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## HEALTH PSYCHOLOGY | RESEARCH ARTICLE

# Social–cognitive correlates of expectant mothers' safe communication behaviour: Applying an adapted HAPA model

L. Kötting[1], N.T. Henschel[1], F. M. Keller[1], C. Derksen[1] and S. Lippke[1]*

**Abstract:** To improve patient safety in obstetrics, patients should perform safe communication. However, there is a lack of attempts in targeting expectant mothers. Behaviour change theories can potentially be applied to safe communication behaviour to understand and target contributing factors. The objective of this study was to apply the Health Action Process Approach (HAPA) to obstetric patients' safe communication behaviour to understand underlying mechanisms of social-cognitive HAPA variables. $N$ = 424 expectant mothers from two university hospitals participated in a cross-sectional survey which was the baseline of a larger randomized controlled trial. The proposed HAPA model with iterative theory-driven extensions were fitted to the data via path modelling. Fit indices were compared. Post-hoc analyses asserted sufficient statistical power. An adapted HAPA model fitted the data best. The adaptation concerned two sequential mediation pathways: The association of intention and safe communication behaviour was mediated by coping self-efficacy and via social support and action planning. Congruent with theory, intention and action planning, mediated by social support and coping self-efficacy, emerged as core factors contributing to safe communication behaviour. The HAPA model can be applied to safe communication behaviour in obstetric patients. Hence, future interventions to enhance expectant mothers' safe communication should be based on behaviour change theories like the hereby tested HAPA model.

**Subjects:** Health Psychology; Behavioral Medicine; Health Communication

**Keywords:** HAPA; action planning; intention; safe communication behaviour; obstetric patients

## 1. Introduction

When health is at danger, individuals seek for help in the healthcare system. According to the *Global Action Plan for Patient Safety* (World Health Organization, 2021), it is estimated that per year, 1 in 10 patients in high-income countries experience harm during a hospital stay. In middle- to low-income countries, such events occur approximately 134 million times worldwide per annum, with 2.6 million patients dying due to unsafe care every year (Runciman et al., 2009). Patient safety can be defined as the absence of harmful events that could have been prevented under the given circumstances (Runciman et al., 2009). A distinction can be made between adverse events (AE) and preventable adverse events (pAE) in patient care. Although both can result in patient harm or death (Eulmesekian et al., 2020), pAE occur when ordinary standards of

care are not met, e.g., due to human factors which mainly relate to psychology (Schrappe, 2018; Shojania & Van De Mheen, 2020).

Communication plays an essential role in the context of pAE and individual health. Poor or inadequate communication has been associated with pAE in several studies over various health-care settings (Bartlett et al., 2008; Liaw et al., 2014; November et al., 2008; Tanaka et al., 2019). Interprofessional communication among team members in different health professions can have a positive impact on patient safety (Olde Bekkink et al., 2018). In obstetrics, formal trainings have been applied for healthcare workers (HCW; Draycott et al., 2006; Monod et al., 2014), but the perspective of patients has largely been neglected. For example, it has been shown that language barriers and language impairments significantly affect communication and thus contribute to diminished patient care quality (Bartlett et al., 2008). Patient-provider communication seems to play a central role especially in emergency situations.

A unique characteristic of obstetrics in comparison to other fields of care is that not only the expectant mother but also the child is exposed to adverse outcomes during treatment (Antony et al., 2018). These adverse outcomes include neonatal mortality, maternal mortality, unplanned or emergency caesarean sections, and haemorrhage. Furthermore, pregnancy itself, or childbirth as such, can be stressful and traumatic for expectant mothers, even when there are no severe medical problems (Molgora et al., 2020). Inadequate doctor-patient communication appears to be significantly associated with pAE (Gittell, 2002).

The perception of expectant mothers plays an crucial role when it comes to communication. When midwifery communication, collaboration, and empowerment are perceived as good, health-promoting behaviours are more likely to be adopted and practiced (Nicoloro-SantaBarbara et al., 2017). A good patient-provider relationship can be built through effective communication, which in turn supports collaborative treatment goals and decision support (Kim et al., 2001; Nicoloro-SantaBarbara et al., 2017). Regarding patient-provider communication in the context of pregnancy experience, two points seem to be particularly important for pregnant women: the information and the relationship function. The first relates to issues such as monitoring the pregnancy as well as finding and offering information, while the second relates to personalising care, managing emotions, and communicating on the same level (Delaney & Singleton, 2020).

Mothers report being hesitant to ask questions. The most common psychological reasons include the perceived hurry of the practitioner, different treatment wishes than the physician, and fear of being perceived as burden (Cheng et al., 2020). Additionally, differences in the hierarchy also play a role, for example, between midwives and pregnant women or due to the perceived authority of the midwife. The perception of authority can be a barrier to open communication between the expectant mother and the midwife (Petersen et al., 2009).

What has not been sufficiently studied is safe communication from the perspective of patients, i.e., expectant mothers in obstetrics especially regarding how pregnant women's communication behaviour can be improved (Lippke et al., 2021). Hence, it is still unclear which variables need to be targeted and which theoretical foundations can help to develop interventions. To empower expectant mothers to communicate safely and, thus, to be active in doctor-patient conversations, the psychological mechanisms that promote safe communication should be examined in more detail. The World Health Organization (WHO) guidelines state that patients and their families should be involved as partners in the delivery of safe care (World Health Organization, 2021). To understand safe patient communication in obstetrics as a health-related behaviour considering psychological variables, behaviour change models can be applied.

