



Year: 2014

Examining gender differences in received, provided, and invisible social control: An application of the dual-effects model

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DOI: <https://doi.org/10.1080/10615806.2014.892585>

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-102929>

Journal Article

Accepted Version

Originally published at:

Lüscher, Janina; Ochsner, Sibylle; Knoll, Nina; Stadler, Gertraud; Hornung, Rainer; Scholz, Urte (2014). Examining gender differences in received, provided, and invisible social control: An application of the dual-effects model. *Anxiety, Stress Coping*, 27(6):678-694.

DOI: <https://doi.org/10.1080/10615806.2014.892585>

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Acknowledgements: The first author is funded by the Swiss National Science Foundation
(PP00P1_133632 / 1). This project was funded by the Swiss National Science Foundation
(100014_124516).

Received date: August 21, 2013

Accepted date: February 5, 2014

This article has been accepted for publication and undergone full peer-review, but has not been through
the copyediting, typesetting, pagination and proofreading process, which may lead to differences
between this version and the Version of Record. Please cite this article as

DOI: 10.1080/10615806.2014.892585

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Abstract

The dual-effects model of social control assumes that social control leads to better health practices, but also arouses psychological distress. However, findings are inconsistent. The present study advances the current literature by examining social control from a dyadic perspective in the context of smoking. In addition, the study examines whether control, continuous smoking abstinence, and affect are differentially related for men and women. Before and three weeks after a self-set quit attempt we examined 106 smokers (77 men, mean age: 40.67, average number of cigarettes smoked per day: 16.59 ($SD = 8.52$, range = 1-40) at baseline and 5.27 ($SD = 6.97$, range = 0-40) at follow-up) and their non-smoking heterosexual partners, assessing received and provided control, continuous abstinence, and affect. With regard to smoker's affective reactions, partner's provided control was related to an increase in positive and to a decrease in negative affect, but only for female smokers. Moreover, the greater the discrepancy between smoker received and partner provided control was, the more positive affect increased and the more negative affect decreased, but again only for female smokers. These findings demonstrate that female smokers' well-being was raised over time if they were not aware of the control attempts of their non-smoking partners, indicating positive effects of invisible social control. This study's results emphasize the importance of applying a dyadic perspective and taking gender differences in the dual-effects model of social control into account.

Keywords: provided social control, received social control, invisible social control, smoking, gender, dual-effects model of social control

Examining Gender Differences in Received, Provided and Invisible Social Control: An
Application of the Dual-Effects-Model

Smoking-related diseases remain the world's most preventable cause of death to date. Smoking is expected to kill more than five million people every year and is a proven risk factor for a variety of diseases, such as cancer, coronary heart disease, and stroke (American Cancer Society, 2012; WHO, 2009). Yet, in Switzerland 27% of the adult population are smokers with 30% of men and 24% of women smoking (Keller, Radtke, Krebs, & Hornung, 2011). Every second Swiss smoker (48%) wants to quit (Keller et al., 2011). However, quitting smoking is very difficult as evidenced by low rates of long-term success in quitting smoking (Hughes, Keely, & Naud, 2004). Therefore, there is a great need to enhance our understanding of the smoking cessation process (Manchòn-Walsh et al., 2007).

A non-smoking partner can influence a partner's smoking behavior (e.g., Manchòn-Walsh et al., 2007). Until now, personal relationship research focussed particularly on social support and the aspect of social control has come to the fore quite recently. Social support may be regarded as an assistance of significant others in times of need (Lewis & Rook, 1999). As well as social support may account for health by relieving stress and promote self-intended health behaviour change, social control may contribute to health by discouraging unhealthy behavior independently of the target person's intention with regard to behavioural change (Lewis & Rook, 1999). Social control refers to a person's attempt to regulate and influence another person's health behavior (Lewis & Rook, 1999; Okun, Huff, August, & Rook, 2007), such as giving advice, making suggestions, discussing, bargaining, persuading, or withdrawing (Butterfield & Lewis, 2002). For married couples the partner is usually the most prominent source of social control (August & Sorkin, 2010; Rook, & Iguarte, 1999; Umberson, 1992).

