

Privacy Needs in Office Environments

Development of Two Behavior-Based Scales

Antal Haans, Florian G. Kaiser, and Yvonne A.W. de Kort

Eindhoven University of Technology, The Netherlands

Abstract. In this paper, we develop two behavior-based privacy-need measures for office environments. These two new scales are designed as objective measures, since they try to avoid introspection. One scale assesses people's motivation to withdraw from social interaction (i.e., the Need-For-Privacy [NFP]) and the other the motivation to seek social exchange (i.e., the Need-For-Socializing [NFS]). Based on survey data from 204 bank employees, our newly-developed measures demonstrated reasonable reliabilities ($> .70$). Regarding construct validity, we found our NFP scale to overlap ($R^2 > 25\%$) with an established NFP measure (Kaya & Weber, 2003) and a need-for-solitude instrument (Pedersen, 1988). The results also corroborate the fact that people's NFP and their NFS are relatively distinct motives ($R^2 = 10\%$).

Keywords: privacy, working conditions, social environments, measurement, Rasch model, item response theory

Introduction

Office environments are expected to accentuate the pros and diminish the cons of social contacts at work. Predictably, offices must be designed so that they can satisfy people's needs for social withdrawal (i.e., privacy in its narrow sense) and for social interaction without compromising either (Brill, Weidemann, & BOSTI Associates, 2001; see also Brennan, Chugh, & Kline, 2002).

In the mid-1970s, the open-plan office was promoted to facilitate free and constructive communication among employees (e.g., Sundstrom & Sundstrom, 1986). Later, more enclosed offices became popular, as they apparently better assist employees in managing their social interactions (cf. Brill, Keable, & Fabiniak, 2000). Flexible work places are the most recent design development. Their main features are enclosed working areas around an open central space, and nonexclusive desk access (see Vos & Voordt, 2001).

Office environments should be evaluated by considering their capacity to satisfy employees' needs to withdraw from, and to seek social interaction. Unfortunately, published privacy-need measures are rare and, from a methodological point of view, unsatisfactory. This is because they generally rest on unreliable single-item measures and because they frequently rely on the respondents to apply their own rules to decide about how much privacy they need: For example, whether they need "a lot," "some," or only "a little" (cf. Anastasi, 1988; Magnusson, 1966).

In this paper, we develop two behavior-based multiple-item privacy-need measures for office environments. For each scale, an objective scoring rule is applied. It is based on a maximum likelihood approach within a Rasch scale calibration (for more details see, e.g., Embretson & Reise,

2000). Our new measures do not rely on introspection into people's privacy needs nor on self-reflection about their privacy-related cognitions. Instead, our approach is based on the idea that people's privacy needs can be assessed by a systematic inspection of the (self-reported or observed) behavioral efforts people engage in to achieve their two privacy goals: Withdrawing from and seeking out social exchange. Besides scale development, a second objective of the present study is to apply the new tools in exploring the privacy significance of two properties of a typical office environment: General office design and exclusiveness of desk access.

Privacy Needs

Altman (1975, 1976) provided the most systematic approach to understanding people's privacy needs (Margulis, 2003). In Altman's model, the need for more or less privacy stems from an internal comparison in which a person's desired level of privacy is balanced against the level achieved. While the privacy desired at a particular moment in time depends on a person's individual history and his or her expectations in a given context (e.g., being in a public place vs. being at home), the achieved privacy, by contrast, represents the social interaction-related experiential quality of the specific situation at that moment in time. Note that achieving the desired amount of privacy is not an end in and of itself, nor is the desired privacy the sole consequence of the built environment. Instead privacy needs represent the motivational basis for achieving the proper amount of social exchange, which in turn serves certain basic functions, such as getting one's work done, making friends,

contemplating life, or recovering from stressful events (e.g., Altman, 1975, Johnson, 1974; Westin, 1967).

Altman (1975, 1976; also Altman, Vinsel, & Brown, 1981) believes there is a single process to simultaneously explain both: A person's subjective need for more or for less privacy. If, for instance, the desired privacy exceeds the achieved privacy, a person experiences too little privacy, and, thus, is motivated to withdraw from social interaction. Too much privacy, by contrast, makes people want to have more social exchange. If there is no discrepancy between a person's desired privacy and his or her encountered or actual privacy, there is no reason to change the current social situation. Evidently, if privacy is perceived subjectively, it is generally done so as a need, which necessarily implies motivational significance.

In contrast to Altman, some authors have argued that privacy might be based on more than one process (e.g., Foddy, 1984), and that both increasing and decreasing privacy are controlled by two separate mechanisms. Regardless of the number of cognitive processes involved, the notion of two divergent needs, one for more and one for less privacy, at least implies two distinct personal experiences. These relate to two motives with distinct social goals: Seeking out and withdrawing from social exchange.

Measurement of Privacy Needs

Published measurement instruments of people's privacy-needs – based on Altman's theoretical conception – are surprisingly rare. More common is the assessment of privacy preferences (e.g., Marshall, 1972; Pedersen, 1979). In opposition to needs, which reflect the discrepancy between achieved and desired privacy, preferences reflect a trait-like inclination for a certain level of desired privacy (see e.g., Burger, 1995).

Privacy needs are often measured with indicators that employ bipolar response scales, which is presumably fed by the idea that there is a single process at work. More importantly though, these measures of privacy-needs are unsatisfactory as they generally rest on single-item measures and frequently rest on subjective scoring rules. Because the respondent decides what numerical value his or her need deserves as a score, he or she not only relies on introspection but also on a subjective numerical judgment. Kaya and Weber (2003), for example, used the difference between a person's desired and actually achieved privacy as a measure of a person's motivation to optimize privacy. While the former is tapped by an item that says, "How much privacy would you like to have?," the latter is assessed by asking, "How much privacy do you actually have?" Moreover, single-item measures are more sensitive to measurement error than aggregated measures (e.g., Anastasi, 1988), so they have predictably poor reliabilities. This in turn negatively affects the strength of a relationship with other variables (e.g., Epstein, 1983).