Safe communication can be considered a health-related behaviour for HCW (Derksen et al., 2022; Kripalani et al., 2007; Lippke et al., 2019) and, therefore also as a health-related behaviour for patients in obstetrics. The well-tested health action process approach (HAPA) could explain communication

behaviour with the help of personal psychological variables from the patient's perspective. The HAPA model was recently tested in the framework of safe communication with HCW in obstetrics. The results suggested that the model serves as a valid theoretical basis to explain changes in safe communication behaviour for HCW (Derksen et al., 2022).

The HAPA model addresses how an individual's intention/motivation is associated with behaviour change and how the behaviour is adopted. The HAPA explicitly considers motivation and awareness of situations in the context of health behaviours (Schwarzer et al., 2007). Within the HAPA, outcome expectancies and risk perception, as well as self-efficacy form the intention (motivational phase) and are thus imperative for behaviour change. To translate the intention to change a behaviour into action (in this case, safe communication behaviour), behaviour planning is required (volitional phase). Action planning and coping self-efficacy mediate the association between intention and behaviour(Schwarzer & Luszczynska, 2008; Schwarzer et al., 2007). Resources such as social support play a special role in the HAPA model: The association between intention and action planning assumed in the HAPA can be mediated by social support across different contexts (Teleki et al., 2019, 2022). On a theoretical note, social support could also play an important role regarding birth. Pregnant women who have formed the intention to communicate safely may activate their social support to help them in making specific behavioural plans, which is thus related to the enactment of safe communication. Social support could be a crucial factor in securing one's plans to communicate safely.

The current study was conducted as part of the TeamBaby project, a larger randomized controlled trial study. The aims of the study were, among others, to understand communication behaviour better and to generate evidence for designing effective intervention. Therefore the HAPA model, as potential theoretical basis for interventions, was tested with communication behaviour in the obstetric context. Previous research has not tested the HAPA in this context so far. Accordingly, the current study is closing this knowledge gap.

By taking all the factors into consideration, safe communication behaviour of pregnant women in the context of obstetrics requires further examination. The aim of the present study is to find out whether patients´ safe communication in obstetrics can be explained by the HAPA model. Furthermore, the mechanisms assumed in the HAPA model will be tested.

Therefore, we hypothesize that the HAPA model can explain pregnant women´s safe communication behaviour, specifically:

(a) Outcome expectancies and risk perception are related to the intention to communicate safely.

(b) Planning mediates the association of the intention with communication behaviour.

(c) There is a serial mediation within the association between intention and communication via coping self-efficacy and action planning, as well as via social support and action planning.

(d) Risk perceptions and outcome expectancies are directly associated with intention but not with communication behaviour.

## 2. Methods

### 2.1. TeamBaby Project
All data was collected as part of the "TeamBaby – Safe, digitally supported communication in obstetrics and gynaecology" project. The aim of the project is to investigate the psychological

mechanisms associated with safe communication in obstetrics. The focus is on enabling pregnant women to communicate safely before and during birth.

### 2.2 Ethical Approval
Ethical approval for the data collection, analysis, and interpretation in two maternity clinics was granted (Ethics Committee for Human Research of the University Hospital Ulm , number 114/19, and the Ethics Committee for Medical Research of the University Hospital Frankfurt; number 19–292).

### 2.3 Participants
The recruitment of expectant mothers took place between June 2020 and August 2021 and was carried out at two German university hospitals. The original questionnaire was administered in German. The item wording presented in the current text is a translation to English conducted by native speakers. One study nurse and one research assistant per clinic recruited expectant mothers for the intervention study in which this baseline survey was conducted. Participants who provided the currently analysed survey data would later take part in a randomized intervention study whereby the intervention group would receive a digital live seminar aiming to foster safe communication behaviour. Recruitment tools consisted of flyers, posters and registration forms, which were distributed for pregnant women in the clinics. These included antenatal care rooms, waiting rooms, the respective wards, and their corridors, as well as lifts. Finally, gynaecologists in private practices, midwives, counselling centres, and pharmacies were also provided with information material and asked to contact pregnant women.

The information material included contact details of the study nurse and research assistant, as well as core information about the study. The project-affiliated staff at the clinics also raised awareness of the study through personal contact with the expectant mothers. Finally, HCW also informed expectant parents about the study at online information events, counselling sessions or birth registrations. Further recruitment efforts were made via social media and the provision of information on the respective websites of both hospitals.

Expectant mothers who wanted to participate in the study mainly registered via email with a registration form. A unique participant code was generated by the expectant mothers within their registration form. Then, the questionnaire link and consent form were sent to expectant parents via email. When completing the online questionnaire, data processing always had to be consented to at the beginning. Without consent, the questionnaire could not be completed. If no consent was given or the questionnaire was not completed, the participants were counted as dropouts. Further inclusion criteria were sufficient knowledge of German, age of maturity (>18 years) and planning to give birth in one of the two hospitals.

### 2.4 Measures
Communication behaviour, outcome expectancies, risk perception, intention, action planning, and perceived support were measured in self-reported questionnaires. Items were based on previously validated scales for the HAPA model and communication behaviour (Gholami & Schwarzer, 2016; Rider & Keefer, 2006; Schwarzer et al., 2007) and revised by the project team (obstetricians and health psychologists). The questions were administered in German. An English translation of the items is included in the appendix (A).

