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Social Science Computer Review 2010 28: 336 originally published online 2 December 2009
DOI: 10.1177/0894439309353099

The online version of this article can be found at:
http://ssc.sagepub.com/content/28/3/336

Published by:
SAGE
http://www.sagepublications.com

Social Science Computer Review
28(3) 336-349

DOI: 10.1177/0894439309353099
http://sscr.sagepub.com


Reaching the Mobile Respondent

Determinants of High-Level Mobile Phone Use Among a High-Coverage Group

Christoph Burger[1], Valentin Riemer[1], Jürgen Grafeneder[1], Bianca Woisetschläger[1], Dragana Vidovic[1], and Andreas Hergovich[1]

Abstract

The aim of this study is to identify the key determinants of high-level mobile phone use in a high-coverage target group by replicating an Australian study conducted by Walsh and White. Factors predicting high-level mobile phone use and relations between self- and prototypical identity are investigated by using an extended version of the theory of planned behavior (TPB). A total of 215 Austrian university students participated by completing two questionnaires, 1 week apart. The first questionnaire assessed attitude, subjective norm, perceived behavioral control (PBC), and intention as well as self- and prototypical identity variables. The second questionnaire assessed mobile phone use in the previous week. It was found that all three TPB variables significantly predicted intention. The addition of identity variables improved the model with self-identity becoming the second strongest overall predictor. In terms of predicting high-level mobile phone behavior, intention and subjective norm, but not PBC, were significant predictors.

Keywords

mobile phone use, theory of planned behavior (TPB), subjective norm, self-identity, prototypical identity, extension, Austria, Europe

In Austria, as in most industrialized countries, the amount of people possessing and using mobile phones is growing very quickly. According to the Austrian Regulatory Authority for Broadcasting and Telecommunications (RTR-GmbH, 2008, p. 18), mobile phone penetration rate in Austria has reached 122% in the second quarter of 2008 and can be assumed to be far higher for specific population groups such as university students. In 2007, technical call minutes in the mobile sector rose more than 23% compared to the previous year. Also, 51% more text messages were sent in the first half of 2008 than in the corresponding period in 2007 (RTR-GmbH, 2008, pp. 20-21). Moreover, the

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technology underlying mobile phones is ever-changing and ever-evolving. Talking on the phone—once the main functionality—has now become only one of many features. In the recent years it has, for example, become possible to send and receive multimedia-based content and to access the Internet as well as to have a General Packet Radio Service (GPRS) navigation system integrated in one's mobile phone. Also, the environment has become more interactive with mobile phones. Short message service (SMS) messages have, for example, already been commonly and successfully used in television to receive viewer feedback and to achieve deeper viewer involvement (Tretiakov & Kinshuk, 2005). Furthermore, in many cities it is now possible to order, pay, and receive parking tickets via mobile phones.

But also from a scientific point of view, the mobile phone has become a very attractive means of data collection. Surveys conducted via SMS or via the browser on the respondent's mobile phone offer new, innovative ways to capture data regardless of time and location of the respondent. Apart from the high mobile phone penetration, further advantages are faster response times, immediate contact with people in the situation and at the moment of interest, and the possibility to get hold of previously hard-to-reach target groups (e.g., Day, 2009; Macer, 2009). However, as with any mode of data collection, there are also possible disadvantages to the mobile Internet approach. Many mobile phone users, for instance, do not possess the technical expertise to go online with their mobile phone or do not even know about the Web capabilities of their mobile phones. In fact, compared to mobile phone penetration, mobile Internet penetration is quite low (13% of Western Europe mobile phone users in 2008 according to Forrester Research, 2009). Another disadvantage is that (perceived) cost deters many potential respondents (for more information, see Macer, 2009).

For conducting mobile research, a high mobile coverage among the target group's members is required. Furthermore, to reach members of this high-coverage group, members should be familiar with the functions of their mobile phones (especially with the Internet capabilities). This is largely the case among users who spend a lot of time with their mobile phones and use them on a high level. Moreover, it can be assumed that persons who spend a lot of time with their mobile phones are more willing to participate in mobile surveys. So, it can be said that a high-coverage group, whose members are using their mobile phones on a high level, would represent a typical target group for conducting mobile research.

However, so far, only little research has been undertaken to understand and explain the psychological mechanisms and determinants behind high-level mobile phone use. To our knowledge, only one in-depth study has been carried out so far assessing influences on high-level mobile phone use from a psychological perspective, such as the theory of planned behavior (TPB). This was done in Australia by Walsh and White (2007). However, it is questionable whether the results of this study can be transferred and applied to a European population, because there seem to be substantial differences concerning the cultural, societal, and economic background. The current study aims to bridge this information gap by identifying the key determinants of high-level mobile phone use in an ideal target group for mobile Internet research, namely in a high-coverage group (i.e., Austrian university students). In doing this, we replicated the above-mentioned Australian study with an Austrian sample of university students of various backgrounds. Furthermore, the current study aims to overcome some methodological limitations of the Australian study. Following Walsh and White, we used TPB (Ajzen, 1991) for the purpose of investigating the basic determinants of mobile phone use.