Other privacy-need measures require rather speculative individual calculations. For example, Pedersen (1988) re-

quests a single subjective estimate for each of several specific privacy needs, such as *need-for-reserve*, *solitude*, *anonymity*, and *intimacy*. These estimates are requested after presenting a concept definition. For instance, reserve involves keeping one's ideas and feelings to oneself rather than expressing them openly. Subsequently, a person has to individually subtract his or her achieved reserve from the desired one. Such a calculation can lead to erroneous computations (cf. Dillman, 2001). As it is also speculative, it probably is vulnerable to individual response styles as well. Measurement, by contrast, is supposed to be objective, which includes an objective way of quantifying (i.e., assigning numbers; e.g., Magnusson, 1966). Strictly speaking, objectivity in measurement is supposed to ensure that responses are not disturbed by concept-irrelevant personal beliefs and individual judgments, and subjective response tendencies.

Other colleagues have tried to make their measures more objective by avoiding introspection in the assessment of people's privacy needs. Weinstein (1982), for example, assessed the need for privacy of fourth-graders by observing the voluntary use of a so-called privacy booth. The problem with this approach is twofold: (1) A single behavior cannot reveal its motivational basis (cf. Greve, 2001), and (2) the use of such a booth can depend on motives other than people's privacy needs. For example, it can be used as a ready-made excuse for not working, or for seeking attention (see Weinstein, 1982). Technically speaking, measurement error and, subsequently, reliability and validity are the concerns here.

The Two Behavioral Goals of Privacy

Privacy need as a motive implies that suboptimal levels leave people with a desire to re-establish optimal privacy and to engage in a certain type and amount of social exchange (Altman, 1975). This typically entails behavioral strategies that assist people in manipulating their social environment. Depending on the strength and the direction of their privacy need, people engage in activities that help them to either increase or decrease social exchange. Increasing and decreasing social exchange are two distinct privacy goals, which are achieved by different kinds of behavior. For example, to increase social exchange, one can open the office door, or approach a colleague. To decrease social exchange, one can shut the office door, and hang up a "do not disturb" sign. If these measures are ignored, one might ask the intruder to leave or even physically remove him or her from the room. Different behavioral means to regulate privacy can either supplement or substitute each other.

The proper behavioral means depend on (1) context-specific social norms and (2) context-specific physical and symbolic characteristics (e.g., Kupritz, 2000; Zeisel, 1997). In an office, for example, it might be customary to knock on doors, whereas it might not at home. Each context offers certain opportunities for and places specific constraints on the behavioral means for regulating privacy (see e.g., Archea 1977; Westin, 1967). Exclusive desk access, open-plan design, and

knocking norms, for example, are tangible assets of an office environment that apply to all its users. So, we expect context properties to be effective for each individual person in a certain environment (cf. Margulis, 2003).

Motivation Strength and Behavior Difficulty

Regulatory behaviors normally require some kind of psychological and physical effort (e.g., Altman, 1975). The amount of effort involved in realizing different behavioral means for optimal privacy is not only context dependent but also diverse. While the use of an impersonal territorial marker is psychologically easy, the face-to-face confrontation with a person generally is not. The more (figuratively speaking) demanding the behavioral measures are, and the more effort and other behavioral and mental costs an individual is willing to invest, the higher his or her motivation (i.e., his or her privacy need). If the tiniest bit of effort is enough to stop a person from engaging in privacy regulation, then his or her privacy need must be rather low. For example, when a person remains seated in a crowded place and does not retreat to his or her office, then presumably he or she has no great need for privacy, assuming he or she is not required to sit there.

Privacy Regulation: A Compound of Goal-Directed Performances

Privacy regulation takes place in a given context with certain symbolic, social, and environmental properties (cf. Pedersen, 1999) and is a function of person characteristics (e.g., one's privacy need). The Rasch model is consistent with this formulation (for an overview see, e.g., Bond & Fox, 2001). In this model, the probability of a person's endorsement of a certain behavior is determined by his or her privacy need and the context-related behavior-dependent costs involved in realizing a behavior. Note that the behavioral costs – that is the difficulty involved in realizing a behavior – are not based on subjective assessments. They are estimated as a function of the proportion of people who perform a certain behavior. In other words, the more people who engage in an act, the lower the costs such a behavior is expected to have and vice versa. The fewer the people who behave in a certain way, the more demanding or costly the particular action presumably is. The motivational strength to strive for optimal privacy (i.e., the goal), which represents a person's need for privacy, is, in turn, estimated using all the behaviors – and their respective obstacles – that a person is willing to engage in (cf. Scheuthle, Carabias-Hütter, & Kaiser, 2005).

Research Goals

In this paper, we develop two behavior-based privacy-need measures for office environments: One measures people's

motivation to withdraw from social interaction, called Need-For-Privacy (NFP); the other measures the motivation to seek social exchange, called Need-For-Socializing (NFS). Our approach does not require a respondent's introspection into his or her privacy needs nor any subjective computations. It is based on the idea that people's needs for privacy and social interaction can be assessed by a systematic inspection of the behavioral efforts they engage in to satisfy their individual needs. Besides scale development, a second objective of the present study was to apply and validate the new tools in exploring the privacy significance of two features of a typical office environment: General office design and exclusiveness of desk access.

Methods

Participants and Procedures

Our sample was drawn from employees of a major Dutch bank. Because of its organizational structure, consent was needed from each of the units selected. Of 71 branches with 100 employees or more, nine branches (12.7%) approved their employees' participation. A contact person in each branch distributed the questionnaires. To ensure confidentiality, participants individually mailed the surveys back to the researchers. Out of the 323 questionnaires distributed, 205 were returned in full (response rate: 63.5%). Participants' mean age was 37.2 ($SD = 9.1$; range 19 to 60); 42.1% were male.

