1 Title: The Effect of a Digital Intervention on Symptoms of Depression in
2 Pregnant Women Exposed to Intimate Partner Violence in Denmark and
3 Spain (STOP study)
4

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Abstract

Introduction and Objective

Intimate Partner Violence (IPV) during pregnancy is a significant public health concern associated with adverse maternal and fetal health outcomes, including increased risk of depression. This study aimed to assess the effectiveness of a digital empowerment-based intervention in reducing symptoms of depression among IPV-exposed pregnant women.

Study Design

This intervention study was nested within a cohort study conducted in Denmark and Spain. Pregnant women attending antenatal care were digital screened for IPV using the Abuse Assessment Screen (AAS) and the Women's Abuse Screening Tool (WAST). Those screening positive were offered a digital intervention comprising 3-6 video consultations with trained IPV counsellors and access to a safety planning app. Changes in depression scores from baseline to follow-up were evaluated using mixed model regression.

Results

From February 2021-October 2022, 1,545 pregnant women (9.6%) screened positive for IPV within our population (8.5% in Denmark and 17.0% in Spain) with 485 (31.4%) meeting the criteria for the intervention. Of those eligible, 104 (21.4%) accepted the intervention, and 55 completed it (13.1%). Post-intervention, a significant reduction in Edinburgh Postnatal Depression Scale (EPDS) was found, with a mean difference of -3.9 (95% CI: -5.3; -2.4), compared to the average pre-intervention score of 11.3. Stratifying the analyses across sociodemographic variables did not alter the overall result, indicating a reduction in EPDS scores irrespective of setting or sociodemographic factors. Notably, the intervention was most effective for women initially presenting with EPDS scores above the depression cut-off.

Conclusion

The findings suggest that, a brief digital intervention is associated with a reduction in depression symptoms among pregnant women exposed to IPV, particularly among those with high depressive scores. This highlights the potential of digital interventions in delivering counseling and shows efficacy when administered by both midwives and psychologists in diverse settings. However, the

absence of a control group underscores the need for caution in interpreting the results

Keywords

Intimate partner violence; domestic violence; telemedicine; mHealth; depression; mental health; antenatal care

Abbreviations

AAS: The Abuse Assessment Screen

CI: Confidence Interval

EPDS: Edinburgh Postnatal Depression Scale

IPV: Intimate partner violence

WAST: Women Abuse Screening Tool

WHO: World Health Organization

Key Message

Symptoms of depression are more common among pregnant women exposed to intimate partner violence. A brief digital intervention during pregnancy proved effective in reducing these symptoms. Future studies should investigate the long-term effects in randomized trials.

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Author contributions

Karen Andreasen: Formal analysis; Data curation; original draft; and Writing; Visualization; Investigation

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1. Introduction

Intimate Partner Violence (IPV) is a major public health issue with 9.3% of pregnant women experiencing physical, 5.5% experiencing sexual, and 18.7% experiencing emotional violence (1). IPV during pregnancy is particularly detrimental as it affects both the pregnant woman and the unborn child (2). Negative effects of IPV on pregnancy outcomes include increased risks of preterm birth, low birth weight, stillbirth (2-4), anxiety, post-traumatic stress disorder, and symptoms of depression (5-10). Overall, 11% of pregnant women experience symptoms of depression (11), yet, women exposed to IPV have a significantly higher prevalence of depression (12-14). Further, mothers with depression may exhibit reduced emotional responsiveness, which potentially may disrupt the mother-child relationship. Long-term, this may lead to emotional and behavioral issues in the child (6, 9, 15, 16).

Early interventions against IPV during pregnancy may reduce exposure, increase empowerment, and thereby improve maternal mental health, including depression (17, 18). Digital health

158 interventions is a feasible approach for supporting individuals exposed to IPV as they can overcome
159 geographical barriers and be more flexible (19-22). A systematic review found that such
160 interventions significantly reduce signs of depression compared to standard care (20). Yet, none of
161 the interventions investigated the effects among pregnant women. This study aims to investigate the
162 effect of a digital empowerment-based intervention on depression symptoms among pregnant
163 women exposed to IPV.
164

165 ## 2. Material and Methods
166

167 This study was an intervention study nested in a prospective cohort and conducted within antenatal
168 care settings in the Region of Southern Denmark and Andalusia, Spain. The profile of the study has
169 previously been described elsewhere (23).
170

171 ### Data Collection
172 We utilized the validated Abuse Assessment Screen (AAS) (24) and the Women Abuse Screening
173 Tool (WAST) (25) to identify women exposed to IPV. Women were assessed for eligibility in
174 relation to their first midwife consultation. In Denmark, eligible pregnant women who screened
175 positive for IPV were briefly informed about the project by the consultation midwife and later
176 provided with further details by a project midwife. In Spain, a psychologist contacted eligible
177 pregnant women and informed them about the project following the consultation. Exclusion criteria
178 were (1) could not be informed about the study alone; (2) lacked the mental or physical capacity to
179 participate; (3) did not understand Danish or Spanish; (4) lacked internet access and/or smartphones
180 or (5) were under the age of 18 in Denmark and 16 in Spain.
181

