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An English scale for measuring mobile phone appropriation: Translation and assessment

Englische Übersetzung und Bewertung einer Skala der Mobiltelefonaneignung

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Abstract: The mobile phone appropriation (MPA) scale, originally developed in German, was translated into and adapted to English and initially validated through a confirmatory factory analysis (CFA) in this study. First, the theoretical background of the MPA model is briefly introduced, followed by explanations regarding the process of translating the original German scale into English (and its back-translation). English data CFA results are discussed in comparison with the CFA results from the most recent German data. The results indicate that the English MPA scale has promising validity. The addition of measurement items for the usage of web applications in the English and German MPA scales is expected to contribute to ongoing research efforts of comparing mobile phone appropriation patterns with and across different social and cultural groups in English-speaking contexts.

Keywords: Mobile phone appropriation, English scale, confirmatory factor analysis, validity.

Zusammenfassung: Die Mobile Phone Appropriation Skala (MPA-Skala), die ursprünglich in deutscher Sprache entwickelt worden war, wurde ins Englische übersetzt und angepasst und in dieser Studie durch eine konfirmatorische Faktorenanalyse (CFA) validiert. Nach einer kurzen Erläuterung des theoretischen Hintergrunds des MPA-Modells wird der Prozess der Übersetzung (und Rückübersetzung) beschrieben. Die Ergebnisse der CFA der englischen Skala werden im Vergleich mit Befunden einer CFA der aktuellsten deutschen Daten diskutiert, wobei sich die Validität der englischen MPA-Skala als vielversprechend erweist. Durch die Erweiterung sowohl in der englischen als auch in der deutschen Skala um Items zur App-Nutzung kann die Skala auch weiterhin zur Untersuchung von Aneignungsmustern der Mobilkommunikation in und zwischen verschiedenen kulturellen Gruppen im englischsprachigen Kontext dienen.

Keywords: Aneignung mobiler Kommunikationsdienste, englische Skala, konfirmatorische Faktorenanalyse, Validität.

1. Introduction

Research on the appropriation and usage of mobile technologies has evolved at a great pace during the past fifteen years, drawing on a large variety of theoretical concepts and research methods. While this variety and openness in the area of mobile communication research has proven productive in exploring social, psy-

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chological, and cultural dimensions of mobile communication, voices calling for theoretical and methodological consolidation have started to grow louder (Hjorth, Burgess, & Richardson, 2012). In response to this call, methodological standardization permits comparisons of research findings across different social and cultural contexts over time (e.g., Katz, Aakhus, Kim, & Turner, 2003; Katz & Sugiyama, 2006), as well as theory building, and helps to put different empirical findings into perspective.

One approach for combining both theory building and methodological standardization is the mobile phone appropriation (MPA hereafter) model proposed by Wirth, von Pape, and Karnowski (2008). This model is comprehensive in terms of incorporating theories from different research paradigms of both qualitative and quantitative traditions. Overcoming the prevalent linear modeling of technology adoption, the MPA model allows researchers to grasp a wide spectrum of mobile phone uses and to integrate personal, social, and technological influence factors.

The MPA model was developed and its scale was first tested in Germany, using the German language MPA scale (von Pape, Karnowski, & Wirth, 2008). The current study aims to translate the original German MPA scale into English, and validate the English scale. Once validated, the English version scale will widen the access to the MPA scale for mobile communication scholars since English is the most frequently used language in academic writing (Genç & Bada, 2010). By utilizing the translated scale, more research can be conducted for testing the MPA model in various social contexts and groups. Cumulative research findings from multiple tests of the model will ultimately contribute to theory building in the mobile communication area. Additionally, the translated scale adds items for measuring usage of downloadable applications to the original instrument from 2008. This addition was inevitable and much needed due to the technological changes that have occurred over the past years.

The first section of this paper introduces the MPA model and its main theoretical constructs, as well as the original German scale measuring those constructs. The second section is dedicated to explaining the process of translation and development of the new, English version of the MPA scale and its evaluation using a sample of the United States (US) college students. The third section presents the results of the confirmatory factor analyses (CFAs) conducted on the English scale with a US sample. In addition, the results of CFA on the German data are provided for comparison. The discussion section outlines new opportunities for research that the translated MPA scale permits, such as exploring cultural differences in mobile phone adoption and usage patterns.

2. Theoretical background of the MPA model

2.1 MPA model

The MPA model (Wirth et al., 2008) integrates the concept of technology adoption as known from diffusion of innovations (DOI; Rogers, 2003) research and the theory of planned behavior (TPB; Ajzen, 1991), with other more finely-grained conceptualizations of the ways in which users implement technological

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innovations into their daily lives. Wirth et al. (2008) subsume these other approaches under the term "appropriation paradigm" (p. 602). Taken from cultural studies (Hall, 1980; de Certeau, 1980), the term "appropriation" emphasizes that the users actively co-construct the meaning of any media product (e.g., a journalistic article or any other media text in the widest sense) during the process in which they fully own the media product by integrating it into their everyday lives. In direct reference to these origins, the domestication approach (Silverstone & Haddon, 1996) provides a framework to study how new communication technologies are being shaped through their integration into a spatial and temporal context and how this process is being negotiated symbolically among users.

Wirth et al. (2008) also count other approaches that have shed light on technology implementation into the domestication paradigm, such as frame analysis (Goffman, 1974) and the uses-and-gratifications approach (UGA; Katz, Blumler, & Gurevitch, 1974), even if they make no direct references to the term of "appropriation." With more distinctive conceptualization of what users do with new communication technologies, these approaches overcome the "binary logic of adoption" (Karnowski, von Pape, & Wirth, 2011) on which DOI and TPB are based. For example, they respond to a major shortcoming of DOI: while Rice and Rogers (1980) acknowledge through the concept of "reinvention" that users do more than just "adopt" innovations in a single decision, they are unable to further explore the phenomenon within the tight conceptual limitations of DOI (von Pape, 2009). Approaches within the appropriation paradigm achieve this higher level of distinction, but they often rely on more qualitative research methods – with the exception of UGA studies, which often follow up on qualitative exploration with quantitative surveys aiming to identify statistically latent factors of gratifications. Without such quantitative operationalization, the findings of most appropriation studies are more difficult to generalize than those issued from the highly quantitative DOI and TPB studies within the adoption paradigm. The MPA model integrates both paradigms (i.e., adoption and appropriation) and aims their operationalization towards a higher level of standardization so that data can be collected with large samples through standardized scales.

To this end, the MPA model was conceived as an extension of TPB (Ajzen, 1991), explaining human behaviors through behavioral, normative, and control beliefs. However, the MPA model extends TPB in order to grasp the multiple aspects of mobile phone appropriation. As such, the MPA model posits that mobile phone uses are influenced by functional, symbolic, normative, and restriction evaluations (see four boxes in the middle in Figure 1). The following section briefly explains the basic theoretical assumptions of the MPA model and illustrates how the model is distinguished from TPB.

First, the MPA model considers appropriation to be a creative and active process, resulting in various usage patterns by individual mobile users. Consequently, behavior is differentiated in several sub-constructs in the MPA model (see box on the right in Figure 1). Mobile phone usage behavior comprises object-related, symbolic, and functional aspects. The object-related aspects include dimensions of fashion (e.g., ring tones and accessories), handling of the device and phone calls received in a social setting, and the general usage frequency of different function-

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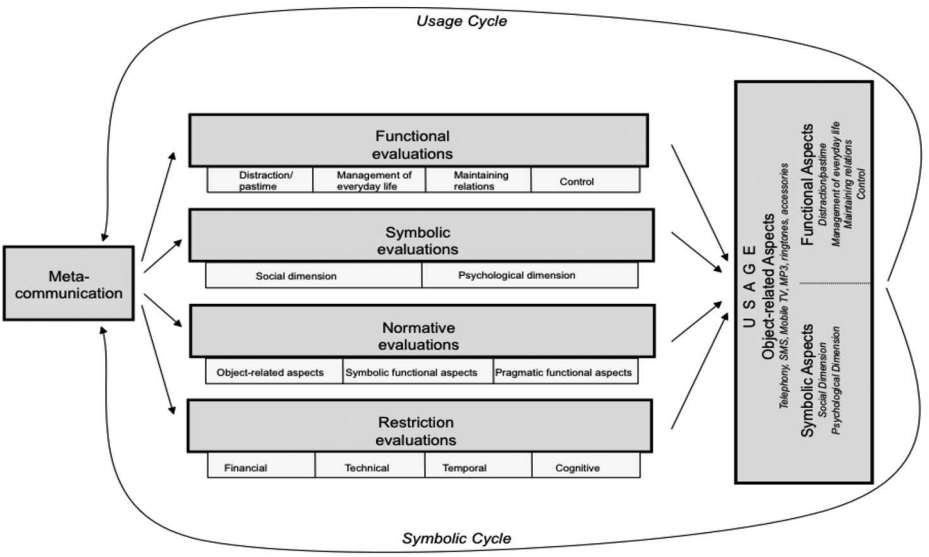
alities, such as voice calling, text messaging, and web-based applications. The functional aspects represent the large variety of mobile phone uses highlighted by appropriation and UGA research findings (e.g., distraction, the management of everyday life, relationship maintenance; see Höflich & Rössler, 2001 and Leung & Wei, 2000 for various motivations of mobile phone uses).