A receptionist for whom the questionnaire was not designed was excluded from our calculations. Of the remaining 204 participants, 60.3% were administrative personnel, 33.2% financial advisors, and 6.5% were either commercial advisors or call-center employees. Administrative personnel and financial advisors do not work in groups, but on individual work assignments. Yet, they differ in the extent to which their work is confined to the office environment (e.g., financial advisors partly work outside their offices). Of the financial advisors and administrative employees, 49.2% had permanently assigned work places used exclusively by them, and 38.4% shared their desks with others. The remaining 12.4% had no assigned work places. Thus, they choose their work place from the available desks on a particular day. Group offices with a small number of people working in a more or less enclosed space were the environments for 8.2% of the respondents. Another 4.3% worked traditionally, as a single person in a more or less enclosed space. Another 54.9% reported that they worked exclusively in an open-plan office. The remaining 32.6% of the employees worked in some mix of office types.

Measures

We used three different approaches to assess a person's privacy needs: (1) The measure proposed by Kaya and Weber

(2003), (2) a set of four specific measures proposed by Pedersen (1988), and (3) our two new scales: One to assess the NFP, and the other to assess the NFS.

1. According to Kaya and Weber (2003), NFP can be characterized as the difference between a person's desired and his or her achieved privacy. While the former is tapped by an item that says, "How much privacy would you usually like to have in the office?," the latter is assessed by asking, "How much privacy do you usually have in the office?" The scores for both items range from 1 (*no privacy at all*) to 7 (*a lot of privacy*). The NFP – the motivation to achieve optimal privacy, the difference between actual and desired privacy – ranges from –6 (*maximal need to seek social exchange*) through 0 (*optimal privacy*) to +6 (*maximal need to withdraw from social interaction*). Of all responses on the two items, 0.7% were found to be missing.

2. Specific needs for privacy, according to Pedersen (1988), refer to what he calls *need-for-reserve*, *isolation*, *solitude*, *anonymity*, *intimacy with friends*, and *intimacy with family*. Of the six dimensions of the original measure, four were included in the present study. Isolation was dropped, since it was expected to be irrelevant in office environments. For the same reason, intimacy with family was combined with intimacy with friends to a single dimension called intimacy with significant others. Each of the four separate needs is measured with a single item. Reserve involves controlling verbal disclosure of personal information to others and involves keeping ideas and feelings to oneself rather than expressing them openly. Solitude is defined as physically separating oneself from others, for example, by closing the office door. In solitude, one cannot be seen or heard by other people. It permits one to be undisturbed. Anonymity refers to feeling alone in a crowd; that is, vanishing in a large group of people and not being recognized as an individual person. Intimacy with someone else refers to a close encounter with another person without disturbances. Intimacy can, for example, be achieved while sitting together with someone at a secluded table. In line with Pedersen's approach, we also assessed these specific needs by having a person compare his or her actually achieved specific privacy with the intended one in the workplace. A description of the respective privacy concept was provided with every item. Scores could range from –4 (*high need for less*) through 0 (*optimal*) to +4 (*high need for more*). Of all responses on the four items, 1.0% were found to be missing.

3. Our two new measures are based on the conception of privacy as a compound of goal-directed performances, which rests on the idea that the need for more or less privacy (social exchange) ultimately results in some distinct behavioral attempts to re-establish an optimal amount of privacy (Altman, 1975). Depending on the strength of this need, people are more or less motivated to regulate privacy and, thus, to take on increasingly demanding behavioral measures to achieve their privacy goals (for a comparable approach in a different domain see Kaiser & Wilson, 2004). Based on the privacy literature (e.g., Kupritz, 1996, 1998;

Vinsel, Brown, Altman, & Foss, 1980) and on previous research (Carton, 2003; Munnecom, 2002), we selected 25 behaviors per privacy goal, which we believe are at an office worker's disposal. To achieve more privacy – when experiencing a NFP – people are expected to engage in actions that result in a reduced social exchange (see Table 1). By contrast, a person's NFS is expected to promote activities that help to increase social exchange (see Table 1). To obscure our research objective, our NFP and NFS items were haphazardly arranged and the questionnaire was non-committally entitled *Behavior In and Around the Office*. Participants were asked: "Please indicate how often you perform each of the following behaviors."

A 5-point response scale was used for each item. For 29 behaviors (e.g., "I keep my office door closed") the responses were *never*, *rarely*, *sometimes*, *often*, and *always*. For the remaining 21 behaviors (e.g., "I ask colleagues to be more quiet") *frequently* and *often* instead of *often* and *always* were used (the *italicized* items in Table 1). Out of all responses, 0.6% were found to be missing. *Does not apply* was a response alternative when an answer was, for whatever reason, not possible. The *does not apply* response was picked in 14.6% of all answers. Technically, these answers were treated as missing values.

Results

Our findings are reported in three sections. First, we describe the calibration of the new behavior-based privacy-need scales. Second, we present construct validity information. Third, we explore individual differences regarding privacy and socializing needs for different work environments.