182 The intervention was empowerment-based as this approach has shown promising results in
183 improving mental health among non-pregnant women(18). It was developed with input from IPV
184 survivors and experts in violence and included up to six one-hour video consultations every second
185 week with an IPV counselor, as well as access to a safety planning app. In Denmark, the IPV
186 counselors were specially trained midwives, whereas in Spain, a psychologist provided the
187 counseling. The video counseling followed a manual and covered the following topics: evaluation
188 of abusive behaviors, safety planning, psychoeducation, self-esteem, and empowerment. Flexibility
189 was maintained to adapt the counseling session to the women´s needs.Prior to the video sessions,
190 participants attended a pre-session where they were introduced to the technical setup and to
191 provided informed consent. The digital consultations were conducted via the "My Hospital" app in
192 Denmark and the "Linkello Medical" platform in Spain. An adapted version of the 'MYPLAN'
193 smartphone app, hidden within a pregnancy app, was used as a safety planning tool to help women
194 create personalized safety plans, mitigate risks of violence, and easily access resources (26) (Figure
195 1: STOP set-up).
196
197 Socio-demographic information, information regarding relationship status and social network were
198 collected electronically via ePROM in Denmark, and in Spain through a digital IPV screening
199 questionnaire.
200
201 The Edinburgh Postnatal Depression Scale (EPDS) was used to assess depressive symptoms. It is a
202 validated 10-item with a 4-point (0-3) Likert scale (min-max score: 0-30). Women who did not
203 respond to all ten items were excluded from analysis. A cut-off score of 11 or above was used to
204 identify women with depressive symptoms (27). A sensitivity analysis using a cut-off score of 10
205 showed no significant changes in the results.

To assess changes in EPDS scores relative to empowerment changes post-intervention, we used the Measure of Victim Empowerment Related to Safety (MOVERS) – a validated 13-item questionnaire designed for evaluating safety-related empowerment. The scale ranged from 1 (never true) to 5 (always true) with higher scores indicating greater level of empowerment. The change in total score from baseline to follow-up was categorized as Improved (total post-score - total pre-score ≥ 0) or Unchanged/ reduced (total post-score - total pre-score ≤ 0).

Data were collected at study inclusion (pre-session) and one month after the intervention (post-session

Statistical Analysis

Baseline participant characteristics were summarized using frequencies with percentages for categorical data and means with standard deviations for continuous data. Absolute EPDS score changes were calculated as the mean difference for each woman before and after intervention. Relative changes in EPDS scores for each woman were categorized as: Improved (total post-score - total pre-score < -1), Unchanged (total post-score - total pre-score ≥ -1 and < 1) or Worsened (total post-score - total pre-score > 1.

Our analysis comprised three steps: First, we compared changes in EPDS score from baseline to follow-up within covariate categories. Separate models were constructed for each covariate, incorporating a participant-specific random intercept. Assumptions were visually evaluated, and all models were tested for interaction. Plots included predicted EPDS mean values and 95% confidence intervals (CIs). Second, we assessed the overall change in EPDS scores post-intervention through multivariate mixed model regression for longitudinal data. This analysis was adjusted for age,

231 country, parity, partner status, educational level, and post-intervention changes in empowerment.
232 These factors were selected a priori as potential influencers of depression scores among IPV-
233 exposed. Finally, we estimated proportions of women with improved, unchanged, or worsened
234 EPDS scores post-intervention, as within categories of EPDS scores above and below the cut-off.
235
236 Analyses were carried out using STATA (v17).
237
238 Ethical approvement was obtained from the Regional Committee on Health Research Ethics for
239 Southern Denmark and the Andalusian Research Ethics Committee. While EPDS may identify
240 women at risk of depression, it is not a diagnostic tool. However, pregnant women with scores
241 above 13 (Denmark) and 17 (Spain) were encouraged to undergo a clinical evaluation by healthcare
242 professionals (n=9) (23).
243

244 3. Results

245
246 Data were collected between January 2021 and July 2022. In total, 16,068 women (82.6%)
247 completed the questionnaire and were screened for IPV with 1,545 screening positive (Figure 2).
248 Among them, 485 (31.4%) were eligible and 104 women were enrolled into the intervention (54
249 Danish, 50 Spanish women). Reasons for ineligibility have been described elsewhere (23). Of those
250 enrolled, 56 women (53.8%) completed the intervention (40 Danish; 16 Spanish women). One
251 woman was excluded for incomplete EPDS items, leaving 55 women for analysis. Two participants
252 suffered an abortion but remained in the study. Sensitivity analysis showed excluding these women
253 did not alter the results.
254

255 Table 1 presents characteristics of women who completed the intervention. Danish women had a
256 mean age of 28.7 years, they were included in gestational week 17.3, and most received 3-4
257 counselling sessions. In Spain, the mean age was 32.3 years, they were included in gestational week
258 8.9, with all receiving 6 sessions. The majority in both countries were aged 26-35, first-time
259 expectant mothers, living with a partner, employed, college-educated, and had a confidant.
260
261 At baseline, 55% (30/55) of the women reported signs of depression (EPDS ≥11) while post-
262 intervention, 30.9 % (17/55) scored above this threshold. In total, 15 women improved their EPDS
263 score below the cut-off (EPDS<11) whereas two increased their EPDS scores above the cut-off
264 (EPDS≥11).
265

