

Helping Motivation and Well-being of Chronic Pain Couples:

A Daily Diary Study

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Abstract

Receiving support from a romantic partner may yield benefits for individuals with chronic pain (ICPs), but may also carry unintended side effects. The conditions under which partner support provision yields (mal)adaptive effects deserve greater attention. Grounded in Self-Determination Theory, partners may provide help for autonomous or volitional (e.g., enjoyment, full commitment) or rather controlled or pressured (e.g., avoiding guilt and criticism) motives. The present study examined associations between day-to-day fluctuations in partners' type of helping motivation and several outcomes, among partners and ICPs.

Seventy couples, with one partner having chronic pain (75.7% female), completed a diary for 14 consecutive days. Daily helping motivation was assessed together with daily affect, relational conflict, and relationship-based need satisfaction. Partners ($M_{\text{age}}=55.14$) additionally reported on daily helping exhaustion, while ICPs ($M_{\text{age}}=54.71$) reported on daily pain intensity, disability, satisfaction with and amount of received help.

Providing autonomous help related to improvements in partners' affective (e.g., positive affect), relational (e.g., conflict) and help-specific (e.g., exhaustion) functioning, which were accounted for by improvements in daily relationship-based psychological need satisfaction. Similarly, daily autonomously motivated help yielded a direct (i.e., relational conflict; perceived amount of help) or indirect (i.e., positive and negative affect; relational conflict; satisfaction with help, disability) contribution in explaining ICP outcomes - through improvements in ICPs' relationship-based psychological need satisfaction.

Findings highlight the importance of a motivational and dynamic perspective on help provision within chronic pain couples. Considering reasons why a partner provides help is important to understand when partners and ICPs may benefit from daily support.

1. Introduction

As primary providers of support, romantic partners of individuals with chronic pain (ICPs) face the challenge of providing adequate help on a daily basis [18,32]. Although partner support allows ICPs to better cope with pain (e.g., [14,42,53]), the helping process may also entail conflicts and can be experienced as less effective [9,38,41,44]. Furthermore, because of its repetitive nature, partners often appraise their helping role as stressful, which may deplete their ability to provide daily support [4,22,52]. The present diary study examined *when* and *why* partners' support provision has (mal)adaptive effects for both the partner and the ICP.

Drawing from Self-Determination Theory (SDT)[11], a broad theory on human motivation, we propose that reasons why partners provide support are crucial. Individuals may provide help for *autonomous* or volitional motives (e.g., enjoyment, full commitment) or rather *controlled* or pressured motives (e.g., avoidance of guilt/criticism, garnering of appreciation) [11]. Helping for autonomous, instead of controlled, reasons relates to greater empathy and helping satisfaction [31,39], less intentions to quit [31], and more effortful helping [5] among healthy volunteers, while it relates to less depressive symptoms in spouses of cancer patients [25] and better (individual/relational) functioning in partners of ICPs [26]. Autonomous helping motivation yields benefits because both partners' and patients' basic psychological needs for relatedness, autonomy, and competence get better satisfied, which constitute critical nutrients for individuals' well-being [10,11,47]. If partners fully endorse the helping instead of experiencing it as a daunting duty, they derive a greater sense of closeness, volition, and effectiveness from the helping [26]. Interestingly, partners' helping motivation could also be a catalyzer for the need satisfaction of ICPs and, hence, for ICP well-being. One study with healthy individuals found that the well-being benefits of autonomous helping motivation also applied to the recipients of help [49]. Autonomously motivated helpers are more open, curious, and receptive to the preferences of the person in need [20] and, hence,

may be better able to attune the timing, amount, and type of provided help, which is critical to nurture the recipient's psychological needs.

This study is the first to explore daily fluctuations in partners' helping motivation in the context of couples dealing with chronic pain. We investigated the relations between partners' daily helping motivation and daily changes in partners' and ICPs' functioning, as indexed by positive/negative affect and relational conflict (partners and ICPs), helping exhaustion (partners only) and perceived amount of received help, satisfaction with received help and disability (ICPs only). These outcomes were selected because they are situated on three levels of generality [45]: general (e.g. affect), relational (e.g., conflict) and help-specific (e.g., helping exhaustion). First, we hypothesized that daily variation in partners' autonomous, relative to controlled, helping motivation would relate uniquely to changes in daily variation in partners' and ICPs' functioning. Regarding ICP outcomes, relationships are expected to be stronger on days with high intensity pain [26]. Second, we hypothesized that partners' and ICPs' daily relationship-based need satisfaction and frustration would function as mediators for the presumed benefits of autonomous, relative to controlled, helping motivation [26,49].

2. Methods

2.1 Study design

The present study is part of a larger study, the "Helping Motivation Diary and Longitudinal Study" (HMDAL-Study), among ICPs and their partner, which comprises, apart from the diary assessment that is reported herein, three separate waves of questionnaire administration, spread across 6 months. For the purpose of the present study, the ICPs and their partners completed daily diaries during 14 days, starting after the T1 questionnaire administration. This study was approved by the ethical committee of the Faculty of Psychology and Educational Sciences of Ghent University.

2.2 Study participants

Participants were couples, recruited through the Flemish Pain League, an umbrella organization for ICPs (see Figure 1). In October 2013, members of the Flemish Pain League received an invitation letter to participate in studies about chronic pain and quality of life in our lab. About 20.78% ($N = 412$) agreed to be contacted by phone. Only members that agreed that their partner would participate in the study were approached. Inclusion criteria for participation of ICPs in the present study were (1) having chronic pain for at least 3 months, (2) physically living together with a partner for at least one year and (3) being sufficiently proficient in Dutch. From the couples that were contacted by phone and who met the inclusion criteria, 86.20% ($N = 100$) was willing to participate. Main reasons for refusal to participate ($N = 16$) were no interest of the partner for taking part in the study, personal or medical problems, or lack of time. Three couples later withdrew from the study because of ICP illness ($N = 1$), job responsibilities ($N = 1$) or an unexpected surgery of the partner ($N = 1$), which resulted in a final sample of 97 couples¹ taking part in the HMDAL-study. In the present diary study the first 70 couples were included.

- Insert Figure 1 about here -

The majority of ICPs were female ($N = 53$; 75.5%); mean age of ICPs and their partner was 54.71 years ($SD = 9.97$) and 55.14 years ($SD = 10.21$), respectively. All couples were Caucasian and most of them (65.7% of ICPS; 72.9% of partners) reported an education until at least the age of 18 and were married or legally cohabiting (82.9%). The mean relationship duration was 27.84 years ($SD = 13.99$). The majority of partners were employed

¹These 97 couples participated in the larger HMDAL-Study, in which we aimed at recruiting 140 chronic pain couples in collaboration with the Flemish Pain League and the Flemish League for Fibromyalgia Patients. Apart from a longitudinal questionnaire study ($N=140$ couples), also two diary studies (two times $N=70$ couples), each addressing a different set of hypotheses, were conducted. The first diary study is described in this paper and includes the first 70 couples that participated in the HMDAL-Study. Couples described in this paper were all members of the Flemish Pain League. Details about the other participating couples, together with more information about the recruitment through the Flemish League for Fibromyalgia Patients will be reported elsewhere.

($N = 41$; 58.6), while only 24.3% of ICPs ($N = 17$) was employed. Almost all ICPs reported more than one pain location ($M = 3.39$, $SD = 1.64$; range 1–7), with pain in the back (85.7%), neck (60%), and lower extremities (56.5%) being reported most frequently. Mean pain duration was 19.41 years ($SD = 14.19$). On a scale from 0 to 10, ICPs reported a mean pain intensity of 6.85 ($SD = 1.55$) and a mean disability of 6.64 ($SD = 1.91$). Thirty-two partners (i.e., 45.71%) also reported pain complaints during the past three months (which is similar to other studies with chronic pain couples, e.g. [21]). Paired-samples t-tests showed that pain duration ($M=8.84$, $SD=12.18$), pain intensity ($M=4.39$, $SD=1.76$) and disability ($M=2.94$, $SD=2.39$) were significantly lower in partners compared with the ICPs (all $ps < .01$; $M=18.27$, $SD=10.08$; $M=6.65$, $SD=1.51$; $M=6.64$, $SD=2.31$).