Scale Calibration

Because the subjective use of the response categories expectedly made answers more arbitrary and less reliable (cf. Kaiser & Wilson, 2000), we had to recode the items of the NFP measure. By categorizing *never* as *no* and collapsing the other four options to a *yes* response, the original 5-point response scale was converted into a less measurement-error-sensitive dichotomous format. Regarding the NFS measure, we recoded 17 items in the same and 8 in a different manner. To improve the NFS's reliability, we kept *rarely* and *never* as two distinct categories and collapsed the remaining three response options (either *sometimes*, *often*, and *always*; or *sometimes*, *frequently*, and *often*) into *sometimes or more* for Items 1, 2, 3, 4, 6, 7, 9, and 10 in Table 1. NFP was assessed using the dichotomous Rasch model (for model details see, e.g., Embretson & Reise, 2000). The scale has a separation reliability of .71. Its internal consistency is $\alpha = .72$. Note that the separation reliability is proposed by Wright and Masters (1982; see also

Table 1. Mean square fit statistics (*MS*) and probability of endorsement (*p*) for the behavioral means aimed at withdrawing from and increasing social interaction

	<i>MS</i>	<i>p</i>
Need-For-Privacy (NFP): Behavioral Means		
1 <i>I call in ill, although I am not actually ill.</i>	.97	.01
2 I hang a “do not disturb” sign on the door or place it somewhere else near my desk.	1.08	.04
3 I wear headphones when I am at the office.	1.19	.05
4 I place myself behind office furniture or behind other objects in the office, such as a lamp or plant.	.96	.06
5 <i>I go to the toilet although this is not necessary.</i>	.82	.06
6 <i>I work at home for a day.</i>	1.16	.08
7 During work, I position myself with my back to my colleagues as much as possible.	1.04	.10
8 <i>I close my eyes for a moment.</i>	1.10	.19
9 <i>I put the receiver down or turn off my cell phone.</i>	.92	.22
10 I pretend to be extremely busy (i.e., I act as if I am being more active than I actually am).	1.03	.36
11 <i>I go for a recreational walk outside the office.</i>	1.04	.38
12 I avoid places where there are many people (e.g., canteen or coffee corner).	1.00	.41
13 I maintain an unresponsive posture when I am sitting behind my desk.	.84	.43
14 When a colleague or somebody else walks past, I pretend not to see him or her.	.92	.43
15 I choose a table in the canteen where no or only a few people are already sitting.	1.06	.47
16 I choose a desk where only few people walk past.	.94	.51
17 I keep my office door closed.	1.15	.52
18 <i>I go to a quiet place in the office.</i>	.85	.53
19 At the office, I talk in a softer voice than I usually do.	1.19	.57
20 <i>I leave the office earlier than I intend to.</i>	1.05	.69
21 <i>I tell people I do not want to be disturbed.</i>	.87	.72
22 I have lunch alone (e.g., at my desk).	1.02	.73
23 <i>I ask colleagues or other persons to be quieter.</i>	.94	.81
24 I take my break at other times than my colleagues.	.98	.88
25 I keep personal thoughts to myself and do not share them with colleagues or other people in the office.	1.03	.93
Need-For-Socializing (NFS): Behavioral Means		
1.b <i>During office hours, I at least sometimes invite someone from outside the office (friends or family) to visit me.</i>	.98	.02
2.b <i>I at least sometimes invite a colleague to come to my workspace for other than work-related reasons.</i>	.96	.13
3.b At the office, I at least sometimes talk in a louder voice than I usually do.	1.06	.14
1.a <i>During office hours, I rarely invite someone from outside the office (friends or family) to visit me.</i>	.98	.17
4.b <i>I at least sometimes try to draw my colleagues’ attention.</i>	1.04	.28
5 I place personal objects near my workspace (e.g., drawings by my children or posters of my favorite sport).	1.01	.29
6.b <i>I at least sometimes walk to places irrelevant for my work simply because many people are there.</i>	.79	.33
7.b <i>I at least sometimes contact someone via the Internet (e.g., e-mail or chat) about other than work-related topics.</i>	.94	.33
8 I make my workplace attractive to other people (e.g., with flowers or music).	1.04	.39
9.b <i>I at least sometimes have telephone conversations about other than work-related topics.</i>	1.02	.48
2.a <i>I rarely invite a colleague to come to my workspace for other than work-related reasons.</i>	.96	.53
10.b <i>I at least sometimes stay at the office longer than I intend to.</i>	.97	.53
11 I choose a desk where many people walk past.	1.02	.53
3.a At the office, I rarely talk in a louder voice than I usually do.	1.06	.55
12 <i>I go to a colleague although this is not required for my work.</i>	.88	.62
7.a <i>I rarely contact someone via the Internet (e.g., e-mail or chat) about other than work-related topics.</i>	.94	.63
13 I take my break at the same time as my colleagues.	1.10	.67
4.a <i>I rarely try to draw my colleagues’ attention.</i>	1.04	.69
14 I leave my office door open.	1.11	.72
15 <i>I go to the office, even though I am ill.</i>	1.12	.72

		<i>MS</i>	<i>p</i>
16	<i>During work, I talk to colleagues about other than work-related topics.</i>	.96	.77
10.a	<i>I rarely stay at the office longer than I intend to.</i>	.97	.77
17	<i>I borrow things from colleagues (e.g., a stapler).</i>	1.04	.79
6.a	<i>I rarely walk to places irrelevant for my work simply because many people are there.</i>	.79	.80
18	I sit behind my desk in such a way that I am clearly visible to other people.	1.01	.90
19	I choose the same desk so that my colleagues know where I am.	1.07	.96
20	During work, I place myself with my face toward my colleagues as much as possible.	1.03	.96
21	I share my personal thoughts with my colleagues or with other people in the office.	1.03	.96
22	I choose a table in the canteen where many people sit.	1.00	.97
9.a	<i>I rarely have telephone conversations about other than work-related topics.</i>	1.02	.97
23	I keep my workplace tidy.	1.05	.98
24	I tell my colleagues they can come to my workplace at all times.	.91	.98

Note that the behavior items were translated from their original Dutch version. They are ordered according to an average person's increasing chances of endorsing them (*p*). These probabilities reflect the symbolic, social, and physical costs of the behaviors in these particular office environments. Ideally, the mean square (*MS*) value for each item is 1.00. *MS*-values below 1.20 stand for an acceptable model fit; they indicate less than a 20% excess in variation in the model prediction compared to what is in the data. Items recoded into three categories (i.e., with two levels of endorsement: **rarely** and **at least sometimes**) are represented as two separate behavioral means (e.g., 10.a and 10.b). Items in *italics* had *never*, *rarely*, *sometimes*, *frequently*, and *often* as their original response options.