So far, the literature almost exclusively examined *received* social control, i.e., the report of the controlled persons on control received from their partners. As known from the research

field of social support (Dunkel-Schetter, Blasband, Feinstein, & Bennett, 1992), however, this is only one perspective to look at within the dyad. Taking both partners' perspectives into account makes it possible to distinguish received and provided social control. Provided social control refers to the perspective of the controlling partner. Previous research on social support showed that these two perspectives of receiver and provider do not necessarily closely correspond (Dunkel-Schetter et al., 1992).

More recently, dyadic approaches have been advanced including both perspectives (e.g. Lewis & Butterfield, 2007; Seidel, Franks, Stephens, & Rook, 2012; Stephens et al., 2010). These dyadic studies considered perspectives of both partners, with one partner reporting on his or her use of particular social control strategies and the other partner reporting on his or her response to these control attempts (c.f. Stephens et al., 2010). The findings of a study from Stephens and colleagues (2010) about the improvement of diabetic patients' food choices suggest that receiving spouses are not always fully aware of social control attempts of their partners and that it is possible that some control attempts to influence diabetic persons' food choices were invisible to recipients. Thus, as a third and truly dyadic variable, the discrepancy between the receiver's report of receipt and the provider's report of provision of control should be examined. Examining not only both perspectives, but also partners' discrepancy in control perceptions can advance our understanding on efficient ways to promote behavior change on the dyadic level substantially. Findings pointing to the usefulness of considering a dyadic perspective come from research on invisible support (Bolger & Amarel, 2007; Bolger, Zuckerman & Kessler, 2000; Howland & Simpson, 2010). The model of invisible support states that the awareness of actual received social support can lead to emotional costs whereas the most effective support seems to be unnoticed, i.e. invisible, by the recipient (Bolger et al., 2000). Empirical evidence for this assumption comes from daily diary studies (e.g., Bolger et al., 2000) as well as experimental studies (Bolger & Amarel, 2007; Howland & Simpson,

2010). One aim of the present paper was to examine whether the assumptions of invisible support also apply to social control as findings from Stephens and colleagues (2010) indicate.

Social Control and Smoking Behavior

Thus far, few studies in social control and health behavior research focussed on specific health behaviors like smoking. Several studies did not assess health behaviors separately, but used a global health behaviour index of different health behaviors. Other studies rather assessed behavioural responses to social control but not so much health behaviour per se. Lewis and Rook (1999) for example asked their participants to indicate in response to social control attempts of a specific network member whether they had changed different health behaviors in the direction advocated or opposite to that advocated or had not changed their behavior at all. Of these studies some reported positive effects of received social control and changing the behavior in the direction advocated (Lewis & Rook, 1999; Umberson, 1992, Westmaas, Wild, & Ferrence, 2002) while others indicated negative effects (Lewis & Rook, 1999; Tucker, Orlando, Elliot, & Klein, 2006). The few studies that focussed specifically on received social control and smoking found rather positive effects (e.g., Scholz et al., in press; Umberson, 1992; Westmaas et al., 2002). For example, in a study by Westmaas and colleagues (2002) received social control appeared to positively affect the ability to reduce smoking behavior. Nevertheless none of these smoking-specific studies considered the perspective of the receiver and the provider of social control alike.

The Dual-effects Model of Social Control

There is not only evidence for the association between received social control and smoking behavior but also for the association between smoking behavior and more negative affect (Becoña, Vázquez, Fuentes, & del Carmen Lorenzo, 1999). The dual-effects model states that received social control can lead to two effects at the same time (Hughes & Gove, 1981; Lewis & Rook, 1999; Okun et al., 2007). On the one hand, social control can lead to better health behavior in the controlled recipient while on the other hand it may also contribute to increases

in psychological distress, for example due to unwelcomed perceived criticism (c.f. Lewis & Rook, 1999).