2.3 Data collection procedure

Participants were contacted by telephone upon agreement to (1) provide more information about the present study and (2) assess inclusion criteria. If both partners in a couple reported having chronic pain, the individual with the longest pain duration was chosen as the ICP. The informed consents and baseline questionnaires were administered via a home visit. After completing the questionnaires, further explanation about the diary study was given. Participants were instructed to fill out the diary in the evening for 14 consecutive days. If there were no planned holidays, participants started filling in the diary the day after the home visit. Both partners received a link and a personal code for completing the diary online. When no computer and/or internet was available, or when participants indicated to have no experience with computer/internet, they received a diary booklet on paper². As a sign of appreciation, couples received a fee of 30 euros after completing the 2-week diary. To enhance completion rates we offered the opportunity to receive a text message every evening as a reminder for completing the diary.

² Fifteen ICPs and 16 partners used the paper version of the diary.

Out of a potential 1960 end-of-day observations (140 individuals (within 70 couples) x 14 days), a total of 1895 were complete (96.68%). Records completed after 10AM the next morning³ were deleted, as suggested by Nezlek [33]. Using this criterion 1889 of the 1895 completed observations were included in the analyses (i.e., 99.68% of the completed observations, 96.38% of total possible observations).

2.4 Diary measures

All measures described below were collected each evening during the 14 consecutive days for both ICPs and partners, unless otherwise specified. To estimate item reliability, a multilevel confirmatory factor analysis framework was used that enables the examination of level-specific reliabilities [17]. Within- and between-level alphas are reported.

2.4.1 Daily helping motivation (only partners)

To measure partners' daily helping motivation, we selected 8 items from the Motivation to Help Scale that was adapted in a previous study for use with chronic pain couples [26]. Every evening, partners received a list of 8 reasons for helping or supporting their partner in pain. They reported on how true these motives were for helping their partner the past day on a 7-point scale ranging from "0" (not at all true) to "6" (totally true). Drawing from SDT, four different types of motivation were distinguished: external motivation (2 items, e.g., "because my partner demanded it from me"), introjected motivation (2 items, e.g., "because I would feel guilty if I didn't help"), identified motivation (2 items, e.g., "because I think it is important to help my partner") and intrinsic motivation (2 items, e.g., "because I enjoy helping my partner"). Items of external and introjected motivation were summed up to represent controlled motivation to help; items of identified and intrinsic motivation were summed to represent autonomous motivation to help. In line with previous studies (e.g., [26,49]), an overall index reflecting the relative degree of autonomous helping motivation was

³ For the paper versions of the diary we relied on the date/time indicated by the participant.

calculated by subtracting controlled motivation from autonomous motivation scores. The scale was reliable at the within-person ($\alpha = .58$) and between-person ($\alpha = .80$) level. When partners indicated that they did not provide help during the past day, they did not receive the helping motivation items. Out of a total of 980 days (70 partners * 14 days), only for 54 days (i.e., 5.5%) scores for helping motivation were missing because partners reported they did not provide support that day.

2.4.2 Daily affect

Participants reported on how they felt during the day by rating 12 adjectives describing 6 positive affective states (e.g., proud, happy, relaxed) and 6 negative affective states (e.g., sad, nervous, scared) [15]. Items on a 7-point scale ranged from 0 (totally disagree) to 6 (totally agree). Daily scores were computed by averaging each participant's ratings for positive and negative affect. In the present study all scales were reliable, with a within-person α of .92 and .87 and a between-person α of .98 and .96 for ICPs' positive and negative affect. For partners' positive and negative affect the within-person α was .93 and .85 and the between-person α was .98 and .94.

2.4.3 Daily relational conflict

Each evening participants indicated whether they had relational tensions or conflicts during the past 24 hours on a 7-point scale ranging from 0 (not at all) to 6 (very much).

2.4.4 Daily helping

Three help-related variables, one among partners and two among ICPs were assessed. Partners reported on the amount of exhaustion they felt by the efforts of helping their partner in pain that day. Three items were selected from a questionnaire used in a previous study with chronic pain couples [26] and were slightly adapted to a daily context. Items ranged from 0 (totally disagree) to 6 (totally agree) and started with "Helping/supporting my partner..."

followed by “physically exhausted me”, “was tiresome” and “mentally exhausted me”. The scale was reliable at the within-person ($\alpha = .81$) and between-person ($\alpha = .97$) level. Parallel to the helping motivation items, these items were only filled in by partners if they reported that they provided any help during the past day. ICPs reported on the amount of received help (i.e., “Did your partner provide help or support today?”) and on their satisfaction with the received help (i.e., “I am satisfied with the help/support that I received from my partner today”). Both items were rated on a scale varying from 0 (totally disagree) to 6 (totally agree). ICPs did not fill in the satisfaction with help item when they scored ‘0’ on the amount of received help.

2.4.5 Daily disability (only ICPs)

To measure daily disability in ICPs we adapted an item of the Graded Chronic Pain Scale [27] to a daily context, in line with previous studies in ICPs [40]. The item “To what extent did your pain hinder you in your activities today?” ranged from 0 (no interference) to 6 (impossible to carry out activity).

2.4.6 Daily pain intensity (only ICPs)

Items for pain intensity were based on the Graded Chronic Pain Scale [27] and adapted to a daily context. Every evening, ICPs completed an item asking “On average, how much pain did you have today?” and “How intense was your worst pain today?”. Items were rated on a 7-point scale ranging from 0 (no pain) to 6 (worst imaginable pain). The scale was reliable at the within-person ($\alpha = .88$) and between-person ($\alpha = .95$) level.

2.4.6 Daily relationship-based need satisfaction and frustration

To measure daily satisfaction and frustration of the three basic psychological needs, we selected 2 items for each basic psychological need (one item for need satisfaction and one for need frustration) of the Basic Psychological Need Satisfaction Need Frustration Scale

(BPNSNF) [10] and slightly adapted them to a daily relational context by starting each item with “In the relationship with my partner today...”. Example items are: “..., I could freely take decisions” (i.e., autonomy satisfaction), “..., I felt pressured to do things that I wouldn’t choose myself” (i.e., autonomy frustration), “..., I was confident that I could do things right” (i.e., competence satisfaction), “..., I felt like a failure by the mistakes I made” (i.e., competence frustration), “..., I felt that (s)he cared about me” (i.e., relatedness satisfaction), and “..., I felt my partner was detached” (i.e., relatedness frustration). Exploratory factor analyses on the need satisfaction and need frustration items, thereby using a promax rotation, demonstrated that two factors needed to be retained, which explained more than 65% of the variance in both partner and ICP responses and clearly resembled a need satisfaction and need frustration factor. Next, to provide further evidence for the validity of our daily need satisfaction/frustration measures, correlations between the aggregated diary scores for partner/ICP need satisfaction and frustration and the respective subscales of BPNSFS (see Chen et al. [10], Vanhee et al. [46]), as assessed in our baseline measurement, were inspected. Each of these correlations were positive, ranging from .42 to .66, all $ps < .01$. In light of these findings, items assessing need satisfaction and frustration were averaged. In ICPs, subscales showed moderate to good reliability for need satisfaction and need frustration at the within-person ($\alpha = .69$ and $.53$, respectively) and at the between-person level ($\alpha = .83$ and $.70$, respectively). For partners, reliabilities for need satisfaction and need frustration at the within-person ($\alpha = .71$ and $.55$, respectively) and at the between-person level ($\alpha = .86$ and $.87$, respectively), were also moderate to good.

2.5 Data analytic strategy

A series of multilevel models were fitted using PROC MIXED in SAS 9.4 to examine same-day associations between partners’ helping motivation and partner and ICP outcomes. Each outcome (both partners: positive and negative affect, conflict; partners only: helping

exhaustion; ICPs only: satisfaction with received help, disability) was modeled separately. With 70 couples and daily diary measures during 2 weeks, the study had more than 90% power to detect a standardized effect equal to .15 at the 5% significance level at the within-subject level. In these multilevel models, we controlled for age and sex of the partner (in models with partner outcomes) and for age and sex of ICPs (in models with ICP outcomes). Data were analyzed considering two different levels; a within-couple level (i.e., Level 1) and a between-couple level (i.e., Level 2). Conceptually there are three levels of analysis (day, person, couple); however, only levels with random variability need to be modeled [8,23]. In the case of distinguishable dyads (e.g., ICP versus partner), there is no additional variability at the middle level, which means that a conceptual three-level model can be represented by a model with only two levels [8].

