to reduce recall-bias and to generate ecologically valid data (Bolger, Davis, & Rafaeli, 2003; Heron & Smyth, 2010). In particular, our dyadic diary study investigated cognitions and partner behaviors as they naturally occur in daily life, over a period of 14 consecutive days and as reported by both
patients and their partners. Importantly, the repeated measures within patients and partners allowed us to analyze within-person effects, that is how daily deviations from one’s typical level of cognitions and behaviors relate to individual and relationship outcomes. Too often, conclusions about within-person effects are drawn based upon between-person designs (e.g., cross-sectional studies), which can be erroneous (Bolger & Laurenceau, 2013; Hamaker, 2011) as these effects can be substantially different (e.g., Inauen, Shrout, Bolger, Stadler, & Scholz, 2016; Schenk, Bos, Slaets, de Jonge, & Rosmalen, 2017; Zawadzki, Smyth, Sliwinski, Ruiz, & Gerin, 2017). Both are important, as insights into between-person differences indicate which persons might need treatment (e.g., highly fatigued patients), while insights into within-person effects indicate which processes need to be targeted in these individuals (e.g., increases in daily catastrophizing). Further, our diary method was carefully designed which resulted in an excellent response rate. These characteristics make it likely that the effects found are generalizable to the real-life setting. Hence, intervening on the underlying processes has the potential to improve patient and relationship outcomes.

Next, the dyadic design allowed us to address the fundamental principle of dyadic research, which is that dyad members are interdependent and mutually influence each other. That is, dyad members’ scores are more similar to (or dissimilar from) each other than scores of individuals who are not members of the same dyad. Further, one partner’s cognitions and behaviors can not only impact his/her own outcomes (actor-effect) but also the outcomes of the other partner (partner-effect; Kenny, Kashy, & Cook, 2006). As such, dyadic designs and analyses explicitly acknowledge that symptoms such as fatigue are not experienced in a vacuum but within a dyadic context in which both members reciprocally influence each other.

Some limitations of our diary method should be mentioned. First, due to practical considerations, some concepts, particularly those requiring partner contact (i.e., partner responses, co-rumination), were only assessed once daily, which hampers drawing conclusions about the temporal order of the effects within days (Chapters 5 & 6). This limitation was addressed by predicting the outcome measures (i.e., fatigue severity and interference, relationship satisfaction) as assessed in the evening while controlling for their value at the previous assessment. Second, inclusion-criteria for the diary component of the study were rather broad, which might be the reason why the mean values of some constructs were rather low (e.g.,
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fatigue, catastrophizing, co-rumination). We might have found higher values of and more variations in these constructs if more severely fatigued patients had been included. Third, as is common in dyadic research (Hagedoorn et al., 2015; Norton & Manne, 2007), highly satisfied couples were likely overrepresented in our sample. As some evidence suggests that operant conditioning effects of partner responses appear to be mostly present in highly satisfied couples (Newton-John, 2002), future research should try to include less satisfied couples and investigate their dyadic coping efforts.

In short, despite some methodological limitations, the studies presented in this thesis give important insights into the relevance of cancer-related fatigue for patients’ well-being and give indications for the importance of daily partner behaviors in patients suffering from multiple chronic conditions. The results of the dyadic diary method provided unique insights into daily cognitions and partner behaviors that impact the patients’ fatigue outcomes and couples’ relationship. The results are likely to be generalizable to dyads’ real life setting and represent targets for interventions aiming to relieve the couples’ fatigue burden.

The diary method applied to research on dyadic coping

The core of this thesis are the data collected with the dyadic diary method. This intensive longitudinal design applied to cancer patients and their partners allowed us to gain unique insights into the daily coping processes in couples facing cancer-related fatigue. In this paragraph, benefits and challenges unique to diary studies applied to dyads are discussed and promising directions for future research are outlined.

