A daily diary study of joint quit attempts by dual-smoker couples: The role of received and

provided social support

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ABSTRACT

Introduction: Smoking individuals often have a romantic partner who also smokes. Social support from a partner is assumed to be beneficial for successful smoking cessation. To date, no study has examined daily support and smoking in dual-smoker couples jointly attempting to quit. The aim was to test the hypothesis that smokers cut down more on days with higher received and provided emotional and instrumental support. Men are expected to benefit more from support provision of their female partners than vice versa.

Methods: In this dyadic diary study, 83 dual-smoker couples reported in daily mobile phone diaries number of cigarettes smoked, how much emotional and instrumental support they received from the other partner, and how much they provided to their partners for 22 consecutive days from a joint quit date on applying the Actor-Partner Interdependence Model.

Results: Evidence was found for a support-smoking link for emotional and instrumental support. On days when women and men reported more received and provided support than usual, they smoked fewer cigarettes (actor effects for both). For men only, partner support was related to smoking: On days when women reported providing more support than usual, men smoked fewer cigarettes (partner effect for men).

Conclusions: Social support plays a key role for ones' own daily smoking in dual-smoker couples. Support provided by women but not by men was related to less smoking in partners. Findings emphasize the need for dyadic and daily assessments in longitudinal studies and trials to understand the dynamics of support in smoking cessation.

Keywords: Received social support, provided social support, smoking cessation, dual-smoker couples, dyadic intensive longitudinal data analysis, APIM

Implications: This study is the first to provide insights into the association between daily smoking and social support after a joint self-set quit attempt of dual-smoker couples using a dyadic intensive longitudinal approach. Received and provided emotional and instrumental support play a key role for ones' own daily smoking in dual-smoker couples after a joint self-set quit date. Furthermore, support provided by women was related to less smoking in partners. Because smokers with a romantic partner who also smokes have lower quit success, it is remarkable that this study replicates findings from a prior study with smoker-nonsmoker couples showing the central role of social support after a quit attempt.

INTRODUCTION

Smokers who smoke on average 16 cigarettes per day loose approximately eleven minutes of their lifetime per cigarette smoked.[1] Smoking is one of the leading causes of preventable death worldwide and is an important risk factor for serious health problems as well as life-threatening diseases such as coronary heart disease, stroke, and lung cancer.[2] High relapse rates in quitters point to the many challenges of smoking cessation[3], particularly in smokers who have a romantic partner who also smokes.[4,5] Among individuals who smoke, it is not uncommon for them to have a partner who also smokes.[4,6] Individuals tend to exhibit health behaviors similar to their spouses.[4,7] Furthermore, spouses or romantic partners have considerable influence on health behavior change[8], including smoking cessation.[6] On the one hand, a romantic partner who also smokes can be a risk factor for continued smoking.[6,9] On the other hand, the successful quitting of one partner seems to increase the likelihood of quitting in the other partner.[4] So far, the existing studies did not examine potential explaining mechanisms for why quitting smoking together might be more successful. One such mechanisms, that will be focused on in this study, is a spouse's or a partner's social support.[10]

So far, the link between social support and smoking is not well understood. On the one hand, longitudinal studies have provided evidence that higher support is associated with quitting or less smoking.[10-12] Social support was particularly important during the initiation process of quitting, and early relapse also indicates that support is most urgently needed early after the quit attempt.[13] On the other hand, contrary to these results intervention studies did not show such positive effects of support from a significant other. A possible explanation is that these interventions were not successful in increasing social support.[14,15] For the development of effective interventions it is, however, necessary to understand the association between social support and smoking in couples by applying dyadic designs and considering both partners of a couple.[16,17] To date, research on social support has mostly focused on individuals, but in daily life most individuals are embedded in close dyadic relationships.[17] In

smoking cessation, few studies considered both partners of a couple and most have focused on smoking-nonsmoking couples.[12,18] Scholz and colleagues found in a daily diary study that increases in received or provided support were related to decreases in daily smoking in smokers with a romantic partner who was not smoking.[12] So far, dual-smoker couples are understudied, especially regarding reciprocal social support exchanges and their effects on smoking.[19] Therefore, the present study aims to address this research gap whilst using a dyadic intensive longitudinal approach.