Findings for the dual-effects model of social control are inconsistent, however. Not only are there inconsistent findings regarding the association between received social control and health behavior (e.g., Knoll et al., 2012 for positive effects and e.g., Helgeson, Novak, Lepore, & Eton, 2004; Thorpe, Lewis, & Sterba, 2008 for negative effects), but also with regard to affective correlates of social control, results are inconsistent: Some studies show evidence for the relationship between received social control and psychological distress (e.g. Helgeson et al., 2004; Lewis & Rook, 1999; Thorpe et al., 2008) while others do not (e.g. August & Sorkin, 2010; Rook, Thuras, & Lewis, 1990). For example, Knoll and colleagues (2012) investigated received social control, pelvic floor exercise and affect. Results of this study indicated that the dual-effects model of social control may have to be extended because no effects of received social control on pelvic floor exercise and affect emerged. However, participants who were satisfied with their relationships seemed to benefit from spousal control in terms of pelvic-floor training while patients less satisfied with their relationships did not and additionally showed decreases in positive affect after control was received (see also Scholz et al., in press).

Therefore, one possibility to clarify such inconsistent results is to enrich the dual-effects model of social control by introducing moderators. Aside from relationship satisfaction moderating social control—outcome relationships, findings by August and Sorkin (2012) indicate that social control may also operate differently for men and women (August & Sorkin, 2012).

Social Control and Gender Differences

In line with consistent gender effects in social support (e.g. Carlson et al., 2002; Smith et al., 2013), there seems to be gender differences in social control and health behavior as well: For men, received social control appeared to positively affect their ability to reduce their smoking

behavior but was less effective for women (Westmaas et al., 2002). A dyadic approach of Seidel and colleagues (2012), albeit with a different health behavior, revealed that diet-related spousal control was positively associated with dietary adherence for male patients but not for female patients. In contrast, Nagurney, Bagwell and Forrest (2009) found that men were more reactant to received social control relative to women. In another study authors found that women reported more positive emotional responses, such as appreciation, in response to more frequent received social control compared to men (August & Sorkin, 2012).

Moreover, so far there are no studies on potential gender differences with regard to the association between affective reactions and social control, nor studies examining social control from a dyadic perspective in the context of smoking cessation. In the present study, we wanted to bring these two important lines of research together. Therefore, we aimed at examining whether differences emerged between men and women with regard to the association between different perspectives of social control and change in smoking behaviour or smokers' affective reactions over time.

Aims of the Present Study

To the best of our knowledge this study is the first to examine how smokers' received and partners' provided social control and the discrepancy between these two perspectives predict continuous abstinence and affective reactions and how these effects differ by gender. The study's first aim, in line with the dual-effects model of social control, was to test social control effects on health behavior and affect applying a dyadic perspective. As proposed by the dual effects model, we hypothesized that smokers' received social control has beneficial effects on smoking behavior (Hypothesis 1a) but detrimental effects on affect (Hypothesis 1b). Moreover, derived from the model of invisible support (Bolger et al., 2000) for affective reactions and from findings of Seidel and colleagues (2012) for health behaviors, we hypothesized that partners' provided social control and "invisible social control" -- a discrepancy between received and provided social control indicating that the partner provided

more control than the target person reported receiving -- would have beneficial effects on both, smoking (Hypothesis 1c) and affect (Hypothesis 1d).

The second aim was to investigate whether there are gender differences in these associations. Some studies found gender differences in social support effects (e.g. Carlson et al., 2002), but gender differences in social control have so far rarely been studied (for an exception, see Seidel et al., 2012; Westmaas et al., 2002). With regard to smokers' received social control, we hypothesized that men would benefit more than women in both smoking reduction (Hypothesis 2a) and affective change (Hypothesis 2b). With regard to partners' reported provision of social control and the discrepancy between received and provided social control, i.e. invisible social control, we hypothesized that especially women would benefit from receiving invisible social control in terms of their affect (Hypothesis 2c), as this might circumvent undermining of self-worth and thus having emotional costs (c.f., Bolger et al., 2000).