#### 2.4.1 Communication Behaviour
Communication behaviour was assessed via seven items from a self-constructed scale based on Rider and Keefer's communication competencies (Rider & Keefer, 2006), e.g., "*During pregnancy, I have communicated my needs clearly*". The answer categories ranged from 1 (*does not apply at all*) to 6 (*applies fully and completely*) with a *Cronbach's α* of .65.

### 2.4.2 Outcome Expectancies

Outcome expectancies were measured with three items, e.g., *"If I communicate well with doctors and midwives, my preferences can be considered during childbirth."* The answer categories ranged from 1 (*does not apply at all*) to 6 (*applies fully and completely*) with a *Cronbach's α* of .81.

### 2.4.3 Risk Perception

Risk perception was assessed with a single item: *"If I compare myself to other people of my age and gender, then my risk of communicating unsafely with doctors and midwives is … ."*. The answer categories ranged from 1 (*much lower compared to other patients*) to 5 (*much higher compared to other patients*).

### 2.4.4 Intention

Participants' intention was measured via two items, e.g., *"I intend to always pay attention that I communicate safely with the doctors and midwives."* The answer categories ranged from 1 (*does not apply at all*) to 6 (*applies fully and completely*) with a *Spearman-Brown coefficient* of .72.

### 2.4.5 Action pPanning

Action planning was assessed via two items: *"I have planned concretely how I communicate well in general."* and *"I have a clear plan for how I can communicate well during childbirth."* The answer categories ranged from 1 (*does not apply at all*) to 6 (*applies fully and completely*) with a *Spearman-Brown coefficient* of .83.

### 2.4.6 Coping Self-Efficacy

Coping self-efficacy was assessed with three items. For example, *"I'm sure I will be able to communicate well even if exhausted."* The answer categories ranged from 1 (*does not apply at all*) to 6 (*applies fully and completely*) with a *Cronbach's α* of .88.

### 2.4.7 Perceived sSupport

Lastly, perceived support was measured via a single item: *"My partner/ accompanying person helps me to communicate well with doctors and midwives."* The answer categories ranged from 1 (*does not apply at all*) to 6 (*applies fully and completely*).

### 2.4.8 Socio-Demographic Data

Age, marital status, highest level of education and nationality were assessed in categorical data. Age (1—"younger than 20 years of age", 2—"20–29 years", 3—"30–39 years", 4—"40–49 years"), education (1—"middle school degree or lower", 2—"high school diploma", 3—"vocational training", 4—"university degree"), and marital status (1—"single", 2—"in a relationship", 3—"married", 4—"divorced/ separated") were measured in 4 categories. Nationality was measured as 1 —"German" or 2—"Other".

### 2.5 Data Analysis

Participant demographics are presented descriptively separated by clinic. After that, means and Pearson correlations of the HAPA constructs are summarized. As missing data were less than 5%, missing item values were replaced by mean scores.

To examine how the HAPA variables are interrelated in the communication behaviour change process, an initial path analysis was calculated. In subsequent steps, one pathway at a time was iteratively changed to achieve a good model fit. Changes to pathways were only made if they fit the literature and brought additional value for the model fit (preferring parsimonious to complex models; Alavi et al., 2020). All adapted models were compared regarding their model fit in a $X^2$-test and the root mean square error of approximation (RMSEA) and comparative fit index (CFI) were reported.

Finally, the model with the best model fit considering the parsimony criterion was analysed in a path analysis (Figure 1).

**Figure 1. Tested path analysis in the HAPA model framework (N = 424), Model 8.**

Note: *p < .05, ** p < .01, *** p < .001. ß = Unstandardized beta coefficient.
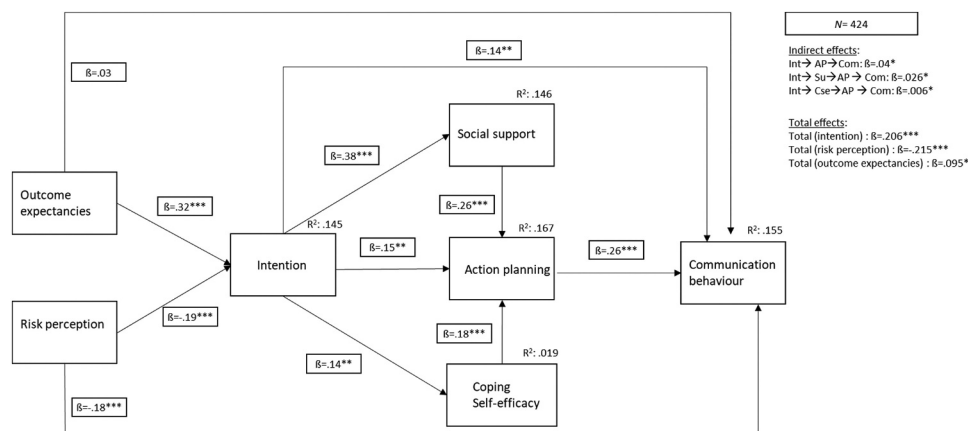


To test the path models and calculate model comparisons, the software MPlus v. 8.6 (Muthen & Muthen, 2017) was used. The maximum likelihood (ML) estimation was applied and significances of effects were determined via bias-corrected bootstrapping (10.000 iterations). A power analysis was calculated using the web application by Wang and Rhemtulla (2021).

## 3. Results

### 3.1 Participants
Originally, 492 pregnant women registered to participate. Of these, 424 (85.14%) completed the questionnaire. Few instances of missing values were imputed by mean values (see, Table 1 and 2). Table 1 gives an overview of the socio-demographic data. The most common age range was between 30 and 39 years. The expectant mothers were predominantly well educated (university degree), married or in a stable partnership and were of German nationality.