Aim of the present study

The aim of the present study was to investigate associations of dual-smoker couples' daily number of cigarettes smoked and received and provided emotional and instrumental social support after a joint self-set quit attempt. The time period of the joint quit attempt and after was chosen because social support seems to be especially important during the early phase after quitting.[13,15] We wanted to examine if positive daily associations between different forms of social support and number of cigarettes smoked as found in smokers from smoker-non-smoker couples applied to dual-smoker couples.[12] Therefore, we used a dyadic intensive longitudinal approach by considering data from both partners of the participating couples.[16] The present study was the first to investigate these associations in dual-smoker couples with a dyadic intensive longitudinal approach considering between-person and within-person variations.

The study looks at daily social support in a multi-faceted way, distinguishing received and provided emotional and instrumental support for female and male partners. Received support is defined as an emotional or tangible resource provided by a significant other in order to help, and comprises retrospective reports of actual support transactions between two partners.[20] Received support shows small to moderate correlations with providers' reports of support given.[10] Emotional support refers to the emotional well-being of recipients and covers

aspects such as comforting and encouraging.[20] Instrumental support refers to practical help or assistance.[20] Based on previous studies, we hypothesized that in the context of smoking cessation emotional and instrumental social support are equally important after a quit attempt.[12] This study focused on smoking-specific support to match the level of specificity of the behavioral outcome and predictors.[21] Dyadic intensive longitudinal models now routinely test for gender differences to detect differential effects of support receipt and provision. Women and men receive and provide social support differently.[10,22] While women seem to benefit from giving support to their intimate partners in close heterosexual relationships, men seem to benefit from receiving support from their female partners.[23,24] Women seem to be better able to adapt support provision to the need of their partners, whereas men react with more negativity to their wives' stress when they are stressed themselves.[25,26] Thus, this study is the first to investigate women's and men's received and provided social support on their own and their partners' daily smoking.

We hypothesized that on days with higher emotional and instrumental support receipt and provision, women and men would cut down on their daily number of cigarettes smoked (actor effects for women and men). Furthermore, based on prior findings of gender differences in social support, we expected to see differential effects of emotional and instrumental support provision and receipt for male and female smokers with stronger benefits for male smokers (partner effects for men).

METHOD

Design and Participants

This study was part of the larger project "Individual regulation and dyadic exchanges during an on-going quit attempt in dual-smoker couples" funded by the Swiss National Science Foundation (PP00P1_133632/1). The project was approved by the Ethics Committee of the University of Bern's Faculty of Human Sciences in Switzerland (2011-11-14409). The

study had a prospective longitudinal design and followed dual-smoker couples in an on-going joint quit attempt by investigating the role of individual regulation and dyadic social exchange processes in smoking cessation. Dual-smoker couples were recruited via newspapers, web pages, public advertising, bulletins, and a market research institution, and received up to 200 Swiss Francs in compensation for their time. In accordance to the WHO criterion for regular smoking each partner of eligible dual-smoker couples had to be smoking at least one cigarette per day and intending to quit smoking together during the study period.[27] Couples had to be in a committed relationship (i.e., either married or in a stable heterosexual relationship for at least one year) and living together for at least six months. Exclusion criteria were participation in a professional program for smoking cessation, female smoker being pregnant, working in shift work, and insufficient comprehension of the German language.

After consent and a baseline assessment of eligibility and socio-demographic data, couples reported their behavior in daily evening diaries for 32 consecutive days around the joint self-set quit date using study provided smartphones (one for each partner). Couples were instructed to fill out the daily survey each night within one hour of going to bed separately from each other, starting 10 days before the quit date and 21 days afterwards. Social support is particularly important during the initiation process of quitting and urgently needed early after the quit attempt.[13,15] Therefore, analyses focused on the day of the quit date and the following 21 days to capture effects of social support during the joint quit attempt of the dual-smoker couples. More details on study procedures can be found online in Appendix A in the Supplementary Material.

Sample Characteristics

A total of 85 heterosexual dual-smoker couples participated in the baseline assessment. Two dual-smoker couples dropped out before their joint self-set quit date. As these two couples were not part of the study's population of quitters, we included data from 83 dual-smoker couples in the analyses. Smokers' age varied widely in the sample (women:

M = 38.5, *SD* = 14.64, range 19-68 years; men: *M* = 40.7, *SD* = 14.51, range 20-71 years), as

did relationship duration (*M* = 12.68, *SD* = 12.79, range 1-47 years). A total of 38 (44.7%) of

the couples were married and 24 (28.2%) had children. Most participants were currently

employed (women: 61.4%; men: 71.8%) and reported having attended 9 years of school

(women: 63.5%; men: 76.5%). Overall, the participating dual-smoker couples showed high

diary completion rates (*n* = 3031 [83.0%] of 3652 possible diary days).