The dyadic diary method is increasingly common in the field of health psychology and has successfully been applied to the study of dyads without and with a health condition. Examples include assessing the association of (a) significant others’ negative and solicitous responses with diverse symptom outcomes in individuals with chronic fatigue syndrome (Band, Barrowclough, Emsley, Machin, & Wearden, 2016), (b) goal conflict and perceived patient gratitude with partners’ helping motivation in couples coping with chronic pain (Kindt, Vansteenkiste, Cano, & Goubert, 2017), (c) partner support and joint engagement with physical activity in overweight and obese couples (Berli, Bolger, Shrout, Stadler, & Scholz, 2018), (d) partner responsiveness with feelings of intimacy in young, heterosexual
couples (Debrot, Cook, Perrez, & Horn, 2012) and (e) patient avoidance and partner constraints of discussing cancer-related concerns with patient affect in couples coping with metastatic breast cancer (Badr, Pasipanodya, & Laurenceau, 2013).

These dyadic studies applied the diary method in order to increase our understanding of how dyads’ daily behaviors relate to intra- or interpersonal outcomes pointing to within-person processes, which might be targeted in interventions. Further, these studies represent how diary data collected in dyads can be used and analyzed differently to address different research questions. For example, in individual analyses, models can be run separately in which either the predictor variable (e.g., partner responses) as reported by the patient or as reported by the partner are used to predict the outcome of interest (e.g., Band et al., 2016). Treating the dyad as the unit of analysis allows modelling both partners’ predictors and outcomes simultaneously while taking the dyads’ interdependence into account and assessing their intra- and interpersonal associations (actor- and partner-effects; e.g., Debrot et al., 2012). Both approaches have been applied in the current thesis (Chapters 5 & 6) and can answer different research questions. That is, using patient and partner reports of the predictor variable separately can inform theory on whether the individuals’ perception of partner behaviors matter in predicting intra- or interpersonal outcomes. Methodologically, these analyses can provide evidence that the associations found are not solely due to shared method variance and give an indication whether social desirability might be an issue (Chapter 5). Dyadic analyses can demonstrate whether patients’ and partners’ cognitions and behaviors influence each other while taking the dyad members’ interdependence into account (Chapter 6). As such, these analyses capture the couples’ interpersonal dynamics and mutual influences, which represent a more valid reflection of their shared social life.

While the dyadic diary method allows answering new and exciting research questions, there are some challenges that need to be addressed. First, most diary research shares the limitation of relying on self-report. While the (semi-)momentary nature of the assessments are assumed to limit recall-bias, social desirability bias might be an issue as well as limitations in studying behaviors that are habitual and unaware to participants (e.g., automatic fatigue-behavior such as sighing; Mehl & Robbins, 2011). Technical advances permit the application of sensor technique allowing a more objective account of some concepts. These sensor data,
however, are meant to augment or replace self-reported intrapersonal concepts such as physical activity or symptom burden (e.g., Low et al., 2017; Wolvers et al., 2017). Interpersonal concepts which might be more prone to social desirability or participants’ unawareness (e.g., negative partner behaviors) and which are at the heart of dyadic research, are still rarely assessed by objective means in daily life. The Electronically Activated Recorder [EAR] is a method that might prove valuable to overcome these limitations. EAR refers to an unobtrusive and naturalistic observation method that allows recording individuals’ acoustic surrounding in their daily life, providing ecologically valid behavioral data that are independent of self-report (Mehl, Pennebaker, Crow, Dabbs, & Price, 2001; Mehl & Robbins, 2011). EAR has been successfully applied in couples coping with cancer (Karan, Wright, & Robbins, 2017; Robbins, López, Weihs, & Mehl, 2015), showing that it is a feasible method to study dyads’ everyday conversations to investigate their adjustment to cancer. Conversations observed with the EAR method should be more ecologically valid than conversations induced in a laboratory setting. Augmenting the EAR method with self-report diary data can complement the objective records with data on participant’s perception of the recorded partner behaviors as well as their effects on symptom and relationship outcomes. As such, this combination of methods is promising to empirically identify partner responses, even beyond the categories central in the operant model, and to define their function by studying the participant’s perceptions and the effects the responses actually exert on patients’ outcomes (see Newton-John (2002) for a discussion on this issue). While the EAR method is promising to provide objective and ecologically valid accounts of couples’ daily communications, it is labor intensive and evokes legal and ethical issues (Mehl & Robbins, 2011), particularly if video recordings would be needed to investigate non-verbal dyadic behaviors (e.g., nodding as expression of responsiveness). However, the development and application of methods that overcome self-report bias and allow gaining insight into naturalistic dyadic behaviors is an exciting and highly important avenue for future dyadic diary research.