### 3.2 HAPA constructs
Descriptive statistics for the HAPA constructs and their correlations are reported in Table 2.

### 3.3 Path Analyses and Model Comparisons
The results of the stepwise iterations and improvements in model fits of the path analyses are depicted in Table 3. The stepwise modifications and their theoretical grounding are described in Table 4.

### 3.4 Final Path Model
Model 8 most accurately explained communication behaviour as a health behavior. It fitted equally well as the previous adaptation (model 7) but offers a less complex explanation for the occurrence of the investigated behaviour (omitting theorized pathways that were empirically non-significant). For this model, we report the unstandardized coefficients in Table 5, and the standardized coefficients in Figure 1 as well as the statistical power with a post-hoc power analysis conducted via a web application (Wang & Rhemtulla, 2021). The post-hoc power analysis was calculated to ensure that all paths could be detected with sufficient power, considering the parameters included (HAPA variables) and the sample size (*N*= 424). This is under the assumption that the effect sizes found in the data collected represent the true effect size (Lakens, 2022).

Model 8, shown in Figure 1, is reported to answer Hypotheses (a) to (d). Table 5 depicts the results along with the power analysis. The model fit was acceptable according to common cut-off values (Schwarzer et al., 2011b) and is displayed in Table 3.

Hypothesis (a) was empirically supported: both outcome expectancies, and risk perception, were associated with the intention to communicate safely. Additionally, hypothesis (b) was empirically

| Table 1. Socio-demographic characteristics of expectant mothers | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Clinic 1** | | **Clinic 2** | | **Missing[1]** | |
| | **n** | **%** | **n** | **%** | **n** | **%** |
| **Age** | | | | | | |
| Younger than 20 years | | | 1 | 0.5 | 3 | 1.3 |
| 20–29 years | 27 | 11.8 | 24 | 12.2 | | |
| 30–39 years | 174 | 76.3 | 160 | 81.6 | | |
| 40–49 years | 24 | 10.5 | 8 | 4.1 | | |
| **Marital status** | | | | | 3 | 1.3 |
| Single | 2 | 0.9 | 6 | 3.1 | | |
| In a committed relationship | 64 | 28.1 | 36 | 18.4 | | |
| Married/registered partnership | 159 | 69.7 | 150 | 76.5 | | |
| Divorced/separated | | | 1 | 0.5 | | |
| **Highest educational level** | | | | | 3 | 1.3 |
| No school-leaving qualification | 1 | 0.4 | 1 | 0.5 | | |
| Secondary or elementary school leaving | | | 1 | 0.5 | | |
| Secondary school diploma | 1 | 9.4 | 6 | 3.1 | | |
| A-Levels | 11 | 4.8 | 11 | 5.6 | | |
| Completed vocational training | 22 | 9.6 | 38 | 19.4 | | |
| University degree[2] | 31 | 13.6 | 47 | 24.0 | | |
| University degree[3] | 159 | 69.7 | 89 | 45.4 | | |
| **Nationality** | | | | | 3 | 1,3 |
| German | 195 | 85.5 | 172 | 89.1 | | |
| other | 30 | 13.2 | 21 | 10.9 | | |

Note. N = 424. [1] *missing values for each clinic* [2] *special German university degree (Hochschule).* [3] *university degree.*

supported, action planning mediated the association between the intention to communicate safely and communication behaviour. Thirdly, the results where congruent with hypothesis (c): a significant serial mediation from intention to social support to action planning to communication behaviour could be found in the path model. Likewise, a significant serial mediation from intention to coping self-efficacy to action planning to communication behaviour could also be found. Regarding hypothesis (d), the results were partially as hypothesized: Risk perception and outcome expectancies were directly associated with intention as hypothesized. Furthermore, there was -as hypothesized- no significant direct association between outcome expectancies and communication behaviour. However, there was a direct association between risk perception and communication behaviour contrary to our hypothesis.

## 4. Discussion

Communication behaviour in 424 pregnant women was examined within the HAPA model. The estimated path model fitted the data well and confirmed most of the hypotheses based on the HAPA: (a) Risk perception and outcome expectancies were related to the intention to communicate safely. (b) Planning mediated the association between intention and communication behaviour. (c) There was a serial mediation within the association between intention and communication via coping self-efficacy and action planning as well as via social support and action planning. (d) Risk perception was directly associated with intention and communication behaviour, and outcome expectancies were associated with intention. Hence, the presented HAPA model can be applied to understand safe communication behaviour in obstetric patients. However, it is important to note that certain adaptations were made to the model, which increased the model fit. It seems that there are some unique aspects of communication behaviour in the form of additional direct and

| Table 2. Correlations and descriptive statistics of constructs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **M (SD)** | **Missing values** |
| 1. Action planning | 1 | | | | | | | 3.66 (1.06) | 3 |
| 2. Communication behaviour | .23** | 1 | | | | | | 4.08 (0.67) | 6 |
| 3. Coping self-efficacy | .20** | .11** | 1 | | | | | 3.40 (0.90) | 3 |
| 4. Outcome expectancies | .07+ | .05* | .08** | 1 | | | | 4.81 (0.65) | 8 |
| 5. Risk perception | −.13** | −.13** | −.14** | −.04 | 1 | | | 2.53 (0.79) | 4 |
| 6. Intention | .20** | .12** | .09** | .15** | −.11** | 1 | | 5.14 (0.69) | 3 |
| 7. Social support | .39** | .11** | .03 | .10** | −.07 | .30** | 1 | 4.83 (1.12) | 6 |