Measures

For 22 consecutive days, partners reported about their daily behavior. Table 1 gives an

overview of means, standard deviations, and ranges of all measures over the 22 diary days.

All items were administered in German; the following item examples have been translated

into English.

Daily number of cigarettes smoked was assessed for both partners by the item "Did you

smoke today (including only one puff)?" Response format was no (0) or yes (1). If the

response was yes, they were asked to report how many cigarettes they had smoked.[28] If

smokers had not smoked, number of cigarettes smoked was coded as 0.

Received daily emotional and instrumental smoking-specific support was assessed in

line with prior studies[12,18,29] with the following instruction before and while the support item

was displayed: "Support can be emotional (e.g., listening, comforting) or can include practical

help (e.g., doing something to help the other person, such as taking on household chores)."

Then both partners rated emotional support with the item: "Today, I received emotional

support from my partner with regard to my smoking cessation", and instrumental support with

the item "Today, I received practical support from my partner with regard to my smoking

cessation", both on the same scale ranging from 1 "definitely not true" to 6 "completely true".

Provided daily emotional and instrumental smoking-specific support was assessed with

one item each for emotional and instrumental support reflecting the same content as the items

for received daily emotional and instrumental smoking-specific support.[12,29] First, the very

same explanation was displayed on the smartphone. Then, both partners rated the item "Today, I provided emotional support to my partner with regard to his/her smoking cessation" for emotional support, and "Today, I provided practical support to my partner with regard to his/her smoking cessation" for instrumental support, on a scale ranging from 1 "definitely not true" to 6 "completely true".

Data Analysis

For all the analyses, data from female and male partners of the 83 dual-smoker couples were analyzed with the Actor-Partner Interdependence Model (APIM) using the two intercept procedure.[16,30] Multilevel modeling was used in order to account for interdependence among the couples (i.e., individual scores were nested within dyads) and for the hierarchical data structure.[31] Analyzing dyadic data allows for the capture of couple-level influence.[32] Therefore, actor (the individual) and partner (the individual's partner) reports of all the predictor variables were used allowing for the estimation of the extent to which female and male partner's outcome is related to their own and their partner's predictor scores while controlling simultaneously for the effect of both.[16]

Actor and partner reports of *received daily emotional and instrumental support* and *provided daily emotional and instrumental support* from women and men were examined as predictors of women's and men's daily smoking in four separate models. The key outcome, *daily number of cigarettes smoked*, had a skewed distribution and is a count variable with a high amount of zeros due to smokers who successfully quit for at least several days. Thus, data were analyzed using a generalized linear mixed model that specified a negative binomial distribution with a logarithmic link function and zero inflation with a constant zero-inflation value only (ZINB).[33-35] The negative binomial model includes a random component reflecting the uncertainty about true rates at which an event occurs for individual cases while accounting for overdispersion.[33] Moreover, zero-inflated negative binomial regression is used to model count data with an excess of zero counts.[34] The effect sizes for these models are rate ratios

(*RR*) and are interpreted as the percentage increase (values > 1) or decrease (values < 1) in daily smoking for a unit increase in the predictor.[36] All analyses were conducted in R version 3.2.2 with the glmmADMB package for fitting generalized mixed models.[37]

The between-person support predictors were computed by calculating the average support for each person across all days after the quit attempt.[31] These variables were grand-mean centered to allow for a meaningful interpretation of the intercept. The within-person support predictors were calculated by centering support at the person mean, resulting in intrapersonal fluctuations around the person-specific mean across the diary days.[31] A time variable for the 22 investigated diary days (centered on joint quit date = 0) was included in all the models to model linear effects over time. Moreover, the average number of cigarettes smoked before the quit date (centered at the grand mean) was included in all models to account for previous smoking.