TPB

According to the TPB (Ajzen, 1991), human behavior is influenced by three factors: *behavioral beliefs, normative beliefs*, and *control beliefs*. In their respective aggregates, behavioral beliefs form a positive or negative *attitude* toward the behavior; normative beliefs lead to perceived social pressure or *subjective norm* about the behavior; and control beliefs lead to *perceived behavioral control*

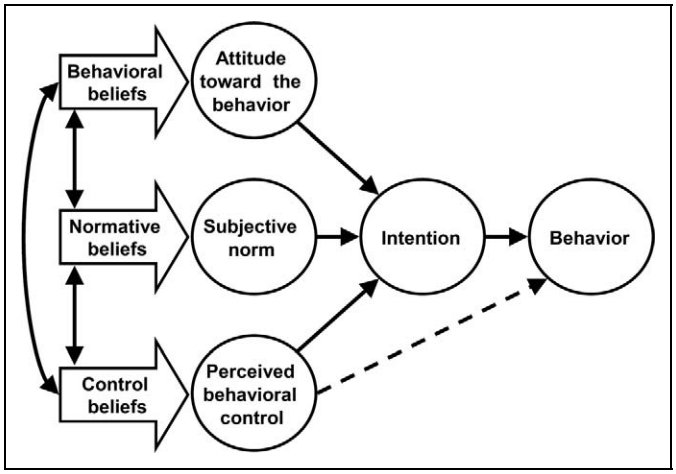

Figure 1. Structural diagram of the Theory of Planned Behavior (TPB; Ajzen, 1991). *Note*. For ease of presentation, potential feedback effects of behavior on the antecedent variables are not depicted.

(PBC) of the behavior. In combination, attitude toward the behavior, subjective norm, and PBC lead to the formation of a behavioral *intention*. As a general rule, the more favorable the attitude and subjective norm and the greater PBC, the stronger the person's intention to perform the behavior in question should be. Finally, given sufficient actual control over the behavior, people are expected to put their intentions into practice when they have the possibility to do so. Intention is therefore understood as the immediate predecessor of behavior. However, because the execution of many behaviors is beyond volitional control of the actor (e.g., time, money, skills, and cooperation with others), the inclusion of the concept of PBC in the TPB has shown to be beneficial to the quality of the prediction. Figure 1 illustrates the TPB in the form of a structural diagram (Ajzen, 1991).

A recent meta-analysis by Armitage and Conner (2001a, p. 481) indicated that the TPB is able to account for 39% of variance in intention and 27% of variance in behavior. In previous studies, mobile phone use has been linked with identity variables, indicating that the incorporation of identity constructs within the TPB might be a useful addition to the model. The addition of role-based measures of self-identity in the TPB has already been done several times (Armitage & Conner, 2001b; Terry, Hogg, & White, 1999) and has significantly improved prediction of behavior. In the meta-analysis by Conner and Armitage (1998, p. 1446), self-identity has been found to explain, on average, an additional 1% of the variance in intention over the TPB predictors. Even more interestingly, Rise, Sheeran, and Skalle (in press) showed in their meta-analysis that self-identity is conceptually and empirically distinct from standard TPB variables and that its inclusion in the TPB captures additional 6% of variance in intention (9% if past behavior was controlled) above and beyond that afforded by standard TPB predictors. Thus, the inclusion of identity constructs within the TPB seems worthwhile when investigating determinants of mobile phone use.

Self-identity

Self-identity may be described as the salient part of a person's self-concept which relates to behavior (Conner & Armitage, 1998). Stryker's (1987) role identity theory proposes that an individual's self-identity is structured into a hierarchy of role identities that correspond to the individual's positions in the social structure (i.e., student, parent, spouse, or employee). Many mobile phone users have reported that they personalize the features (e.g., ring tone, display) on their phones to reflect their

personal likings (Walsh & White, 2007) and that mobile phone use is a fundamental part of their lives (Carroll, Howard, Peck, & Murphy, 2002; Ling, 2000). This can be interpreted as indication that mobile phones are a form of self-identity expression. Stryker's role identity theory provides a possible explanation for this phenomenon in assuming that behaviors which are positively reinforced are likely to be repeated, consequently becoming a highly salient and integral part of the individual's self-concept. Following the study of Walsh and White (2007), the current study also used a role-based self-identity measure.