In preparation for data analysis, all daily predictors were centered within clusters (i.e. in this case person-mean centered) [13], as this is considered the most appropriate form of centering when the primary interest involves a Level 1 predictor (i.e., daily helping motivation). This method removes all between-couple variation from the predictor and yields a “pure” estimate of the pooled within-couple (i.e., Level 1) regression coefficient [13]. To control for between-couple variation, each partner’s mean value for helping motivation was added as a predictor at Level 2. By including this mean score, the effect of helping motivation on partner and ICP outcomes is partitioned into two parts [51]: (a) the effect of daily deviations from each partner’s mean level of helping motivation on different outcomes (within-couple component) and (b) the effect of each partner’s mean level of helping motivation on different outcomes (between-couple component). Further, Level 2 covariates were grand-mean-centered (i.e., age). Notably, because a sample size of 70 couples only yields 22% power to detect a between-subject standardized effect equal to .15, predictors at

the between-couple level were not addressed in the research questions of the current study, but only controlled for.

For each outcome, a baseline model was estimated first to calculate the intraclass correlation coefficient. Next, predictors were added in the model. An autoregressive covariance structure was used in the analyses to take autocorrelation into account [8]. This structure has homogeneous variances and correlations that decline exponentially with distance. To examine whether partners' daily helping motivation related to a change in outcomes in partners and ICPs, we controlled for prior day levels of the outcome. An overview of the variables added in the analyses at Level 1 and 2 is presented in Tables 2 and 3. The variables that are part of the proposed mediation were all at the within-couples or the lower level (i.e., Level 1); therefore, the mediation analyses we conducted are also referred to as $1 \rightarrow 1 \rightarrow 1$ mediation or lower level mediation [3,24]. Multilevel mediation allows for the possibility that each of the effects may vary across couples. In the absence of upper-level variation of the effect of the exposure on the mediator (the a-path) and of the mediator on the outcome (the b-path), the mediated effect in the 1-1-1 setting reduces to $a*b$. In line with other diary studies [1], we found no evidence against such homogeneous effects (i.e. the corresponding random effect variances were very small).

3. Results

3.1 Descriptive statistics and Preliminary Analyses

Table 1 provides between-couple correlations, based on the aggregated diary scores ($N=70$), between the variables of interest. Within-couple correlations in the measured variables are shown on the diagonal. The positive and negative affect scores of partners and ICPs were not correlated. In contrast, relational conflicts and need satisfaction and frustration were positively correlated within the couple. Paired samples t -tests further showed that partners, in

general, reported more positive affect ($t=5.22$, $p<.01$) and less negative affect ($t=-3.40$, $p<.01$) than ICPs.

The ICC represents the percentage of the total variance of a variable that is due to between-couple mean differences [8]. The amount of within-couple variation can be calculated by subtracting the ICC from 1. Within-couple differences accounted for 27.57% of the variance in partners' helping motivation (see Table 1). The variable with the largest within-couple variation was relational conflicts with 68.81% when measured in partners and 71.19% when measured in ICPs.

- Insert Table 1 about here -

3.2. Partners' daily helping motivation and partner/ICP outcomes

To investigate the associations of partners' daily helping motivation with partner and ICP outcomes, we analyzed each outcome separately. Results of these analyses are displayed in Table 2 (partner outcomes) and Table 3 (ICP outcomes).

After controlling for measures assessed the previous day, fluctuations in partners' daily autonomous helping motivation related positively to improvements in positive affect and decreases in negative affect, relational conflict, and helping exhaustion among partners. Taking into account ICP's daily pain intensity, the significance of partners' daily helping motivation predicting partner outcomes was left intact, attesting to the robustness of the impact of daily helping motivation on partner outcomes. In all described models, partner age and sex were not significant (see Table 2).

- Insert Table 2 about here -

Next, we examined whether partners' daily helping motivation would relate to ICP outcomes as well. With respect to the day-level measures, fluctuations in partners' daily helping motivation related to improvements in ICPs' satisfaction with and amount of received

help, while predicting decreases in relational conflict. Next, when controlling for the contribution of ICP's daily pain intensity, the initially observed effect for satisfaction with received help became non-significant, while pain intensity appeared to be a systematic predictor of all outcomes among ICPs (except for the amount of received help; see third column in Table 3). To further test whether the relation between partners' helping motivation and ICP outcomes differs depending on reported ICP pain intensity, we performed several moderation analyses, which revealed no significant interaction effects. Furthermore, also in these models, ICP age and sex appeared to be no significant predictor (see Table 3).

- Insert Table 3 about here -

3.3. The mediating role of need satisfaction and need frustration

Next, we tested whether the associations between partners' daily autonomous helping motivation and partner and ICP outcomes were mediated by partners' and ICPs' relationship-based need satisfaction and need frustration, respectively. For the a-paths we tested two separate models, one involving partners' or ICPs' need satisfaction (a1-paths) and one involving need frustration (a2-paths). In each of these models we controlled for participants' need satisfaction and frustration the previous day. Second, we simultaneously tested whether the change in need satisfaction (b1-paths) and frustration (b2-paths) was related with partner outcomes and ICP outcomes. In each model we controlled for the effect of ICPs' daily pain intensity, when testing a- and b-paths. With regard to the ICP outcomes, the presence of the total effect (*c*) of partners' helping motivation upon ICP outcomes was not a prerequisite for testing indirect effects [29]. Robustness of the mediated effects against unmeasured common causes (or confounders) of the mediator and outcome was assessed by means of sensitivity analyses. We found that for our mediated effects relatively strong effects of such unmeasured time-varying common causes of M (i.e. ICPs' need satisfaction/frustration) and Y (i.e. different ICP outcomes) are needed to yield zero (or non-significant) mediated effects. To

investigate the significance of the indirect effect ($a*b$) of helping motivation on changes in partner or ICP outcomes through changes in psychological need satisfaction and need frustration, respectively, we performed a Sobel test [2]. Results of all mediation analyses are displayed in Table 4 (partner outcomes) and Table 5 (ICP outcomes).

Results showed that partners' daily helping motivation was significantly related to a change in partners' day-to-day need satisfaction (a1-path) and need frustration (a2-path). For all outcome variables, the change in partners' need satisfaction and frustration significantly related to a change in partners' daily positive and negative affect, conflict and feelings of helping exhaustion (b1- and b2-paths). Furthermore, the initial associations between helping motivation and the different outcomes were no longer significant. Results showed that all indirect effects were significant, indicating that partners' helping motivation contributed to changes in partners' daily outcomes through the improvement of partners' need satisfaction ($a1*b1$ -path) and a decrease of partners' need frustration ($a2*b2$ -path) (see Table 4).

- Insert Table 4 about here -

The findings among ICPs were very similar. Specifically, partners' daily helping motivation also significantly related to a change in ICPs' day-to-day need satisfaction (a1-path) and need frustration (a2-path). Subsequently, we simultaneously tested whether changes in ICPs' need satisfaction and frustration were related to ICP outcomes. For all outcome variables, changes in ICPs' need satisfaction (b1-paths) and frustration (b2-paths) strongly related in the hypothesized direction to changes in ICPs' daily outcomes. Only changes in ICPs' need frustration did not contribute to changes in the amount of received help and disability. The initial association between helping motivation and conflict (c') remained present, while for the amount of received help it was no longer significant. Finally, results showed that all indirect effects through ICPs' need satisfaction were significant, while only 1 out of 6 indirect effects through ICPs' need frustration was significant. For ICPs' daily

conflict, the effect of partners' helping motivation was partially mediated by ICPs' need satisfaction and frustration, while for daily amount of received help, this effect was fully mediated by ICPs' need satisfaction but not by ICPs' need frustration. For the other outcomes, there was only an indirect effect through ICPs' need satisfaction, indicating that partners' helping motivation contributed to a decrease in ICPs' daily negative affect and disability, and to an improvement in ICP's daily positive affect and satisfaction with received help through improvements in ICPs' need satisfaction (see Table 5)⁴.