Method

Sample and Procedure

This study was part of a larger project "Dyadic and Individual Regulation to End Chronic Tobacco Use (DIRECT)" funded by the Swiss National Science Foundation (100014_124516). For more details about the project and other theoretical questions please see Ochsner and colleagues (2014)¹. The study had a longitudinal design and followed smokers and their non-smoking partners from a baseline assessment before a quit attempt to a follow-up three weeks later. Participants were recruited via newspapers, web pages, and a market research institution.

Eligible smokers had in accordance to the WHO (1998) criterion for regular smoking to be smoking at least one cigarette per day and wanting to quit smoking. In addition, they had to be in a committed relationship with a non-smoking heterosexual partner (i.e., either being married or in a stable heterosexual relationship for at least one year and living together for at

least six months) who was also willing to participate. The non-smoking partners, who were the source of provided social control in this study, had to be never-smokers or non-smokers for at least five years. Potential participants that were enrolled in a formal smoking cessation program were excluded. A further exclusion criterion was being pregnant or partner being pregnant. All participants had to be at least 18 years old and were required to speak German fluently.

Both measurement points took place at the University of Zurich in Switzerland. After receiving information about the study, all participants provided informed consent at the baseline assessment. Couples received numeric identifiers to guarantee anonymity. During the first session the smoking partner was asked to set a quit date, and the couples filled out a questionnaire. In addition, the smokers' point prevalence of smoking was biochemically verified with a carbon monoxide (CO) test of expired air (West, Hajek, Stead, & Stapleton, 2005). For this verification we used the Smokerlyzer (Bedfont Instruments, Harrietsham, UK). Three weeks after the quit date all the participants filled out another questionnaire and again smoking was biochemically verified. After attending both measurement points the couples received 100 Swiss Francs. All couples were treated in accordance to the ethical guidelines of the Helsinki Declaration 2000.

Sample Characteristics

Overall, 106 regular smokers ($n = 77$ men, 72.6%) and their heterosexual non-smoking partners took part in the baseline assessment. At the three-week follow-up 99 couples (93.4%) remained. Of these 99 couples ($n = 72$ men, 72.7%), mean age of the smokers was 40.15 years ($SD = 9.36$, range = 19-64) and mean age of the non-smoking partners was 38.76 years ($SD = 9.66$, range = 20-63). The mean duration of relationship was 161.37 months ($SD = 108.77$). The majority of the couples were married (66.7%) and had children (57.6%). Most of the regular smokers reported having attended 9 years of schooling (69.7%). The average number of cigarettes smoked per day during the past seven days was 16.59 ($SD = 8.52$, range = 1-40)

at baseline and 5.27 ($SD = 6.97$, range = 0-40) at follow-up. At the follow-up 38 (35.8%) participants did not smoke according to the measure of continuous abstinence between their quit date and the follow-up. Additionally, continuous abstinence was biochemically verified. All the 38 participants reporting continuous abstinence were also biochemically identified as non-smokers.

Dropout analyses revealed that there were no significant differences concerning received and provided social control, number of cigarettes smoked, smokers' positive and negative affect, gender, relationship status, marital status, years of schooling, social desirability and nicotine dependence between the 99 couples who attended both measurement points and the seven couples who only attended baseline. Only for age, there was a tendency of a difference between smokers who attended both measurement points and those who only attended baseline: Older smokers were slightly more likely to dropout whereas younger smokers were slightly more likely to continue, $t(104) = 2.03$, $p = .045$; mean age continuing participants: $M = 40.15$, $SD = 9.36$, mean age dropouts: $M = 48.00$, $SD = 16.15$ for dropouts.

Measures

All item examples were translated from German. At the baseline assessment we assessed smokers' received social control, partners' provided social control, affective reactions of smokers, smokers' social desirability and nicotine dependence of smokers. At the three-week follow-up we assessed continuous abstinence of the smokers and smokers' affective reactions.