Figure 1: The MPA model



Source: Wirth et al., 2008, p. 606.

Second, the MPA model takes into account the symbolic value of the mobile phone as an object itself as well as how it is used (e.g., display of social status, expression of self-identity; Leung & Wei, 2000). Therefore, an additional layer to object-related and functional usage was considered in the MPA model (see the box on the right, "Symbolic Aspects" in Figure 1). Through this addition of symbolic aspects of mobile phone appropriation, both social and psychological, the model captures the concept and extent of observability (Rogers, 2003) of mobile devices, making the choice and use of mobile phones a continuous statement about oneself in public (Katz & Sugiyama, 2006).

Third, the model reshapes the theoretical constructs of behaviors that influence technology usage (see boxes in the middle in Figure 1). According to the classification of behaviors into various sub-dimensions, behavioral beliefs are differentiated between functional and symbolic evaluations, that is, the user's beliefs about the functional and symbolic aspects of their future mobile phone-related behaviors. Normative evaluations refer to the users' beliefs and judgments about the social norms and ethics related to their future mobile-related behavior (Ajzen, 1991). Restriction evaluations represent users' beliefs about different types of constraints that hinder their future mobile phone-related behaviors, such as cost and technical skills.

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Fourth, the MPA model integrates the impact of communication about communication technologies into the appropriation process of mobile technologies: meta-communication (see box on the left in Figure 1). Mass communication, interpersonal communication, and observation of others' mobile phone usage are all considered to be distinctive forms of meta-communication. Hence, behavioral, normative, and control beliefs as well as symbolic evaluations are negotiated via communication among mobile users, producers, and in mass media. Consequently, the MPA model is conceptualized as a cycle, with appropriation being a constantly renewed process. Pragmatic and symbolic mobile uses are not only the results of behavioral, normative, or control beliefs, but also become the bases of those beliefs (Ouellette & Wood, 1998).

For this reason, the MPA model was built as a circular model, connecting latent constructs, such as perceived social norms, perceived restrictions, or usage patterns. Following the logic of Lazarsfeld and Henry (1968), these latent constructs cannot be measured directly. Hence, reflective scales are needed to do so, which means, from a methodological standpoint, the MPA model and its associated measurement scales capture a reflective measurement process (Coltman, Devinney, Midgley, & Venaik, 2008; Rossiter, 2002). The latent factors of the model are conceptualized to influence (i.e., cause) the items developed for their measurement.

Taken as a whole, the MPA model allows identifying and explaining various patterns of mobile phone use. Researchers have tried to integrate TPB, TAM (technology adoption model), and UGA approaches into building their own model of technology adoption and found significant relationships between users' perceived needs, ease of use, resource availability, and usage behaviors respectively (Mohebbi, Khatibi, & Keramati, 2012; Park, 2010). The MPA model is distinctive from the previous research in its inclusion and emphasis of symbolic aspects of evaluations and usage of technology, which was rarely considered before, and only partially captured by a single theoretical construct of "image" in Mohebbi et al.'s proposed model. Similar to cultural studies' approach (Hall, 1980; Silverstone & Haddon, 1996) and social learning theory (Bandura, 1977, 1986), the MPA model highlights the importance of taking into account both users' creative input in the process of adoption, which is not always planned in advance, thus distinctive from TPB, and meta-communication about appropriation of new communication technologies. Figure 1 illustrates the MPA model, including the aforementioned theoretical components and their consisting constructs.

2.2 The German MPA scale

The original German MPA scale was developed and initially assessed by von Pape et al. (2008). The scale originally contained 119 items and was assessed with a combined sample of German respondents. A total of 161 participants completed an online survey using a portal for mobile communication, while 110 students completed a pencil-and-paper questionnaire. Internal consistency tests were performed using Cronbach's alpha (Clark & Watson, 1995). As a result, the number

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of items was reduced to a total of 85 by an exclusion of redundant and inconsistent items.

The reduced version of the scale was then tested in a German-speaking context in April and May 2006 with a sample of 842 individuals (von Pape et al., 2008). Participants' demographics were as follows: 58.9 percent were males and 41.1 percent were females, with an average age of 20.7 years (*SD* = 5.6). About 78 percent of the respondents were students, and 18.7 percent of the respondents were employed adults. The remaining 3.4 percent of respondents were unemployed, homemakers, or retired. This latter version of the German scale, with a total of 85 items, was translated into English in 2011. The process of translation is explained in the following section.

2.3 The English MPA scale

The English MPA scale was first translated from German by a professional translator. The first author of the current study was consulted for clarification whenever necessary, and she further consulted the second and third authors (who are native speakers of German and fluent in English) during the process of translation. To reflect the widespread adoption of downloadable mobile phone applications since the establishment of Apple's App Store in the summer of 2008, a total of thirteen measurement items were added to the English scale (which had been developed before the App Store was introduced). As the MPA model is generally conceived to abstract from the particularities of any specific type of phone, the necessary changes were limited to the very descriptive construct of object-related use. Existing measures, such as frequency and length of phone conversations, were thus complemented by 12 items measuring the frequency of application-related activities such as web browsing, writing emails, and searching information through the smartphone, with a scale from 1 (never) to 5 (very often). One additional item asked for the total number of applications currently downloaded to the phone. Also, English MPA scale included one extra item measuring usage of mobile phones for relationship maintenance (i.e., I use my cellphone to always stay connected with my best friends) for improvement of construct reliability. In the appendix, we provide the complete 98-item MPA scale.

To establish the validity of the MPA scale translation in its semantic, conceptual, and normative equivalence between the German and the English version, another bilingual (i.e., German and English) translator was hired to back-translate the English scale into German. Although the back-translation had not been performed before data collection using the English scale, we determined that it was a necessary procedure to ultimately validate the translated scale (Behling & Law, 2000; Harkness, Pennell, & Schoua-Glusberg, 2004). The back-translated German scale was then compared to the original German scale, item by item.

The main difference we found between the back-translation and the original MPA scale was the wording of the second-person subject, namely *you*: The original German scale used an informal version, *Du*, whereas the German back-translation was done using a formal version, *Sie*. The German language distinguishes between the formal and informal version of the second-person subject, whereas

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the modern English language does not differentiate between the formal and informal *you*. In order to make sure that this difference did not originate from the perception of different social and cultural norms of the relevant countries (i.e., Germany and the U.S.), we asked the back-translator for details about her word choice. She explained that when faced with a choice between formal and informal language, it seemed more appropriate to choose a formal version for survey questionnaires used in public research. Even if the original German scale had used an informal version, *Du*, the translation into English of that word would have been the same, *you*. Therefore, the difference in the formality of the second-person subject in the German survey most likely would not have influenced English-speaking respondents' understanding of the questionnaire.

There were a few other differences identified between the first translation (i.e., from German to English) and the back-translation (i.e., from English to German). For example, an item such as "It is important to me to always stay in touch with my friends" was intended to have a general meaning in the original German scale (i.e., "Es ist mir wichtig, mich meinen engsten Mitmenschen immer nahe zu fühlen"). When it was translated from English to German (i.e., "Mir ist es wichtig immer mit meinen Freunden in Kontakt zu sein/bleiben"), however, the authors found the back-translation used more specific words such as "Freunden in Kontakt" to describe actions such as "staying in touch." The original German scale used "Mitmenschen immer nahe zufühlen," instead, which has a more general meaning of maintaining contacts. Another scale item, "I use my cell phone for entertainment," also showed a slight shift in meaning when translated from English back to German. The authors found that the original German item (i.e., "Ich nutze mein Handy zum Zeitvertreib") was closer in its meaning to one's use of a cellular phone for pastime and diversion, but the back-translation (i.e., "Ich benutze mein Handy zur Unterhaltung") used a slightly different and more ambiguous term, rather highlighting the aspects of entertainment and diversion. Thus, it is possible that the distraction aspect of mobile phone usage was perceived to be weaker than originally intended, compared to the fun and playful aspect, when English-speaking participants were taking the survey. Nevertheless, the authors, upon reviewing all the differences between the original and the back-translated scale, concluded that those differences were, overall, minimal. Therefore, those differences did not seem to have influenced the process of data collection in significant ways, despite the back-translation being performed post hoc data collection.