- Insert Table 5 about here -

4. Discussion

Coping with chronic pain represents a relational and interdependent process [6]. As partners are a primary source of support, it is crucial to understand when partners' support provision is experienced as helpful and entails benefits for partners' and ICPs' personal well-being as well as the couple's relational functioning. Although support often yields benefits, that is not necessarily the case. Indeed, support may be portrayed as a double-edged sword [37], with multiple studies pointing to both advantages and costs associated with social support in the context of intimate relationships [35]. To shed light on the effects of provided help on both the partner and the ICP, this study examined partners' underlying motives for helping, thereby drawing upon Self-Determination Theory (SDT). With regard to partner outcomes, studies have shown elevated distress [28], relational dissatisfaction [16] and caregiver exhaustion [22] among partners of ICPs. It is yet unknown why some partners of ICPs suffer more than others. Herein, we suggested that a motivational perspective may be useful, as partners' different reasons for engaging in helping behavior may yield differential correlates, not only

⁴ On an exploratory basis, we analyzed whether the presence of chronic pain in partners moderated the examined associations. Only for 3 out of 14 outcome variables (4 partner outcomes + 6 ICP outcomes + partner and ICP need satisfaction/frustration) a significant moderation was found. Partners' daily autonomous helping motivation related positively to improvements in positive affect and decreases in negative affect, only for those partners having chronic pain themselves ($B=.28$ (.05)^{***}, $CI=[.19; .38]$ and $B=-.18$ (.05)^{*}, $CI=[-.28; -.09]$). Also, the effect of partners' helping motivation on partners' need satisfaction was stronger for partners with chronic pain ($B=.31$ (.04)^{***}, $CI=[.24; .39]$) compared with partners without chronic pain ($B=.17$ (.04)^{***}, $CI=[.09; .25]$).

for the partners themselves but also for ICPs [26,49]. We reasoned that on days that partners are volitionally committed to provide help (i.e. *autonomously* motivated), they may display a more open and receptive attitude to the ICP's perspective, resulting in improved need satisfaction within the relationship and, hence, better individual and relational outcomes. In contrast, on days that partners feel pressured to provide help (i.e. *controlled* motivated), they may be more narrowly focused on their own agenda and needs, with such a tunnel view hampering their responsiveness to ICPs' preferences and precluding experiences of need satisfaction.

Daily autonomous helping motivation relates to daily functioning

The current findings indicate that partners' daily autonomous, relative to controlled, helping motivation was, as hypothesized, associated with partners' daily personal, relational, and help-related functioning, even when controlling for partners' functioning the previous day and taking into account ICPs' levels of pain intensity. Specifically, on days where partners reported higher autonomous motives for helping, they reported better personal functioning, as indexed by improved positive affect and decreased negative affect, less relational conflicts and feeling less exhausted due to helping. This indicates that, if partners do not experience pressure, either externally or internally, but rather are committed to provide help and even enjoy doing so, they feel better by the end of the day and encounter fewer tensions within their relationship. These results are in line with previous cross-sectional studies showing that autonomous reasons for helping your partner with chronic pain or illness are associated with better individual and relational functioning of the caregiving partner [25,26]. The present study significantly extends previous research by showing that fluctuations in partners' helping motivation related to improvements or decreases in daily personal, relational, and help-related functioning. Another objective of the present study was to examine satisfaction and frustration of partners' psychological needs as critical mechanisms in the association between partners'

daily helping motivation and partner outcomes. Daily helping motivation was found to impact partner outcomes through changes in partners' need satisfaction and frustration.

Interestingly, our findings further demonstrated that partners' daily helping motivation also related to changes in ICP outcomes. Specifically, day-to-day variation in partners' autonomously motivated helping was mainly indirectly and positively related to ICPs' positive affect, satisfaction with and amount of received help, while being negatively related to ICPs' negative affect, relational conflicts and disability via improvements in ICPs' need satisfaction. ICPs' need frustration only played an explanatory role for changes in ICP-reported relational conflict. These findings are in line with previous studies involving strangers showing that the benefits of autonomous helping motivation radiate towards recipients of help [50] and that ICPs' fulfillment of needs appear to be a key factor in explaining their daily functioning (e.g., [34,36]). The current findings slightly deviate from a previous cross-sectional study among chronic pain couples due to a lack of interaction between helping motivation and pain intensity. In that previous study, partners' helping motivation was only associated with ICPs' relationship functioning in ICPs reporting high intensity pain [26]. In the present study, no moderation effects of pain intensity were found, which may be due to the difference in measurement of pain intensity (i.e., pain during past 6 months versus pain during past day). Instead, daily autonomous helping motivation (indirectly) related to ICP outcomes regardless of experienced pain that day, even though daily pain clearly occurred as an important predictor of ICPs' daily functioning. Future research should replicate these results to examine whether partners' helping motives are indeed relevant for ICPs with higher and lower levels of pain. Presumably, on a specific day, the ICP may sense the sincerity of the autonomously provided help and directly benefit from it, even when (s)he experiences little pain.

Theoretical and practical implications

Results of this study add important information to our understanding of partners as key players in dealing with pain. By using a motivational framework, we can look beyond the effects of partners' behavioral responses' to pain behavior. Although this study mainly includes couples with long lasting relationships, partner's motivation for providing help seems to vary considerably on a day-to-day basis. Indeed, although most of the helping motivation appeared to vary between partners, with some partners being on average more autonomously motivated than others, there was also substantial variation within partners. Thus, consideration of these within-person variations attests to the adoption of a dynamic approach to the support process.

Further, given the strongly held recognition that pain is a bio-psycho-*social* phenomenon [19], understanding the underlying mechanisms of partners' caregiving role is essential. The SDT-perspective seems useful in this regard as it posits that support effectiveness may depend on the extent to which it nurtures or thwarts universal psychological needs for autonomy, competence, and relatedness [48]. Using this theory within pain research has the potential of providing more clinically relevant directions of how partners can support the ICP, both at its own and the ICP's advantage. Indeed, the way in which partners provide support may help to explain the relation between autonomous helping motivation and experienced need satisfaction in both the partner and ICP, an issue that deserves greater attention in future work. Partners can be more or less need supportive toward the ICP, that is, they can be more or less controlling (vs. autonomy supportive), more or less cold or rejecting (vs. relationally supportive), more or less critical or negative (vs. competence supportive) [48].

Although the current study primarily addressed the role of partners in predicting ICPs' functioning, the impact is likely to be bidirectional. Indeed, other researchers also point to the importance of reciprocity of support in chronic pain couples [35,48]. This mutuality of

support is also covered by the idea of “dyadic coping”, which became an important concept in the literature of couples dealing with chronic diseases [7,30,43]. If we want to protect partners of ICPs against a “helping burnout”, we should also pay attention to the role of ICPs in supporting need satisfaction in partners and eliciting particular motives for help. For instance, guilt-inducing statements may awaken more pressured forms of help and engender greater need frustration, with resulting negative consequences for the partner.

Limitations, future research and conclusion

This study has several limitations. First, we were unable to address causality. Although conclusions about same-day associations were strengthened by accounting for yesterday’s level of partners’ and ICPs’ daily outcomes, temporal ordering could, however, not be established. To establish a causal pathway, experimental research is needed. Second, data represent partner and ICP self-reports of daily behavior. To overcome this limitation observational research is necessary to reveal differences in the type, the amount, and the quality of help provided by partners depending on their motivation. Hence, future research can provide more insights on how motivation is translated into actual behavior and investigate how couples communicate [12] about pain and helping. Third, the included couples were all Caucasian, in a stable relationship, with high average marital satisfaction, which limits generalizability of our findings. Also, we cannot exclude that social desirability may artificially drive some of the observed associations, a tendency that may be controlled for in future work.

In conclusion, this study showed that daily fluctuations in partners’ helping motivation related to daily fluctuations in partners’ and ICPs’ daily functioning through, respectively, daily satisfaction and frustration of partners’ and ICPs’ basic psychological needs. These findings underscore the importance of a differentiated and dynamic approach towards the

support process. Rather than merely considering the fact that partners provide help, it seems critical to take into account the motives underlying helping behavior. This may help us understand when and why provided help yields benefits, for both the support provider (i.e. romantic partner) and the support receiver (i.e. ICP). Future studies may further investigate ways to enhance a need supportive coping style among couples dealing with chronic pain. Given the critical role of autonomous helping motivation, future research may also examine which factors promote autonomous motives and prevent partners from becoming controlled motivated in the helping process.