Smoker's received social control was assessed at baseline. The items were adapted from Butterfield and Lewis (2002). Received social control ($M = 1.47$, $SD = .50$, Cronbach's Alpha = .69) contained 4 items, such as "My partner tried to influence my smoking behavior by making suggestions how to reduce smoking or how to quit". The response scale ranged from 1 "rarely/none of the time (less than one day)" to 4 "mostly or all of the time (five to seven days)".

Partner's provided social control was adapted from items assessing received social control (Butterfield & Lewis, 2002) and was also assessed at baseline. Provided social control ($M = 1.57$, $SD = .57$, Cronbach's Alpha = .75) contained 4 items reflecting the same content as the items for received social control, such as "I tried to influence my partners smoking behavior by making suggestions how to reduce smoking or how to quit". The response scale ranged from 1 "rarely/none of the time (less than one day)" to 4 "mostly or all of the time (five to seven days)".

Smoking cessation was assessed with a measure of continuous abstinence (from quit date until three-week follow-up). Measures of continuous abstinence are the most conservative measures of smoking cessation (West et al., 2005)². Continuous abstinence was measured by a single self-report item at the three-week follow-up: "Have you smoked since self-set quit date?". The response format in the present study was 1 = "No or smoking of maximum five cigarettes" versus 2 = "Yes, more than five cigarettes". Participants can be classified as abstinent even if they have smoked a maximum of five cigarettes from the start of the abstinence period (West et al., 2005). Moreover, the point prevalence of non-smoking at the three-week follow-up was biochemically verified with a carbon monoxide test (CO) of expired air (West et al., 2005).

Affective reactions of the smoker were assessed at baseline and at the three-week follow-up by using the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). Positive affect (Baseline: $M = 4.00$, $SD = .72$, Cronbach's Alpha = .72; Follow-up: $M = 3.94$, $SD = .75$, Cronbach's Alpha = .89) and negative affect (Baseline: $M = 2.50$, $SD = .80$, Cronbach's Alpha = .79; Follow-up: $M = 2.40$, $SD = .79$, Cronbach's Alpha = .86) contained ten items each. The smoking participants were asked to rate their own mood during the past seven days. The response scale ranged from 1 "not at all" to 6 "extremely" for each adjective.

Social desirability of the smoker was assessed at baseline ($M = 1.69$, $SD = 1.67$, Cronbach's Alpha = .61) by the Social Desirability Scale-17 (SDS-17; Stoeber, 2001). The

response format was dichotomous (1 = do not agree, 2 = agree). Higher values indicated higher social desirability. Social desirability served as a covariate in this study.

Nicotine dependence of the smoker was assessed at baseline ($M = 2.49$, $SD = .92$) by using a single item from the Fagerstrom-Test of Nicotine Dependence (Heatherton et al., 1991) “When after waking up do you smoke your first cigarette?”. The response scale ranged from 1 “within five minutes” to 4 “after 60 minutes”. Thus, lower values indicate stronger nicotine dependence. Nicotine dependence served as well as a covariate in this study.

Data Analyses

Descriptive statistics and scale values were computed with SPSS 20. Missing values at baseline were less than 2% and at three-week follow-up less than 7% in all variables. Information on received social control and social desirability was missing for one person each (0.9%). Information on provided social control was missing for two participants (1.9%). Moreover, except for a tendency of age, no systematic dropout was present. As data were mostly complete (only 7% attrition over time) and no difference in smoking behavior at baseline for dropouts and completers emerged, listwise deletion of missing cases was applied (Graham, 2009).

Change values over time of the dependent variables change in positive and negative affect over time were calculated by subtracting baseline values from follow-up values. Negative values indicate a reduction in positive or negative affect from baseline to follow-up. Mean and difference scores of received and provided social control were computed to determine the partner bias in the analyses (Kenny, Kashy, & Cook, 2006). Mean scores were calculated as sum of received and provided social control divided by two. Discrepancy scores were calculated by subtracting received social control reported by the smokers from provided social control reported by the non-smoking partners (c.f. Biehle & Mickelson, 2012). Positive values indicate that more social control was provided than received or in other words positive values indicate occurrence of invisible social control.