266 ## Changes in EPDS score

267 The pre-EPDS score was 10.9 in Denmark and 12.5 in Spain. Overall, a significant reduction in
268 EPDS scores was observed after the intervention with a mean difference (MD) of -3.9 (95% CI: -
269 5.3; -2.4) compared to the pre-score of 11.3 (Table 2). Reductions in EPDS scores were evident
270 across socio-demographic categories: country, parity, education level, employment status, and
271 gestational age at inclusion (Table 2). However, the reduction in EPDS score was significant only
272 for women living with a partner and it was borderline significant for women aged over 36 years (p-
273 value=0.05).
274
275 Figure 3 shows plots from mixed model regression for each covariate. Testing differences in EPDS
276 score from baseline to follow-up between slopes within covariate categories revealed no significant
277 differences (p-values >0.05), indicating similar changes in EPDS score across different covariate
278 categories. Most plots indicated a reduction in EPDS score post-intervention, although with
279 overlapping confidence intervals. Yet, there was no change in the EPDS score for the women whose

empowerment score remained unchanged/worsened (p: 0.701), and significant interaction was identified within categories of empowerment suggesting different changes in EPDS score (p: 0.023).

Among the 55 women, 27 (49.1%) received all 6 counselling sessions, while the remaining women had fewer sessions. Regardless of the number of completed sessions, there was a significant reduction in EPDS scores. Pre-session EPDS score was 13.3 for women attending all 6 sessions, compared to 9.6 and 9.2 for those attending 5 or 3-4 sessions, respectively. However, there were no significant differences in the reduction of EPDS scores between these categories (p-values: 0.76-0.81).

The multivariate mixed model regression, stratified by empowerment categories due to interaction (Table 3), revealed a significant decrease in EPDS scores for women with improved empowerment post-intervention (-4.77; p: 0.000) while there were no significant differences for participants with unchanged or reduced empowerment scores (p: 0.78).

Individual EPDS score changes were examined post-intervention. Of the participants, 40 (73%) showed improvement, 8 (15%) had no change, and 7 (13%) experienced worsened scores. Notably, all 7 women with worsened scores initially had a pre-intervention EPDS score below the cut-point of 11. Stratified on pre-intervention EPDS score, those with initial scores >11 was more likely to significantly improve depressive symptoms compared to those with scores <11 (93% vs. 48%, p<0.001).

304 ## 4. Discussion

305 We found a significant improvement in the EPDS score following a digital intervention aimed at
306 empowering pregnant women exposed to IPV. The intervention proved effective across diverse
307 settings and socio demographic characteristics and had highest impact among women presenting
308 with higher depression symptoms.

309

310 We observed the highest pre-intervention scores in women under the age of 26, those with the
311 lowest educational attainment, those unemployed and those living with a partner. Interestingly,
312 these same groups also showed the most substantial reductions in their EPDS scores after the
313 intervention. Similar findings have been observed in other intervention studies(13, 28, 29). In
314 contrast, women no longer in a violent relationship did not experience reductions in EPDS scores;
315 moreover, their mean EPDS score at pre-intervention was below cut-off, indicating no depressive
316 symptoms. We included women with past exposure to violence because leaving a violent partner
317 does not guarantee violence cessation (8, 30, 31), however, it may reduce the frequency of violence
318 and positive impact the mental health. Interventions like ours, which specifically address violent
319 situations and safety planning, may be less suitable for women not living with an abusive partner.
320 These women may benefit more from other strategies focusing on improving their quality of life, as
321 their needs may have shifted from ensuring the immediate safety (32) and suggest that one
322 intervention model may not be suitable for IPV-exposed women.

323

324 The intervention was designed to enhance participants' empowerment, as studies have documented
325 the positive impact of empowerment-based interventions on depression (17, 18), and a change in
326 empowerment scores was included in the adjusted analysis. Our results suggest that increased levels
327 of safety-related empowerment, potentially served as a protective factor against the development of

328 depressive symptoms. However, our tool (MOVERS scale) has limitations as it focuses on
329 empowerment changes related to safety, making it more relevant for women currently experiencing
330 violence. Yet, women no longer in a relationship with an abusive partner may experience
331 empowerment in other domains. Hence, incorporating assessments that capture empowerment
332 across various domains could offer a more comprehensive understanding of individuals'
333 empowerment status.
334
335 Cross-country variations in intervention set-up –midwives in Denmark and psychologists in Spain –
336 resulted in similar EPDS score reductions. A Cochrane review found a beneficial effect of
337 psychological counseling on depression among IPV-exposed women, regardless of the counsellor's
338 background (33). From a clinical perspective, midwife counselling may be more accessible than
339 psychologist counselling. Yet, this does not apply if there is a need for more in-depth trauma
340 therapy. Midwives consider discussions about relationships, including inquiries about IPV, relevant
341 during midwife consultations as part of their work (34, 35). However, continuous IPV training and
342 supervision with a clinical psychologist are essential to enhance midwives' confidence in
343 counselling (36, 37).
344
345 Although we observed a positive effect of the intervention on signs of depression among
346 participants, it is essential to discuss the feasibility in a clinical context. We used two different
347 digital screening approaches: population-based screening in Denmark using routine ePROM data
348 linked to patient files and tablet screening in Spanish antenatal clinics. The implementation of
349 ePROMs in Denmark enables the screening of a large number of women (38) ; however, routine
350 screening was linked to a lower intervention acceptance rate (18%) compared to Spain (45%).The
351 comparatively lower figures in Denmark likely reflect challenges in implementation IPV screening