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Conflict of interest statement

The authors have no conflicts of interest to disclose.

References

- [1] Badr H, Laurenceau JP, Schart L, Basen-Engquist K, Turk D. The daily impact of pain from metastatic breast cancer on spousal relationships: A dyadic electronic diary study. *Pain* 2010;151:644–654. doi:10.1016/j.pain.2010.08.022.
- [2] Baron RM, Kenny DA. The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *J. Pers. Soc. Psychol.* 1986;51:1173–82.
- [3] Bauer DJ, Preacher KJ, Gil KM. Conceptualizing and testing random indirect effects and moderated mediation in multilevel models: New procedures and recommendations. *Psychol. Methods* 2006;11:142–163. doi:10.1037/1082-989X.11.2.142.
- [4] Berg CA, Upchurch R. A developmental-contextual model of couples coping with chronic illness across the adult life span. *Psychol. Bull.* 2007;133:920–54. doi:10.1037/0033-2909.133.6.920.
- [5] Bidee J, Vantilborgh T, Pepermans R, Huybrechts G, Willems J, Jegers M, Hofmans J. Autonomous motivation stimulates volunteers' work effort: A self-determination theory approach to volunteerism. *Volunt. Int. J. Volunt. Nonprofit Organ.* 2012;24:32–47. doi:10.1007/s11266-012-9269-x.
- [6] Bodenmann G, Meuwly N, Kayser K. Two conceptualizations of dyadic coping and their potential for predicting relationship quality and individual well-being. *Eur. Psychol.* 2011;16:255–266. doi:10.1027/1016-9040/a000068.
- [7] Bodenmann G, Pihet S, Kayser K. The relationship between dyadic coping and marital quality: a 2-year longitudinal study. *J. Fam. Psychol.* 2006;20:485–93. doi:10.1037/0893-3200.20.3.485.
- [8] Bolger N, Laurenceau J-P. *Intensive longitudinal methods: An introduction to diary and experience sampling research.* New York: Guildford Press, 2013.

- [9] Boothby JL, Thorn BE, Overduin LY, Charles Ward L. Catastrophizing and perceived partner responses to pain. *Pain* 2004;109:500–506. doi:10.1016/j.pain.2004.02.030.
- [10] Chen B, Vansteenkiste M, Beyers W, Boone L, Deci EL, Van der Kaap-Deeder J, Duriez B, Lens W, Matos L, Mouratidis A, Ryan RM, Sheldon KM, Soenens B, Van Petegem S, Verstuyf J. Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motiv. Emot.* 2015:216–236. doi:10.1007/s11031-014-9450-1.
- [11] Deci EL, Ryan RM. The “ What ” and “ Why ” of goal pursuits : Human needs and the self-determination of behavior. *Psychol. Inq.* 2000;11:227–268.
- [12] Edlund SM, Carlsson ML, Linton SJ, Fruzzetti AE, Tillfors M. I see you’re in pain – The effects of partner validation on emotions in people with chronic pain. *Scand. J. Pain* 2015;6:16–21. doi:10.1016/j.sjpain.2014.07.003.
- [13] Enders CK, Tofighi D. Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychol. Methods* 2007;12:121–138. doi:10.1037/1082-989X.12.2.121.
- [14] Evers AW., Kraaimaat FW, Geenen R, Jacobs JW., Bijlsma JW. Pain coping and social support as predictors of long-term functional disability and pain in early rheumatoid arthritis. *Behav. Res. Ther.* 2003;41:1295–1310. doi:10.1016/S0005-7967(03)00036-6.
- [15] Fontaine J, Veirman E. The new novelty dimension: method artifact or basic dimension in the cognitive structure of the emotion domain? In: Fontaine JRJ, Scherer KR, Soriano C, editors. *Series in affective science*. Oxford, UK: Oxford scholarship online, 2013. pp. 233–242.
- [16] Geisser ME, Cano A, Leonard MT. Factors associated with marital satisfaction and mood among spouses of persons with chronic back pain. *J. Pain* 2005;6:518–25. doi:10.1016/j.jpain.2005.03.004.

- [17] Geldhof GJ, Preacher KJ, Zyphur MJ. Reliability estimation in a multilevel confirmatory factor analysis framework. *Psychol. Methods* 2014;19:72–91. doi:10.1037/a0032138.
- [18] Goubert L. Pain within a social context: Towards an understanding of bidirectional influences. In: Main CJ, Keefe F, Jensen MP, Vlaeyen JWS, Vowles KE, editors. *Fordyce's behavioral methods for chronic pain and illness: republished with invited commentaries*. Washington, D.C.: IASP Press, 2015. pp. 387–398.
- [19] Hadjistavropoulos T, Craig KD, Duck S, Cano A, Goubert L, Jackson PL, Mogil JS, Rainville P, Sullivan MJL, de C Williams AC, Vervoort T, Fitzgerald TD. A biopsychosocial formulation of pain communication. *Psychol. Bull.* 2011;137:910–39. doi:10.1037/a0023876.
- [20] Hodgins HS, Knee CR. The integrating self and conscious experience. In: Deci EL, Ryan RM, editors. *Handbook of self-determination research*. Rochester: NY: University of Rochester Press., 2002. pp. 87–100.
- [21] Issner JB, Cano A, Leonard MT, Williams AM. How do I empathize with you? Let me count the ways: Relations between facets of pain-related empathy. *J. Pain* 2012;13:167–175. doi:10.1016/j.jpain.2011.10.009.
- [22] Jones SL, Hadjistavropoulos HD, Janzen JA, Hadjistavropoulos T. The relation of pain and caregiver burden in informal older adult caregivers. *Pain Med.* 2011;12:51–58. doi:10.1111/j.1526-4637.2010.01018.x.
- [23] Kenny DA, Kashy DA, Cook W. *Dyadic Data Analysis*. New York: Guildford Press, 2006.
- [24] Kenny DA, Korchmaros JD, Bolger N. Lower level mediation in multilevel models. *Psychol. Methods* 2003;8:115–128.
- [25] Kim Y, Carver CS, Deci EL, Kasser T. Adult attachment and psychological well-being

- in cancer caregivers: the mediational role of spouses' motives for caregiving. *Health Psychol.* 2008;27:S144–54. doi:10.1037/0278-6133.27.2(Suppl.).S144.
- [26] Kindt S, Vansteenkiste M, Loeys T, Cano A, Lauwerier E, Verhofstadt LL, Goubert L. When is helping your partner with chronic pain a burden? The relation between helping motivation and personal and relational functioning. *Pain Med.* 2015;16:1732–1744. doi:10.1111/pme.12766.
- [27] Von Korff M, Ormel J, Keefe F, Dworkin S. Grading the severity of chronic pain. *Pain* 1992;50:133–149.
- [28] Leonard MT, Cano A, Johansen AB. Chronic pain in a couples context: a review and integration of theoretical models and empirical evidence. *J. Pain* 2006;7:377–90. doi:10.1016/j.jpain.2006.01.442.
- [29] Loeys T, Moerkerke B, Vansteelandt S. A cautionary note on the power of the test for the indirect effect in mediation analysis. *Front. Psychol.* 2015;5:1549. doi:10.3389/fpsyg.2014.01549.
- [30] Meier C, Bodenmann, Moergeli, Jenewein. Dyadic coping, quality of life, and psychological distress among chronic obstructive pulmonary disease patients and their partners. *Int. J. Chron. Obstruct. Pulmon. Dis.* 2011:583. doi:10.2147/COPD.S24508.
- [31] Millette V, Gagné M. Designing volunteers' tasks to maximize motivation, satisfaction and performance: The impact of job characteristics on volunteer engagement. *Motiv. Emot.* 2008;32:11–22. doi:10.1007/s11031-007-9079-4.
- [32] Newton-John TR. How significant is the significant other in patient coping in chronic pain? *Pain Manag.* 2013;3:485–93. doi:10.2217/pmt.13.52.
- [33] Nezlek JB. *Diary methods for social and personality psychology.* SAGE. Nezlek JB, editor London: Sage Publications, 2012.
- [34] Patrick H, Knee CR, Canevello A, Lonsbary C. The role of need fulfillment in