To test the moderation hypotheses we conducted regression analyses (Cohen, Cohen, West, & Aiken, 2003). For each predictor of social control (smokers' received social control, partners' provided social control and discrepancy of received and provided social control) and the different outcome variables (continuous abstinence and change in positive and negative affect over time) we conducted separate regression analyses. We used age, nicotine dependence, and social desirability as covariates if these variables were correlated with the outcome variables. All predictors were grand-mean centered except for gender (0 for men and 1 for women) to avoid problems with multicollinearity (Cohen et al., 2003). Interaction terms were composed by multiplying values of the different predictors of social control with gender. To test whether the regression slopes were significant, simple slopes analyses were ran following the recommendations by Preacher, Curran and Bauer (2006).

Results

In Table 1 all bivariate correlations between the main variables of the study and potential covariates are shown. Continuous abstinence was only related to nicotine dependence. Persons indicating continuous abstinence had already reported lower nicotine dependence at baseline compared to participants who have smoked more than five cigarettes since their quit date. Thus, this variable was included as a covariate in all analyses of continuous abstinence. As neither social desirability, nicotine dependence, nor age were related to smokers' change in positive or negative affect over time, these variables were not included in the respective analyses. A positive association between change in negative affect over time and gender indicated that smoking women experienced more change in negative affect over time than smoking men. Also, change in negative affect over time was negatively related to provided social control by partners.

insert Table 1 about here

Prediction of Continuous Abstinence (from Quit Date until Three-Week Follow-Up)

The results of the logistic regression analyses on the potential gender-differential interaction of received and provided social control for the prediction of continuous abstinence in recipients are displayed in Table 2. In contrast to our assumptions, there were no main effects of received and provided social control nor the discrepancy on continuous abstinence of recipients (Hypothesis 1a and 1c). Likewise, gender did not moderate these effects (Hypothesis 2a). Thus, continuous abstinence was not associated with either received or partner-provided social control for neither female nor male smokers in this sample.

insert Table 2 about here

Prediction of Change in Smokers' Positive and Negative Affect over Time

The results of the regression analyses on the interaction of received and partner-provided social control with gender for the prediction of change in receiving smokers' positive and negative affect over time are displayed in Table 3. In the following, we are going to report results of received social control, then results of partner-provided social control and finally results of the discrepancy between these two perspectives with regard to their effects on smokers' affect.

There were no main effects of smokers' received social control (Hypothesis 1b) nor interaction effects between received social control and gender for the prediction of change in smokers' positive and negative affect over time (Hypothesis 2b). Likewise, no main effects for partner-provision of social control or the discrepancy measures occurred (Hypothesis 1d). Gender moderated the effect of partners' *provided* social control on change in smokers' positive affect (see Figure 1, left panel). This interaction indicated that partners' provided social control was related to an increase in smokers' positive affect over time, but only for smoking women (simple slope analyses: 0.63 (0.22) $t = 2.82, p = 0.01$), not for smoking men (simple slope analyses: -0.01 (0.16) $t = 0.03, p = 0.98$). Gender moderated the effect of partners' provided social control on change in smoker's negative affect as well (see Figure 1, right panel). Partners' provided social control was related to a decrease in smokers' negative

affect over time, but again only for smoking women (simple slope analyses: $-0.88 (0.24) t = -3.75, p = 0.001$), not for smoking men (simple slope analyses: $-0.21 (0.18) t = -1.18, p = 0.24$). These results are in line with our hypotheses that provided social control seems to be more beneficial relating to smoking women's positive and negative affect over time than received social control (Hypothesis 2c).