3. Validation of the English MPA scale and comparison with the German data

3.1 Samples

The English MPA scale was evaluated with a sample of 230 students enrolled in four introductory communication courses at a large northeastern university in the U.S. Fifty-nine percent (n = 135) of students were females and 41 percent (n = 93) were males. Two students did not report their sex. Participants' average age was 20.2 years old (SD = 2.1) and 59.1 percent (n = 130) of them had a monthly disposable income of less than $500, including allowances from family sources.

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About 24 percent of participants (n = 52) reported monthly income of $500 to $1000; 6.1 percent reported $1000 to $1500, and the rest, 10.9 percent reported above $1500. Participants were majoring in social sciences (38.2%; n = 87), humanities (23.2%; n = 53), and business/management/labor studies (23.2%; n = 53). Approximately 15 percent of respondents were majoring in other subject areas, such as engineering, pharmacy, and nursing. About 44 percent (n = 101) of students reported they worked either full- or part-time; their jobs ranged widely, from cashiers and servers to a call-center supervisor and a bank teller. However, most of them worked in customer service. Despite the demographic diversity of the survey participants, those who volunteered to participate in the study did not constitute a representative sample of the U.S. college students due to the nature of convenience sampling.

Participants completed an online survey, which was available from late November till early December 2011. The survey was hosted on a professional survey platform (i.e., surveymonkey.com). Participants were first asked to provide consent, then answer questions assessing the MPA scale dimensions. At the conclusion of the survey, participants were asked to provide demographic information. Participants received extra credit as compensation for research participation. All survey items were measured with 5-point Likert-type scales (e.g., 1 = *strongly disagree*, 5 = *strongly agree*), except for the items measuring the actual time spent on mobile communication and number of web applications downloaded. Initially, a total of 319 respondents participated in the online survey, but for the main analysis, we chose to omit responses with large amount of missing data. All research procedure was approved by the Institutional Review Board (i.e., a research ethics committee) of the first author's university at the time of data collection.

Due to the rapid changes in the mobile media ecology (see Bold & Davidson, 2012) that took place during the five years between the original assessment of the German scales in 2006, and the testing of the English scales in 2011, the comparability of these two datasets was questionable. We, therefore, retested the German scales – enhanced by the items on web-based applications usage via mobile phones described above – on a convenience sample of German users in February 2012. Importantly, our goal for this study was not to conduct a cross-cultural comparison of the MPA model, but rather to use the German data as an anchor point for interpreting and examining the English data and to understand whether the results obtained with the U.S. data were appropriate. Participants were recruited via banners on the website of a German TV music channel. The average age of participants was 22.1 years (SD = 8.5). About sixty-four percent (n = 519) of participants were females and the rest (35.6%; n = 287) were males. The biggest portions of the German participants (77.9%; n = 628) were university students, 18.7 percent (n = 151) were employed, and 3.4 percent (n = 27) had other occupations.

3.2 Initial analyses

Prior to analyses, in the English data, a visual inspection of the retained cases revealed that missing values for each variable had occurred randomly throughout the dataset; they were, therefore, imputed with the series-mean (IBM SPSS Missing

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Values 22, 2013). Initial analyses were conducted on both the English data set and the 2012 German data set introduced in the samples section. First, we examined the strength and direction of the correlations between each item in a subscale and the other items in the same subscale. We also examined how strongly items in subscales of the same dimension (e.g., all items in the meta-communication dimension) correlated. Inter-item correlations provided information about convergent validity (DeVellis, 2003). In the English data of the normative evaluations scale, 25 out of the total 91 correlations were not significant. In all other subscales, items correlated significantly with the other items measuring the same dimension. In the German data, the normative evaluations scale revealed a similar issue: 21 of the 91 correlations were not significant. All other items correlated significantly with the remaining items in their respective subscales. We flagged problematic items and examined them in corroboration with Cronbach's alpha scores and confirmatory factor analyses results to decide whether they should be dropped.

Second, we conducted reliability analyses by examining Cronbach's alphas, which provided information about construct reliability (DeVellis, 2003). We relied on Cronbach's alpha (as opposed to other reliability estimates, such as omega) given its widespread adoption in the literature and likelihood that it would provide other researchers a helpful baseline. Results are included in Table 1 for both English and German data. Comparing reliabilities side by side revealed that English scale reliabilities were higher in the majority of cases than their German counterparts. Table 1 also provides descriptive statistics for each variable in the model.

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Table 1: Reliabilities for English and German data

	English data (N = 230)							German data (N = 806)					
	No. of items	*M (SD)*	S/K	Alpha/ S-B Coef.	Revised items	Revised alpha	Coef. *H*	No. of items	*M (SD)*	S/K	Alpha/ S-B Coef.	Revised items	Revised alpha
MC interpersonal	5	2.78 (0.73)	0.44/-0.03	.79		N/A	.81	5	2.35 (0.82)	0.43/-0.44	.77		N/A
MC mass media	5	2.64 (0.78)	0.39/0.05	.77		N/A	.74	5	2.91 (0.84)	-0.16/-0.50	.67		N/A
MC observation	5	3.09 (0.77)	0.07/-0.15	.80		N/A	.80	5	3.26 (0.83)	-0.32/-0.10	.62	4	.65
FV distraction	2	3.53 (0.68)	0.12/-0.18	.34		N/A	.40	2	3.47 (0.95)	-0.50/-0.12	.67		N/A
FV everyday organization	2	3.86 (0.62)	-0.62/1.05	.58		N/A	.64	2	3.88 (0.80)	-0.65/0.42	.65		N/A
FV relationship maintenance	2	3.77 (0.73)	-0.76/1.48	.62		N/A	.62	2	3.85 (0.87)	-0.65/0.14	.62		N/A
FV control	2	3.86 (0.80)	-0.83/0.86	.74		N/A	.77	2	4.22 (0.71)	-1.19/1.81	.50		N/A
SV psychological	5	3.48 (0.69)	-0.10/-0.10	.75		N/A	.80	5	3.23 (0.88)	-0.20/-0.41	.72	4	.72
SV social dimension	4	3.24 (0.66)	0.04/0.11	.65		N/A	.69	4	2.58 (0.95)	0.26/-0.58	.63		N/A
Normative evaluation	13	3.78 (0.55)	-0.69/2.10	.75	8	.79	.79	13	3.20 (0.88)	-0.08/0.22	.69	8	.72
Restriction evaluation	4	1.90 (0.62)	0.47/0.15	.64		N/A	.74	4	2.26 (0.82)	0.47/0.15	.59	3	.64
Use fashion	3	2.26 (0.78)	0.70/0.64	.72		N/A	.73	3	1.83 (0.85)	0.70/0.64	.68		N/A
Use handling	3	2.76 (1.12)	0.14/-0.98	.60	2	.75	.79	3	2.19 (0.97)	0.63/-0.14	.43	2	.50
Use applications	12	2.98 (1.14)	-0.42/-0.91	.30	11	.95	.95	12	2.40 (1.05)	0.21/-1.12	.21	11	.91
FA control	6	4.19 (0.72)	-0.93/1.27	.94		N/A	.93	3	4.21 (0.85)	-1.23/1.38	.82		N/A
FA distraction	3	3.86 (0.91)	-0.85/0.53	.91			.92	2	2.74 (1.31)	0.21/-1.12	.91		N/A
FA everyday organization	5	3.35 (1.02)	-0.32/-0.52	.81	3	.89	.91	5	2.85 (1.00)	0.08/-0.61	.81		N/A
FA relationship maintenance	5	4.07 (0.67)	-0.52/0.72	.88		N/A	.93	4	3.49 (1.06)	-0.47/-0.53	.85		N/A
SA social dimension	4	2.32 (0.78)	0.29/-0.45	.75		N/A	.76	4	1.95 (0.86)	0.94/0.54	.84		N/A
SA psychological	4	3.75 (0.94)	-0.52/-0.19	.89		N/A	.93	4	3.44 (1.05)	-0.29/-0.84	.74		N/A

Notes:
MC: Meta-Communication, FV: Functional Evaluations, SV: Symbolic Evaluations, FA: Functional Aspects of Usage, SA: Symbolic Aspects of Usage.
S/K: Skewness and Kurtosis
Alpha: Cronbach alpha
S-B coef: Spearman-Brown coefficients, calculated for two-item scales. Revised Cronbach's alphas were calculated after CFA for all except 'use of applications' for which the revised Cronbach's alpha was calculated by dropping item 2 (number of applications, which was not included in the CFAs either).
Coef. *H*: construct reliability of the latent factors, calculated post CFAs and based on standardized values from the overall models (see Table 3) where applicable.