352 in routine antenatal care, including time constraint and midwives lack of confidence in discussing
353 IPV (37, 39-41). Additionally, some women may have declined an intervention due to concerns
354 about potential consequences, such as involvement of child protection services or anonymity issues.
355 The Danish findings align with an Australian study where 2.9% of the pregnant women screened
356 IPV-positive routinely in antenatal care and among them, 24.8% were referred for specialized
357 support. (42).
358
359 Half of the women received 6 sessions, while the remaining women received fewer. The choice of
360 fewer sessions by some women might indicate either that they did not require additional sessions or
361 that their needs were not addressed adequately in the intervention. We did not find any significant
362 difference in the reduction of EPDS scores based on the number of completed sessions. Instead, we
363 observed that women who received more sessions had higher initial depression scores. This
364 observation could suggest successful self-selection.
365
366 There were differences between IPV-exposed participants and non-participant: More participants
367 screened both AAS and WAST positive, lacked social network, and fewer Danish participants were
368 foreign-born, and employed (Table A1). These factors should be taken into consideration regarding
369 study results and generalizability. No other significant differences were observed.
370
371 A major strength of this study is that the screening and digital intervention occurred within a non-
372 selected population of pregnant women who were referred to routine antenatal care in both
373 Denmark and Spain. Moreover, it is a cross-country European study that provides country-specific
374 and cross-cultural evidence regarding the potential and challenges of digital solutions of IPV in
375 relation to screening rooted in antenatal care.

376

377 However, our study also has limitations. First, we excluded women who did not speak
378 Danish/Spanish; thus, our findings cannot be generalized to these groups. Second, the lack of a
379 control group prevents assessment of how EPDS scores might have changed without the
380 intervention. Yet, other studies that have examined women's mental health during pregnancy have
381 found consistent EPDS scores with minimal variation in repeated measurements (9, 43, 44). Third,
382 the small study population could impact the results and may limit the ability to detect differences.
383 Finally, we did not measure EPDS scores in the postpartum period. Given the episodic and varying
384 severity of IPV exposure, a short follow-up period may not capture changes in women's mental
385 health (6, 8).

386

387 Conclusion

388 This study found that a brief digital empowerment-based intervention may improve the mental
389 health of IPV-exposed pregnant women. The digital design is an efficient way of delivering
390 counselling to pregnant women, irrespective of their geographical location. The intervention proved
391 effective when delivered by both midwives and psychologists, and in two different countries.

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403 Figure 1: STOP intervention

