

Running Head: SOCIAL SUPPORT AND SMOKING

Examining the relationship between daily changes in support and smoking around a self-
set quit date

Urte Scholz

University of Zurich

Gertraud Stadler

Columbia University New York

Sibylle Ochsner

University of Zurich

Pamela Rackow

University of Zurich

Rainer Hornung

University of Zurich

Nina Knoll

Freie Universität Berlin

Author Note

Address correspondence to: Urte Scholz, University of Zurich, Department of Psychology,
Applied Social Psychology, Binzmuehlestrasse 14 / Box 14, CH-8050 Zürich, Switzerland.
Phone: +41 44 635 72 50, Fax: +41 44 635 72 59, Email: urte.scholz@psychologie.uzh.ch

This study was funded by the Swiss National Foundation (100014_124516). We would
like to thank all students who helped with data collection.

SOCIAL SUPPORT AND SMOKING

1

Running Head: SOCIAL SUPPORT AND SMOKING

Examining the relationship between daily changes in support and smoking around a self-set quit date

Abstract

Objective: Social support from one's partner is assumed to be beneficial for successful smoking cessation. However, thus far, no study has examined the fine-grained temporal dynamics of daily support and smoking in the process of quitting.

Methods: In this longitudinal mobile phone study, smokers ($N = 100$, 28% women, *mean age* = 40.48 years) reported daily number of cigarettes smoked and how much smoking-specific emotional and instrumental social support they received from their partner for 10 days before and 21 days after a self-set quit date. Non-smoking partners' ($N = 99$, *mean age* = 38.95 years) reports of provision of support were assessed to validate the smokers' self-reports regarding support received. Time-lagged analyses were conducted using a change-predicting-change model.

Results: Prior and concurrent increases in received emotional smoking-specific support were related to less smoking. Effects were more pronounced after the quit date, which is when support is most needed. Prior change in smoking did not predict change in received support. Results with partner reports of provision of support and results with instrumental support were almost identical.

Conclusions: Daily changes in social support preceded and accompanied daily changes in smoking particularly after a self-set quit date. Findings emphasize the need for a prospective daily diary approach to understand the dynamics of social support in smoking cessation.

Keywords: smoking, quit date, social support, couples, daily diary

Smoking is the leading cause of preventable death from lifestyle factors (Mokdad, Marks, Stroup, & Gerberding, 2004). High relapse rates in smoking cessation indicate the importance of using external resources such as social support (Westmaas, Bontemps-Jones, & Bauer, 2010). Social support comprises resources provided to a recipient in need; functions of support may be emotional (e.g., comforting), instrumental (e.g., practical assistance), or informational (e.g., advice). In this study, we focus on emotional and instrumental support as they are expected to be most relevant for buffering the daily stress smokers experience while quitting (cf. Westmaas et al., 2010)¹. Although both general and smoking-specific support are related to cessation (e.g., Mermelstein, Cohen, Lichtenstein, Baer, & Kamarck, 1986), it is recommended to match the level of specificity of behavior and predictors (Ajzen & Fishbein, 1977). Thus, this study focused on smoking-specific support. Recipients' reports of support receipt can be validated by providers' reports of support given (e.g., Westmaas et al., 2010).

Longitudinal studies provided some evidence that higher support is related to less smoking (Mermelstein et al., 1986). Intervention studies, however, did not demonstrate the assumed effectiveness of partner support on quitting smoking, possibly because these interventions were not successful in increasing support (Park, Tudiver, & Campbell, 2012). Thus, to better inform interventions, it is crucial to increase the understanding of the interplay between support and smoking. One aspect that has been neglected so far is the ideal timing of support; that is, when in the process of smoking cessation support should be targeted to make it most helpful for smokers (May & West, 2000; Mermelstein et al., 1986; Westmaas et al., 2010). To date, evidence on the best timing of support is limited because most prospective studies assessed support at baseline and smoking cessation at one or a limited number of follow-up

¹ There are also other functions of social support that were not considered in the present research, such as self-esteem support, appraisal support, etc.. These kinds of support are types of perceived available social support which is known to be rather stable across time and thus not an appropriate measure for assessing dynamic processes in social support on a daily basis.

assessments, with long time periods in between, revealing little in terms of process dynamics (Westmaas et al., 2010). Daily assessment of support and smoking during a quit attempt is needed due to smokers' high rates of early relapse after quitting (Shiffman et al., 2007).