- relationship functioning and well-being: a self-determination theory perspective. *J. Pers. Soc. Psychol.* 2007;92:434–57. doi:10.1037/0022-3514.92.3.434.
- [35] Rafaeli E, Gleason MEJ. Skilled support within intimate relationships. *J. Fam. Theory Rev.* 2009;1:20–37. doi:10.1111/j.1756-2589.2009.00003.x.
- [36] Reis HT, Sheldon KM, Gable SL, Roscoe J, Ryan RM. Daily well-being: The role of autonomy, competence, and relatedness. *Personal. Soc. Psychol. Bull.* 2000;26:419–435. doi:10.1177/0146167200266002.
- [37] Revenson TA, Schiaffino KM, Majerovitz SD, Gibofsky A. Social support as a double-edged sword: The relation of positive and problematic support to depression among rheumatoid arthritis patients. *Soc. Sci. Med.* 1991;33:807–813.
- [38] Romano JM, Jensen MP, Turner JA, Good AB, Hops H. Chronic pain patient-partner interactions: Further support for a behavioral model of chronic pain. *Behav. Ther.* 2000;31:415–440. doi:10.1016/S0005-7894(00)80023-4.
- [39] Ryan RM, Connell JP, Grolnick W, Lynch J, Frederick C, Mellor- C, Wellborn J, Whitehead E, Deci E. Perceived locus of causality and internalization : Examining reasons for acting in two domains. 1989;57:749–761.
- [40] Van Ryckeghem DML, Crombez G, Goubert L, De Houwer J, Onraedt T, Van Damme S. The predictive value of attentional bias towards pain-related information in chronic pain patients: A diary study. *Pain* 2013;154:468–475. doi:10.1016/j.pain.2012.12.008.
- [41] Schwartz L, Jensen MP, Romano JM. The development and psychometric evaluation of an instrument to assess spouse responses to pain and well behavior in patients with chronic pain: the Spouse Response Inventory. *J. Pain* 2005;6:243–52. doi:10.1016/j.jpain.2004.12.010.
- [42] Suurmeijer TPBM, Sonderen FLPV, Krol B, Doeglas DM, Heuvel WJAVD, Sanderman R. The relationship between personality, supportive transactions and

- support satisfaction, and mental health of patients with early rheumatoid arthritis. Results from the Dutch part of the euridiss study. *Soc. Indic. Res.* 2005;73:179–197. doi:10.1007/s11205-004-0562-y.
- [43] Traa MJ, De Vries J, Bodenmann G, Den Oudsten BL. Dyadic coping and relationship functioning in couples coping with cancer: A systematic review. *Br. J. Health Psychol.* 2014;20:1–39. doi:10.1111/bjhp.12094.
- [44] Turk DC, Kerns RD, Rosenberg R. Effects of marital interaction on chronic pain and disability: Examining the down side of social support. *Rehabil. Psychol.* 1992;37:259–274. doi:10.1037//0090-5550.37.4.259.
- [45] Vallerand R. Toward a hierarchical model of intrinsic and extrinsic motivation. Zanna MP, editor San Diego: Academic Press, 1997.
- [46] Vanhee G, Lemmens GMD, Verhofstadt LL. Relationship satisfaction: High need satisfaction or low need frustration? *J Soc Behav Pers* n.d.;in press.
- [47] Vansteenkiste M, Ryan RM. On psychological growth and vulnerability: Basic psychological need satisfaction and need frustration as a unifying principle. *J. Psychother. Integr.* 2013;23:263–280. doi:10.1037/a0032359.
- [48] Weinstein N. *Human motivation and Interpersonal Relationships: Theory, Research, and Applications.* Springer New York, 2014.
- [49] Weinstein N, Ryan RM. When helping helps: autonomous motivation for prosocial behavior and its influence on well-being for the helper and recipient. *J. Pers. Soc. Psychol.* 2010;98:222–44. doi:10.1037/a0016984.
- [50] Weinstein N, Ryan RM. When helping helps: Autonomous motivation for prosocial behavior and its influence on well-being for the helper and recipient. *J. Pers. Soc. Psychol.* 2010;98:222–244. doi:10.1037/a0016984.
- [51] West SG, Ryu E, Kwok O-M, Cham H. *Multilevel Modeling: Current and Future*

- Applications in Personality Research. *J. Pers.* 2011;79:2–50. doi:10.1111/j.1467-6494.2010.00681.x.
- [52] Ybema, Jan F, Kuijer, Roeline D, Hagedoorn M, Buunk BP. Caregiver burnout among intimate partners of patients with a severe illness: An equity perspective. *Pers. Relatsh.* 2002;9:73–88. doi:10.1111/1475-6811.00005.
- [53] Zyrianova Y, Kelly BD, Gallagher C, McCarthy C, Molloy MG, Sheehan J, Dinan TG. Depression and anxiety in rheumatoid arthritis: the role of perceived social support. *Ir. J. Med. Sci.* 2000;175:32–36.

Figure – Legends

Fig.1. Flowchart of how sample size was obtained through the Flemish Pain League.

Figure 1

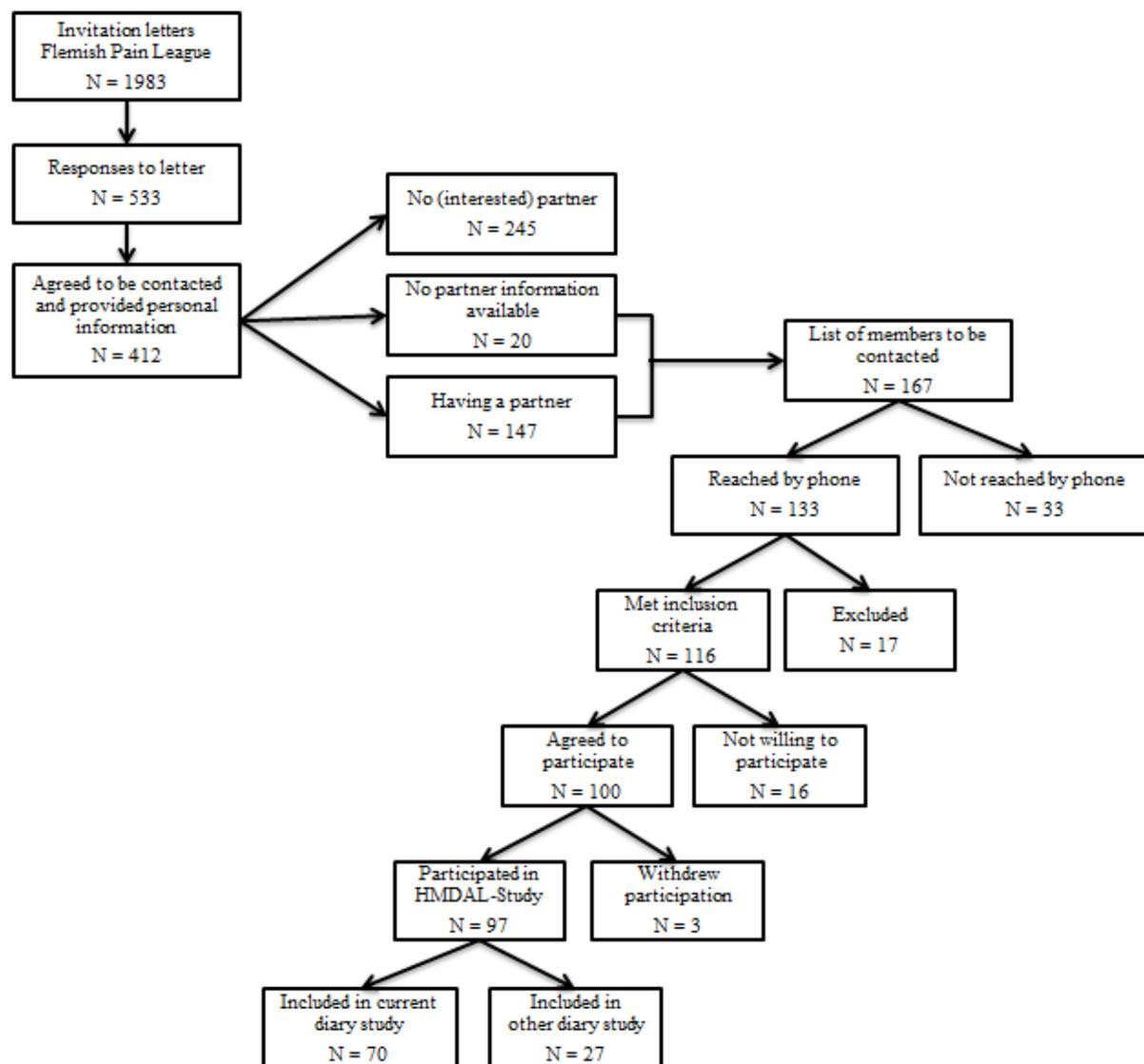


Table 1. Means and Standard Deviations of Aggregated Variables, ICC values, and Correlations among Study Variables (for ICPs below and partners above the diagonal)