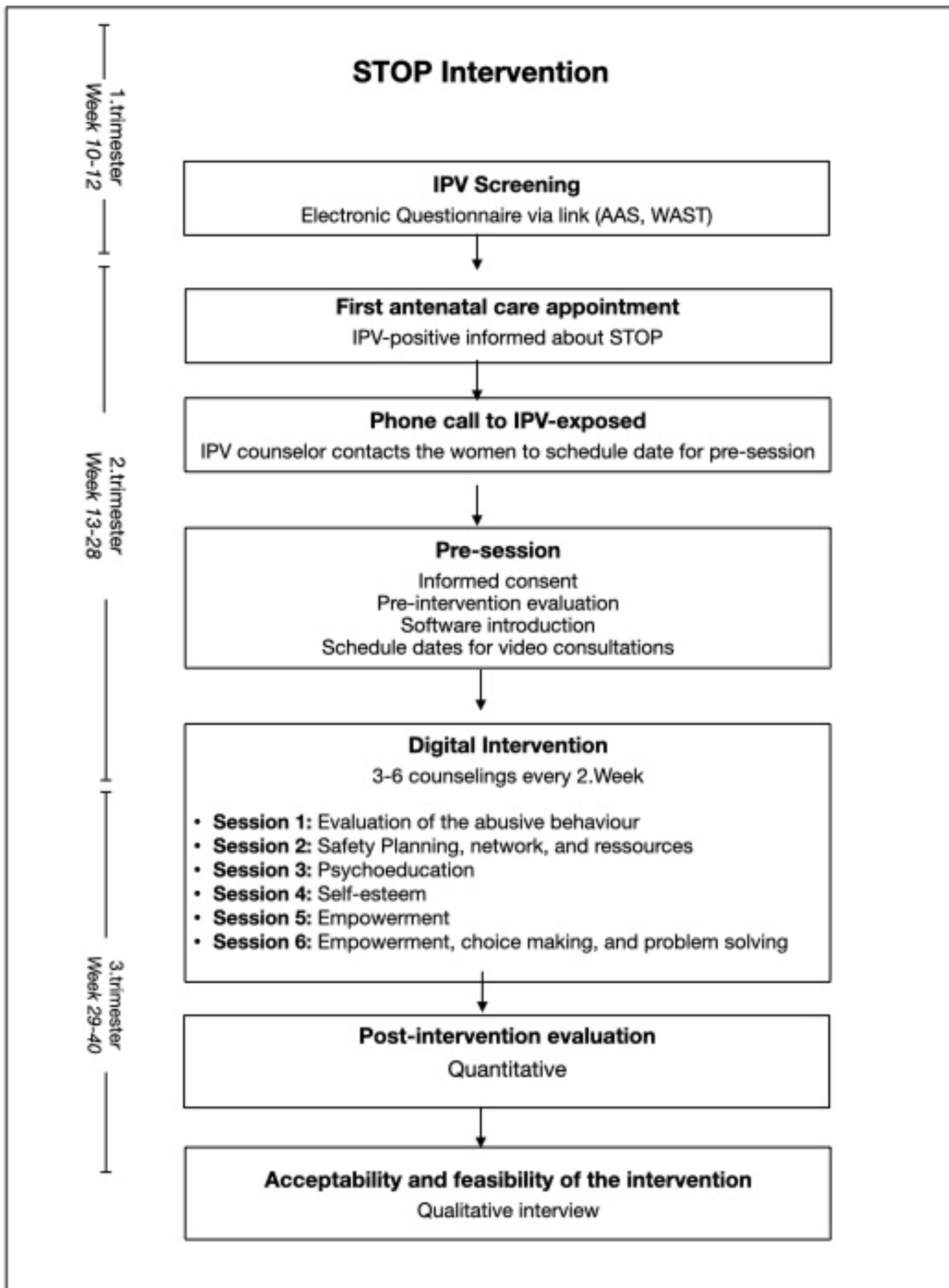

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Table 1: Socio-demographic and antenatal characteristics of the participants

	Denmark N=40 n (%)	**Spain N=15** n (%)	**Total** n (%)	**P-value**
	40 (72.7)	15 (27.3)	55	
Age, mean (sd)	28.7 (5.4)	32.2 (6.5)	29.6 (5.9)	0.036[a]
Age groups				
< 26	10 (25.0)	3 (20.0)	13 (23.6)	
26-35	26 (65.0)	8 (53.3)	34 (61.8)	
>35	4 (10.0)	4 (26.7)	8 (14.5)	0.34[c]
Partner status				
Partner, living together	28 (70.0)	13 (86.7)	41 (74.5)	
Partner, not living together	3 (7.5)	1 (6.7)	4 (7.3)	
No partner*	9 (22.5)	1 (6.7)	10 (18.2)	0.388[c]
Educational level				
Primary school	5 (12.5)	1 (6.7)	6 (10.9)	
Secondary school	15 (37.5)	7 (46.7)	22 (40.0)	
College	20 (50.0)	7 (46.7)	27 (49.1)	0.74[c]
Employment status				
Employed	27 (67.5)	10 (66.7)	37 (67.3)	
Unemployed	13 (32.5)	5 (33.3)	18 (32.7)	0.95[b]
Nationality				
Foreign	0 (0.0)	1 (6.7)	1 (1.8)	
Spanish	N/A	14 (93.3)	14 (25.5)	
Danish	40 (100.0)	N/A	40 (72.7)	0.00[c]
Social Network**				
Have a person to trust	38 (95.0)	12 (80.0)	50 (90.9)	
Do not have a person to trust.	1 (2.5)	3 (20.0)	4 (7.3)	0.057 [c]
Number of children prior to this pregnancy				
0	21 (52.5)	9 (60.0)	30 (54.5)	
1	13 (32.5)	6 (40.0)	19 (34.5)	
2+	6 (15.0)	0 (0.0)	6 (10.9)	0.348[c]
Gestational age at inclusion, mean (sd)***	17.3 (4.1)	8.9 (2.1)	15.3(5.2)	0.00[a]
Number of Counselling Sessions				
3-4	15 (37.5)	0 (0.0)	15 (27.3)	
5	13 (32.5)	0 (0.0)	13 (23.6)	
6	12 (30.0)	15 (100.0)	27 (49.1)	0.00[c]

407 *[a]: Wilcoxon rank sum test;[b]: Chi2 test;[c]: Fishers exact test*
408 **: At the time of questionnaire completion, the pregnant woman was not in a relationship.*
409 ***: Missing information on Social Network at inclusion in one person*
410 ****: Missing information on gestational age at inclusion in three persons*