Early relapse also indicates that support is most urgently needed early after the quit attempt (May & West, 2000). This can be explained by the buffering effect of support, i.e., that receiving support is most helpful when an individual is stressed (cf. Westmaas et al., 2010). Findings on withdrawal symptoms suggest that smoking cessation is indeed a stressful event (Westmaas et al., 2010). Thus, daily diary studies that examine the timing of support during a quit attempt are needed, and the present study aims to address this research gap. In particular, we had the following hypotheses: First, based on the results of prospective studies, we assumed that an increase in support from one day to the next will be related to a subsequent decrease in smoking (prospective hypothesis). Second, because it is likely that support also has fast-acting effects, we hypothesized that an increase in support from one day to the next day will be related to a concurrent decrease in smoking (concurrent hypothesis). Finally, based on the evidence that quitting is most stressful early on, we hypothesized that these lagged and concurrent effects of support on smoking will be stronger at the quit date and after than before the quit date (buffering hypothesis).

Methods

Design and Participants

This study was part of a larger project (DIRECT), funded by the Swiss National Science Foundation (100014_124516). Participants were recruited for an observational study investigating the role of individual regulation and dyadic exchange processes in smoking cessation around a self-set quit date (see Ochsner et al., 2014). This purpose of the study was communicated openly to potential participants during recruitment. For a detailed description of the design and recruitment strategies, see Ochsner et al. (2014). Inclusion criteria were

smoking at least one cigarette daily, intention to quit smoking during the study, being married or in a committed heterosexual relationship with a non-smoking partner for at least one year, cohabitation with the partner for at least six months, and no participation in a professional smoking cessation program during study participation as most smokers try to quit on their own (Westmaas et al., 2010). Exclusion criteria (also for the nonsmoking partner) were pregnancy, shift work, and insufficient comprehension of the German language.

Participants first provided online informed consent and then completed a socio-demographic questionnaire online (T0). A baseline assessment (T1) took place at the university where smokers set their quit date. Then, couples completed end-of-day diaries for 32 days, starting 10 days before the self-set quit date and for 21 days thereafter using study provided smartphones (one for each partner). Couples were compensated with 200 Swiss Francs (ca. 207 USD) for participation. All participants were treated in accordance with the ethical guidelines of the Helsinki Declaration (2000).

Measures

Daily number of cigarettes smoked was assessed by the item “Did you smoke today (including only one puff)?” At a positive response, participants were asked to report how many cigarettes they had smoked (Heatherton, Kozlowski, Frecker, & Fagerström, 1991); otherwise, daily number of cigarettes smoked was coded as 0.

Smoker received and partner provided daily emotional and instrumental smoking-specific support. Participants saw a definition of emotional and instrumental support before and while the support item was displayed: “Support can be emotional (e.g., listening, comforting) or practical (e.g., doing something to help the other person, such as taking on household chores).” The items read: “Today, I received emotional / instrumental support from my partner with regard to my smoking cessation” (smoker received support) and “Today, I provided emotional / instrumental support to my partner with regard to his/her smoking

cessation” (partner provided support). Response scales ranged from 1 (“definitely not true”) to 6 (“completely true”) (see Bolger, Zuckerman, & Kessler, 2000).