												partner		ICP		ICC	
	1	2	3	4	5	6	7	8	9	10	11	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	partner	ICP
1. Autonomous Motivation ^P	-	.42**	-.49**	-.52**	-.20†	.17	.20	.19	.19	.57**	-.54**	2.19	1.47	-	-	72.43	-
2. Positive Affect	.07	<u>.02</u>	-.63**	-.40**	-.42**	-.05	-.07	.04	.01	.51**	-.33**	3.77	1.02	2.77	1.20	51.5	59.24
3. Negative Affect	-.04	-.55**	<u>-.03</u>	.41**	.30*	-.06	.03	-.17	-.14	-.35**	.53**	.95	.78	1.45	1.14	69.68	52.11
4. Relational Conflict	-.28*	-.07	.26*	<u>.50**</u>	.35**	-.26*	-.17	-.06	-.06	-.72**	.56**	.77	.74	.73	.77	31.19	28.81
5. Helping Exhaustion ^P	-	-.03	.11	-.00	-	.02	.14	.10	.15	-.41**	.32**	.64	.89	-	-	61.25	-
6. Satisfaction Received Help ^{ICP}	.17	.14	-.13	-.47**	.02	-	.68**	-	-	.24*	-.13	-	-	4.37	1.05	-	44.22
7. Amount Received Help ^{ICP}	.20	.03	-.02	-.27*	.14	.68**	-	-	-	.26*	.04	-	-	3.46	1.33	-	55.70
8. Disability ^{ICP}	.19	-.42**	.33**	-.03	.10	.11	.28*	-	-	.19	-.10	-	-	3.31	1.21	-	56.08
9. Pain Intensity ^{ICP}	.19	-.43**	.34**	.00	.15	.08	.27*	.89**	-	.19	-.14	-	-	3.53	1.10	-	64.74
10. Psychological Need Satisfaction	.36**	.46**	-.34**	-.49**	-.05	.62**	.43**	-.12	-.09	<u>.40**</u>	-.59**	4.33	1.02	4.19	1.02	62.44	57.62
11. Psychological Need Frustration	-.33**	-.26*	.63**	.64**	.12	-.48**	-.34**	.12	.08	-.36**	<u>.30*</u>	.95	.83	1.02	.80	42.97	45.72

Note. Values along the diagonal (bold, italic, underlined) represent within-couple correlations. ICP = only measured in ICPs, P = only measured in partners

M=mean, SD=standard deviation, ICC=intraclass correlation coefficient

† $p < .10$

* $p < .05$

** $p < .01$

Table 2. Multilevel Regression Analyses: Partners' Daily Helping Motivation Predicting Partner Outcomes

Daily predictor	Partner Outcomes							
	Positive Affect				Negative Affect			
	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI
<i>Level 1 (within-couple)</i>								
Helping Motivation	.16 (.03)***	[.09; .22]	.16 (.03)***	[.10; .23]	-.11 (.03)***	[-.18; -.04]	-.11 (.03)**	[-.18; -.04]
Outcome Previous Day	-.16 (.03)***	[-.23; -.09]	-.17 (.03)***	[-.24; -.10]	-.24 (.03)***	[-.31; -.17]	-.25 (.03)***	[-.31; -.17]
ICP Pain Intensity			-.16 (.04)***	[-.24; -.08]			.14 (.04)***	[.06; .22]
<i>Level 2 (between-couple)</i>								
Mean Helping Motivation	.26 (.09)**	[.10; .43]	.29 (.09)**	[.11; .46]	-.23 (.06)***	[-.35; -.11]	-.22 (.06)***	[-.34; -.10]
Mean ICP Pain Intensity			-.14 (.12)	[-.37; .08]			-.04 (.08)	[-.20; .12]
sex	.16 (.28)	[-.38; .71]	.26 (.29)	[-.31; .82]	.11 (.19)	[-.27; .49]	.13 (.20)	[-.26; .52]
age	-.01 (.01)	[-.03; .02]	-.00 (.01)	[-.03; .02]	.00 (.01)	[-.01; .02]	.00 (.01)	[-.01; .02]
-2 Res Log Like	2054.7		2037.7		2029.3		2018.7	
Daily predictor	Conflict				Helping Exhaustion			
	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI
	<i>Level 1 (within-couple)</i>							
Helping Motivation	-.16 (.04)***	[-.23; -.08]	-.16 (.04)***	[-.23; -.08]	-.11 (.03)***	[-.16; -.05]	-.11 (.03)***	[-.17; -.05]
Outcome Previous Day	-.17 (.03)***	[-.24; -.10]	-.17 (.03)***	[-.24; -.11]	.00 (.00)	[-.00; .00]	.00 (.00)	[-.00; .00]
ICP Pain Intensity			.08 (.05)	[-.01; .17]			.07 (.03)*	[.00; .13]
<i>Level 2 (between-couple)</i>								
Mean Helping Motivation	-.20 (.06)***	[-.31; -.10]	-.20 (.06)***	[-.32; -.09]	-.23 (.08)**	[-.39; -.07]	-.23 (.08)**	[-.40; -.07]
Mean ICP Pain Intensity			-.00 (.08)	[-.15; .15]			.08 (.11)	[-.14; .31]
sex	.29 (.18)	[-.07; .64]	.29 (.19)	[-.08; .66]	-.35 (.26)	[-.85; .16]	-.36 (.26)	[-.88; .15]
age	.01 (.01)	[-.01; .02]	.01 (.01)	[-.01; .02]	-.01 (.01)	[-.03; .01]	-.01 (.01)	[-.03; .02]
-2 Res Log Like	2140.2		2137.8		1723.3		1721.9	

Note. ICP = individuals with chronic pain, -2 Res Log Like = value of -2 times Residual Log Likelihood. CI = confidence interval. Results displayed in the first column of each outcome variable are analyses without controlling for ICP pain intensity. Results in the third column of each outcome variable represent analyses including ICP pain intensity. *p<.05; **p<.01; ***p<.001.

Table 3. Multilevel Regression Analyses: Partners' Daily Helping Motivation Predicting ICP Outcomes