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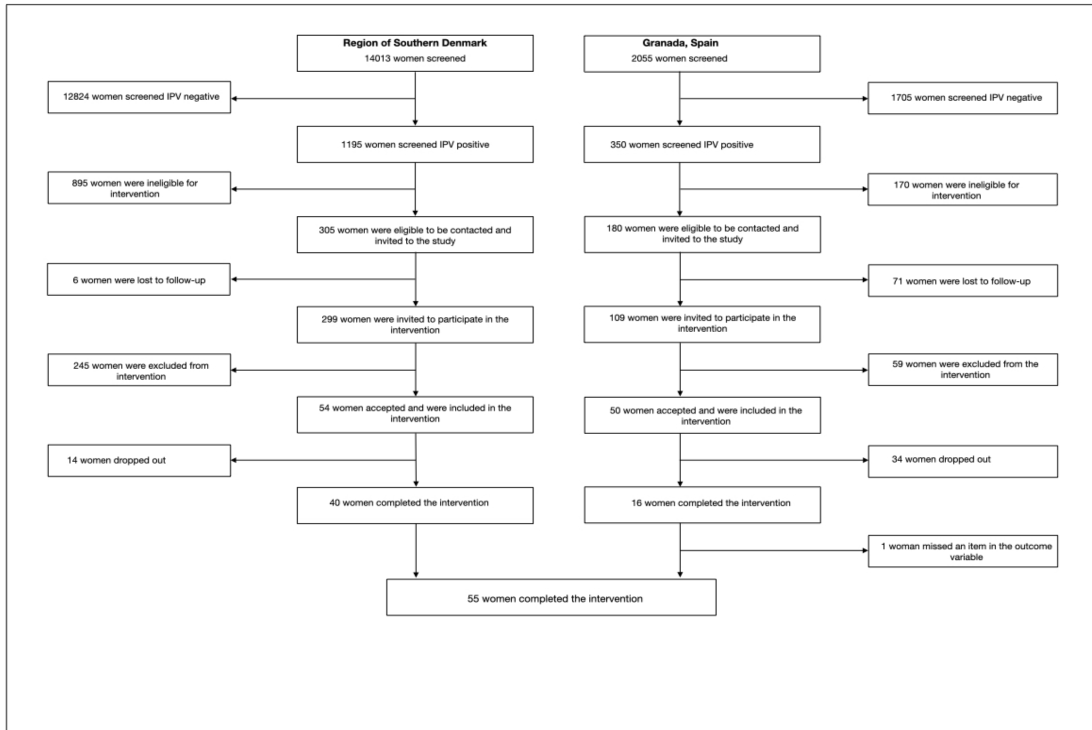
Figure 2: Flowchart



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437 Table 2: Pre- and post-intervention mean EPDS score according to socio-demographic and antenatal characteristics.

	N	Pre EPDS Mean Score (95%)	Post EPDS Mean Score (95%)	EPDS Difference Score diff. (95% CI)	P Value	Difference between categories Score diff. (95% CI)	P Value
Overall	55	11.3 (9.7-12.9)	7.6 (6.2; 8.9)	-3.9 (-5.3; -2.4)	N/A		
Country							
Denmark	40	10.86 (9.00; 12.72)	7.06 (5.20; 8.92)	-3.80 (-5.54; -2.06)	<0.001		
Spain	15	12.53 (9.55; 15.52)	8.53 (5.55; 11.52)	-4.00 (-6.84; -1.16)	0.006	-0.20 (-3.53; 3.13)	0.906
Number of Counselling Sessions							
3-4	15	9.20 (6.22; 12.18)	5.40 (2.42; 8.38)	-3.80 (-6.62; -0.98)	0.008		
5	13	9.61 (6.49; 12.73)	6.46 (3.34; 9.57)	-3.15 (-6.19; -0.12)	0.041	0.65 (-3.50; 4.79)	0.760
6	27	13.31 (11.11; 15.50)	9.09 (6.89; 11.28)	-4.22 (-6.33; -2.12)	<0.001	-0.42 (-3.94; 3.10)	0.814
Age							
<26	13	13.82 (10.63; 17.01)	9.28 (6.09; 12.47)	-4.54 (-7.58; -1.49)	0.003		
26-35	34	10.59 (8.58; 12.60)	7.00 (4.99; 9.01)	-3.59 (-5.47; -1.71)	<0.001	0.95 (-2.63; 4.53)	0.603
>=36	8	10.37 (6.18; 14.57)	6.50 (2.31; 10.69)	-3.88 (-7.76; 0.01)	0.050	0.66 (-4.27; 5.60)	0.792
Education							
Primary or Secondary	28	12.50 (10.27; 14.73)	8.36 (6.12; 10.59)	-4.14 (-6.25; -2.04)	<0.001		
Above Secondary school	27	10.11 (7.86; 12.36)	6.56 (4.31; 8.80)	-3.56 (-5.70; -1.41)	0.001	0.59 (-2.42; 3.59)	0.702
Employment							
Employed	37	10.81 (8.88; 12.75)	7.00 (5.07; 8.93)	-3.81 (-5.62; -2.00)	<0.001		
Unemployed	18	12.34 (9.60; 15.08)	8.39 (5.66; 11.13)	-3.94 (-6.54; -1.35)	0.003	-0.13 (-3.30; 3.03)	0.934
Parity							
Nulli para	30	10.77 (8.61; 12.92)	6.80 (4.65; 8.95)	-3.97 (-6.00; -1.93)	<0.001		
> Nulli para	25	11.99 (9.60; 14.38)	8.27 (5.88; 10.66)	-3.72 (-5.95; -1.49)	0.001	0.25 (-2.77; 3.27)	0.873
Gestational age at inclusion							
<10 gest. Week	11	11.55 (8.02; 15.07)	8.09 (4.56; 11.62)	-3.45 (-6.81; -0.10)	0.043		
10-20 gest. week	27	10.48 (8.23; 12.73)	6.48 (4.23; 8.73)	-4.00 (-6.14; -1.86)	<0.001	-0.55 (-4.52; 3.43)	0.788
>20 gest. Week	10	11.57 (8.45; 14.70)	8.00 (4.87; 11.13)	-3.57 (-6.54; -0.60)	0.018	-0.12 (-4.60; 4.36)	0.959
Partner Status							
Partner, living together	41	11.91 (10.06; 13.76)	7.62 (5.77; 9.47)	-4.29 (-5.99; -2.59)	<0.001		
Partner, not living together	4	11.75 (5.77; 17.73)	7.50 (1.52; 13.48)	-4.25 (-9.70; 1.20)	0.126	0.04 (-5.67; 5.75)	0.988
No partner	10	8.60 (4.98; 12.23)	6.70 (3.08; 10.33)	-1.90 (-5.35; 1.55)	0.280	2.39 (-1.45; 6.24)	0.222
Empowerment Post-Intervention (MOVERS)							
No Change/reduced empowerment	11	11.90 (8.34; 15.46)	11.26 (7.70; 14.83)	-0.64 (-3.89; 2.61)	0.701		
Improved empowerment	40	11.65 (9.84; 13.46)	6.88 (5.06; 8.69)	-4.78 (-6.48; -3.07)	<0.001	-4.14 (-7.81; -0.47)	0.027