Bond & Fox, 2001). It represents the ratio between true and estimated variance of people's privacy needs and, thus, is in line with a classical definition of reliability. All items fit the scale with nonsignificant *t*-values smaller than 1.96 and mean square (*MS*) values smaller than 1.20 (see Table 1). This latter figure stands for a 20% excess in variation between the observed and expected responses. This is important because it reflects on the appropriateness of the Rasch model. The overall fit statistics for the 25 items of the NFP scale are as follows: The mean of mean squares [*M*(*MS*)] = 1.01, standard deviation of mean squares [*SD*(*MS*)] = .11, mean of *t*-values [*M*(*t*)] = .00, standard deviation of *t*-values [*SD*(*t*)] = 1.22. Ideally, *M*(*MS*) and *SD*(*t*) should be 1.0, while *M*(*t*) should be 0 (see, e.g., Bond & Fox, 2001). For *SD*(*MS*) no general reference value can be given. Out of 204 participants, only five persons (2.5%) fit poorly (*t* > 1.96); the overall fit statistics for the participants are *M*(*MS*) = 1.00, *SD*(*MS*) = .29, *M*(*t*) = -.01, *SD*(*t*) = 1.01.

NFS was assessed using the partial credit (Rasch-family) model (for model details see, e.g., Bond & Fox, 2001). In our version of this model, a difficulty was estimated for each of the, at most, two levels of endorsement of an item. The NFS scale has a separation reliability of .74. Its internal consistency is $\alpha = .73$. All but one of the items fit the scale with nonsignificant *t*-values smaller than 1.96 and *MS*-values smaller than 1.20 (see Table 1). The item "I choose a desk near a coffee machine, printer, or copier" was subsequently excluded from our analysis. The overall fit statistics for the remaining 24 items of the NFS scale are as follows: *M*(*MS*) = 1.01, *SD*(*MS*) = .08, *M*(*t*) = .06, *SD*(*t*) = .95. Out of 204 participants, six persons (2.9%) fit poorly (*t* > 1.96); the overall fit statistics for the participants are *M*(*MS*) = .98, *SD*(*MS*) = .32, *M*(*t*) = -.40, *SD*(*t*) = 1.00. In sum, the fit statistics and the reliability information of our two new behavior-based privacy-need scales appear to be indicative of two relatively sound one-dimensional mea-

sures. Evidence for the validity of the two newly-developed scales is provided below.

Construct Validation

Information about the construct validity of the two new measures can be derived from (1) the convergence with traditionally used privacy-need measures, and (2) the discrepancy with theoretically related but dissimilar concepts. Table 2 reports means (*M*), standard deviations (*SD*), separation reliabilities, and correlations of the two new scales (NFP and NFS), the Kaya and Weber (2003) instrument (KWNFP), and the four Pedersen (1988) measures (PNFR, PNFA, PNFI, PNFS).

While the need-for-solitude (PNFS) correlated significantly with our new NFP scale ($r = .25$), as well as with need-for-intimacy (PNFI; $r = .24$) and anonymity (PNFA; $r = .19$), the Kaya and Weber need-for-privacy measure (KWNFP) correlated exclusively with need-for-solitude (PNFS; $r = .34$) and our new NFP scale ($r = .26$). By contrast, the new NFS scale did not covary with any of the traditional measures (all *ps* > .05). It somewhat overlaps ($r = .23$, $R^2 = 5.3\%$), however, with the new NFP scale, indicating a slightly oblique privacy-needs space.

Since single-item measures are more sensitive to measurement error than aggregated measures, which in turn negatively affects the strength of a relationship with other variables, we tried to correct the reported correlations for measurement error attenuation with a standard procedure (cf. Charles, 2005). Unfortunately, we could not find reliability information in the literature for either the Pedersen measures or the Kaya and Weber instrument. Therefore, we decided to use the correlation between the need-for-solitude (PNFS) and Kaya and Weber's need-for-privacy (KWNFP; $r = .34$; cf. Table 2) as an internal consistency

Table 2. Descriptive statistics, reliabilities, and bivariate correlation coefficients of different privacy-need measures

	<i>N</i>	<i>M</i>	<i>SD</i>	NFP	NFS	KWNFP	PNFR	PNFA	PNFI	PNFS
NFP	204	−.66	1.08	.71	.23**	.26**	−.07	.08	.08	.25**
NFS	204	1.05	.95		.74	.00	.09	.03	−.04	−.04
KWNFP	202	.73	1.34			—	.02	−.01	.03	.34**
PNFR	204	−.06	1.07				—	.19**	−.04	−.12
PNFA	203	.20	.82					—	.16*	.19**
PNFI	202	.24	.81						—	.24**
PNFS	203	.42	.98							—

Note that the figures in the upper right triangle of Table 2 represent Pearson correlation coefficients. The diagonal gives the separation reliabilities of the two newly-developed measures; * stands for $p < .05$, ** for $p < .01$. NFP stands for the new Need-For-Privacy scale, NFS for the new Need-For-Socializing scale, KWNFP represents the need-for-privacy measure by Kaya and Weber (2003), PNFR, PNFA, PNFI, and PNFS represent the need-for-reserve, anonymity, intimacy, and solitude dimensions of the Pedersen (1988) instrument, respectively.

equivalent of these two measures, assuming that they assess either the same or at least a highly similar concept (cf. Newell, 1995). Note that this reliability estimate is expected to be conservative, especially in comparison to a conventional test-retest reliability. In other words, it is possible that we are overcorrecting and, thus, overestimating the strength of the relationships with PNFS and with KWNFP.