Prototypical Identity Influence

Prototypes can be described as the images individuals hold of typical people who perform specific behaviors. They are assumed to reflect a form of influence in that individuals compare themselves to the prototype and judge whether the prototype possesses desired or undesirable characteristics, or whether it is characteristic of a desired membership group (Gibbons & Gerrard, 1995). The prototype willingness model (PWM) by Gibbons and Gerrard (1995) consists of the following components, which both influence individuals' willingness to engage in certain behaviors (e.g., mobile phone use): *Prototype perception* describes the individual's overall evaluation of the image, whereas *prototype similarity* describes the extent to which an individual is similar to the prototype. Both components can also be found in Sirgy's (1982, 1985) self-image congruence theory: Prototype perception conforms to the concept of the *stereotypic image of the generalized product user* and prototype similarity to the concept of *actual self-image congruity*. According to this theory, consumers might evaluate a product by matching their product-user image with their actual self-concept. The greater the match of both concepts, the more likely they are to use the product, because they infer that the use of the product will meet their self-consistency needs.

The Current Study

The current study aims to explore the psychological mechanisms and key determinants of high-level mobile phone use in a European high-coverage group (i.e., Austrian university students). Furthermore, it aims to test the validity of the TPB as a model for predicting and understanding high-level mobile phone use. It also seeks to improve the understanding of the effect of self–other relations on behavior by assessing the role of self- and prototype identity influences within the TPB. The current study is an extended replication of the study by Walsh and White (2007), providing some enhancements to overcome methodological limitations. In response to suggestions made by Walsh and White (2007), we used more extreme (i.e., more positive or negative) prototypical image descriptors for the measurement of prototype favorability to obtain a wider range of responses. We assumed that it would be easier for participants to show their attitude toward prototypes when the provided descriptors can be clearly identified as negative or positive. Furthermore, we drew a more balanced sample regarding the distribution of sex and the participants' fields of studies.

Hypotheses

According to the TPB, intention to engage in a specific behavior should be predicted by three variables: attitude, subjective norm, and PBC (see Figure 1). *Hypothesis 1* was formulated to test whether the expectations of the TPB hold true when predicting intention to engage in high-level mobile phone use.

Hypothesis 1: Attitude, subjective norm, and PBC predict intention to engage in high-level mobile phone use.

In the Australian study, the inclusion of identity variables in the TPB turned out to be an important contributor to its explanatory power. In the current study, we aimed to test, if this result could also be replicated in a European sample. We therefore propose *Hypothesis 2*:

Hypothesis 2: The addition of identity variables improves prediction of intention over the TPB alone.

In the study of Walsh and White (2007), prototype favorability did not contribute to the explanation of additional variance in the prediction of high-level mobile phone use. The authors speculated that this could have methodological grounds and proposed that further research should use more extreme prototypical image descriptors that might improve the measurement of prototype favorability. In the current study, we followed this suggestion leading to the formation of our third *hypothesis*:

Hypothesis 3: Prototype favorability will be a better predictor for intention than in the study by Walsh and White (2007) due to the implementation of more extreme prototypical image descriptors.

Walsh and White (2007) furthermore found that the effects of prototype similarity on intention to engage in high-level mobile phone use were mediated via self-identity. We proposed *Hypothesis 4* to test whether this also applied to the current study.

Hypothesis 4: Self-identity is a mediator of prototype similarity.

Finally, our last *hypothesis* again was logically derived out of one of the basic assumptions of the TPB regarding the prediction of behavior (see Figure 1).

Hypothesis 5: Intention and PBC, but not attitude or subjective norm, predict high-level mobile phone use.

Method

Participants

Participants filled in two questionnaires. The first questionnaire was completed by 439 Viennese university students. Out of them, 60.4% (265) also took part in the second wave of data collection. After the exclusion of largely incomplete questionnaires, 215 university students (90 male [41.9%], 125 female [58.1%]) with ages ranging from 16 to 46 ($M_{age} = 23.8$ years, $SD = 3.9$) were included in the following analyses. The participating students attended different branches of studies: 134 participants were students of psychology (62.3%; 36 male [26.9%], 98 female [73.1%]), 50 were students of sport (23.3%; 27 male [54.0%], 23 female [46.0%]), 20 were students of electrical engineering (9.3%, 20 male [100.0%]), and 11 were students of other branches of studies (5.1%; 7 male [63.6%], 4 female [36.4%]).