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3.3 Confirmatory factor analysis

The next step of assessing the English MPA scale was to conduct a confirmatory factor analysis (CFA) on each individual scale and on subscales measuring the same dimensions, to examine the factor structure and dimensionality of the measures. A full measurement model offered combined fit indices and some information about each scale, but not full information about each scale. Therefore, we conducted individual scale CFAs to assess the structure of each scale (when possible) and subscales, in case future researchers may wish to use only parts of the full MPA scale. Table 2 presents the results of the CFAs on the English data. In addition, we also conducted a CFA on the 2012 German data for comparability. Table 3 includes the results of the German CFA. For both data sets, scales measured with two or three items could not be assessed individually (i.e., under-identified or just-identified models). Therefore, we assessed them along with other items in the same subscale. For example, the functional evaluations (FV in Table 2 and Table 3) of distraction, everyday organization, relationship maintenance, and control were each measured with two items. An overall model for functional evaluations with these four subscales combined was tested (i.e., FV overall in tables). Based on these overall models (where applicable), we computed the standardized path coefficients (included in the Appendix) for the English scales. We also calculated a second type of reliability for the English scale items, coefficient *H* (Hancock & Mueller, 2001). This index captures the reliability of the latent construct, not the observed items as Cronbach's alpha does. Hence, it can provide information about the relationship between a latent factor and the items that are supposed to measure it.

Analyses were conducted using the LISREL 9.20 program (Jöreskog & Sorbom, 2015), the maximum likelihood estimation method, the raw data (from which the program generated a covariance matrix), allowing latent factors to covary, and making the metric assumption by fixing paths from the latent factor to the first indicator to 1. Model fit was evaluated based on the criteria put forth by Hu and Bentler (1999). We relied on the comparative fit index (CFI) as an incremental fit measure, the root mean square error of approximation (RMSEA) as a parsimonious fit index, and the standardized root mean squared residual (SRMR) as an absolute index. According to Hu and Bentler (1999), the recommended values are: CFI ≥ .95, RMSEA ≤ .06, and SRMR ≤ .08.

Model fit was adequate for several scales in both the English and German data sets and improved for several others once modifications were implemented. These modifications consisted of dropping items in which the latent factor explained less than 10 percent of the variance or allowing errors of items that were phrased in a similar manner (i.e., overlapped in their meaning) to covary. Freeing error residuals when the correlation may be due to measurement is recommended in order to capture meaningful relationships that are justified based on measurement theory and to represent the latent variables accurately (Cole, Ciesla, & Steiger, 2007). For example, in the meta-communication (MC) of interpersonal scale (both English and German), the errors of items 2 and 3 were allowed to covary given the phrasing; item 2 asked "how often do you discuss with others about new applications…" whereas items 3 asked "how often do you discuss with

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Table 2: MPA confirmatory factor analyses fit indices (English data)

	Initial model fit						Model fit after modifications					
	X^2	*df*	*p*	CFI	RMSEA	SRMR	X^2	*df*	*p*	CFI	RMSEA	SRMR
MC interpersonala	45.51	5	.00	.90	.19	.08	29.86	4	.00	.94	.17	.06
MC mass media[b]	93.97	5	.00	.74	.28	.13	1.38	3	.71	1.00	.00	.01
MC observation[c]	18.43	5	.00	.96	.11	.05	8.30	4	.08	.99	.07	.03
MC overall[d]	206.29	83	.00	.91	.08	.07	N/A					
FV distraction	N/A – Under-identified model (2 items), fit indices not available											
FV everyday organization	N/A – Under-identified model (2 items), fit indices not available											
FV relationship maintenance	N/A – Under-identified model (2 items), fit indices not available											
FV control	N/A – Under-identified model (2 items), fit indices not available											
FV overall[e]	39.74	14	.00	.92	.09	.05	N/A					
SV psychological dimension[f]	18.95	5	.00	.95	.11	.06	7.91	4	.09	.99	.07	.04
SV social dimension[g]	38.74	2	.00	.75	.29	.10	0.13	1	.72	1.00	.00	.00
SV overall[h]	85.89	25	.00	.88	.11	.07	N/A					
Normative evaluation[i]	247.48	65	.00	.72	.11	.09	55.46	18	.00	.93	.10	.06
Restriction evaluation	2.69	2	.26	1.00	.04	.03	N/A					
Use fashion	N/A – Just-identified model, fit indices not available											
Use handling	N/A – Just-identified model, fit indices not available											
Use applications[j]	303.91	44	.00	.88	.16	.06	151.77	40	.00	.95	.11	.04
Use overall[k]	278.69	112	.00	.94	.08	.06	257.97	97	.00	.94	.09	.06
FA control[l]	434.46	9	.00	.73	.46	.12	15.81	5	.01	.99	.10	.01
FA distraction	N/A – Just-identified model (3 items), fit indices not available											
FA every organization[m]	140.58	5	.00	.77	.35	.15	N/A – Just-identified model, fit indices not available					
FA relationship maintenance	12.25	5	.03	.99	.08	.03	N/A					
FA overall[n]	242.47	109	.00	.96	.07	.05	N/A					
SA sociological dimension	13.16	2	.001	.95	.16	.04	N/A					
SA psychological dimension	0.05	2	.97	1.00	.00	.00	N/A					
SA overall[o]	44.10	19	.00	.97	.08	.05	N/A					

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Note: N = 230, MC: Meta-Communication, FV: Functional Evaluations, SV: Symbolic Evaluations, FA: Functional Aspects of Usage, SA: Symbolic Aspects of Usage.
[a] Revised model with an error covariance permitted between items 2 and 3.
[b] Revised model with an error covariance permitted between items 2 and 3 and between items 4 and 5.
[c] Revised model with an error covariance permitted between items 1 and 3.
[d] Includes interpersonal media-mediated, and observation together in a model, with the modifications implemented for each individual scale.
[e] Includes distraction, everyday organization, relationship maintenance, and control together in a model.
[f] Revised model with an error covariance permitted between items 1 and 3.
[g] Revised model with an error covariance permitted between items 3 and 4.
[h] Includes symbolic value psychological and social dimensions, together in a model, with the modifications implemented for each individual scale.
[i] Revised model with items 8, 9, 11, 12, and 13 dropped (latent factor explained less than 10% variance) and an error covariance permitted between items 1 and 2 and items 3 and 4
[j] Revised model with errors covariances permitted between items 4 and 7; 4 and 8; 7 and 8; 10 and 11.
[k] Includes fashion, handling, and applications together in a model, with the modifications implemented the applications scale. Revised model with item 3 in the handling scale dropped (latent factor explain less than 10% variance).
[l] Revised model with errors covariances permitted between items 1 and 2; 3 and 5; 4 and 5; 5 and 6.
[m] Revised model with items 4 and 5 dropped (latent factor explained less than 10% of the variance).
[n] Includes control, distraction, everyday organization, and relationship maintenance together in a model, with the modifications implemented for each individual scale.
[o] Includes symbolic psychological and social aspects together in a model, with the modifications implemented for each individual scale.