Finally, each regression model contained the following predictors: Two intercepts (one each for women and men), the linear time variable (centered at the quit date), the between-person level of women's and men's actor and partner support predictors at Level 2, and the within-person level of women's and men's actor and partner support predictors at Level 1. Additionally, grand-mean centered number of cigarettes smoked for days before the quit date was included as covariate at Level 2. Furthermore, a maximal random effects structure was specified for each model including random slopes of all Level 1 predictors (allowing men and women to differ in associations between predictor and outcome).[38] Random effects smaller than .0001 were excluded from the models.

RESULTS

Received daily emotional and instrumental support as predictor of daily smoking

The zero-inflated negative binomial generalized linear mixed model reported in Table 2 tested between-person and within-person actor and partner effects of women's and men's received emotional and instrumental support on daily smoking. The two intercepts (one for

women and one for men) describe the rate or estimated number of cigarettes smoked on the quit date for the average woman or the average man when all covariates equal zero; the average number of cigarettes smoked for the quit day was low at about 1.5 cigarettes compared to about 12 cigarettes per day before the quit date (emotional support, intercept for women: 1.49, for men: 1.83; instrumental support, intercept for women: 1.41, for men: 1.71 cigarettes smoked), indicating that most participants indeed tried to quit on the quit date. Time showed a negative trajectory in both models (for both received emotional and instrumental support: RR = 0.94), indicating that daily number of cigarettes smoked decreased by 6% over the 22 diary days after the joint quit date. More daily smoking before the quit date predicted lower quit success (for received emotional support: RR = 1.08 and for received instrumental support: RR = 1.07), indicating that with each additional cigarette smoked before the quit attempt participants smoked 8% and 7% more after the quit attempt.

This study provided no evidence that between-person differences in support levels after the joint self-set quit attempt were related to smoking. Rather, within-person fluctuations in received emotional and instrumental support were related to daily smoking (actor effects for women: received emotional support, RR = 0.90 and received instrumental support, RR = 0.93; actor effects for men: received emotional support, RR = 0.92 and received instrumental support, RR = 0.94). On days when women received one unit more emotional and instrumental support than usual, they smoked 10% and 7% fewer cigarettes than on days with average support. On days when men received one unit more emotional and instrumental support than usual, they smoked 8% and 6% fewer cigarettes that day than on days with average support.

This study provided some evidence that within-person fluctuations in received support were linked with partner's daily smoking at the 10% significance level, i.e., that when one partner received more support than usual on a given day the other partner smoked less that day. Men's day-to-day fluctuations in received emotional support were not significantly

related to women's daily smoking (RR = 0.98, p > .10). But on days when women reported the receipt of one unit more emotional support than usual, men smoked 6% fewer cigarettes that day than on days when women received average support (RR = 0.94, p < .10). On days when men received one unit more instrumental support than usual, women smoked 4% fewer cigarettes that day than on days when men received average support (RR = 0.96, p < .10). Women's day-to-day fluctuations in received instrumental support were not significantly related to men's daily smoking, although they showed the same direction and size of the effect (RR = 0.96, p > .10).

The random intercepts indicate that female and male smokers varied considerably in daily smoking on the quit date around the average cigarettes per day. Other random effects were either small with large standard errors or not estimable.

Provided daily emotional and instrumental support as predictor of daily smoking

The zero-inflated negative binomial generalized linear mixed model reported in Table 3 tested between-person and within-person actor and partner effects of women's and men's provided emotional and instrumental support on daily smoking. As in the models with received social support, the average number of cigarettes smoked for the quit day was low (emotional support, intercept for women: 1.39, for men: 1.71; instrumental support, intercept for women: 1.50, for men: 1.74 cigarettes smoked). Time showed a negative trajectory in both models (for both emotional and instrumental support: RR = 0.94), indicating that daily number of cigarettes smoked decreased by 6% over the 22 diary days after the joint quit date. More daily smoking before the quit date predicted lower quit success (for both provided emotional and instrumental support: RR = 1.08), indicating that with each additional cigarette smoked before the quit attempt participants smoked 8% more after the joint quit attempt.

Also comparable to the results of received social support, there was no evidence that between-person differences in levels of support provision after the joint quit attempt were related to smoking. Rather, within-person fluctuations in provided emotional and instrumental

support were related to daily smoking (actor effects for women: provided emotional support, $RR = 0.93$ and provided instrumental support, $RR = 0.92$; actor effect for men: provided emotional support, $RR = 0.92$ and provided instrumental support, $RR = 0.94$). On days when women provided one unit more emotional and instrumental support than usual, they smoked 7% and 8% fewer cigarettes than on days with average support provision. On days when men provided one unit more emotional and instrumental support than usual, they smoked 8% and 6% fewer cigarettes that day than on days with average support provision.