The corrected correlations corroborate the proposed behavior-based measures' concurrent and discriminant validity even more strongly with a $r_{corr} = .54$ for Kaya and Weber's need-for-privacy measure (KWNFP) and a $r_{corr} = .50$ for Pedersen's need-for-solitude (PNFS) with the new NFP scale, and a $r_{corr} = .32$ for our two new scales. In fact, the NFP and the NFS are nearly independent. Technically speaking, predicting privacy needs from socializing needs is very hard with only 10% variance overlap. Although oblique, they almost form an orthogonal privacy-needs space.

Privacy and Socializing Needs and Office Environments

We compared people's NFP and NFS in different office environments. To decrease the possibility that an office worker's interaction with colleagues is work and not privacy-related, we included only the financial advisors and the administrative personnel, that is the employees with individual rather than group assignments, for these two analyses. Two types of office environments, group office and traditional office designs, were excluded because of small sample sizes ($n = 8$ and 15 , respectively). For the same reason, we also excluded employees without a permanently assigned work place ($n = 25$). Subsequently, we performed two independent ($2 \times 2 \times 2 \times 2$) ANCOVAs to search for differences in people's NFP and in their NFS depending on (1) gender, (2) personnel type (administrative personnel vs. financial advisors), (3) the type of office environment (open-plan vs. mixed offices), and (4) the exclusiveness in work-desk access (exclusively vs. nonexclusively used desk). In this model, gender and personnel type were in-

cluded as control factors. Additionally, people's age and the number of days per week spent in the office were used as two covariates.

Need-for-Privacy in Offices

Regarding NFP, we found a marginally significant effect of office type: $F(1, 116) = 3.6$, $p = .06$, $\eta^2 = 2.4\%$; indicating that, compared to those working in a mixed office design, employees working in an open-plan office have a higher need for privacy. The effect of the covariate "days per week spent in the office" was significant as well: $F(1, 116) = 4.7$, $p = .03$, $\eta^2 = 3.2\%$; indicating that the more time spent in the office, the higher the need for privacy. At the same time, neither personnel type, gender, exclusiveness of desk use, nor the covariate "age" turned out to be statistically significant. In addition to the main effect, we found the exclusiveness of desk use by office type interaction to be significant: $F(1, 116) = 8.5$, $p < .01$, $\eta^2 = 5.8\%$. Employees who had to share their desk with others had an even higher need for privacy in open-plan offices. Furthermore, the three-way interaction, gender by exclusive desk use by office type, was found to be significant: $F(1, 116) = 3.3$, $p = .04$, $\eta^2 = 4.1\%$. Because of the tentative nature of our exploration, we refrained from further exploring this rather complex interaction.

Need-for-Socializing in Offices

Regarding NFS, we found a significant office type effect: $F(1, 116) = 5.4$, $p = .02$, $\eta^2 = 3.5\%$; indicating that, compared to those working in a mixed office design, employees working in an open-plan office have a higher need for socializing. This time, the effect of the covariate "age" was significant: $F(1, 116) = 15.4$, $p < .01$, $\eta^2 = 10.0\%$; indicating that younger employees experience a higher need for social interaction. Moreover, we found a marginally significant effect of personnel type: $F(1, 116) = 3.7$, $p = .06$, $\eta^2 = 2.4\%$; indicating that financial advisors had a higher need for social interaction than administrative personnel. Next

to the main effects, no significant interactions were found. Gender, exclusiveness of desk use, and the covariate “days per week spent in the office” did not appear to be significantly related with our NFS measure.

Discussion

In our research, we developed two behavior-based multiple-item privacy-need measures for office environments based on Altman's (1975, 1976) conception of privacy. Both instruments employ a maximum likelihood-based objective scoring of responses. Both scales are grounded in a systematic inspection of the behavioral means people engage in to achieve their privacy goals (cf. Kaiser & Wilson, 2004), be it withdrawing from or increasing social exchange. These instruments do not require introspection regarding either people's needs or regarding their achieved levels of either privacy or socializing. With a sample of 204 bank employees, we were successful in calibrating a NFP and a NFS instrument, finding separation reliabilities of .71 and .74, respectively, and quite acceptable fit statistics. We took some liberty in deviating from a strictly confirmatory Rasch model implementation by searching for a formally superior response format for our NFS measure. The scale must be confirmed in a future study, before the instrument can be used in an application.

By comparing people's scores on the two new scales with their scores from several traditional measures, our results corroborate the construct validity of both new instruments: Convergent validity regarding NFP and discriminant validity regarding NFS. As a matter of fact, NFP correlated reasonably with both Kaya and Weber's (2003) corresponding measure and Pedersen's (1988) need-for-solitude instrument: $r_{corr} = .54$ and $r_{corr} = .50$. NFS, by contrast, was not significantly related to any of the traditional measures (see Table 2).

The other substantive finding of our research concerns the privacy significance of two of the features of a typical office environment: General office design and exclusiveness in desk access. Our study confirms that open-plan offices indeed promote both a need for privacy and a need for social interaction (see Brennan et al., 2002; Brill et al., 2000). Note, however, that because of sample sizes, traditional and group offices could not be included in our analysis. We found that people working in an open-plan office, compared to those in mixed offices, experienced slightly higher needs for both socializing and privacy. This finding could suggest that open-plan offices might overshoot their goal by inadvertently stimulating a desire for social interaction beyond the original baseline. Alternatively interpreted, it could also mean that open-plan offices obstruct both socializing and acquiring privacy (and, thus, activate the corresponding need). Finally, it could also be the case that people choose to work in an office environment that is most

effective in supporting their respective need for privacy and/or socializing.

Exclusiveness in desk access does not seem critical for a person's need for socializing, but for his or her need for privacy, as indicated by two interactions. In particular, we found that the relation between exclusiveness of desk access and a person's need for privacy is moderated by gender and type of office (i.e., open-plan or mixed office environment). Further research with larger samples is required to corroborate and substantiate the nature of these fairly small and complex relationships.