While rapid technological advances (e.g., internet, mobile technologies, data storage systems) and analytical methods (e.g., multilevel analyses, time series analyses) allow diverse designs, applications and research questions to be addressed, the basic theoretical insights into daily processes are at risk to lag behind. That is, we currently lack knowledge on the time intervals in which daily processes unfold.
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in daily life (Hamaker & Wichers, 2017). For instance, does the maladaptive effect of catastrophizing thoughts on fatigue unfold immediately, within several minutes or across hours or only across days? Our results suggest that catastrophizing and fatigue are reciprocally related within several hours within days (Chapter 4). However, other time intervals might be possible and investing them might even lead to different conclusions about their association (Hamaker & Wichers, 2017). It is likely, that also partner behaviors might exert their dual effects in different time intervals. For example, solicitous partner responses might be sustained despite their maladaptive effect on fatigue as they lead to proximal increases in partners’ intimacy. Understanding the immediate gains and more distal costs of partner behaviors might help develop educational modules for partners. Knowledge of the time intervals in which daily processes unfold are also essential to inform the number and interval of assessments needed to investigate a certain construct of interest (Bolger et al., 2003; Hamaker & Wichers, 2017).

A related issue is the operationalization of constructs in diary designs. Often, validated measures developed for non-diary designs assessing trait-like characteristics are shortened and adapted to measure the construct of interest in daily life. A major concern in the selection and adaptation of diary items is that they must be sensitive to measure the time-varying nature of the construct of interest. The number of items selected is often guided by the practical considerations to reduce the participant burden. While this is a very important consideration, also evidence should inform how to measure constructs in daily life in a reliable and valid manner. While this issue received recently some research attention (e.g., Darnall et al., 2017), more research on how to operationalize time-varying constructs in daily life is needed to improve our understanding of how cognitive and behavioral processes unfold in daily life. Of particular importance for the daily assessment of partner behaviors is the question of how specific the selected items should be. That is, while two items on seemingly related partner responses (e.g., taking over household chores, giving a compliment) are expected to be highly correlated in cross-sectional or longitudinal designs representing a general trait-like solicitousness, on a daily level, both responses are less likely to co-occur. The difference between assessing trait- and state-like partner behaviors has important implications for how to assess reliability indicators for diary scales and which reliability values can be deemed acceptable.
Fourth, much dyadic research is driven by the assumption that the effects of daily dyadic processes pile up over time and as such impact important long-term outcomes. However, few studies so far have empirically investigated this assumption. An exception is the study of Wilson and colleagues (2017) who combined a three-week diary design with a longitudinal data collection to predict a change in osteoarthritis patients’ physical functioning. Patients whose partners were more empathically responsive to their pain expressions in daily life had better physical functioning 18 months later compared to patients whose partners were less empathically responsive. This study provides an excellent example for the theoretical and clinical relevance of studying daily partner behaviors to understand patients’ long-term outcomes. Their findings strongly suggest that patterns in daily partner behaviors indeed impact patient outcomes over time. Hence, targeting daily partner responsiveness appears promising in fostering patients’ long-term functioning. As daily life is often experienced in and shaped by a social context, studying long-term outcomes of daily partner behaviors is an important endeavor for future research.