Note. N = 424. *p < .05, ** p < .01, *** p < .001. Less than 5% missing values. Missing imputed by mean.

| Table 3. *Model comparison of adapted HAPA models (N = 424)* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **X²** | **df** | **p** | **RMSEA** | **CFI** | **ΔModels** | **ΔX²** | **Δdf** |
| Model 1 | 84.574 | 12 | .001 | .120 | .752 | | | |
| Model 2 | 73.168 | 11 | .001 | .115 | .788 | 2–1 | 11.606* | 1.00 |
| Model 3 | 42.512 | 10 | .001 | .088 | .889 | 3–2 | 30.656* | 1.00 |
| Model 4 | 30.905 | 9 | .001 | .076 | .925 | 4–3 | 11.607* | 1.00 |
| Model 5 | 30.959 | 10 | .001 | .070 | .928 | 5–4 | .054 | 1.00 |
| Model 6 | 18.134 | 7 | .011 | .061 | .962 | 6–5 6-4 | 12.825* 12.771* | 1.00 2.00 |
| Model 7 | 18.167 | 8 | .020 | .055 | .965 | 7–6 | .033 | 1.00 |
| Model 8 | 20.491 | 9 | .015 | .055 | .961 | 8–7 8–6 8–5 | 2.324 2.357 10.468* | 1.00 2.00 2.00 |

Note: *p < .05, ** p < .01, *** p < .001.

serial mediation effects. For example, intention is associated with both coping self-efficacy and social support, which in turn are related to action planning, which is associated with safe communication behaviour. Additionally, safe communication behaviour is also directly related to risk perception and intention.

The HAPA model assumes that intention is formed by evaluating expected outcomes and perceived risks (Schwarzer et al., 2011a). Our results suggest that such a process also underlies the formation of intentions to communicate safely in pregnant women. On a theoretical note, the presented findings confirm the broad application spectrum of the HAPA model to explain the formation of behaviour intention in different contexts (Hu et al., 2022; Zhang et al., 2019) and in the same field of research, but with a sample of healthcare professionals (Derksen et al., 2022).

The findings are of practical relevance given that outcome expectancies and perceived risks are associated with a higher intention to communicate safely, interventions designed to improve both could be effective in improving patients' communication intention. For designing interventions, patients´ awareness of potential risks should be aided by outcome expectancy: if the evaluation of one's outcome expectations is rated positively, the intention to communicate safely can be promoted. Our findings are in line with previous evidence (Schwarzer et al., 2018). On the other

| Table 4. Description of each HAPA model adaptation | |
| --- | --- |
| **Model** | **Changed paths compared to previous model** |
| Model 2 | Added: intention → communication behaviour<br>Reason: At first, we investigated whether the HAPA model would fit better to the context at hand if one adds a modification that certain HAPA studies found in the past: a direct path from intention to behaviour (e.g., Lao et al. 2021). In theoretical terms: We investigated to what extent the processes theorized within the volitional phase of the HAPA model would completely explain the intention-behaviour relationship. As in previous studies, this was not the case, which implicates that further processes might additionally underly mentioned relation in the context at hand. |
| Model 3 | Removed: intention → communication behaviour<br>Added: social support → action planning; copings self-efficacy → action planning<br>Reason: Next, we investigated another alternative modification (from the original HAPA model) that exists in the literature: direct effects from social support and from coping self-efficacy to action planning. In theoretical terms, these modifications mean: 1) the more a person is convinced of their ability to safely communicate even in challenging situations, the more likely they are to form concrete action plans for this; 2) the more a person perceives social support from their partner regarding their aim to communicate safely, the more this facilitates forming concrete action plans given the additional support. |
| Model 4 | Added: Intention → communication behaviour<br>Reason: In this step we applied the two HAPA modifications from the previous steps together. We could have done this directly but went the separate steps to examine towhich extent each modification increases overall model applicabilityrespectively and also to investigate to which extent the combination of both steps performs superior to each seperate one. |
| Model 5 | Removed: social support → communication behaviour<br>Reason: As part of this modification step we removed a non-significant regression path. The reason is that we wanted to avoid overfitting and achieve a good model fit due to reduced degrees of freedom. A comparison with model 4 shows even with reduced degrees of freedom, the model still performs well. |
| Model 6 | Added: Outcome expectancies → communication behaviour;<br>Risk perception → communication behaviour<br>Social support → communication behaviour<br>Reason: We investigated an additional HAPA modification (compared to model 4) that has been proposed in the literature (e.g., Lao et al. 2021). Like those previous researchers we wondered to what extent mere awareness of a health risk (risk perception) and a positive belief concerning behavioural outcomes (outcome expectancies) would suffice for health behaviour change to occur or if the HAPA processes including planning, coping self-efficacy etc. are indeed a necessary condition. Indeed, these direct effects on safe communication behaviour emerged additionally rendering the association between coping self-efficacy and the behavioural outcome non-significant. |
| Model 7 | Removed: Social support → communication behaviour<br>Reason: In this step, we combined the modifications made in steps 5 and 6, highlighting that their combination performs better than each on its own. Compared to the previous step (model 6) this involved removing the non-significant regression path between social support and communication behaviour. |
| Model 8 | Removed: Coping self-efficacy → communication behaviour<br>Reason: In the last step we removed the last remaining non-significant regression path to investigate whether the less parsimonious resulting model would still perform well. As a result, we show how model 8, which has been modified according to previous HAPA literature and is slightly more complex than model 1 by three degrees of freedom, performs much better in the behavioural context at hand. |

hand, risk perception was directly related to communication behaviour. Although this connection is not part of the initial HAPA assumptions, previous research has found that the presumed distal predictor of outcome expectancies directly predicted behaviour (Ungar et al., 2021). By adapting our model to include such direct paths, we investigated whether the same would apply to our behavioural context, which was partly the case. On the other hand, more indirect behaviour changes pathways emerged in the analyses.