Daily predictor	ICP Outcomes											
	Positive Affect		Negative Affect				Conflict					
	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI
<i>Level 1 (within-couple)</i>												
Helping Motivation	.05 (.04)	[-.02; .13]	.07 (.04)	[-.00; .13]	-.02 (.04)	[-.10; .06]	-.04 (.04)	[-.11; .04]	-.14 (.04)***	[-.22; -.06]	-.15 (.04)***	[-.23; -.07]
Outcome Previous Day	-.09 (.04)*	[-.16; -.02]	-.07 (.03)*	[-.13; -.00]	-.16 (.04)***	[-.23; -.09]	-.12 (.04)**	[-.19; -.05]	-.19 (.04)***	[-.26; -.11]	-.19 (.04)***	[-.26; -.12]
ICP Pain Intensity			-.48 (.04)***	[-.56; -.39]			.40 (.05)***	[-.19; -.05]			.14 (.05)**	[.04; .23]
<i>Level 2 (between-couple)</i>												
Mean Helping Motivation	.00 (.11)	[-.21; .22]	.08 (.10)	[-.11; .28]	.03 (.10)	[-.16; .23]	-.03 (.09)	[-.21; .15]	-.09 (.06)	[-.21; .03]	-.09 (.06)	[-.22; .03]
Mean ICP Pain Intensity			-.56 (.13)**	[-.82; -.30]			.44 (.12)**	[.19; .68]			.03 (.09)	[-.14; .19]
Sex	.34 (.37)	[-.40; 1.07]	-.01 (.34)	[-.67; .66]	-.16 (.34)	[-.82; .50]	.09 (.32)	[-.53; .71]	-.28 (.21)	[-.69; .12]	-.27 (.21)	[-.68; .15]
Age	-.00 (.00)	[-.00; .00]	-.00 (.00)	[-.00; .00]	.00 (.00)	[-.00; .00]	.00 (.00)	[-.00; .00]	-.00 (.00)	[-.00; .00]	-.00 (.00)	[-.00; .00]
-2 Res Log Like	2198.8		2070.9		2287.6		2213.3		2247.3		2246.6	
Daily predictor	Satisfaction Received Help		Amount Received Help				Disability					
	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI
	<i>Level 1 (within-couple)</i>											
Helping Motivation	.10 (.05)*	[.00; .20]	.10 (.05)	[-.00; .20]	.13 (.05)**	[.04; .23]	.13 (.05)**	[.04; .23]	.05 (.04)	[-.04; .13]	.02 (.03)	[-.05; .08]
Outcome Previous Day	-.28 (.04)***	[-.35; -.21]	-.28 (.04)***	[-.35; -.20]	-.30 (.04)***	[-.37; -.23]	-.29 (.04)***	[-.36; -.22]	-.12 (.04)**	[-.19; -.04]	.01 (.03)	[-.04; .06]
ICP Pain Intensity			-.16 (.06)**	[-.28; -.04]			.09 (.06)	[-.02; .20]			.93 (.04)***	[.85; 1.00]
<i>Level 2 (between-couple)</i>												
Mean Helping Motivation	.06 (.09)	[-.13; .10]	.05 (.10)	[-.13; .24]	.14 (.11)	[-.08; .36]	.11 (.12)	[-.11; .34]	.12 (.10)	[-.08; .32]	-.02 (.05)	[-.12; .08]
Mean ICP Pain Intensity			.08 (.14)	[-.19; .35]			.23 (.16)	[-.07; .54]			1.00 (.07)***	[.86; 1.13]
Sex	.42 (.32)	[-.19; .63]	.43 (.32)	[-.21; 1.06]	-.05 (.38)	[-.80; .70]	.07 (.39)	[-.69; .83]	-.26 (.34)	[-.93; .41]	.27 (.17)	[-.06; .60]
Age	.00 (.00)	[-.00; .00]	.00 (.00)	[-.00; .00]	.00 (.00)	[-.00; .00]	.00 (.00)	[-.00; .00]	-.00 (.00)*	[-.00; -.00]	-.00 (.00)	[-.00; .00]
-2 Res Log Like	2195.6		2244.9		2523.0		2523.9		2362.1		1828.1	

Note. ICP = individuals with chronic pain, -2 Res Log Like = value of -2 times Residual Log Likelihood. CI = confidence interval. Results displayed in the first column of each outcome variable are analyses without controlling for ICP pain intensity. Results in the third column of each outcome variable represent analyses including ICP pain intensity. *p<.05; **p<.01; ***p<.001.

Table 4. The Mediating Role of Need Satisfaction (NS) and Frustration (NF) in the Relations between Partners' Helping Motivation and Partner Outcomes

Effect	Partner Outcomes											
	Positive Affect			Negative Affect			Conflict			Helping Exhaustion		
	B	SE	95% CI	B	SE	95% CI	B	SE	95% CI	B	SE	95% CI
a1	.23 ***	.03	[.17; .29]	.23 ***	.03	[.17; .29]	.23 ***	.03	[.17; .29]	.23 ***	.03	[.17; .29]
b1 (NS)	.45 ***	.04	[.37; .53]	-.30 ***	.04	[-.38; -.21]	-.39 ***	.04	[-.47; -.30]	-.17 ***	.04	[-.24; -.10]
a2	-.18 ***	.04	[-.25; -.11]	-.18 ***	.04	[-.25; -.11]	-.18 ***	.04	[-.25; -.11]	-.18 ***	.04	[-.25; -.11]
b2 (NF)	-.10 **	.03	[-.16; -.03]	.19 ***	.04	[.12; .25]	.35 ***	.04	[.28; .42]	.17 ***	.03	[.11; .23]
c'	.05	.03	[-.01; .11]	-.02	.03	[-.09; .04]	-.02	.03	[-.09; .05]	-.05	.03	[-.10; .01]
a1*b1	.11 ***	.02	[.07; .15]	-.07 ***	.01	[-.09; -.05]	-.09 ***	.02	[-.13; -.05]	-.04 ***	.01	[-.06; -.02]
a2*b2	.02 **	.01	[.00; .04]	-.03 ***	.01	[-.05; -.01]	-.06 ***	.01	[-.08; -.04]	-.03 ***	.01	[-.05; -.01]

Note. CI = confidence interval. The a-paths represent the relation between helping motivation and need satisfaction (a1) and frustration (a2) (while controlling for need satisfaction and frustration the previous day); the b-paths represent the relation between need satisfaction (b1) and need frustration (b2) and partner outcomes (while controlling for the outcome at the previous day); the c'-path is the relation between helping motivation and the different partner outcomes when b1 and b2 are taken into account. In each model we controlled for ICP pain intensity. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 5. The Mediating Role of Need Satisfaction (NS) and Frustration (NF) in the Relations between Partners' Helping Motivation and ICP Outcomes

Effect	ICP Outcomes																	
	Positive Affect			Negative Affect			Conflict			Satisfaction Received Help			Amount Received Help			Disability		
	B	SE	95% CI	B	SE	95% CI	B	SE	95% CI	B	SE	95% CI	B	SE	95% CI	B	SE	95% CI
a1	.15***	.03	[.09; .22]	.15***	.03	[.09; .22]	.15***	.03	[.09; .22]	.15***	.03	[.09; .22]	.15***	.03	[.09; .22]	.15***	.03	[.09; .22]
b1 (NS)	.36***	.04	[.28; .43]	-.30***	.04	[-.38; -.22]	-.32***	.05	[-.41; -.23]	.34***	.06	[.23; .46]	.27***	.06	[.16; .39]	-.12**	.04	[-.19; -.05]
a2	-.07*	.03	[-.13; -.00]	-.07*	.03	[-.13; -.00]	-.07*	.03	[-.13; -.00]	-.07*	.03	[-.13; -.00]	-.07*	.03	[-.13; -.00]	-.07*	.03	[-.13; -.00]
b2 (NF)	-.15***	.04	[-.23; -.07]	.31***	.04	[.22; .39]	.37***	.05	[.28; .46]	-.18**	.06	[-.30; -.07]	-.09	.06	[-.20; .02]	.04	.04	[-.03; .11]
c'	.00	.03	[-.06; .07]	.04	.04	[-.04; .11]	-.08*	.03	[-.15; -.00]	.05	.05	[-.05; .15]	.08	.05	[-.02; .17]	.04	.03	[-.02; .10]
a1*b1	.06***	.01	[.03; .08]	-.05***	.01	[-.07; -.02]	-.05***	.01	[-.07; -.03]	.05***	.01	[.02; .08]	.04***	.01	[.02; .07]	-.02**	.01	[-.01; -.03]
a2*b2	.01	.01	[-.00; .02]	-.02	.01	[-.04; .00]	-.03*	.01	[-.05; -.01]	.01	.01	[-.00; .03]	.01	.00	[-.00; .02]	.00	.00	[-.00; .01]

Note. CI = confidence interval. The a-paths represent the relation between helping motivation and need satisfaction (a1) and frustration (a2) (while controlling for need satisfaction and frustration the previous day); the b-paths represent the relation between need satisfaction (b1) and need frustration (b2) and ICP outcomes (while controlling for the outcome at the previous day); the c'-path is the relation between helping motivation and the different ICP outcomes when b1 and b2 are taken into account. In each model we controlled for ICP pain intensity. *p<.05; **p<.01; ***p<.001.