Data Analysis

We used a change-predicting-change analysis approach with multilevel models implemented in SPSS 20 (Stadler, Snyder, Horn, Shrout, & Bolger, 2012). We calculated change scores for adjacent days for the outcome and the predictor variables. Change in smoking from yesterday to today ($Smoking_t - Smoking_{t-1}$) was our dependent variable. To test the *prospective hypothesis*, the model prospectively predicted changes in smoking by prior changes in support from two days ago to yesterday ($Support_{t-1} - Support_{t-2}$), adjusting for prior changes in smoking from two days ago to yesterday ($Smoking_{t-1} - Smoking_{t-2}$). Moreover, in accordance with the *concurrent hypothesis*, concurrent changes in support from yesterday to today ($Support_t - Support_{t-1}$) were also included in the analyses. Change scores had a meaningful zero, indicating no change. We included Day_t 3 to 32 in the analyses because prior change scores were not available for Day 1 and 2, resulting in a total of 30 diary days. Moreover, a linear time variable centered on the third diary day and a binary indicator for the period from quit date on (coded 0 for days prior and 1 for quit date and after) and their interactions were included. To test the buffering hypothesis, interaction terms between the predictors and the quit date indicator were included (Singer & Willett, 2003). For significant interaction terms, simple slope analyses were run (Preacher, Curran, & Bauer, 2006).

Results

Descriptive Results

A total of 902 couples had contact with the study team, resulting in 589 eligible couples (65%). Of those, 106 couples (18%) agreed to participate. Six participants dropped out before the quit date and were thus excluded. The 100 smokers included in the analyses were middle-aged ($M = 40.48$, $SD = 9.86$, range = 19-72 years) and predominantly male (72%). Overall,

99 partners completed the diary phase. One partner was not fluent in German and thus did not participate. Partners' mean age was 38.95 years ($SD = 9.67$, range = 20-63). Most participants were married (66%), and 34 (34%) were in a committed relationship. The majority had children (58%) and had attended at least 9 years of school (70%). The diary phase included 3000 possible observations; smokers completed 2756 observations (91.9%) and non-smoking partners completed 2732 (91.1%) observations. The number of missing diary days was unrelated to age, sex, received and provided emotional and instrumental social support, number of cigarettes smoked, and nicotine dependence. Thus, we assume in our analyses that missings are missing at random. At quit date, 49 participants (49%) reported that they quit. A total of 30 smokers (30%) reported to be continuously abstinent from quit date on until the end of the diary phase. For between-person means and standard deviations, see Table A1 in Appendix 1.

Changes in support and daily smoking before and after the quit date

When predicting changes in smoking, positive values indicate an increase in the number of cigarettes smoked from one day to the next. In the analysis with prior and concurrent changes in smoker-reported received emotional support as predictors, the typical participant (with no prior change in cigarettes smoked and no prior and concurrent change in received support) started out with no change in number of cigarettes smoked from the third to the fourth day ($b = .24$; see Table 1). There was a trend for smokers to reduce smoking before the self-set quit date ($b = -.12$). At the quit date and following it, there was a significant average reduction in number of cigarettes smoked of 3.3 cigarettes per day. The time slope after the quit date differed from the time slope before the quit date ($b = .25$), resulting in a positive simple time slope, reflecting increased smoking due to relapses ($b = .14$). Before the quit date, a prior increase in smoking from two days ago to yesterday predicted a reduction in subsequent smoking ($b = -.37$). This effect was weaker after the quit date ($b = .19$), resulting in a still

negative simple slope ($b = -.18$). Before the quit date, a prior increase in social support was related (at $p < .10$) to less subsequent smoking ($b = -.25$). There was a trend for this effect to become stronger after the quit date ($b = -.23$). After the quit date, a prior increase in support seemed to be related to a subsequent decrease in smoking ($b = -.48$), but this effect needs to be interpreted with caution due to the non-significant interaction. Before the quit date, concurrent change in support was unrelated to change in smoking ($b = -.10$). After the quit date, however, this effect became stronger ($b = -.54$), resulting in a negative simple slope and indicating reduced smoking when support was increased ($b = -.64$).

The pattern of the results remained the same when we used partner reports of changes in provided emotional support instead of smoker reports. We also used cross-lagged analyses to test whether a prior change in smoking predicted a subsequent change in support and found no evidence for this direction of effects, except for partner reports of provided support, which decreased when a prior increase in smoking occurred, but only after the quit date.