Communication intention is directly and indirectly associated with actual communication behaviour. The direct link between intention and communication behaviour in healthcare settings indicates the crucial role of motivational processes. In previous research, the link of intention to communication behaviour was found to be ambiguous as the intention behaviour gap was only found in a subsample (Derksen et al., 2022). In this study, a direct effect emerged

| Table 5. Results from the path analysis in the HAPA framework (c.f. Figure 1) | | | | | | |
|---|---|---|---|---|---|---|
| **Parameters** | *b* | *SE* | *p* | *B 95% CI* | *ß* | *Power* |
| **Direct paths** | | | | | | |
| Oe → Int | **.338** | .049 | .001 | [.240; .431] | .32*** | >.99 |
| Oe → Comm behaviour | .030 | .052 | .560 | [−.071; .134] | .03 | .10 |
| Rp →Int | **−.161** | .040 | .001 | [−.243; .084] | −.19*** | .99 |
| Rp → Comm behaviour | **−.150** | .050 | .003 | [−.247; −.051] | −.18*** | .97 |
| Int → Su | **.622** | .086 | .001 | [.456; .792] | .38*** | >.99 |
| Int → Ap | **.236** | .080 | .003 | [.081; .396] | .15** | .86 |
| Int → Cse | **.181** | .061 | .003 | [.060; .298] | .14** | .83 |
| Int → Comm behaviour | **.131** | .055 | .017 | [.021; .236] | .14** | .74 |
| Ap → Comm behaviour | **.163** | .029 | .001 | [.104; .219] | .26*** | >.99 |
| Cse → Ap | **.205** | .055 | .001 | [.096; .313] | .18*** | .98 |
| Su → Ap | **.248** | .049 | .001 | [.152; .341] | .26*** | >.99 |
| **Indirect effects** | | | | | | |
| Int → Su → Ap → Comm behaviour | **.025** | .008 | .001 | [.013; .043] | .026* | >.99 |
| Int → AP → Comm behaviour | **.038** | .015 | .010 | [.014; .073] | .04* | .82 |
| Int → Cse → Ap → Comm behaviour | **.006** | .003 | .066 | [.002; .015] | . 006* | .56 |
| **Total effects** | | | | | | |
| Int → Comm behaviour | **.201** | .057 | .001 | [.088; .310] | .206*** | .98 |
| Rp→ Comm behaviour | **−.182** | .051 | .001 | [−.280; −.080] | −.215*** | >.99 |
| Oe→ Comm behaviour | **.098** | .050 | .050 | [.000; .197] | .095* | .54 |

Note: N = 424, *p < .05, ** p < .01, *** p < .001. ß = Unstandardized beta coefficient. Int = intention. Su = social support. Ap = action planning. Comm behaviour = communication behaviour. Cse = coping self-efficacy. Oe = outcome expectancies. Rp = risk perception.

in contrast to other research covering the intention behaviour gap. Sutton (2008) provides an example whereby the intention-behaviour-gap is completely mediated by action planning, indicating that volitional mechanisms are at work. In the current research, we also examined indirect associations.

Regarding the indirect links, intention is firstly associated with safe communication behaviour via action planning. We thus conclude that patients' intention to communicate safely was in part associated with the actual behaviour via formulation of concrete plans. This finding resonates with previous research on bridging the intention behaviour gap (Sutton, 2008; Teng & Mak, 2011; Yeager et al., 2018; Zhang et al., 2019). Evidently, communication behaviour is in line with a long list of behaviours for which this process was observed. This finding has practical implications for assisting patients in overcoming the intention-behaviour-gap regarding their safe communication: For instance, HCW or antenatal classes should assist pregnant women in the formulation of concrete action plans to communicate safely and transfer volitional self-efficacy and social support to build up resources.

Secondly, there is a separate/additional indirect route wherein action planning is involved: intention affects coping self-efficacy, which dynamically interrelates with action planning, and which in turn affects safe communication behaviour. This is partially in line with previous research in the same context (Derksen et al., 2022) and corresponds with other fields and variables of interest in the HAPA model (Hamilton et al., 2018; Pinidiyapathirage et al., 2018; Reyes Fernández et al., 2015; Schwarzer et al., 2011a). However, the current study was the first one investigating health behaviours within a sequential mediation model. The results demonstrate that after individuals intend to communicate safely, they rely on the skills required and potential barriers encountered in an attempt to enact this intention. This leads to an assessment of their own ability

to cope with such challenging situations and, ideally, the conclusion that potential obstacles are manageable. Once such a belief is established, it can support the formulation of concrete action plans that facilitate safe communication behaviour. Therefore, pregnant women should be supported and encouraged to believe in their ability to communicate safely.