Design and Procedure

The current study was prospective in design. After an online pilot study, two waves of data collection 1 week apart were conducted. Participants completed the first questionnaire assessing TPB and identity variables. One week later, they completed the second questionnaire assessing mobile phone use in the past week. Both questionnaires were administered during university courses held by cooperating lecturers. A unique code identifier was used to ensure participants' anonymity

as well as to match the corresponding questionnaires of both waves for subsequent analyses. The target behavior in both waves of data collection was high-level mobile phone use, with *mobile phone use* defined as "to make and receive phone calls, to send and receive SMS and multimedia messaging service (MMS), to take photos, to use the alarm clock function, and all other services and functionalities." High-level mobile phone use was operationalized as the number of days the participant used a mobile phone for all the above-stated purposes at least 12 times a day. The target level of 12 times a day was detected in the online pilot study.

Measures

Pilot Study. A pilot study was conducted online prior to the first wave of data collection. Out of the 498 ($M_{age} = 26$ years, $SD = 7.2$) participants, 215 (43.2%) were male and 283 (56.8%) were female. First, participants completed a questionnaire in which they were asked in detail about the frequency of their general mobile phone use. This information was used to pinpoint the cutoff score concerning high-level mobile phone use, resulting in a much higher score than that used by the Australian study (score: 5, Walsh & White, 2007, p. 2413) with an overall use median of 12 uses per day. Second, participants were asked to provide up to six adjectives describing a typical mobile phone user. As a next step, the intuitions of four native speakers were elicited to organize the adjectives into categories based on meaning and polarity (positive vs. negative). Any discrepancies in the identified clusters were then discussed until a consensus was reached to avoid overlap and redundancy. Out of each of the 16 categories with the highest number of words, the most extreme (in terms of valence) adjective was identified (again, individual selections were discussed until a general consensus was reached). These adjectives were used to form prototypical image descriptors in the Wave 1 questionnaire to measure prototype variables. We chose stronger (extremely positive/extremely negative) descriptors to get a broader range of responses from the participants.

Wave 1: Main Questionnaire. The Wave 1 questionnaire consisted of items measuring the standard TPB variables (intention, attitude, subjective norm, and PBC) as well as identity variables (self-identity, prototype similarity, and prototype favorability) in relation to high-level mobile phone use. The majority of the items were positively worded, but we also included some negatively worded items to minimize the risk of response bias. Items were measured using either 7-point Likert scales or semantic differential scales.

Intention. The strength of intention to perform the target behavior was assessed by three items (7-point scale ranging from 1 [*do not intend*] to 7 [*do intend*]). A sample item is "I do/do not intend to use my mobile phone (i.e., to phone, SMS, MMS, other . . .) at least 12 times a day in the next week." Reliability was high (Cronbach's $\alpha = .92$).

Attitude. The attitude toward the performance of high-level mobile phone use was assessed via four 7-point semantic differential scales (e.g., *unpleasant/pleasant*). Reliability was high (Cronbach's $\alpha = .88$).

Subjective norm. The perceived pressure from important others to perform or not perform the target behavior was assessed by 11 items (7-point scale ranging from 1 [*strongly disagree*] to 7 [*strongly agree*]). A sample item is "Those people who are important to me would want me to use my mobile phone at least 12 times a day in the next week." Reliability was high (Cronbach's $\alpha = .89$).

PBC. The individuals' perception of how much control they have over the performance of the target behavior was measured by 11 items (7-point scale ranging from 1 [*strongly disagree*] to

7 [*strongly agree*]). A sample item is "I am confident that I could use my mobile phone at least 12 times a day in the next week." Reliability was satisfying (Cronbach's $\alpha = .56$).

Self-identity. The extent to which performing a behavior is a part of the individual's self-concept was measured by three items (7-point scale ranging from 1 [*strongly disagree*] to 7 [*strongly agree*]). A sample item is "Being a mobile phone user is an important part of who I am". Reliability was satisfying (Cronbach's $\alpha = .79$).

Prototype similarity. The perception of how similar the individuals' characteristics are to their image of a prototypical mobile phone user was measured by the absolute difference between participants' ratings (a) of how much preselected adjectives described the prototypical image and (b) of how much the same adjectives describe their self-image (Gibbons & Gerrard, 1995; Mannetti, Pierro, & Livi, 2004). The 16 descriptors of mobile phone users (*popular, communicative, up-to-date, annoying, addicted, stressed, disinterested, indispensable, loud, flexible, desired, egoistic, ruthless, organized, impolite, helpful*) were obtained from the pilot study. Participants were asked to rate how much each of the 16 characteristics describe "a typical mobile phone user." Items were rated on a 7-point scale ranging from 1 (*not at all*) to 7 (*completely*). Subsequently, participants were asked to think about themselves and rate how much each of the 16 characteristics describe themselves on a 7-point scale ranging from 1 (*not at all*) to 7 (*completely*). Absolute difference scores between participants' prototypical image and actual self-ratings were calculated, summed, and averaged to measure how similar each participant's self-image was to the prototypical image. Reliability was satisfying (Cronbach's $\alpha = .79$).