We conducted several sensitivity analyses. First, we also examined smoker reports and partner reports of instrumental support (see Table A2 in Appendix 1). Second, time trends in predictor and outcome variables may result in biased effects (Curran & Bauer, 2011). Therefore, all analyses were conducted with detrended predictor variables. Finally, all analyses were repeated for those 70 participants who relapsed after the quit date. In all these analyses, the pattern of results was very similar to the results reported in Table 1.

Discussion

This study is the first to examine the effects of prior and concurrent changes in social support on changes in smoking around a self-set quit date using a daily diary design. We hypothesized prior and concurrent change of support to be important predictors of change in smoking (*prospective* and *concurrent hypotheses*). We found support for both the prospective and concurrent hypotheses, i.e., increases in support preceded and accompanied decreases in

smoking. Moreover, we hypothesized that the effects of support on smoking would be stronger from the quit date on than before the quit date due to increased stress levels (*buffering hypothesis*). Concurrent changes in support were more strongly related to changes in smoking from the quit date on, when support seemed to be most needed. These findings are in line with the buffering hypothesis that support is particularly effective during times of high stress (Westmaas et al., 2010). We assume that support indeed helped ease the stress of quitting or reducing smoking and strengthened adaptive coping in smokers. Future studies should assess indicators of stress and coping in order to test these assumptions directly (Westmaas et al., 2010). Also, future intervention studies should target daily support around the quit date to positively affect smoking cessation.

This study has some limitations. No objective measures of smoking were used to reduce participant burden, so self-reporting is a potential source of bias. A strength of the daily diary design using mobile phones, however, is reduced retrospective biases (Shiffman, 2009). Future studies might assess support and smoking episodes right when they occur to further reduce retrospective or memory bias. Another limitation is the use of single items for measuring support. Short diaries are important for preventing attrition in intensive longitudinal studies. We can demonstrate criterion (i.e., predictive) validity of our single-item measures. Future studies should provide in depth validation of the single item measures used in daily diary assessments. Finally, negative forms of support seem to play a role for smoking cessation (Park et al., 2012) and were not assessed, but should be included in future studies.

To conclude, the present study is the first to provide insights into the relationship of daily changes in smoking and received and provided smoking-specific support before and after a self-set quit attempt. Prior and concurrent increases in support from a non-smoking partner were associated with less smoking. Effects were more pronounced after the quit date, which is when support may be most needed.

References

- Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, *84*(5), 888–918. doi:10.1037/0033-2909.84.5.888
- Bolger, N., Zuckerman, A., & Kessler, R. C. (2000). Invisible support and adjustment to stress. *Journal of Personality and Social Psychology*, *79*(6), 953–961.
- Curran, P. J., & Bauer, D. J. (2011). The disaggregation of within-person and between-person effects in longitudinal models of change. *Annual review of psychology*, *62*, 583–619. doi:10.1146/annurev.psych.093008.100356
- Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerström, K.-O. (1991). The Fagerstrom test for nicotine dependence: A revision of the Fagerstrom tolerance questionnaire. *British Journal of Addiction*, *(86)*, 1119–1127.
- May, S., & West, R. (2000). Do social support interventions (“buddy systems”) aid smoking cessation?: A review. *Tobacco Control*, *9*(4), 415–422. doi:10.1136/tc.9.4.415
- Mermelstein, R., Cohen, S., Lichtenstein, E., Baer, J. S., & Kamarck, T. (1986). Social support and smoking cessation and maintenance. *Journal of Consulting and Clinical Psychology*, *54*(4), 447–453.
- Mokdad, A. H., Marks, J. S., Stroup, D. F., & Gerberding, J. L. (2004). Actual Causes of Death in the United States, 2000. *JAMA: Journal of the American Medical Association*, *291*(10), 1238–1245.
- Ochsner, S., Luszczynska, A., Stadler, G., Knoll, N., Hornung, R., & Scholz, U. (2014). The interplay of received social support and self-regulatory factors in smoking cessation. *Psychology & Health*, *29*(1), 16–31. doi:10.1080/08870446.2013.818674