Thirdly, action planning is involved in yet another serial mediation: intention is associated with social support, which in turn is related to action planning, and which again is associated with communication behaviour. Again, this finding is congruent with previous research (Paech & Lippke, 2017; Paech et al., 2016; Scholz et al., 2013). However, the current investigation adds to the pre-existing evidence in a new focus area while examining sequential mediation paths. Prior research focused on single mediation paths. We conclude from our results that pregnant women who have formed the intention to communicate well also mobilize social support, which in turn is associated with the planning of safe communication. The questionnaire item of social support is: "My partner/ accompanying person helps me to communicate well with doctors and midwives". Social support in the context of safe births is an important factor in our view, as pregnant women can secure their own plans through social support. The practical implications of this finding suggest that pregnant women should be assisted in planning and enactment of safe communication by involving their partners actively. Partners in turn can help women by providing social support and encouraging discourse about action plans. Nevertheless, it is possible that social support already facilitates the development of the intention to act in a certain way (Hu et al., 2022). Therefore, future research should validate the retrieved causal associations between social-cognitive constructs and test causal effects in experimental studies.

### 4.1 Limitations and Future Research

The study design is cross-sectional, so that causal conclusions are not possible. Longitudinal data would have allowed a clearer interpretation of the results and should be examined in future research. For example, the HAPA model could be applied in a RCT (randomized control trial) design. It is vital for future research to test and further investigate psychological mechanisms in RCT designs using behaviour change models. Future research should thus be concerned with the application of different methodological and design approaches to determine more causal changes instead of determining correlations between variables only.

In the present study, subjective reports and single items were also used, which might differ in their measurement accuracy. Both practices may imply limitations in terms of reliability. A further limitation that should be noted is the measurement of communication behaviour. It was measured retrospectively which may be associated with recall bias and social desirability. Future studies should therefore focus on measuring communication behaviour and its associated social-cognitive variables from a prospective perspective. Further, more measurement timepoints should be included in future research to not only show long-term changes. Moreover, objective measures are needed in the future, too.

It should also be noted that the mothers-to-be included in the study were highly educated and to the most part native speakers. This may relate to a self-selection bias which should be overcome in future studies. The current sample had good insights into their communication behaviour and associated constructs. This limits the generalizability of the results. Since the women were recruited via the two project-affiliated clinics and wanted to participate in the following training, it is possible that especially highly motivated expectant mothers participated in the study. Hence, the study should be replicated (with a longitudinal design) with women from different socio-economic backgrounds and cultural contexts.

### 4.2 Conclusion

Taken together, the results prove that the HAPA framework can be applied to expectant mothers' safe communication behaviour. These findings can serve as a foundation for future research that can investigate safe communication in antenatal care and during childbirth. Safe communication behaviour should be understood from a psychological perspective and targeted in interventions,

for example, as shown by the results of this study: Forming realistic action plans and mobilizing social support seems helpful to guarantee safe communication behaviour. Interventions should be based on psychological behaviour change theories and evaluated in thorough research designs.

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### Disclosure statement
The authors declare that the research was conducted in the absence of any commercial or financial relationship that could be construed as a potential conflict of interest.

### Data Availability
The data that support the findings of this study are available on request to the corresponding author, SL. The data are not allowed to be made publicly available due to privacy and data security reasons of research participants.

### Author contributions
LK, FMK, CD, and SL contributed to data collection and monitoring as well as conceptual aspects of the present study. LK analysed and described the data statistically and wrote all parts of the manuscript. NTH has provided advice on the methodology and reviewed the results. SL also advised on the methodological conception of the paper. NTH, FMK and CD have provided advice on the logic and structure of the paper. All co-authors endorsed the present version and contributed to the manuscript's process .

### Correction
This article has been corrected with minor changes. These changes do not impact the academic content of the article.

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**Appendix A**

**Questionnaire**

*Please answer the questions honestly and spontaneously. There is no right or wrong answer.*

| During pregnancy, when I was in contact with healthcare workers, I … . | Does not apply at all | Does not apply | Does slightly not apply | Does slightly apply | Does apply | Does apply fully |
|---|---|---|---|---|---|---|
| … reassessed whether I have passed on sufficient information. comm1 | ○1 | ○2 | ○3 | ○4 | ○5 | ○6 |
| … checked that I explained everything correctly when I was asked something. comm2 | ○1 | ○2 | ○3 | ○4 | ○5 | ○6 |
| … have communicated my needs clearly. comm3 | ○1 | ○2 | ○3 | ○4 | ○5 | ○6 |
| … addressed and coordinated upcoming steps early enough. comm4 | ○1 | ○2 | ○3 | ○4 | ○5 | ○6 |
| … was thinking about how much time they could take for a consultation. comm5 | ○1 | ○2 | ○3 | ○4 | ○5 | ○6 |
| … expressed my concerns and fears. comm6 | ○1 | ○2 | ○3 | ○4 | ○5 | ○6 |
| … tried to understand their perspective and situation. comm7 | ○1 | ○2 | ○3 | ○4 | ○5 | ○6 |

If I compare myself to other people of my age and gender, then my risk of communicating unsafely with doctors and midwives is … rp

| … much lower compared to other patients. | … lower compared to other patients. | … the same compared to other patients. | … higher compared to other patients. | … much higher compared to other patients. |
|---|---|---|---|---|
| ○1 | ○2 | ○3 | ○4 | ○5 |