Prototype favorability. Individuals' overall evaluation of the prototype's characteristics was assessed using the ratings of the 16 characteristics for prototypical image (see above) together with the question "How favorably do you view the image of a typical mobile phone user?" rated on a 7-point scale ranging from 1 (*extremely favorably*) to 7 (*not at all favorably*). Half of the 16 characteristics could be classified as positive, the other half as negative. The single question item and the ratings of the negative characteristics were reversed to reflect favorability of the prototype. After calculation of reliability measures, two adjectives (one positive "indispensable" and one negative "impolite") were excluded from further calculation, because of their low contribution to the overall measure. Reliability of the remaining 14 adjectives and the single question item was satisfying (Cronbach's $\alpha = .75$).

Wave 2: Follow-Up Questionnaire. One week after completing the first questionnaire, participants completed a second questionnaire examining their performance of the target behavior in the past week. High-level mobile phone use was assessed by having participants indicate how many days in the past week they had used their mobile phone at least 12 times per day for any purpose. The item was rated on a 7-point scale ranging from 1 (*not at all*) to 7 (*every day*). Additional items that assessed how often participants used the different features of their mobile phone (e.g., calls, SMS, MMS, etc.) in the past week were included to increase the reliability of this measure.

Results

Correlations Among TPB Variables and Identity Variables

To ensure that all variables represented distinct concepts, intercorrelations (see Table 1) were examined. Low to moderate correlations were found between the TPB predictors. The TPB predictors were moderately correlated with intention and behavior, with intention emerging as the strongest

Table 1. Descriptive Analysis of High-Level Mobile Phone Use: Means, Bivariate Correlations, and Alpha Coefficients

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. Attitude	4.15	1.33	(.88)							
2. Subjective norm	3.78	1.26	.52*	(.89)						
3. PBC	4.71	0.79	.28*	.33*	(.56)					
4. Self-identity	3.73	1.70	.40*	.43*	.26*	(.79)				
5. Prototype favorability	4.14	0.60	.26*	.25*	.11	.40*	(.75)			
6. Prototype similarity index	5.43	0.63	.19*	.20*	.14*	.31*	.58*	(.79)		
7. Intention	3.78	2.04	.51*	.69*	.45*	.55*	.25*	.24*	(.92)	
8. High-level mobile phone use	3.73	2.27	.40*	.57*	.40*	.40*	.12	.16*	.76*	–

Note: Means in the current study are based on 7-point scales (ranging from 1 to 7), apart from prototype similarity, which reflects the difference between items scored on 7-point scales. PBC = perceived behavioral control. *$p < .05$.

behavioral correlate. Almost all correlations among the TPB variables were significant. Between prototypical identity and self-identity variables, low but significant correlations (rs = .31–.40) were found, indicating that the measurement of prototypical identity influences was somewhat, but not strongly, related to self-identity. Furthermore, low to moderate correlations were found between the identity influence variables and TPB criterion variables of intention and behavior.

Analysis Predicting Behavioral Intentions Including Self- and Prototypical Identity Variables

We performed a hierarchical multiple regression analysis with the intention to use a mobile phone at least 12 times a day in the next week as dependent variable and the independent variables attitude, subjective norm, and PBC in Step 1 and self- and prototypical identity in Step 2. The linear combination of the TPB predictors significantly accounted for 55.5% (54.9% adjusted) of the variance in intention (see Table 2). All three variables were significant predictors. Contrary to the findings of Walsh and White (2007), subjective norm emerged as the strongest predictor of intention, followed by PBC, and attitude. Therefore, participants who report a positive attitude toward high-level mobile phone use, perceive important others' approval for high-level mobile phone use, and perceive control over factors preventing high-level mobile phone use are more likely to intend to engage in high-level mobile phone use. These findings provide support for *Hypothesis 1*. As predicted, the addition of identity variables in Step 2 significantly accounted for an additional 5.2% of variance in intention. This result clearly supports *Hypothesis 2*. However, of the identity variables, only self-identity reached a level of significance, thus becoming the strongest identity predictor of high-level mobile phone use intention ($\beta = .26$, $p < .001$). Neither prototype similarity ($\beta = .04$, $p = .44$) nor prototype favorability ($\beta = -.05$, $p = .33$) were significant predictors of intention. Therefore, our results do not support *Hypothesis 3*.