Lastly, a general concern in research applying a diary design is the risk of self-selection bias, particularly due to a lack of experience with modern electronic devices (Heron & Smyth, 2010). As the dissemination of electronic devices is ongoing, this bias is likely to decline in the future. However, specific to dyadic diary research is the risk of overselection of the most satisfied couples. In dyadic research in general, highly satisfied couples might be overrepresented (Hagedoorn et al., 2015; Norton & Manne, 2007), possibly because only highly satisfied couples commit to jointly participate in research. As diary designs often have intensive study protocols, this self-selection bias might even be more pronounced in these studies; an assumption that should be empirically assessed. To foster the generalizability of research findings, extra effort should be invested to include less satisfied couples into dyadic diary research.

A promising application of the diary method is its use within interventions. The term *ecological momentary intervention* refers to interventions that are delivered via electronic devices to individuals in their daily life and within their natural environment that aim to improve psychosocial and health outcomes (adapted from Heron and Smyth (2010)). These diary interventions are often used to augment existing clinical treatments but some are implemented as self-standing interven-
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tions. Further, as diary interventions are delivered in and adapted to participants’
daily life, new skills and behaviors might be more easily integrated into their daily
routines, making long lasting adherence more likely. Additionally, these designs
might reduce costs and time investment of clinicians and make treatment ac-
cessible to groups which would otherwise be hard to reach (e.g., highly fatigued
cancer survivors) by making traveling to the treatment side obsolete (Heron &
Smyth, 2010).

While diary interventions have been successfully applied to target patients
across various health behaviors and outcomes (e.g., smoking cessation, weight loss,
healthy eating, physical activity; Heron & Smyth, 2010; Kaplan & Stone, 2013),
diary interventions targeting dyads are rare. However, research suggests that dyad
members’ health behaviors are closely interrelated (e.g., Cobb et al., 2016; Meyler,
Stimpson, & Peek, 2007; Myers Virtue et al., 2015). For example, cancer survivors’
physical activity has been found being closely related to that of their partners
(Myers Virtue et al., 2015). That is, when one partner met the guideline of the
recommended amount of weekly physical activity, the other partner was likely to
meet the guideline as well. Given this interdependence and evidence that physi-
cal activity interventions can relieve cancer-related fatigue (Mustian et al., 2017),
targeting both dyad members’ physical activity with a dyadic diary intervention
might increase the interventions’ beneficial effect on patient outcomes and lead to
long lasting improvements. As such, more research is needed on how couples can
be effectively targeted with diary interventions. Of note, these interventions need
carefully designed control groups in order to be able to disentangle the unique and
added value of including the patient’s partner into the intervention (Arden-Close
& McGrath, 2017; Badr & Krebs, 2013) and the possible confounding effect of re-
peated measurements and self-monitoring with the assumed working mechanism
of the intervention (Scholz & Berli, 2014).

Implications for clinical practice

In the following, the clinical implications of our research findings are discussed in
more detail. Our results indicate that a substantial group of patients experiences
persistent severe fatigue and related disturbances in their goals (Chapter 2). Clinici-
cians need to be aware of the persistence and interfering nature of cancer-related
fatigue. In line with the recent recommendation of the National Comprehensive
Cancer Network [NCCN], patients’ fatigue should be closely monitored (NCCN, 2016) to identify patients in need for psychosocial support. The results of this thesis inform four critical questions for the development and implementation of such psychosocial support interventions targeted at fatigue in cancer survivors. These questions include (1) whom to target, (2) which processes to target, (3) how to target these processes and (4) when to initiate the treatment.

First, as patients’ symptom outcomes appear to be amenable to partner behaviors (Chapters 5 & 6), both patients and their partners should be targeted in interventions aiming to relieve fatigue. That is, interventions should integrate an intrapersonal and interpersonal perspective, which acknowledges that both dyad members contribute to the patients’ fatigue experience.