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Table 3: MPA confirmatory factor analyses fit indices (German data)

	Initial Model Fit						Model Fit after Modifications					
	X^2	*df*	*p*	CFI	RMSEA	SRMR	X^2	*df*	*p*	CFI	RMSEA	SRMR
MC interpersonal	12.27	5	.03	1.00	.04	.02			N/A			
MC mass media[a]	201.42	5	.00	.76	.22	.10	2.40	4	.66	1.00	.00	.01
MC observation[b]	16.34	5	.01	.98	.05	.03	.00	1	.94		Perfect fit	
MC overall[c]	330.81	72	.00	.95	.07	.06						
FV distraction	N/A – Under-identified model (2 items), fit indices not available											
FV everyday organization	N/A – Under-identified model (2 items), fit indices not available											
FV relationship maintenance	N/A – Under-identified model (2 items), fit indices not available											
FV control	N/A – Under-identified model (2 items), fit indices not available											
FV overall	68.72	14	.00	.98	.07	.03			N/A			
SV psychological dimension[d]	110.03	5	.00	.90	.16	.08	8.35	1	.00	.99	.10	.02
SV social dimension	N/A – Just-identified model, fit indices not available											
SV overall[e]	19.81	12	.07	1.00	.03	.02			N/A			
Normative evaluation[f]	688.27	65	.00	.72	.11	.09	88.94	17	.00	.95	.07	.05
Restriction evaluation[g]	44.45	2	.00	.91	.16	.06	N/A – Just-identified model, fit indices not available					
Use fashion	N/A – Just-identified model, fit indices not available											
Use handling	N/A – Just-identified model, fit indices not available											
Use applications[h]	643.20	54	.00	.95	.12	.06	247.57	47	.00	.98	.07	.04
Usage overall[i]	597.16	125	.00	.97	.07	.06	575.24	109	.00	.97	.07	.06
FA control	N/A – Just-identified model (3 items), fit indices not available											
FA distraction	N/A – Under-identified model (2 items), fit indices not available											
FA every organization[j]	53.34	5	.00	.97	.11	.05	7.71	4	.10	1.00	.03	.01
FA relationship maintenance[k]	87.65	2	.00	.95	.23	.05	3.08	1	.08	1.00	.05	.01
FA overall[l]	463.79	69	.00	.96	.08	.07	372.10	68	.00	.97	.07	.07
SA sociological dimension[m]	50.20	2	.00	.97	.17	.04	0.66	1	.42	1.00	.00	.00
SA psychological dimension	2.37	2	.31	1.00	.02	.01			N/A			
SV overall[n]	68.00	18	.00	.99	.06	.04			N/A			
Measurement model[o]	6661.68	2873	.00	.97	.04	.06			N/A			

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Note. N = 806, MC: Meta-Communication, FV: Functional Evaluations, SV: Symbolic Evaluations, FA: Functional Aspects of Usage, SA: Symbolic Aspects of Usage.
[a] Revised model with an error covariance permitted between items 2 and 3.
[b] Revised model with item 5 dropped (latent factor explained less than 10% of the variance) and en error covariance permitted between items 1 and 3.
[c] Includes interpersonal media-mediated, and observation together in a model, with the modifications implemented for each individual scale.
[d] Revised model with item 5 dropped (latent factor explained less than 10% variance) and an error covariance permitted between items 1 and 3.
[e] Includes psychological and social dimensions together, with the modifications implemented for each individual scale.
[f] Revised model with items 6,10,11, 12, and 13 dropped (latent factor explained less than 10% variance) and error covariances permitted between items 1 and 2; 4 and 5; and 7 and 8.
[g] Revised model with item 3 dropped (latent factor explained less than 10% of the variance).
[h] Revised model with an error covariance permitted between items 4 and 7; 4 and 8; 5 and 6; 5 and 9; 5 and 12; 6 and 13; 10 and 11.
[i] Includes fashion, handling, and applications together in a model, with the modifications implemented the applications scale. Revised model with item 3 in the handling scale dropped (latent factor explain less than 10% variance).
[j] Revised model with an error covariance permitted between items 4 and 5.
[k] Revised model with an error covariance permitted between items 1 and 3.
[l] Includes control, distraction, everyday organization, and relationship maintenance together in a model, with the modifications implemented for each individual scale. Revised model includes an additional error covariance between relationship maintenance items 2 and 5.
[m] Revised model with an error covariance permitted between items 1 and 2.
[n] Includes symbolic psychological and social aspects together in a model, with the modifications implemented for each individual scale.
[o] Includes all variables with the modification implemented for each scale.

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others what functions…." Although not all error covariances were identical between the English and German data, several of them were the same. Additionally, we tested an overall measurement model for the German data, which fit the data adequately (see the last row in Table 3), but the sample size of English data was not large enough for assessing a full measurement model.

4. Results of initial analyses and confirmatory factor analyses

The results of our validity assessments revealed several important points about the English version of the MPA scale. We complement our report of these results with relevant information from the comparison with the German MPA scale. First, internal consistency tests suggest most of the subscales have acceptable (> .70), good (> .80), or excellent (> .90) reliability (George & Mallery, 2003). Only three dimensions (i.e., the social dimension of symbolic evaluations, the restriction evaluations, and the handling dimension of usage) of the English scale have questionable reliabilities in the .60s (George & Mallery, 2003). By comparison, four dimensions (i.e., the mediated communication and the observation in meta-communication, the social dimension of symbolic evaluations, and normative evaluations) of the German scale have reliabilities in the .60s and one dimension (i.e., restriction evaluations) has reliability score in the .50s. Therefore, one of the conclusions we draw about the English MPA scale is that its reliability is comparable (and actually better in some cases) than the initial German MPA scale. In addition, latent coefficient *H* reliabilities indicate the English version's latent constructs are measured appropriately in most cases. According to Hancock and Mueller (2001), the magnitude of the coefficient should be .70 or higher, a standard met by most subscales.

Second, results of confirmatory factor analyses (CFAs) supported the theorized dimensionality of the MPA scales. Although not all sub-dimensions could be assessed due to the number of insufficient scale items (i.e., two or three), the majority of the scales performed relatively well in the analyses, especially after the implementation of theoretically justifiable modifications (e.g., permitting errors to covary when items were measured using similar wording). Moreover, for the majority of the scales, the models were comparable between the English and the German data, indicating the translation of the scale was successful at maintaining the dimensionality initially intended when creating the German scale.

The CFAs also revealed weak or problematic items that ought to be dropped from scales given their meager contribution. For example, the third item in the handling dimension of usage proved to be one such item for both the English and the German scales. A total of four items generated an issue in both the English and the German data. Some items proved problematic only in the German scale (e.g., item 5 in the observation dimension of meta-communication; a total of five items), whereas others proved to be problematic only in the English scale (e.g., item 4 in the everyday organization dimension of functional aspects; a total of four items). All in all, we dropped eight items in the English scale and nine items in the German scale.

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The overall model fit of the CFA models assessing the factor structure of subscales proved acceptable in the majority of the subscales in both the English and German data based on Hu and Bentler's (1999) standards. The RMSEA fit index approached the recommended values in several cases (e.g., .08, .10). Given that .06 for this index is not an absolute value and the index tends to be positively biased (Kenny, 2014), we considered models with such close RMSEA values acceptable as well. Table 2 provides fit indices of CFA results on the English data and Table 3 on the German data.

5. Discussion

The current study outlined the development of the original MPA scale and provided its translation from German to English in order to make it applicable in an English-speaking context. The results of the reliability tests and confirmatory factor analyses (CFAs) for validating the English scale provided us some confidence about the accuracy of the translation and performance of the scale. Most dimensions of the translated MPA scale had acceptable reliability scores (i.e., Crobach's alpha and coefficient *H*), and CFA results supported the initially theorized dimensions of the MPA model. Developed before the first iPhone was released, the theoretical model underlying the MPA scale had not been updated until recently. That is why the model had to be extended in the English version through the addition of items referring to the object-related aspects of mobile phone use, namely the download and usage of web-based applications. The initial step undertaken in this study to validate the English MPA scale was successful, and it was productive in terms of revealing dimensions that require further development and tests of measurement items.

Among researchers studying the appropriation of media technologies, there is a widespread consensus that appropriation is best studied with qualitative methods. As Berker, Hartmann, Punie, and Ward (2006) argue, in the context of domestication research, "qualitative research methods . . . encapsulate the nuances of consumption and the way that users inscribe artefacts with meaning to give them a place in the network of the home and everyday life" (p. 6; see also Morley, 1999). Given that notion, the purpose of the MPA scale development was not to create an instrument that allowed for the prediction of specific uses with statistical precision, as was the case for the theory of planned behavior or technology acceptance model. Rather, the goal was to have a standardized tool, allowing the identification of mobile phone usage patterns and the exploration of those identified patterns.

Petrič, Petrovčič, and Vehovar (2011) found that the use of the mobile phone, among various other interpersonal communication technologies, has become equally as common as face-to-face interaction for people's socializing and self-expression needs. Similarly, Ramirez, Dimmick, Feaster, and Lin (2008) revealed a hierarchy of interpersonal media competition: the cell phone, instant messaging, email, and landline telephone. As both Petrič et al.'s and Ramirez et al.'s research noted, people employ various modes of communication such as texting, voice calling, and email for distinctive purposes, but sometimes, one medium replaces

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another medium's gratifications, or their functions overlap. As advanced smartphones, which allow for multiple modes of communication within a single device, become more widely available, the importance of studying various patterns of mobile phone appropriation in a comprehensive, as opposed to a device-specific, way greatly increases.