Mediation Analysis

The relations between prototype similarity and self-identity (*Hypothesis 4*) were tested by conducting a mediation analysis. Following the procedure outlined in Baron and Kenny (1986), we estimated three regression equations to test the mediational model of self-identity completely mediating the influence of prototype similarity on intention to engage in high mobile phone use (see Figure 2). First, we regressed self-identity on prototype similarity, showing a significant influence ($\beta = .31$, $p < .001$). Second, we regressed intention on self-identity ($\beta = .55$, $p < .001$). Finally, as can be seen in Table 2, we performed a hierarchical regression analysis of intention entering

Table 2. Hierarchical Multiple Regression Analyses Testing the Role of standard TPB variables, and Self- and Prototypical Identity Influences on Intention to Engage in High-Level Mobile Phone Use and on the Actual Mobile Phone Use

Variable	R	R^2	$R^2\Delta$	*F*	*df*	β_{step1}	β_{step2}	β_{step3}
Prediction of intention								
Step 1	.75	.56	.56	87.828***	3,211			
Attitude						.18**	.13*	
Subjective norm						.52***	.45***	
PBC						.22***	.19***	
Step 2	.78	.61	.05	9.090***	3,208			
Self-identity							.26***	
Prototype similarity							.04	
Prototype favorability							−.05	
Mediation on intention								
Step 1	.24	.06	.06	12.444**	1,213			
Prototype similarity						.24*	.07	
Step 2	.55	.31	.25	76.311***	1,212			
Self-identity							.53***	
Prediction of behavior								
Step 1	.71	.50	.50	104.860***	2,212			
Intention						.68***	.60***	.62***
PBC						.05	.05	.05
Step 2	.71	.51	.01	2.038	2,210			
Attitude							−.03	−.01
Subjective norm							.14*	.15*
Step 3	.72	.51	.00	.703	3,207			
Self-identity								−.03
Prototype similarity								−.02
Prototype favorability								−.05

Note. PBC = perceived behavioral control. *$p < .05$. **$p < .01$. ***$p < .001$.

prototype similarity in step 1 ($\beta = .24$, $p < .01$) and self-identity in Step 2 with prototype similarity becoming insignificant in Step 2 ($\beta = .07$, $p = .25$). Taking into account the above-mentioned results, it can be concluded that the influence of prototype similarity on intention is completely mediated by self-identity (see Figure 2). This finding clearly confirms *Hypothesis 4*.

Analysis Predicting Behavior Including Identity Variables

We performed a series of hierarchical regression analyses to examine the effect of intention, PBC and identity variables on high-level mobile phone use. In Step 1, we entered intention and PBC. In Step 2, attitude and subjective norm were included to confirm that the effects of these variables on behavior are mediated via intention. In Step 3, we entered self-identity and prototype predictors. The results are shown in Table 2. The linear combination of intention and PBC significantly accounted for 49.7% (49.3% adjusted) of the variance in high-level mobile phone use, with only intention ($\beta = .62$, $p < .001$) becoming significant. Although the addition of attitude and subjective norm in Step 2 did not significantly improve the prediction of high-level mobile phone use ($F = 2.038$, $p = .13$), subjective norm contributed significantly to the model ($\beta = .14$, $p < .05$). Thus, intention did not emerge as the only significant predictor of high-level mobile phone use. Furthermore, the addition of self-identity and prototype predictors in Step 3 did not improve the prediction of high-level mobile phone use. According to these findings, individuals who intend to use their

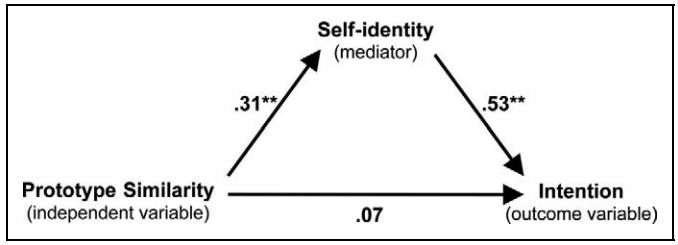

Figure 2. Mediational model. The relations between prototype similarity and intention are mediated by self-identity.
Note. The labels of the arrows represent the standardized regression coefficients.
*$p < .01$.**$p < .001$.

mobile phone at least 12 times a day and who perceive important others' approval for high-level mobile phone use are more likely to engage in high-level mobile phone use. Thus, *Hypothesis 5* can only be partially supported, as intention and subjective norm but not PBC predicted behavior.

Discussion

The aim of the current study is to identify the key determinants of high-level mobile phone use in a high-coverage target group. It examines the effects of the standard TPB variables and the role of identity measures on predicting both the intention to engage in the target behavior (i.e., high-level mobile phone use) and the actual behavior. This was done by replicating the study by Walsh and White (2007). However, the current study introduced some modifications in methodology and sampling compared to its Australian counterpart. The main differences refer to the pilot study that was conducted prior to the first wave of data collection. First, the level of mobile phone use has been elicited, resulting in a much higher cutoff score for high-level mobile phone use (score: 12) compared to the score used in the Australian study (score: 5; Walsh & White, 2007, p. 2413). Second, when selecting the adjectives to describe typical mobile phone users in the first questionnaire, more extreme descriptors (positive and negative) of prototypical mobile phone users have been chosen to get a wider range of responses from participants and subsequently improve the assessment of prototype favorability. Finally, a more balanced sample was drawn (42% male, 62% students of psychology), compared to the Australian study by Walsh and White (25% male, 100% students of psychology).