Moreover, within-person fluctuations in provided support were linked with partner's daily smoking. Men's day-to-day fluctuations in provided emotional and instrumental support were not significantly related to women's daily smoking (for both $RR = 0.98$, $p > .10$). But on days when women reported one unit more provided emotional support than usual, men smoked 8% fewer cigarettes that day than on days when women provided average support ($RR = 0.92$, $p < .05$). On days when women provided one unit more instrumental support than usual, men smoked 6% fewer cigarettes that day than on days when women provided average support ($RR = .94$, $p < .10$).

The random intercepts indicate that female and male smokers varied considerably in daily smoking on the quit date around the average cigarettes per day. Other random effects were either small with large standard errors or not estimable.

In additional analyses, we also examined all the associations reported above for the ten days before the joint self-set quit date. In all these analyses, the pattern of results for days before the joint quit date was very similar to the results reported in Table 2 and Table 3. However, the effects were smaller as the reported ones, which support the assumption that social support is most needed during and after the actual quit attempt when both smokers have to refrain from smoking.

DISCUSSION

This study is the first to follow dual-smoker couples through a joint self-set quit attempt in everyday life differentiating between women's and men's effects on their own smoking behavior and their partners'. As hypothesized, we found evidence that on days with higher emotional and instrumental support receipt and provision, women and men cut down on their own daily number of cigarettes smoked (actor effects for women and men). Because smokers with a partner who also smokes have lower quit success[6], it is remarkable that this study replicates from a prior study of smoker-nonsmoker couples showing the central role of social support after a quit attempt. Results of this study confirmed that it is equally beneficial for female and male smokers to receive emotional and instrumental support from their partners. This finding is in line with prior research showing that both women and men seem to benefit from social support in times of high stress.[20] Receiving support might have helped to ease the stress of quitting and potentially strengthened adaptive coping in dual-smoker couples.[12] An alternative explanation for this effect is the enabling hypothesis of social support.[39] This hypothesis states that receiving support strengthens one's self-efficacy, which in turn facilitates behavior change.[40] Moreover, not only receiving support but also providing emotional and instrumental support to their partners seems to be beneficial for one's own reduction in smoking. One possible explanation could be that assisting the partner in smoking cessation might also beneficially influence one's own self-efficacy and in turn be positively related to one's own behavior change. Future research might also want to assess smokers' self-efficacy in order to formally test these assumptions.

For men only, we found partner effects for provided emotional and instrumental support indicating that men smoked less on days when women provided more emotional and instrumental support than usual. These results are in line with our hypothesis, assuming it to be especially beneficial for men when their female partners provide support. In previous studies on social support and gender differences, men benefited more from receiving support while women benefited from giving support in close relationships.[23,24] An explanation for

these gender differences is that women seem to be better able to adapt their support provision to the needs of their partner, compared to men who seem to react with more negativity to their female partner's stress when they are stressed themselves.[25,26] Smoking cessation is likely a highly stressful event for the participating dual-smoker couples, given their initially high levels of smoking of on average 16 cigarettes per day. Future intervention studies focusing on the partner as the support provider should thus consider this gender difference.

In previous studies, mostly emotional support was investigated in the context of smoking cessation.[10] In the present study we assessed both emotional and instrumental support in addition to both partners' perspectives (i.e. received, provided). Thus, we were able to estimate potentially distinct effects of different kinds of received and provided support. Daily smoking-specific emotional and instrumental support was beneficial in dual-smoker couples. Therefore, it seems that in the context of smoking cessation both emotional as well as instrumental support are important predictors for smoking abstinence in dual-smoker couples. Future intervention studies should include different kinds of social support to facilitate quitting in dual-smoker couples.

The dyadic intensive longitudinal approach with 22 consecutive days of measurement allowed disentangling day-to-day fluctuations in support within persons from stable individual differences in support levels between persons. Such an approach is urgently needed because results from between- and within-person levels do not necessarily correspond[18,31], as our results confirmed. At the within-person level, higher daily support was associated with less smoking, for both female and male smokers and no matter if support was received or provided, emotional or instrumental. Contrary, at the between-person level, we found no significant associations between support levels and smoking. The results that male and female partners during a quit attempt smoked fewer cigarettes on days with higher than usual support confirm the importance of social support as a within-person predictor in smoking cessation. Our findings imply that differences in number of cigarettes smoked cannot be explained by

differences in people's average amount of received or provided support over time. Rather, increases or decreases in received or provided support in people's daily life seem crucial.