It is hard to even compare the mobile phones in use today to those used in 2008, due to the rapid rate of technological advancement. The contexts of use and even the demographics of users have changed significantly. Therefore, a model with a solid theoretical framework should withstand these drastic changes, and offer dimensions along which these evolutions can be measured. This is the case for the MPA model and its scales. Future studies using the MPA scale could examine if the functional use of mobile phones has shifted from a social tool to an entertainment tool, or whether people talk less about the medium and more about the content once, and if at all, the evolution of mobile phones stabilizes and innovation begins to "close."

One line of study, which may be developed in the near future, is a comparison of research findings across different cultural settings, such as among English-speaking user groups from various cultures and societies (c.f. Campbell, 2007). Such research, if done, will contribute to articulating socio-cultural processes and consequences of mobile phone appropriation. Moreover, comparative studies based on the standardized scale will help distinguish generalities from peculiarities of technology usage patterns across diverse social and cultural groups. Another path to follow is the pursuit of longitudinal studies, which would allow researchers to trace the evolution of mobile phone appropriation over time and to test the "circular" nature of the MPA model in itself. We believe the translated English scale from this study will contribute to facilitating such research endeavors.

One caveat and a limitation that future research should circumvent is the use of two-item measures for sub-dimensions of functional evaluations (both in the English and the German scales). Cronbach's alpha values were not an appropriate statistic to calculate the reliability of those two-item scales, which is why we reported Spearman-Brown coefficients (Eisinga, te Grotenhuis, & Pelzer, 2013; see Table 1). Furthermore, some of the three-item subscales became two-item scales after the elimination of an item that proved problematic based on CFAs (e.g., the handling dimension of usage). For such subscales, fit indices were not available either, making the assessment of the scales' factor structure impossible by itself, which is why we created overall models for these dimensions. Thus, a clear suggestion for future research using the MPA scale is to add measurement items for these dimensions to perform not only a more refined measurement of the sub-dimensions but also psychometric assessments of the sub-dimensions.

Another caveat of this study is the back-translation of the translated English items into German and the comparison to the original German items, which only happened after the empirical testing of the English scales. Due to the satisfactory results of this back-translation and comparison, the effects of this step being conducted later in the study are negligible in our case, but further work in translating the MPA scales into other languages should avoid this mistake.

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The current study's sample size might seem smaller than desirable to validate a 98-item scale based on a CFA. Although a larger sample size is always preferable, scholars' recommendations for sample size vary. Some note that even less than 100 participants could be enough for a CFA (Wolf, Harrington, Clark, & Miller, 2013) or structural equation modeling (Iacobucci, 2010), whereas others note different ratios for sample size to the number of parameters, ranging from 2:1 (Kline, 1979), to 20:1 (Hair, Anderson, Tatham, & Black, 1995). Thus, our sample size is acceptable, although, given that the MPA scale is in its infancy, future studies should try to use larger sample sizes to assess the scale's validity further. In addition, the current study used a convenience sample of US college students. Although the main goal of this study was to validate the MPA scale and examine its reliabilities, future studies using the scale should employ samples with more demographic diversity or potentially rely on random sampling methods in order to increase generalizability of the scales to the broader mobile phone user population.

Future challenges that may demand adapting the MPA scales and even the MPA model in its entirety are cloud computing, wearable technologies (e.g., Google glass, iWatch), and the advancement of device ecosystems. Once a mobile phone is no longer a complete device in itself but rather perceived as part of a larger whole (in terms of an ecosystem of devices including speakers, tablets, laptops or cloud space), the model may have to be extended to incorporate those technological changes as well. We believe this study was a meaningful start for the continuous extension and development of the MPA model, and has contributed to the building of a solid theoretical and methodological foundation in the area of mobile communication research.

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Appendix

English and German MPA scales

English Scale Items	German Scale Items
Meta-communication	
Interpersonal dimension (with M, SD, and standardized factor loadings, λ)	
How often do you discuss with others about the appearance of cell phones? (*M* = 2.85, *SD* = 0.84, λ = .72)	Wie häufig unterhältst Du Dich mit anderen über das Aussehen von Handys?
How often do you discuss with others about the new applications available on the cell phone market? (*M* = 3.27, *SD* = 1.01, λ = .68)	Wie häufig unterhältst Du Dich mit anderen über Neuheiten auf dem Handymarkt?
How often do you discuss with others what functions your cell phones have? (*M* = 3.28, *SD* = 0.98, λ = .77)	Wie häufig unterhältst Du Dich mit anderen darüber, was Eure Handys alles können?
How often do you discuss with others where you keep your cell phones (on your belt, in your bag…)? (*M* = 2.09, *SD* = 1.03, λ = .57)	Wie häufig sprichst Du mit anderen darüber, wo Ihr Euer Handy verstaut (am Gürtel, in der Tasche, ...)?
How often do you talk with others about people bragging with their cell phones? (*M* = 2.40, *SD* = 1.07, λ = .54)	Wie häufig unterhältst Du Dich mit anderen darüber, dass manche Leute mit ihrem Handy auch ganz schön angeben?
Mediated communication dimension	
How often do you realize that an actress/actor in a movie is using a new stylish cellphone? (*M* = 2.33, *SD* = 1.15, λ = .69)	Wie häufig fällt es dir auf, dass eine Person in einem Film gerade mit einem schicken, neuen Handy telefoniert?
How often do you learn about new cellphone applications or functions through advertisements? (*M* = 3.09, *SD* = 1.04, λ = .65)	Wie häufig erfährst aus der Werbung von neuen Handyfunktionen?
How often do you learn of new cellphone applications or functions from the newspapers or TV? (*M* = 2.93, *SD* = 1.05, λ = .53)	Wie oft erfährst du aus der Zeitung oder dem Fernsehen von Neuheiten auf dem Handymarkt?
While watching a movie, how often do you think to yourself that the actress/actor on screen should not be using their cellphones in certain situations on screen? (*M* = 2.20, *SD* = 1.06, λ = .53)	Wie häufig denkst Du Dir, dass eine Person in einem Film Ihr Handy in dieser Situation besser nicht benutzen sollte?
How often do you realize that an actor/actress in a movie organizes appointments or gatherings by using cellphones? (*M* = 2.66, *SD* = 1.08, λ = .57)	Wie häufig fällt es dir auf, dass eine Person in einem Film mit ihrem Handy Termine und Verabredungen organisiert?
Observation dimension	
How often do you realize that someone you personally know has a new cellphone? (*M* = 3.55, *SD* = 0.94, λ = .68)	Wie häufig fällt es Dir auf, dass eine Person in Deinem persönlichen Umfeld ein neues Handy hat?
How often do you notice that someone around you is using an application or function in their phone that you have never used? (*M* = 3.29, *SD* = 0.98, λ = .73)	Wie häufig fällt es dir auf, dass jemand in Deinem Umfeld Funktionen an seinem Handy benutzt, die Du noch nie genutzt hast?
How often do you notice when someone around you has a newest version of a cellphone? (*M* = 3.43, *SD* = 1.06, λ = .74)	Wie häufig fällt es dir auf, dass jemand in Deinem Umfeld ein Handy der neuesten Generation hat