In summary, the reported effects – although small (less than 6% explained variance) – generally seem unsurprising in their direction and provide further evidence for the discriminant validity of our two measures. In support of this claim, note that a person's age was significantly related to his or her need for social interaction. By contrast, a person's need for privacy was related to the time per week a person actually spent in the office.

The relatively small, but significant, correlation between NFP and NFS ($r_{corr} = .32$) reveals that both dimensions are fairly distinct. So, predicting privacy from socializing needs is nearly impossible. This implies that a person can experience a need for privacy and one for socializing more or less independently from each other. Although sensible, this is not what we would predict from Altman's (1975, 1976) theorizing. According to Altman, people can experience either too much or too little social exchange, but not both concurrently. A two-process model (one for social engagement and the other for withdrawal) would be more in accordance with our findings (cf. Foddy, 1984). Further research is, however, needed to conclusively determine the strength and generalizability of the relationship found between privacy and socializing needs and to substantiate their underpinning.

Moreover, according to Altman, the need for privacy and the need for social interaction are volatile mental states, which are highly unstable and changeable depending on personal and contextual circumstances. By contrast, we measured them in a different manner by having people recall a number of social behaviors over time in a particular context. Obviously, our approach implies relatively enduring but context-specific needs. By limiting the scope to an aggregate of socializing and privacy-related behaviors, the proposed measurement model can assess people's two privacy needs with an accuracy of 70% to 75%. The price psychology has to pay is a context-specific and trait-like conception of people's needs. In other words, our findings, for one, cannot be generalized to other-than-office environments. Two, if we wish to measure privacy in other-than-office environments, the instrument has to be adapted to the privacy-related actions of this dissimilar context.

Such a more trait-like conception of people's privacy needs has, however, some noteworthy advantages as well. It opens up new lines of research in which we will be able to empirically explore the relationships of the two privacy needs to resiliency or proneness to occupation-related

stress. Moreover, people with distinct needs for privacy might be more or less susceptible to work-related burnout, a syndrome that has previously also been associated with various forms of social withdrawal (cf. Maslach, Schaufeli, & Leiter, 2001).

Since our research is exclusively based on self-reports about behavior, three possible shortcomings are worth mentioning. First, social desirability could play a role. With a comparably constructed behavior-based conservation motivation measure, we previously found that the responses of mature adults, like the ones in this study, proved relatively unbiased in their readiness to respond in ways they might have thought we wanted them to (see Kaiser, 1998). Second, from previous research with the above-mentioned conservation motivation measure, we also know that self-reported practices reveal satisfactory correspondence to actual behavior (see Kaiser, Frick, & Stoll-Kleemann, 2001). Third, we exclusively used behaviors, although people could just as well endorse cognitive measures to achieve privacy goals (cf. Kupritz, 2000): Reappraising subjective control, for example. This self-imposed limitation not only allows us to abstain from introspection into people's privacy-related needs but also, in principle, to switch to behavior observation as a means of data collection (for an example see Carton, 2003); an expectation that needs to be corroborated in a future study.

Despite possible limitations and despite a need for replication, we believe that our two new behavior-based privacy-need measures are promising instruments for postoccupancy evaluation and office-environment-related comparisons alike. Furthermore, we believe that the proposed assessment method for privacy needs is similarly suitable for homes and other-than-office environments, as the goal-directed behavior approach – proposed by Kaiser and colleagues (Kaiser & Wilson, 2004; Scheuthle et al., 2005) – is capable of overcoming most of the measurement problems in current privacy research.

Acknowledgments

This research was supported by the Human-Technology Interaction Group at Eindhoven University of Technology, The Netherlands. We gratefully acknowledge Rabobank Facilitair Bedrijf for its institutional support of the data collection. We thank Marleen Carton, Terry Hartig, Wesley Schultz, and three anonymous reviewers for their comments on earlier drafts of this paper, Steven Ralston for his language support, and the volunteers who filled out questionnaires.

References

- Altman, I. (1975). *The environment and social behavior*. Monterey, CA: Brooks/Cole.
- Altman, I. (1976). Privacy: A conceptual analysis. *Environment & Behavior*, 8, 7–29.
- Altman, I., Vinsel, A., & Brown, B.B. (1981). Dialectic conceptions in social psychology: An application to social penetration and privacy regulation. *Advances in Experimental Social Psychology*, 14, 107–160.
- Anastasi, A. (1988). *Psychological testing* (6th ed.). New York: Macmillan.
- Archea, J. (1977). The place of architectural factors in behavioral theories of privacy. *Journal of Social Issues*, 33(3), 116–137.
- Bond, T.G., & Fox, C.M. (2001). *Applying the Rasch model: Fundamental measurement in the human sciences*. Mahwah, NJ: Erlbaum.
- Brennan, A., Chugh, J.S., & Kline, T. (2002). Traditional versus open office design, a longitudinal field study. *Environment & Behavior*, 34, 279–299.
- Brill, M., Keable, E., & Fabiniak, J. (2000). The myth of open-plan. *Facilities Design & Management*, 19(2), 36–38.
- Brill, M., Weidemann, S., & BOSTI Associates. (2001). *Disproving widespread myths about workplace design*. Jasper, IN: Kimball International.
- Burger, J.M. (1995). Individual differences in preference for solitude. *Journal of Research in Personality*, 29, 85–108.
- Carton, M. (2003). *Privacy van verpleeghuis-bewoners met dementie: De ontwikkeling van een meetinstrument op basis van gedrag* [Privacy among nursing-home residents with dementia: Development of a behavior-based privacy measure]. Unpublished master's thesis, Eindhoven University of Technology, The Netherlands.
- Charles, E.P. (2005). The correction for attenuation due to measurement error: Clarifying concepts and creating confidence sets. *Psychological Methods*, 10, 206–226.
- Dillman, D.A. (2001). *Mail and Internet surveys: The tailored design method* (2nd ed.). New York: Wiley.
- Embretson, S.E., & Reise, S.P. (2000). *Item response theory for psychologists*. Mahwah, NJ: Erlbaum.
- Epstein, S. (1983). Aggregation and beyond: Some basic issues on the prediction of behavior. *Journal of Personality*, 51, 360–392.
- Foddy, W.H. (1984). A critical evaluation of Altman's definition of privacy as a dialectical process. *Journal for the Theory of Social Behavior*, 14, 297–307.
- Greve, W. (2001). Traps and gaps in action explanation: Theoretical problems of a psychology of human action. *Psychological Review*, 108, 435–451.
- Johnson, C.A. (1974). Privacy as personal control. In S.T. Margulis (Ed.), *Man-environment interactions: Privacy* (Vol. 2; pp. 83–100). Stroudsburg, PA: Dowden, Hutchinson, & Ross.
- Kaiser, F.G. (1998). A general measure of ecological behavior. *Journal of Applied Social Psychology*, 28, 395–422.
- Kaiser, F.G., Frick, J., & Stoll-Kleemann, S. (2001). Zur Angemessenheit selbstberichteten Verhaltens: Eine Validitätsuntersuchung der Skala Allgemeinen Ökologischen Verhaltens [Accuracy of self-reports: Validating the General Ecological Behavior scale]. *Diagnostica*, 47, 88–95.
- Kaiser, F.G., & Wilson, M. (2000). Assessing people's general ecological behavior: A cross-cultural measure. *Journal of Applied Social Psychology*, 30, 952–978.
- Kaiser, F.G., & Wilson, M. (2004). Goal-directed conservation behavior: The specific composition of a general performance. *Personality and Individual Differences*, 36, 1531–1544.