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*Please now answer general questions about communication with doctors and midwives.*

| If I communicate well with the professional staff … | Does not apply at all | Does not apply | Does slightly not apply | Does slightly apply | Does apply | Does apply fully |
|---|---|---|---|---|---|---|
| … the atmosphere during the birth will be good. oe1 | ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 |
| … all important information will be considered during the birth. oe2 | ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 |
| … my preferences can be considered during childbirth. oe3 | ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 |
| **I am sure that I can communicate well …** | **Does not apply at all** | **Does not apply** | **Does slightly not apply** | **Does slightly apply** | **Does apply** | **Does apply fully** |
| … even when I am under stress. cse1 | ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 |
| … even if I'm exhausted. cse2 | ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 |
| … when I am in pain. cse3 | ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 |
| **I intend to always pay attention that I …** | **Does not apply at all** | **Does not apply** | **Does slightly not apply** | **Does slightly apply** | **Does apply** | **Does apply fully** |
| … communicate well with doctors and midwives. int1 | ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 |
| … communicate well with my partner/ accompanying person. int2 | ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 |
| **I have planned precisely how …** | **Does not apply at all** | **Does not apply** | **Does slightly not apply** | **Does slightly apply** | **Does apply** | **Does apply fully** |
| … to communicate well in general. ap1 | ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 |
| … to communicate well giving birth. ap2 | ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 |
| … how to communicate well even under difficult circumstances. cp | ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 |
| **My partner/ accompanying person …** | **Does not apply at all** | **Does not apply** | **Does slightly not apply** | **Does slightly apply** | **Does apply** | **Does apply fully** |
| … helps me to communicate well with doctors and midwives. supp | ◯1 | ◯2 | ◯3 | ◯4 | ◯5 | ◯6 |

## Appendix B

This appendix provides additional information about the model adaptions conducted before selecting model 8 as the best fitting model. Table 4 below summarizes which pathways were added or removed in this iterative process. Figure B1 shows the first model (Model 1) and Figure B2 shows the final and best fitting model (Model 8).

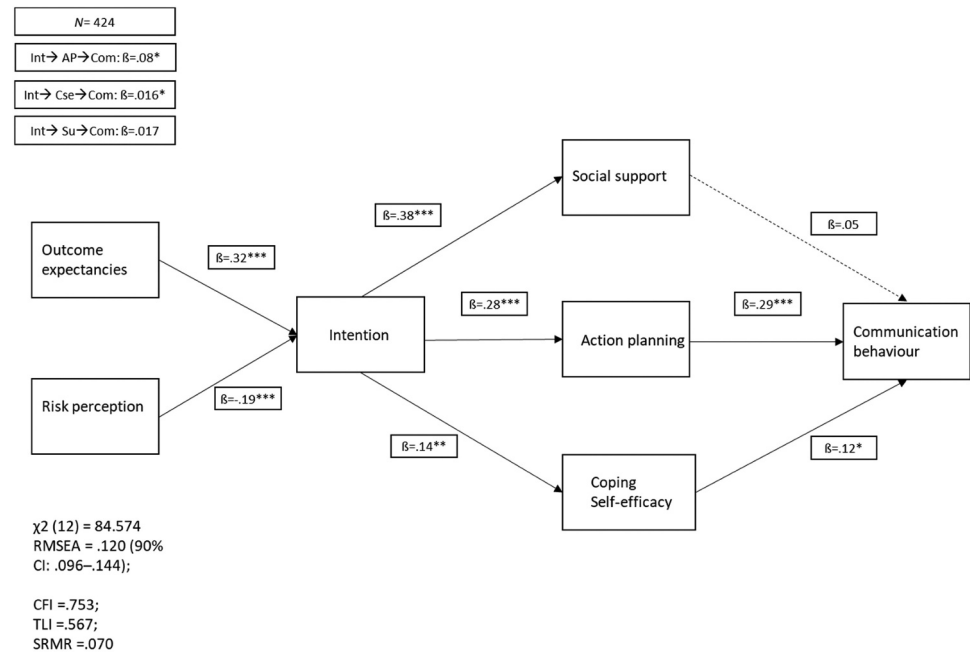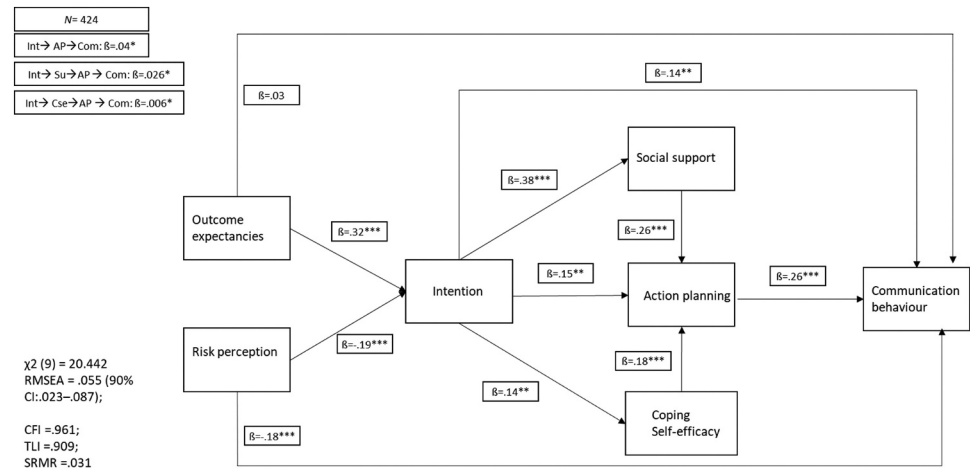**Figure B1. First version of the HAPA model before adaptations.**



**Figure B2. Final adapted version of the HAPA model.**

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