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How often do you realize when someone on the go is using their cellphone to make appointments or gatherings? (*M* = 2.94, *SD* = 1.13, λ = .67)	Wie häufig fällt es Dir auf, dass jemand unterwegs mit seinem Handy seine Termine und Verabredungen organisiert?
How often do you pay attention where someone stores their cellphone (on their belt, in their bag/purse…)? (*M* = 2.23, *SD* = 1.05, λ = .46)	Wie häufig achtest du darauf, wo jemand sein Handy verstaut (am Gürtel, in der Tasche,...)?
Functional evaluations	
Distraction/Pastime dimension	
It is important to me that my daily routine allows times for distractions. (*M* = 3.64, *SD* = 0.85, λ = .38)	Es ist mir wichtig, dass mein Alltag mir immer wieder Ablenkungen bietet.
It is important to me that I am never bored. (*M* = 3.41, *SD* = 0.91, λ = .58)	Es ist mir wichtig mich nie langweilen zu müssen.
Management of everyday life dimension	
It is important to me that my daily routine allows times for distractions. (*M* = 3.83, *SD* = 0.79, λ = .58)	Es ist mir wichtig meine Termine und Kontakte immer gut im Griff zu haben.
It is important to me that my daily routine can be flexibly organized. (*M* = 3.90, *SD* = 0.91, λ = .75)	Es ist mir wichtig meinen Alltag flexibel organisieren zu können.
Relationship maintenance dimension	
It is important to me to always know what is going on with my significant others. (*M* = 3.63, *SD* = 0.88, λ = .66)	Es ist mir wichtig mit meinem Umfeld immer in Verbindung zu stehen.
It is important to me to always stay in touch my friends. (*M* = 3.92, *SD* = 0.83, λ = .68)	Es ist mir wichtig mich meinen engsten Mitmenschen immer nahe zu fühlen.
Control dimension	
It is important to me to always be reachable, whenever and wherever. (*M* = 3.72, *SD* = 1.00, λ = .85)	Es ist mir wichtig erreichbar zu sein, wenn's drauf ankommt.
It is important to me to always be aware of what is going on around me. (*M* = 4.01, *SD* = 0.79, λ = .66)	Es ist mir wichtig mitzubekommen, was in meinem persönlichen Umfeld geschieht.
Symbolic evaluations	
Psychological dimension	
It is important to me that my accessories match me. (*M* = 3.00, *SD* = 1.01, λ = .53)	Es ist mir wichtig, dass meine Accessoires zu mir passen.
It is important to me that I like the technology I use. (*M* = 4.05, *SD* = 0.75, λ = .44)	Es ist mir wichtig, dass ich technische Geräte die ich besitze gerne benutze.
It is important to me that I own nice accessories. (*M* = 3.26, *SD* = 1.00, λ = .79)	Es ist mir wichtig schöne Accessoires zu besitzen.
It is important to me that I can afford expensive things. (*M* = 3.04, *SD* = 1.08, λ = .76)	Es ist mir wichtig, mir wertvolle Dinge leisten zu können.
It is important to me to always have my cellphone with me. (*M* = 4.02, *SD* = 1.05, λ = .51)	Es ist mir wichtig, mein Handy immer bei mir zu haben.
Social dimension	
I think it is good that with a cellphone one has the ability to pull back from uncomfortable situations (e.g. through a phone call). (*M* = 3.71, *SD* = 0.92, λ = .48)	Es finde es gut, dass man mit einem Handy immer die Möglichkeit hat, sich aus unangenehmen Situationen zurückzuziehen (z.B. durch ein Telefonat).
I think it is good that one can be independent thanks to one's cellphone. (*M* = 3.61, *SD* = 0.88, λ = .49)	Ich finde es gut, dass man sich mit dem Handy auch ein bisschen selbst darstellen kann.

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I think it is important that I can present myself in public with my accessories. (M = 2.90, SD = 0.93, λ = .73)	Ich finde es wichtig, dass ich mich mit meinem Handy in der Öffentlichkeit gut sehen lassen kann.
Based on one's cellphone, one can tell what kind of person the individual is and what they place value on. (M = 2.74, SD = 1.02, λ = .58)	An ihrem Handy kann man meist gut erkennen, wer eine Person ist und worauf sie Wert legt.
Normative evaluation	
Nowadays, it is expected that when plans change, an individual must be flexibly reachable on their cellphones. (M = 4.15, SD = 0.68, λ = .64)	Es wird heutzutage vorausgesetzt, dass man per Handy flexibel erreichbar ist, wenn sich Pläne kurzfristig ändern.
When making plans with others, it is expected that people always have their cellphones with them to be able to discuss when and where to meet. (M = 4.15, SD = 0.70, λ = .70)	Bei gemeinsamen Unternehmungen gehört es dazu, dass man ein Handy dabei hat, um sich vor Ort abzustimmen.
In my circle of friends, people are very dependent on their cellphone in order to be included in the group. (M = 3.53, SD = 1.05, λ = .59)	In meinem Freundeskreis ist man auf ein Handy angewiesen, wenn man dabei sein möchte.
My closest friends expect me to keep them in the loop with my cellphone. (M = 3.64, SD = 0.98, λ = .65)	Meine engsten Mitmenschen erwarten von mir, dass ich sie per Handy auf dem Laufenden halte, wie es mir geht.
When one doesn't keep in touch with others through their cellphone for quite some time, it can happen that others will take it personally. (M = 3.70, SD = 1.03, λ = .63)	Wenn man sich länger nicht per Handy meldet, kann es passieren, dass andere das persönlich nehmen.
There are clear rules regarding what kinds of things can be said over the phone and things that should better be said in person. (M = 4.00, SD = 0.95, λ = .46)	Es gibt klare Regeln, welche Dinge man über das Handy sagen sollte und welche besser persönlich.
Today, people notice what kind of phone you use and what it looks like. (M = 3.95, SD = 0.71, λ = .43)	Heutzutage wird schon darauf geachtet, welches Handy man besitzt und wie es aussieht.
Based on what kind of cellphone and the way it is decorated, one can receive positive or negative reactions from others. (M = 3.44, SD = 0.86; item dropped in CFAs)	Mit dem Handy und der Art wie man es schmückt kann man durchaus positiv oder negativ auffallen.
When someone does not want to be noticed their cellphone, they should pay attention to where and when they are using it. (M = 2.75, SD = 0.93; item dropped in CFAs)	Wer nicht mit seinem Handy auffallen möchte, sollte schon genau aufpassen, wann und wie er es nutzt.
There are clear rules regarding where and when one should use a cellphone and in which situations they should not. (M = 3.08, SD = 0.93, λ = .36)	Es gibt klare Regeln, wann und wo man ein Handy nutzen sollte und in welchen Situationen besser nicht.
When you are on the go and playing with your cellphone, others can feel bothered by it. (M = 3.95, SD = 0.86; item dropped in CFAs)	Wenn man unterwegs ist und man spielt mit seinem Handy herum, dann können sich andere davon gestört fühlen.
When someone is proud of their cellphone, they most likely have nothing better of which they can be proud. (M = 3.56, SD = 0.96; item dropped in CFAs)	Wer auf sein Handy stolz ist, hat vermutlich nichts Besseres, worauf er/sie stolz sein könnte.
Showing off a cool cellphone can get you laughed at. (M = 2.66, SD = 1.08; item dropped in CFAs)	Wenn man ein tolles Handy hat und damit bei Anderen Eindruck machen möchte, dann kann sich damit leicht lächerlich machen.

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Restriction evaluations	
Financial aspect	
Cellphones plans are too expensive for me to use my phone frequently. (*M* = 2.66, *SD* = 1.01, λ = .47)	Das Handy ist für mich zu teuer, um es häufig zu nutzen.
Cognitive aspect	
Cellphones are too complicated for me to use them for everything they have to offer. (*M* = 2.16, *SD* = 1.07, λ = .68)	Das Handy ist für mich einfach zu kompliziert, um es voll nutzen zu können
Technical aspect	
There are functions that I would like to use but are not available in my cellphone. (*M* = 2.43, *SD* = 1.23, λ = .36)	Es gibt Funktionen, die ich gern einmal ausprobieren würde, die aber auf meinem Handy nicht laufen.
Time aspect	
One would need a lot more time to be able to learn fully what functions a cellphone has to offer and to be able to operate it. (*M* = 2.79, *SD* = 1.14, λ =.78)	Man bräuchte viel mehr Zeit, um sich in die Nutzungsmöglichkeiten des Handys hinein zu arbeiten.
Usage	
Overall time spent using (not included in CFA/SEM)	
About how high is your monthly cellphone bill?	Wie hoch ist Ihre monatliche Handyrechnung ungefähr?
About how long (in minutes) is an average cellphone conversation of yours? (open-ended question)	Wie lange (in Minuten) dauert momentan ein durchschnittliches Handygespräch bei Ihnen?
How many phone calls do you receive on your cellphone in any given day? (open-ended question)	Wie viele Anrufe tätigen Sie momentan ungefähr pro Tag mit Ihrem Handy?
How many voice calls per day do you have on your cellphone? (open-ended question)	Wie viele Anrufe erhalten Sie momentan ungefähr pro Tag auf Ihrem Handy?
Fashion dimension	
How often do you change your cellphone's ring tone? (*M* = 1.97, *SD* = 0.90, λ = .59)	Wie oft wechselst Du Deinen Handy-Klingelton?
How often do you change the display on your cellphone? (*M* = 2.74, *SD* = 1.04, λ = .68)	Wie oft wechselst Du das Logo auf Deinem Handy-Display?
How often do you change the accessories such as hanging items or protection cover for your cellphone? (*M* = 2.06, *SD* = 1.00, λ = .76)	Wie oft wechselst Du die Chin-chins an Deinem Handy?
Handling dimension	
When you are together with others, is your cellphone visible for everyone or is it put away? (*M* = 2.67, *SD* = 1.15, λ = .85)	Wenn Du unterwegs bist, ist dein Handy dann für jeden sichtbar oder eher versteckt?
When you are sitting together with others, do you keep your cellphone on the table or do you leave it in your purse/bag? (*M* = 2.86, *SD* = 1.36, λ = .72)	Wenn du mit Anderen zusammensitzt, legst Du dein Handy dann eher auf den Tisch oder lässt du es eher in der Tasche?
When you are sitting together with others and your cell phone rings, do you stay there and answer your phone call or do you get up and take your phone call somewhere else? (*M* = 3.13, *SD* = 1.34; item dropped in CFAs)	Wenn Du mit Anderen zusammensitzt und dein Handy klingt, bleibst du dann zum telefonieren sitzen oder stehst du eher auf und gehst woanders hin?
Web-based applications dimension	
How often do you download new applications to your cellphone? (*M* = 2.85, *SD* = 1.22, λ = .87)	Wie häufig lädst Du Dir neue Apps auf Dein Handy herunter?