- Park, E. W., Tudiver, F. G., & Campbell, T. (2012). Enhancing partner support to improve smoking cessation. *Cochrane Database of Systematic Reviews*, 7, CD002928. doi:10.1002/14651858.CD002928.pub3
- Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational Tools for Probing Interactions in Multiple Linear Regression, Multilevel Modeling, and Latent Curve Analysis. *Journal of Educational and Behavioral Statistics*, 31(4), 437–448. doi:10.3102/10769986031004437
- Shiffman, S. (2009). How many cigarettes did you smoke? Assessing cigarette consumption by global report, time-line follow-back, and ecological momentary assessment. *Health Psychology*, 28(5), 519–526. doi:10.1037/a0015197
- Shiffman, S., Balabanis, M. H., Gwaltney, C. J., Paty, J. A., Gnys, M., Kassel, J. D., . . . Paton, S. M. (2007). Prediction of lapse from associations between smoking and situational antecedents assessed by ecological momentary assessment. *Drug and Alcohol Dependence*, 91(2-3), 159–168. doi:10.1037/t28829-000;
- Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York, NY, US: Oxford University Press.
- Stadler, G., Snyder, K. A., Horn, A. B., Shrout, P. E., & Bolger, N. P. (2012). Close relationships and health in daily life: A review and empirical data on intimacy and somatic symptoms. *Psychosomatic Medicine*, 74(4), 398–409. doi:10.1037/t02175-000.
- Westmaas, J. L., Bontemps-Jones, J., & Bauer, J. E. (2010). Social support in smoking cessation: reconciling theory and evidence. *Nicotine & Tobacco Research*, 12(7), 695–707.

Table 1: *Multilevel models of changes in daily smoking regressed on prior changes in smoking and prior and concurrent changes in received and provided smoking-specific emotional social support before and after the quit date*

	Received emotional support				Provided emotional support			
	<i>b</i>	<i>b</i> simple slope post quit date (SE)	95% CI		<i>b</i>	<i>b</i> simple slope post quit date (SE)	95% CI	
			Lower	Upper			Lower	Upper
Intercept	.24		-.27	.74	.16		-.35	.66
Time (centered at Day 3)	-.12#		-.24	.01	-.09		-.22	.04
Period from quit date on	-3.28**		-4.02	-2.54	-3.26**		-4.01	-2.51
Time x period from quit date	.25**	.14** (.01)	.13	.38	.23**	.14** (.02),	.10	.36
Prior change in smoking	-.37**		-.44	-.30	-.38**		-.45	-.30
Prior change in smoking x period from quit date	.19**	-.18** (.02)	.10	.27	.20**	-.18** (.02)	.11	.28
Prior change in support	-.25#		-.53	.03	-.18		-.46	.10
Prior change in support x period from quit date	-.23	-.48** (.09)	-.55	.10	-.37*	-.56** (.08)	-.70	-.05
Concurrent change in support	-.10		-.41	.20	-.36*		-.65	-.08
Concurrent change in support x period from quit date	-.54**	-.64** (.11)	-.86	-.21	-.25	-.62** (.10)	-.57	.06

Note. For received emotional support: $N = 100$ participants, 30 days maximum, $n = 2570$ available days; for provided emotional support: $N = 99$, 30 days maximum, $n = 2568$ available days; b = unstandardized regression coefficients, 95% CI = 95% confidence interval; # $p < .10$; * $p < .05$, ** $p < .01$; period from quit date on (0 = prior quit date, 1 = quit date and after). For received emotional support, only random effects for period from quit date x prior changes in received emotional support ($b = .08$, $SE = .11$, $p = .43$) and concurrent changes in received emotional support ($b = .34$, $SE = .12$, $p = .01$) could be estimated; residual variance of received emotional support = 14.37, $SE = .43$, $p = .001$; autocorrelation = $-.04$, $SE = .04$, $p = .37$. For provided emotional support, only random effects for concurrent changes in support ($b = .18$, $SE = .09$, $p = .04$) could be estimated. Residual variance of provided emotional support = 14.30, $SE = .45$, $p = .001$; autocorrelation = $-.07$, $SE = .05$, $p = .19$.

Supplemental Material-Additional

[Click here to download Supplemental Material-Additional: Appendix.docx](#)