Strengths and limitations

Strengths of the present study are the dyadic intensive longitudinal design, which allowed considering actor and partner effects of women's and men's support at the between-person and the within-person level in dual-smoker couples. A further strength of the dyadic daily diary design is the ecological validity of the data. Nonetheless, the present study has some limitations. First, the use of single items for measuring received and provided emotional and instrumental smoking-specific support is a limitation. However, brief daily assessments are important for preventing attrition in intensive longitudinal couple studies. A second limitation is that no objective measure of smoking was used because self-reporting measures are a potential source of memory and recall biases.[41] However, due to the short recall interval of one day in this design, retrospection errors should be minimized.[42] Moreover, in the present study point prevalence of non-smoking was biochemically verified with a carbon monoxide test of expired air [43] at follow-up after the diary phase. All 34 (40%) women and 28 (32.9%) men of the 83 dual-smoker couples reporting continuous abstinence one month after their joint self-set quit date were also identified as non-smokers by the objective point prevalence measure. Future studies, however, might want to consider assessing smoking in everyday life with wearable sensors to completely eliminate retrospective or memory bias. Finally, the current research design does not allow for causal inferences.

Conclusions

To conclude, the present study is the first to provide insights into the association between daily smoking and received and provided support after a joint self-set quit attempt of dual-smoker couples using a dyadic intensive longitudinal approach. Receiving and providing emotional and instrumental support on a joint quit date and after positively relates to less smoking. Furthermore, support provision by women is related to less smoking in men. Future

studies should target social support in interventions in order to allow causal inferences in dual smoker couples quitting jointly.

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Declaration of Interests

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Table 1

Available data, means, standard deviations, and ranges for main variables for N = 83 dual-smoker couples separated for female and male partners

for the quit date and the 21 days after

	n		M		SD		Range	
	Women	Men	Women	Men	Women	Men	Women	Men
Daily number of cigarettes smoked	1553	1473	4.24	4.31	6.38	5.75	0 to 40	0 to 34
Received daily emotional social support	1555	1476	2.41	2.35	1.48	1.39	1 to 6	1 to 6
Received daily instrumental social support	1555	1476	2.32	2.18	1.43	1.32	1 to 6	1 to 6
Provided daily emotional social support	1555	1476	2.36	2.23	1.40	1.29	1 to 6	1 to 6
Provided daily instrumental social support	1555	1476	2.27	2.13	1.36	1.27	1 to 6	1 to 6

Table 2

Received Daily Support and Smoking: Parameter estimates for Negative Binomial Generalized Estimating Equations Models with Zero Inflation (ZINB) of the daily number of cigarettes smoked as a function of received daily emotional and instrumental smoking-specific support

| | Received daily emotional support | | | | | Received daily instrumental support | | | | |
| | | | | 95% CI | | | | | 95% CI | |
Fixed Effects	*b*	*SE*	RR	Lower	Upper	*b*	*SE*	RR	Lower	Upper
Intercept women	0.40	0.34	1.49	-0.26	1.06	0.35	0.34	1.41	-0.31	1.00
Intercept men	0.60*	0.30	1.83	0.01	1.19	0.54°	0.29	1.71	-0.04	1.11
Time	-0.06***	0.02	0.94	-0.10	-0.03	-0.06***	0.02	0.94	-0-09	-0.02
Number of cigarettes smoked before quit date	0.08*	0.03	1.08	0.02	0.12	0.07*	0.03	1.07	0.02	0.13
Actor support women$_{\text{between-person}}$	-0.27	0.38	0.77	-1.01	0.48	-0.40	0.39	0.67	-1.16	0.36
Actor support men$_{\text{between-person}}$	0.30	0.34	1.35	-0.37	0.97	0.38	0.33	1.46	-0.26	1.01
Partner support women$_{\text{between-person}}$	0.23	0.39	1.26	-0.53	0.99	0.27	0.38	1.32	-0.47	1.02
Partner support men$_{\text{between-person}}$	-0.08	0.34	0.93	-0.75	0.60	-0.24	0.33	0.79	-0.89	0.41
Actor support women$_{\text{within-person}}$	-0.10***	0.03	0.90	-0.16	-0.05	-0.08*	0.03	0.93	-0.15	-0.01
Actor support men$_{\text{within-person}}$	-0.09***	0.02	0.92	-0.13	-0.05	-0.07**	0.03	0.94	-0.11	-0.02
Partner support women$_{\text{within-person}}$	-0.02	0.02	0.98	-0.06	0.02	-0.04°	0.02	0.96	-0.08	0.01
Partner support men$_{\text{within-person}}$	-0.06°	0.03	0.94	-0.13	0.00	-0.04	0.03	0.96	-0.11	0.02
Random Effects (variances)	Estimate	*SE*				Estimate	*SE*			
Intercept women	6.32	2.51				6.21	2.49			
Intercept men	4.83	2.20				4.39	2.10			
Time	0.018	0.13				0.02	0.13			
Actor support women$_{\text{within-person}}$	0.01	0.11				0.02	0.14			
Partner support men$_{\text{within-person}}$	0.02	0.14				0.02	0.12			