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Approximately how many applications have you downloaded to your cellphone currently? (not included in CFA/SEM)	Wie viele Apps hast Du derzeit ungefähr auf Dein Handy heruntergeladen?
How often do you browse the Web with your cellphone? (M = 3.68, SD = 1.47, λ = .83)	Wie häufig surfst Du über Dein Handy im Internet?
How often do you play games on your cellphone? (M = 2.95, SD = 1.37, λ = .75)	Wie häufig spielst Du auf Deinem Handy Spiele?
How often do you listen to music on your cellphone? (M = 2.96, SD = 1.49, λ = .80)	Wie häufig hörst Du auf Deinem Handy Musik?
How often do you search for specific information on your cellphone? (M = 3.48, SD = 1.43, λ = .84)	Wie häufig suchst Du durch Dein Handy nach spezifischen Informationen?
How often do you use social networking sites on your cellphone? (M = 3.59, SD = 1.57, λ = .83)	Wie häufig nutzt Du über Dein Handy Social Networking Sites?
How often do you use your cellphone for navigation or maps? (M = 3.12, SD = 1.45, λ = .85)	Wie häufig nutzt Du Dein Handy als Navigationsgerät oder als Karte zur Orientierung?
How often do you read books or documents on your cellphone? (M = 2.26, SD = 1.26, λ =.70)	Wie häufig liest Du Bücher oder Dokumente auf Deinem Handy?
How often do you shop through your cellphone? (M = 2.03, SD = 1.13, λ = .66)	Wie häufig machst Du über Dein Handy Online-Einkäufe?
How often do you read or write email on your cellphone? (M = 3.17, SD = 1.46, λ = .80)	Wie häufig liest oder schreibst Du E-mails auf Deinem Handy?
How often do you watch videos on your cellphone? (M = 2.69, SD = 1.36, λ = .83)	Wie häufig siehst Du Videos auf Deinem Handy?
Functional usage aspects	
Control dimension	
I always have my cell phone with me to be reachable in case of emergencies. (M = 4.20, SD = 0.80, λ = .79)	Ich habe mein Handy immer bei mir, um im Notfall erreichbar zu sein.
I always have my cellphone with me to be able to call for help in emergencies. (M = 4.26, SD = 0.80, λ = .77)	Ich habe mein Handy immer bei mir um in Notsituationen Hilfe rufen zu können.
I always have my cell phone with me to be able to reach my family all the time. (M = 4.20, SD = 0.78, λ = .80)	Ich habe mein Handy immer bei mir, um meine Familie immer erreichen zu können.
I always have my cell phone with me to be able to reach my friends all the time. (M = 4.11, SD = 0.84, λ =.89)	Ich habe mein Handy immer bei mir, um meine Freunde immer erreichen zu können.
I always have my cell phone with me so that my family can reach me all the time. (M = 4.21, SD = 0.79, λ = .80)	Ich habe mein Handy immer bei mir, um für meine Familie immer erreichbar zu sein.
I always have my cell phone with me so that my friends can reach me all the time. (M = 4.10, SD = 0.86, λ = .89)	Ich habe mein Handy immer bei mir, um für meine Freunde immer erreichbar zu sein.
Distraction/Pastime dimension	
I use my cellphone to kill time. (M = 3.74, SD = 0.97, λ = .87)	Ich nutze mein Handy um damit die Zeit tot zu schlagen.
I use my cellphone for entertainment. (M = 3.98, SD = 0.93, λ = .88)	Ich nutze mein Handy zum Zeitvertreib.
I use my cellular phone when I'm bored. (M = 3.86, SD = 1.05, λ = .92)	Ich nutze mein Handy, wenn mir gerade langweilig ist.

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Management of everyday life dimension	
I use my cellphone to organize my daily schedule (M = 3.20, SD = 1.16, λ = .93)	Ich nutze mein Handy um meinen Alltag zu organisieren.
I use my cellphone to keep my schedule, my contacts, and my responsibilities in order. (M = 3.60, SD = 1.02, λ = .84)	Ich nutze mein Handy, um meine Termine, Kontakte und Verabredungen im Griff zu behalten.
I use my cellphone to coordinate work-related appointments. (M = 3.25, SD = 1.18, λ = .81)	Ich nutze mein Handy um berufliche Termine zu koordinieren.
I use my cellphone to plan activities with my friends. (M = 3.95, SD = 0.96; item dropped in CFAs)	Ich nutze mein Handy um Unternehmungen mit Freunden zu planen.
I use my cellphone to plan activities with my family. (M = 3.65, SD = 1.02; item dropped in CFAs)	Ich nutze mein Handy um Unternehmungen mit der Familie zu planen.
Relationship maintenance	
I use my cellphone to constantly keep in contact with my friends. (M = 4.05, SD = 0.88, λ = .87)	Ich nutze mein Handy als ständiger Kontakt zu meinen Freunden.
I use my cellphone to maintain long distance relationships. (M = 3.95, SD = 0.92, λ = .55)	Ich nutze mein Handy um Beziehungen auch über große Distanzen zu pflegen.
I use my cellphone to stay in touch with friends. (M = 4.21, SD = 0.69, λ = .89)	Ich nutze mein Handy um mit Freunden in Verbindung bleiben.
I use my cellphone to always stay connected with my best friends. (M = 4.17, SD = 0.73, λ = .90)	
I use my cellphone to stay in contact with people that I could see face-to-face. (M = 3.95, SD = 0.83, λ = .76)	Ich nutze mein Handy um mit Leuten in Kontakt bleiben kann, die ich nicht persönlich treffen kann.
Symbolic usage aspects	
Psychological dimension	
When I forget my cellphone at home, I feel incomplete. (M = 3.91, SD = 1.08, λ = .82)	Wenn ich mein Handy zuhause vergesse, fühle ich mich wie ein halber Mensch.
My cellphone is an important part of me. (M = 3.66, SD = 1.12, λ = .93)	Mein Handy ist ein wichtiger Bestandteil meines Lebens
My cellphone is an extension of me. (M = 3.28, SD = 1.25, λ = 0.87)	Mein Handy gehört zu mir.
I like to use my cellphone. (M = 4.16, SD = 0.84, λ = .70)	Ich benutze mein Handy gerne.
Social dimension	
My cellphone shows what kind of a person I am just as much as my clothing and my demeanor do. (M = 2.43, SD = 1.02, λ = .63)	Mein Handy und mein Umgang mit ihm zeigen ebenso gut wie meine Kleidung und mein Verhalten, was für ein Typ ich bin.
Sometimes I catch myself bragging while being on the phone so that the people around me can hear. (M = 1.86, SD = 0.94, λ = .69)	Manchmal ertappe ich mich dabei, dass ich vor den Leuten um mich herum beim Telefonieren etwas angebe.
I often catch myself leaving my cellphone well in the sight of the other people around me. (M = 2.53, SD = 1.08, λ = .67)	Ich ertappe mich häufig dabei, dass ich mein Handy für Andere gut sichtbar auf den Tisch lege.
When others speak about their cell phones, I like to tell them what kind of cell phones I own. (M = 2.44, SD = 1.10, λ = .67)	When Andere über ihr Handy sprechen erwähne ich gerne, welches Handy ich besitze.

Note: Mean (*M*) and standard deviation (*SD*) for each item was calculated with observed data. Standardized path coefficients (λ) was calculated based on revised CFA models and using values from the overall models (instead of individual scale models) where applicable.

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