Second, processes to target include patients’ and partners’ cognitions as well as partner behaviors. To disrupt the daily vicious cycle of fatigue and catastrophizing thoughts (Chapter 4), patients should learn to identify and replace negative thoughts about fatigue, as well as to counteract affective changes related to fatigue and catastrophizing. Similarly, partners might learn to identify and replace negative thoughts about patients’ fatigue in order to prevent the couples’ joint co-rumination (Chapter 6) and instead, enable a more adaptive communication style (e.g., mutual constructive conversations). Additionally, maladaptive partner responses should be addressed (Chapter 5). For instance, solicitous responses towards fatigue-behavior, while adaptive for the couples’ relationship, worsen patients’ fatigue outcomes. Hence, solicitous responses should be discouraged. Facilitative responses towards well-behavior should be encouraged as these benefit patients’ functioning as well as the couples’ relationship. As the impact of partner responses on individual and relationship outcomes might be intensified with increasing levels of patients’ daily fatigue severity (Chapter 5), couples should receive guidance on how to communicate about patients’ current levels of fatigue to enable partners to attune their responses to the patients’ need for support. In short, patients and their partners might need support to prevent their catastrophizing thoughts, they should be educated about the dual effects of partner responses and trained to engage in adaptive forms of communications about fatigue, that allow inferring the patients’ current need for support but do not have a ruminative focus.

Third, as cognitions and partner behaviors appear to unfold their maladaptive effect quickly in daily life, interventions should teach patients and partners
to apply adaptive coping strategies in daily life. Diary interventions could support this aim. After initial monitoring of daily cognitions and partner behaviors, individualized messages could be sent to prompt couples’ adaptive coping strategies. For example, short text messages delivered to their cellphones could remind couples of practiced adaptive cognitions, help patients to cope with negative affect and suggest adaptive partner behaviors (e.g., go for a walk together).

Fourth, as a small group of patients seems to recover from severe fatigue shortly after diagnosis (Chapter 2) and the treatment phase is time intensive and burdensome, initiating treatment at early survivorship might be a reasonable approach. At that time, it might be clear which patients are likely to remain severely fatigued and require psychosocial support.

In short, dyadic diary interventions, initiated during early survivorship, that facilitate adaptive daily cognitions and behaviors in both members of the dyad might successfully decrease patients’ fatigue burden while preserving the dyads’ relationship. Such a daily intervention directed at both dyad members might be a feasible, effective and ecologically valid strategy to create long lasting improvements in the well-being of the growing group of patients diagnosed with cancer and their partners.

**General conclusion**

This thesis was dedicated to investigate the daily effects of cognitions and partner behaviors on patients’ fatigue outcomes and both partners’ relationship satisfaction in couples coping with post-treatment cancer-related fatigue. The strengths of the studies entail the dyadic diary design, combining an intrapersonal as well as interpersonal perspective of research as well as advanced statistical analyses. First, chapter 2 and 3 demonstrated the relevance of studying post-treatment fatigue and indicated the importance of an individual’s relationship status and living arrangement in mitigating the adverse effects of chronic conditions. The diary method revealed maladaptive cognitions as well as adaptive and maladaptive partner behaviors in couples’ coping with cancer-related fatigue. On an intrapersonal level, a daily reciprocal relationship between patients’ catastrophizing and fatigue severity, fueled by negative affect, appeared to perpetuate fatigue. On an interpersonal level, couples’ co-rumination, rooted in daily catastrophizing thoughts of patients and their partners, and some partner responses (i.e., solicitous responses
towards fatigue-behavior, negative responses towards well-behavior) appeared to perpetuate fatigue and its interfering effects respectively. At the same time, some partner responses (i.e., solicitous and punishing responses towards fatigue-behavior, facilitative responses towards well-behavior), but not co-rumination, also appeared to impact the couple’s relationship. Only facilitative responses towards well-behavior were found to be beneficial for patients’ fatigue outcomes as well as their relationship satisfaction. Cognitions and partner behaviors operate in daily life and, within days, execute their (mal-)adaptive effects on patient and relationship outcomes. The results of this thesis are hoped to inform the development of interventions aiming to relieve the fatigue burden in cancer survivors and their partners while preserving the couple’s relationship satisfaction. Given the daily nature of the processes investigated in the current thesis, applying a diary intervention to both dyad members might be a promising application of these findings.
References


Chapter 7


Chapter 7


### General discussion