Discussion of Hypotheses

Hypothesis 1. In line with the Australian study (Walsh & White, 2007), the results of the current study support the usefulness of Ajzen's (1991) original TPB in the prediction of behavioral intention in that attitude, subjective norm, and PBC were all positively and significantly related to the behavioral intention to engage in high-level mobile phone use. In contrast to the replicated study, subjective norm, but not PBC, turned out to have the highest effect size among the TPB variables by far. Attitude and PBC had similar smaller effects. Similar to the Australian study, TPB accounted for a larger proportion of variance in behavioral intention (55.5% compared to 59.7% in Walsh & White, 2007, p. 2420) than the average amount of variance (39%) found by Armitage and Conner (2001a, p. 481) in their meta-analysis of TPB studies. These findings indicate that the TPB is particularly useful for the prediction of the intention to engage in high-level mobile phone use.

Hypothesis 2. Concerning the role of identity influences, support was found for *Hypothesis 2*, as the inclusion of identity influences in the TPB significantly improved the prediction of

high-level mobile phone use intentions, accounting for additional 5.2% of the variance. The amount of additional variance explained was virtually the same as in Walsh and White (5.6%, 2007, p. 2421). In contrast to the Australian study, self-identity was the only significant identity influence variable in the prediction of intention as prototype similarity did not reach statistical significance. Self-identity, however, turned out to be the second best predictor (after subjective norm) in the overall TPB plus identity model, documenting the central importance of self-identity in predicting intention to engage in high-level mobile phone use. Thus, our results clearly support the inclusion of self-identity as an additional predictor in the TPB.

Hypothesis 3. A further aim was to improve the measurement of prototype favorability by using more extreme descriptors of a prototypical mobile phone user, as suggested by Walsh and White (2007). As mentioned above, in spite of our efforts, neither prototype favorability nor prototype similarity showed a significant influence on intention. A possible reason for this result could lie in the conspicuous nature of mobile phone use. Because mobile phones are often used publicly, social components could become salient in the comparison of the self-concept to the stereotypic user. The high importance of subjective norm in the current study has already confirmed the relevance of social factors when it comes to mobile phone use. A possible theoretical framework for future studies investigating this issue could be Sirgy's (1982, 1985) self-congruity theory which—apart from actual self-image congruity (i.e., prototype similarity), which was used in the current study—also differentiates between ideal, social, and ideal social self-image congruity where the closeness of the typical product user is compared to how users would like to see themselves, how they believe they are seen by significant others, or how they would like to be seen by significant others, respectively. Moreover, mobile phone users might have certain motives to change their actual behavior (i.e., seeking self-image incongruity) because they are curious and seek innovation or because they simply want to reduce their high-level mobile phone use. All these aspects should be taken into consideration by future studies. Another explanation may be found in the high prevalence of mobile phone use in Austria. According to the RTR-GmbH (2008), there are more mobile phones in use than people living in Austria (i.e., mobile phone penetration in Austria has reached 122% in the second quarter of 2008). Thus, virtually everyone is a mobile phone user and it may have been difficult for the participants to imagine what prototypical mobile phone users would be like, when they were asked in the questionnaire by assigning typical characteristics to them. Therefore, it is likely that prototypical images are less important in populations with higher mobile phone density than in populations with lower mobile phone density, because the distinction between a prototypical mobile phone user and an average mobile phone user becomes blurred. The relatively small standard deviations of prototype similarity and prototype favorability in relation to the corresponding means (see Table 1) may support this assumption.

Hypothesis 4. The current study sought to explore whether prototype similarity is mediated by self-identification as a behavioral performer. We found support for the assumption that similarity to a prototype influences behavior via self-identity. This indicates that individuals who perceive that they possess the characteristics of a typical behavioral performer are more likely to intend to engage in the behavior when the behavior forms part of their self-identity. Thus, the mediating effect of self-identity between prototype similarity and intention could be explained if prototype similarity is located on the same level as behavioral, normative, and control beliefs (see Figure 1). Further research should shed light on possible explanations for these findings regarding high-level mobile phone use.