Note. N = 83 couples, 22 days maximum, n = 1826 available days. b = unstandardized regression coefficients, SE = standard errors, RR = rate ratios, 95% CI = 95% confidence intervall. ° $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. The R package glmmADMB does not provide significance tests for random effects.

Table 3

Provided Daily Support and Smoking: Parameter estimates for Negative Binomial Generalized Estimating Equations Models with Zero Inflation (ZINB) of the daily number of cigarettes smoked as a function of provided daily emotional and instrumental smoking-specific support

Fixed Effects	Provided daily emotional support					Provided daily instrumental support				
				95% CI					95% CI	
	b	*SE*	RR	Lower	Upper	*b*	*SE*	RR	Lower	Upper
Intercept women	0.33	0.33	1.39	-0.32	0.98	0.40	0.34	1.50	-0.26	1.06
Intercept men	0.54°	0.30	1.71	-0.06	1.13	0.55°	0.30	1.74	-0.04	1.15
Time	-0.06***	0.02	0.94	-0.09	-0.03	-0.06***	0.02	0.94	-0.09	-0.03
Number of cigarettes smoked before quit date	0.08**	0.03	1.08	0.02	0.14	0.08*	0.03	1.08	0.02	0.14
Actor support women$_{between-person}$	-0.20	0.40	0.82	-0.98	0.57	-0.44	0.39	0.64	-1.20	0.32
Actor support men$_{between-person}$	0.14	0.37	1.15	-0.58	0.86	0.20	0.36	1.22	-0.51	0.91
Partner support women$_{between-person}$	0.38	0.40	1.46	-0.41	1.17	0.49	0.41	1.64	-0.31	1.30
Partner support men$_{between-person}$	0.19	0.35	1.80	-0.50	0.88	0.02	0.34	1.02	-0.64	0.68
Actor support women$_{within-person}$	-0.08**	0.03	0.93	-0.13	-0.03	-0.08***	0.02	0.92	-0.13	-0.04
Actor support men$_{within-person}$	-0.09***	0.02	0.92	-0.14	-0.04	-0.06*	0.03	0.94	-0.11	-0.01
Partner support women$_{within-person}$	-0.02	0.02	0.98	-0.06	0.02	-0.02	0.03	0.98	-0.08	0.05
Partner support men$_{within-person}$	-0.08*	0.03	0.92	-0.15	-0.02	-0.06°	0.03	0.94	-0.13	0.00
Random Effects (variances)	Estimate	*SE*				Estimate	*SE*			
Intercept women	5.89	2.43				6.26	2.50			
Intercept men	4.78	2.19				4.82	2.19			
Time	0.02	0.13				0.02	0.13			
Actor support women$_{within-person}$	0.001	0.03				-	-			
Partner support women$_{within-person}$	-	-				0.002	0.05			
Partner support men$_{within-person}$	0.02	0.14				0.02	0.13			

Note. *N* = 83 couples, 22 days maximum, *n* = 1826 available days. *b* = unstandardized regression coefficients, *SE* = standard errors, RR = rate ratios, 95% CI = 95% confidence intervall. ° p < .10, * *p* < .05, ** *p* < .01, *** *p* < .001. The R package glmmADMB does not provide significante tests for random effects.