Gender also moderated the effect of the discrepancy of received and provided social control on change in smokers' positive affect and is displayed in Figure 2 (left panel). This interaction indicates that the greater the discrepancy of received and provided social control the greater the increase in smokers' positive affect over time, but only for female smokers (simple slope analyses: $0.41 (0.16) t = 2.60, p = 0.01$), not for male smokers (simple slope analyses: $-0.03 (0.14) t = 0.19, p = 0.85$). Positive or greater discrepancy values indicate that more social control was provided than received, i.e. the occurrence of invisible social control. The more invisible control the greater the increase in smoking women's positive affect over time. Gender also moderated the effect of the discrepancy of received and provided social control on change in smokers' negative affect (see Figure 2, right panel). This interaction indicated that the greater the discrepancy of received and partner-provided social control the greater the decrease in smokers' negative affect over time, but again only for female smokers (simple slope analyses: $-0.55 (0.17) t = -3.32, p = 0.001$), not for male smokers (simple slope analyses: $-0.08 (0.15) t = 0.55, p = 0.58$). Positive or greater discrepancy values indicate here also occurrence of invisible social control. The more invisible control the greater the decrease in smoking women's negative affect over time. Therefore, these results are in line with our hypotheses that women would benefit more from invisible social control than men (Hypothesis 2c).

insert Table 3, Figure 1 and Figure 2 about here

Discussion

This study aimed at filling an important gap in the literature on the dual-effects model of social control. To date, findings for the dual-effects model of social control left two important issues unaddressed: First, only the receiver perspective of social control, but not the provider perspective nor the discrepancy between receiver and provider had been examined so far. Second, gender, as an important moderator when it comes to the effects of social exchange processes (e.g., social control, social support) on behavior and well-being, has been neglected so far. Thus, this study examined whether differences emerged between men and women with regard to the association between different perspectives of social control and change in smoking behavior or smokers' affective reactions over time. Overall, results of this study stress the importance of considering different perspectives of social control and of including gender as a moderator of the dual-effects model of social control.

Individuals are more likely to stop smoking if their partners are nonsmokers (McBride et al., 1998) and they are more likely to believe that they can maintain abstinence if their partner is a nonsmoker (Severson et al., 1995). Moreover, other studies reported beneficial effects of received social control for men after a quit attempt (c.f. Westmaas et al., 2002). At the same time, there are several studies indicating a null effect of received social control on health behavior (e.g., Lewis & Rook, 1999; Okun et al., 2007). In this study and in contrast to our assumptions, neither smokers' received, partners' provided nor the discrepancy of these two perspectives had an effect on continuous abstinence. An explanation might be that in this study, we focused on the effects of concrete social control strategies, whereas Westmaas and colleagues (2002) for example operationalized received social control on a more general way (i.e., the partner wanting the smoker to quit). It might well be that on a more general level, the influence of a nonsmoking partner on the smoking behavior of the smoker might be evident whereas some kinds of concrete strategies might not have the effect that is desired by the partner. Further studies are thus needed to test what exact kind of concrete social control strategies have a positive effect on smoking cessation. Another explanation might be that we

did not have sufficient statistical power for the logistic regression analyses to detect effects in continuous abstinence. As mentioned in the method section, this study was a correlational study in nature and due to the low success rates in unsupported quitting sample size was powered for numbers of cigarettes smoked as a continuous outcome measure. For the present study we chose the dichotomous measure of continuous abstinence (West et al., 2005) as outcome variable because the ultimate goal of social control attempts of non-smoking partners is abstinence in the smoker. For this dichotomous measure this study is underpowered. Running the analyses with numbers of cigarettes smoked as the alternative continuous outcome, however, did not change the results.

With regard to smokers' received social control and affective reactions of the smokers, we found that for smoking men and women received social control was not related to change in smokers' positive or negative affect over time. The dual-effects model of social control suggests that control might have affective costs (e.g., Okun et al., 2007). Moreover, from the social support research we know that receiving support can be ineffective or even have negative effects for a person's well-being (e.g., Bolger et al., 2000). Lack of effects of received social control for men and women, thus, may also mean that the smokers may have stayed unharmed by receiving social control attempts from their non-smoking partners. Still, future studies might examine under what conditions social control is beneficial for the individual trying to change their health behavior (e.g., when need for social control is high) and under what conditions it is not.