Hypothesis 5. In line with the results of Walsh and White (2007), intention, but not PBC, significantly predicted high-level mobile phone use (explained variance 49.7%). However, in contrast to expectations of the TPB and the study by Walsh and White, a further variable reached statistical significance in predicting behavior in the current study, namely subjective norm

(contributing an additional 1.0% of variance). The TPB cannot explain this, because it expects that only intention and PBC can have a direct effect on behavior. Subjective norm, however, can only influence behavior through the mediating variable of intention. Contrary to expectations, the findings of our study propose that subjective norm can influence behavior both indirectly via intention and directly without being mediated by intention. The effect of PBC on behavior, in contrast, seems to be completely mediated by intention.

In our study, the overall model explained about the same amount of variance as in the Australian study (50.7% compared to 51.4% in Walsh & White, 2007, p. 2422), with subjective norm, instead of PBC, taking the role of significantly predicting behavior. Although only partial support was found for the use of the TPB in the prediction of high-level mobile phone use as intention and subjective norm, but not PBC, significantly predicted behavior, our results indicate that the TPB is able to provide a valid prediction for high-level mobile phone use, at least in industrialized countries.

Overall Discussion

The findings of the current study have three major implications. First, Ajzen's (1991) standard TPB was able to account for a substantial proportion of the variance in both intention (explained variance 55.5%) and behavior (explained variance 49.7%) in terms of high-level mobile phone use. Apart from a few minor inconsistencies, the results confirm the usefulness of the TPB in the prediction of high levels of mobile phone use. The inclusion of identity variables in the prediction of intention yielded another 5.2% of explained variance. Our results therefore clearly support the inclusion of self-identity as an additional predictor in the TPB. Because the target behavior in the current study was high-level mobile phone use and not the full range of mobile phone use intensities, it can be assumed that effect sizes have been attenuated. Viewed from this perspective, it is very likely that our results have underestimated the true results, rendering the results the lower limit of what might be predictable.

Second, the current research found results both consistent and inconsistent with the replicated Australian study (Walsh & White, 2007). Although the amount of explained variance was similar in the prediction of intention and behavior, both studies yielded somewhat different results concerning the prominence of the predictor variables. Although PBC was the most important predictor of intention and intention the only significant predictor of behavior in the Australian study, in the current study subjective norm was the most important predictor of intention and both intention and subjective norm were significant predictors of behavior. It can be concluded that the findings of the current study suggest that subjective norm does not only play a highly important role in predicting intention to engage in high-level mobile phone behavior but also in predicting the actual behavior. These results become even more interesting when they are compared to the previous research, where subjective norm was found to be the weakest predictor of intention in the TPB (Armitage & Conner, 2001a). This discrepancy could be explained by the social nature of mobile phones as communication devices, by the presumably high social integration of university students and by the high mobile phone penetration in Austria. Regarding identity influences, in our study only self-identity reached statistical significance whereas in the study by Walsh and White also prototype similarity played a significant role in the prediction of intention.

Third, the current study revealed subjective norm and self-identity as the key determinants for intention to engage in high-level mobile phone use, and intention as the key determinant for high-level mobile phone use. We think this is of special interest for researchers conducting mobile surveys, seeking to better reach their target group, because information gathered by this study helps to understand the underlying psychological mechanisms of high-level mobile phone use in a high-coverage target group. Apart from that, our findings could be beneficial regarding the modification

of problematic mobile phone use. Our findings suggest that particularly subjective norm and self-identity might be promising targets for the development of persuasive strategies and other interventions aimed at reducing inappropriate and problematic use of mobile phones (e.g., using mobile phones while driving; see Bianchi & Phillips, 2005 for more information).

Limitations

Although we tried to account for suggestions made by Walsh and White (2007), such as drawing a more balanced sample, developing more extreme adjectives to describe prototypical mobile phone users, and using more than one item for prototype favorability, there are still a number of limitations to the current research. First, the use of self-report measures to assess the level of mobile phone use may not have been a reliable method of measuring the actual use. Although additional questions were incorporated into the study to validate participants' reported use, using a diary method or reviewing mobile phone accounts may have provided more accurate data. Second, the sample of the current study was limited to an age group of around 24 years. Future research using non-student populations with equal numbers of participants in various age groups could help in further understanding mobile phone use across age groups, and identify whether the effects of self- and prototypical identity on behavior differ by age (Walsh & White, 2007). Third, the current study does not provide any information on the proportion of different types of mobile phone use. It may be found, that simple communicational activities are less influenced by prototypical identity variables than activities requiring higher technical standards, such as watching TV or using the Internet over the mobile phone.

Authors' Note

The authors wish to express their gratitude to Shari P. Walsh of Queensland University of Technology for providing additional information which allowed us to replicate the Australian study and also served as the basis for comparisons with our current study.

Declaration of Conflicting Interest

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

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