- Kaya, N., & Weber, M.J. (2003). Cross-cultural differences in the perception of crowding and privacy regulation: American and Turkish students. *Journal of Environmental Psychology*, 23, 301–309.
- Kupritz, V.W. (1996). HEM: Directed means for improving current limits of privacy research. *Journal of Architectural and Planning Research*, 13, 310–327.
- Kupritz, V.W. (1998). Privacy in the workplace: The impact of building design. *Journal of Environmental Psychology*, 18, 341–356.
- Kupritz, V.W. (2000). Privacy management at work: A conceptual model. *Journal of Architectural and Planning Research*, 17, 47–63.
- Magnusson, D. (1966). *Test theory*. Reading, MA: Addison-Wesley.
- Margulis, S.T. (2003). On the status and contribution of Westin's and Altman's theories on privacy. *Journal of Social Issues*, 59, 411–429.
- Marshall, N.J. (1972). Privacy and environment. *Human Ecology*, 1, 93–110.
- Maslach, Ch., Schaufeli, W.B., & Leiter, M.P. (2001). Job burn-out. *Annual Review of Psychology*, 52, 397–422.
- Munnecom, B.M.M.J. (2002). *Klachten bij baliewerkplekken: Gebrek aan privacy en gebrek aan controle bij informatiebalijs* [Complaints at front desks: Lack of privacy and lack of control at information counters]. Unpublished master's thesis, Eindhoven University of Technology, The Netherlands.
- Newell, P.B. (1995). Perspectives on privacy. *Journal of Environmental Psychology*, 15, 87–104.
- Pedersen, D.M. (1979). Dimensions of privacy. *Perceptual and Motor Skills*, 48, 1291–1297.
- Pedersen, D.M. (1988). Correlates of privacy regulation. *Perceptual and Motor Skills*, 66, 595–601.
- Pedersen, D.M. (1999). Model for types of privacy by privacy functions. *Journal of Environmental Psychology*, 19, 397–405.
- Scheuthle, H., Carabias-Hütter, V., & Kaiser, F.G. (2005). The motivational and instantaneous behavior effects of contexts: Steps toward a theory of goal-directed behavior. *Journal of Applied Social Psychology*, 35, 2076–2093.
- Sundstrom, E., & Sundstrom, M.G. (1986). *Work places, the psychology of the physical environment in offices and factories*. New York: Cambridge University Press.
- Vinsel, A., Brown, B.B., Altman, I., & Foss, C. (1980). Privacy regulation, territorial displays, and effectiveness of individual functioning. *Journal of Personality and Social Psychology*, 39, 1104–1115.
- Vos, P.G.J.C., & Voordt, D.J.M. van der (2001). Tomorrow's offices through today's eyes: Effects of innovation in the working environment. *Journal of Corporate Real Estate*, 4, 48–65.
- Weinstein, C.S. (1982). Privacy-seeking behavior in an elementary classroom. *Journal of Environmental Psychology*, 2, 23–35.
- Westin, A.F. (1967). *Privacy and freedom*. New York: Atheneum.
- Wright, B., & Masters, G.N. (1982). *Rating scale analysis: Rasch measurement*. Chicago: MESA.
- Zeisel, J. (1997). *Inquiry by design; tools for environment-behavior research*. New York: Cambridge University Press.

About the authors

Antal Haans is a Ph.D. candidate at Eindhoven University of Technology, Eindhoven, the Netherlands. His research interests include virtual environments, mediated communication, and the modeling of psychological concepts within a person-environment interaction framework.

Florian G. Kaiser is Associate Professor of Social and Environmental Psychology at Eindhoven University of Technology, Eindhoven, The Netherlands. His research interests include the attitude-behavior relationship (particularly with respect to nature conservation/preservation), theory & measurement of behavior and attitude, and the assessment of individual differences regarding various person-environment interaction topics.

Yvonne de Kort is Assistant Professor of Environmental Psychology at Eindhoven University of Technology, Eindhoven, The Netherlands. Her research interests are restorative effects of environments, experiences in and utility of virtual environments, situated social interaction and awareness, and locatedness in mediated interactions.

Florian G. Kaiser

Eindhoven University of Technology (IPO 1.22)
P.O. Box 513
NL-5600 MB Eindhoven
The Netherlands
E-mail f.g.kaiser@tm.tue.nl