With regard to partners' provided social control and affective reactions of the receiving smokers, results indicate that provided social control was related to an increase in smokers' positive affect over time and to a decrease in smokers' negative affect over time, but only for smoking women. These results support our hypotheses that partner-provided social control might be related to fewer threats for self-worth and emotional costs for smoking women (Bolger & Amarel, 2007), especially when compared to receiving social control. Moreover,

this study's aim was also to include a dyadic perspective by focusing on the discrepancy between received and provided social control. The discrepancy of received and provided social control was examined to determine the partner bias in the analyses (Kenny, Kashy, & Cook, 2006). The pattern of results indicates that the more invisible social control the greater the increase in smokers' positive affect over time and the greater the decrease in smokers' negative affect over time, but again for smoking women only. These findings demonstrate that the smoking women's well-being was raised over time if they were not aware of social control attempts of their non-smoking partners, indicating positive effects of invisible social control for smoking women. The most effective social control attempts may go unnoticed by the receiver (c.f., Bolger et al., 2000; Stephens et al., 2010). These results for the smoking women, hence, support our hypotheses about provided and invisible social control. The findings confirm that invisible social control is effective and that the model of invisible support from Bolger and colleagues (2000) can be expanded for social control. Future studies should also take the assumed mechanisms of such an effect (e.g., fewer emotional costs, fewer threats of self-worth) into account. In addition, the model of invisible social support (Bolger et al., 2000) focussed on affective well-being and did not consider specific health behaviors as outcomes. Future studies should investigate the relation of invisible social control and specific health behaviors.

Overall, the results of the present study provide evidence for the usefulness of differentiating between both partners' perspectives of social control and for the model of invisible social control related to well-being. But what do these findings mean for the dual-effects model of social control? Female smokers' well-being increased over time if they were not aware of the social control attempts of their non-smoking partners. These findings indicated that women do not experience more psychological distress when receiving or being provided with social control as the original dual-effects model of social control predicts. In contrast, provided control and invisible control turned out to be beneficial for smoking

women's positive and negative affect development after smoking cessation attempts. Moreover, the dual-effects model assumed negative effects on affect. However, these could not be found for men. Thus, in future research the dual-effects model may need to be refined in terms of adding gender as a moderator and potentially complemented also with assumptions on invisible social control. Moreover, different health behaviors should be examined. For example, behaviors that are relatively easy to accomplish, such as making a single medical appointment for a preventive checkup, might result in different effects of received and provided or invisible control than behaviors that are difficult to initiate and maintain (such as smoking cessation).

Limitations

There are several limitations of this study. First, all measures of central predictors and outcomes are based on self-report only. Reports of received and provided social control and smokers' affect over time should be mostly valid when assessed via self-report. However, self-reported data can be biased. To account for this potential bias we included social desirability in our study. Social desirability was unrelated to self-report of received and provided social control, smokers' affect and continuous abstinence. Moreover, smoking behavior was objectively quantified by expired air carbon monoxide (West et al., 2005). Second, longer follow-ups might have been desirable. Short measurement intervals do not allow a prediction of long-term behavior change (West et al., 2005). However, the most relapses took place in the first three-weeks after smoking cessation. And third, this study had a correlational design. The effects need to be cautiously interpreted and assumptions of causality are not appropriate.

Conclusions

To the best of our knowledge this was the first study testing the effects of social control from different perspectives within a smoking – nonsmoking dyad applying the dual-effects

model of social control and focusing on gender differences. Provided and invisible social control seem to be beneficial for female smokers' affective development after quitting.

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Footnotes

¹This study was part of a larger longitudinal study. Based on these data, the research team has pursued other unique theoretical questions in another publication with a different focus and different data subsets (Ochsner et al., 2014).

²This study was a correlational study in nature and due to the low success rates in unsupported quitting, sample size was powered for numbers of cigarettes smoked as a continuous outcome measure. We chose the dichotomous measure of continuous abstinence (West et al., 2005) as outcome variable because the ultimate goal of social control attempts of non-smoking partners is abstinence in the smoker. However, with a sample size of 100 participants we did not have sufficient statistical power to detect effects with the dichotomous outcome continuous abstinence (McClelland & Judd, 1993). Thus, results on smoking cessation are to be considered with caution.