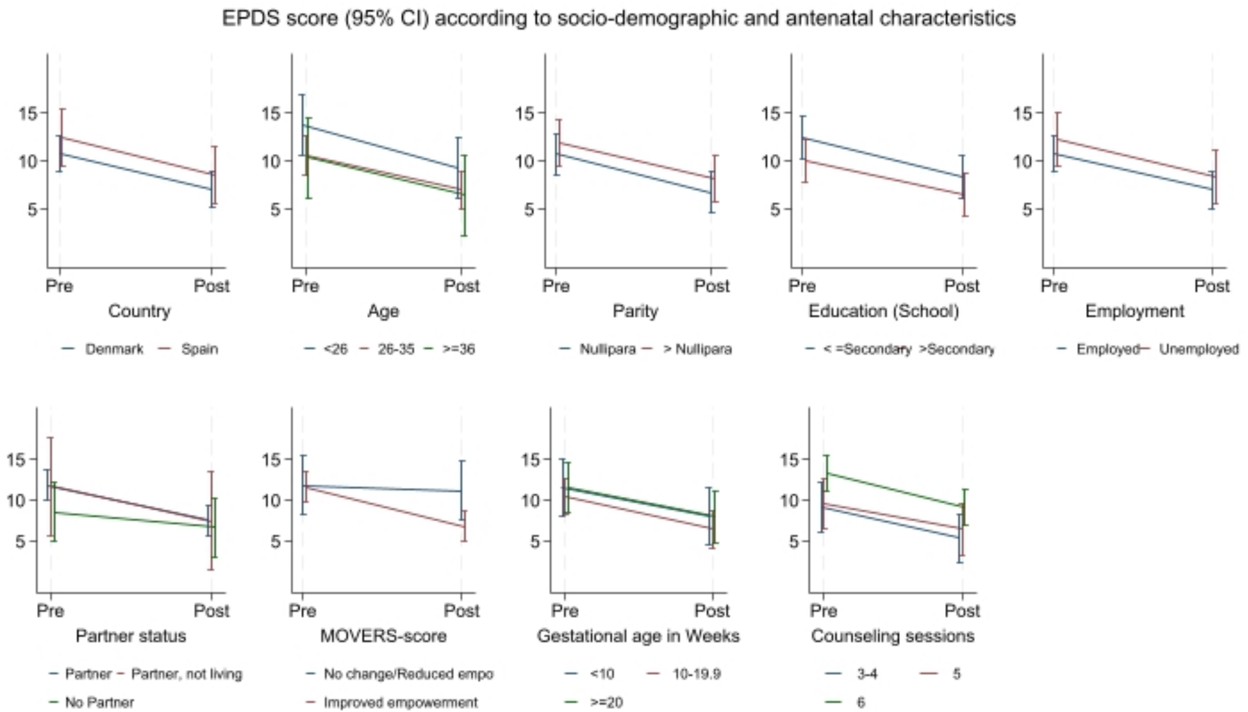
438 **Missing information on gestational age at inclusion on 3 persons; Empowerment is missing on 4 persons.*

Table 3: Change in mean EPDS score Post intervention.

	Score difference	(95% CI)
EPDS score *	-3.9	(-5.3; -2.5)
EPDS score ** (Improved Empowerment)	-4.77	(-6.2; -3.3)
EPDS score *** (Unchanged/ reduced Empowerment)	-0.64	(-5.1; 3.8)

** Change in EPDS score from baseline to follow-up using linear mixed regression models for longitudinal data*
Due to interaction, stratified analyses were conducted within categories of changes in Empowerment scores.
***Mixed Model regression, adjusted for country, age, partner status, parity, educational level, and Empowerment score improved.*
****Mixed Model regression, adjusted for country, age, partner status, parity, educational level, and Empowerment score unchanged/reduced.*

Figure 3: Plots over EPDS Score means (95%CI) at Pre-and Post-intervention, according to covariates.



455 Table 4: Relative changes in EPDS score according to pre-intervention maternal mental health.

Change in EPDS score								
	N	Improved EPDS Score		Unchanged EPDS score		Worsened EPDS score		P Value
Overall								
	55	40	73%	8	15%	7	13%	
EPDS score pre intervention								
Score below or equal to 11	25	12	48%	7	28%	6	24%	
Score above 11	30	28	93%	1	3%	1	3%	0.001

456 *Fischer's exact test*

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478 **Supplemental Files**

479 Table A1: Comparison of Sociodemographic Variables among Included and not included IPV-Positive Women

	Denmark				Spain			
IPV positive	**Not included**	**Included**	**Total**	**P-value**	**Not included**	**Included**	**Total**	**P-value**
n (%)	1141 (95.5)	54 (4.5)	1195 (100.0)		239 (84.8)	43 (15.2)	282 (100.0)	
Age groups								
< 25	239 (20.9)	14 (25.9)	253 (21.2)		64 (26.8)	11 (25.6)	75 (26.6)	
26-35	755 (66.2)	35 (64.8)	790 (66.1)		125 (52.3)	24 (55.8)	149 (52.8)	
>35	144 (12.6)	5 (9.3)	149 (12.5)	0.583	17 (7.1)	2 (4.7)	19 (6.7)	0.805
Missing	3 (0.3)	0 (0.0)	3 (0.3)		33 (13.8)	6 (14.0)	39 (13.8)	
Marital status								
Partner, living together	996 (87.3)	37 (68.5)	1033 (86.4)		211 (88.3)	34 (79.0)	245 (86.9)	
Partner, not living together	81 (7.1)	4 (7.4)	85 (7.1)		21 (8.8)	6 (14.0)	27 (9.6)	
No partner	55 (4.8)	12 (22.2)	67 (5.6)	0.498*	5 (2.1)	3 (7.0)	8 (2.8)	0.110
Missing	9 (0.8)	1 (1.9)	10 (0.8)		2 (0.8)		2 (0.7)	
Educational level								
Primary school	133 (11.7)	6 (11.1)	139 (11.6)		43 (18.0)	7 (16.3)	50 (17.7)	
Secondary school	304 (26.6)	19 (35.2)	323 (27.0)		125 (52.3)	26 (60.5)	151 (53.5)	
College	658 (57.7)	27 (50.0)	685 (57.3)		65 (27.2)	10 (23.3)	75 (26.6)	
other	38 (3.3)	0 (0.0)	38 (3.2)	0.284	0 (0)	0 (0)	0 (0)	0.708
Missing	8 (0.7)	2 (3.7)	10 (0.8)		6 (2.5)	0 (0)	6 (2.1)	
Employment status								
Employed	896 (78.5)	37 (68.5)	933 (78.1)		159 (66.5)	28 (65.1)	187 (66.3)	
Unemployed	240 (21.0)	15 (27.8)	255 (21.3)	0.016*	76 (31.8)	15 (34.9)	91 (32.3)	0.727*
Missing	5 (0.4)	2 (3.7)	7 (0.6)		4 (1.7)	0 (0)	4 (1.4)	
Parity								
Nulli para	522 (45.7)	25 (46.3)	547 (45.8)		95 (39.7)	14 (32.6)	109 (38.7)	
> Nullipara	616 (54.0)	24 (44.4)	640 (53.6)	0.489	140 (58.6)	29 (67.4)	169 (59.9)	0.397*
Missing	3 (0.3)	5 (9.3)	8 (0.7)		4 (1.7)	0 (0)	4 (1.4)	
Social network								
Have a person to trust	974 (85.4)	43 (79.6)	1017 (85.1)		220 (92.1)	35 (81.4)	255 (90.4)	
Do not have a person to trust	19 (1.7)	5 (9.3)	24 (2.0)	0.04	16 (6.7)	8 (18.6)	24 (8.5)	0.018*
Missing	148 (13.0)	6 (11.1)	154 (12.9)		3 (1.3)	0 (0)	3 (1.1)	
Nationality								
Native	804 (70.5)	53 (98.1)	857 (71.7)		211 (88.3)	35 (81.4)	246 (87.2)	
Foreign born	149 (13.1)	1 (1.9)	150 (12.6)	0.011*	25 (10.5)	8 (18.6)	33 (11.7)	0.195*
Missing	188 (16.5)	0 (0.0)	188 (15.7)		3 (1.3)	0 (0)	3 (1.1)	
IPV-screening criteria								
WAST positive only	739 (64.8)	2 (3.7)	741 (62.0)		181 (75.7)	20 (46.5)	201 (71.3)	
AAS positive only	332 (29.1)	42 (77.8)	374 (31.3)		30 (12.6)	7 (16.3)	37 (13.1)	
AAS and WAST positive	70 (6.1)	10 (18.5)	80 (6.7)	0.000*	28 (11.7)	16 (37.2)	44 (15.6)	0.000

480 *P-values were calculated without missing values using the Chi-squared test. For marked (*) cases, P-values were calculated with Fisher's exact test, and with*
481 *the Mann-Whitney test for # cases.*
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