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Pregnancy-related diastasis rectus abdominis: Impact of a multi-component group-based intervention

Abstract

Purpose: To explore the feasibility and effect on outcomes of a one-time multi-component group-based intervention among women with pregnancy-related diastasis rectus abdominis (DRA).

Methods: Women with clinically diagnosed DRA and minimum 8 weeks postpartum participated in a pre-post cohort pilot study. Subjects participated in a group workshop consisting of education and exercise prescription. They were assessed before the workshop and 8 weeks later with a booster session at 4 weeks. The following assessments were used: inter-recti distance (finder width), linea alba (LA) integrity, LA tension generating capacity, active straight leg raise (ASLR), Pelvic Floor Disability Index (PFDI-20), and global rating of change scale(GRC).

Results: Thirty participants were enrolled in this study and 16 completed both pre and post measurements (53.3%). Following intervention, all outcomes measures improved with statistically significant changes in IRD (finger width), LA integrity, and LA tension generation.

The average GRC score was 1.7. Issues with loss to follow up point to lack of feasibility of this intervention in its current format.

Conclusion: We found one-time multi-component group-based intervention improved pregnancy-related DRA outcomes. Future studies need to further explore the effect of the different components within this intervention, particularly behavioural strategies. Further, the benefit of applying self-management principles in DRA interventions as well as further investigating assessment techniques is also warranted.

Keywords: sdiastasis rectus abdominis, exercise, self-management, feasibility

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Introduction

Diastasis rectus abdominis (DRA) is a condition largely characterized as a midline separation of the rectus abdominis muscles at the linea alba (LA).[1–3] The widening and subsequent thinning of the LA results in impaired integrity of the tissue which alters the ability of the LA to maintain stability and transmit load through the abdominal wall.[1] DRA is highly prevalent throughout pregnancy and postpartum. An estimated 30% to 70% of pregnant women have this condition and 35-60% remain affected into the postpartum period.[3–5] Furthermore, it has been found that 23-32% of women have persistent DRA at 1-year post-partum.[6,7] Some of the reported consequences of DRA include: cosmetic concerns; lumbopelvic pain; and pelvic floor dysfunctions manifested as urinary incontinence, fecal incontinence, and pelvic organ prolapse.[8–10] Due to its high prevalence and associated functional impairment secondary, and understanding of best conservative care strategies are important for women's health physiotherapists and other relevant perinatal care practitioners.

Current clinical practice regarding DRA emphasizes measurement of the inter-recti distance (IRD) using digital palpation (finger width), callipers, or ultrasound for the diagnosis of DRA.[1,3,6,7,11,12] The IRD is generally assessed along the length of the LA, between the two sides of the rectus abdominis muscles, at more than one specified site, although there is no established standard protocol for assessment.[1,7,12–14] Furthermore, it has been recently proposed that IRD measurement alone may not capture the behaviour and function of the LA.[13] Due to the fact that the methods for measurement and criteria for diagnosis of DRA remain unstandardized, this issue was explored in a recent Canadian Delphi Consensus study.[14] A total of 28 expert-based recommendations were derived from this study, three of which were specific to assessment of DRA.[14] Experts agreed that IRD measurement alone is not sufficient to garner a meaningful understanding of the function of the abdominal wall. Rather, the assessment of DRA should encompass other parameters including the tension generating capability of the LA with a voluntary pelvic floor or transversus abdominis (TA) contraction and assessing the integrity of the LA with digital palpation.[14] However, currently there is not an established method of operationalizing these assessment techniques.

Although there are no published guidelines for the optimal conservative management of DRA, a widely used and well-accepted, although yet to be proven effective, intervention is exercise.[8,11] The most recent systematic review investigative the effect of exercise on DRA found that due to the poor quality of current literature, no conclusions regarding the efficacy of exercise in DRA management could be made.[11] A recent rigorously conducted randomized control trial (RCT) conducted by Gluppe and colleagues (2018), found no effect of a 16-week supervised postpartum exercise program focusing on pelvic floor and trasversus abdomins (TA) muscle training.[8] These findings contrasted those of an earlier and less rigorous study which determined some benefit to DRA with a similar exercise focus.[15]

Two practice-based research studies have pointed to interventions for DRA that extended beyond exercise presciption. Keeler and colleagues (2012) conducted a cross-sectional study exploring clinical practice patterns among USA women's health physical therapists.[16] The most common interventions cited in this study were: TA and rectus abdominis strengthening, posture training, education related to appropriate mobility and lifting techniques, and the "Noble method".[16] More recently (2019) a Canadian Delphi Consensus study established 28 expert-based practice recommendations related to assessment, behavioural strategies and exercise principles.[14] Combining providers perspectives from these studies together with finding from more rigorous research trials highlights the need to further explore both behavioural strategies and exercise prescription within an intervention for DRA. Furthermore, the current literature inclusive also points to the needs to expand assessment strategies beyond just examining IRD.

The purpose of the study was to assess both the feasibility and effect on outcomes of a multicomponent (education related to behavioural strategies and prescribed exercises) one-time group based pregnancy-related DRA workshop.

Methods

Study design

A pre-post cohort design was employed with an intervention period lasting eight weeks. Following initial screening, confirmation of eligibility and provision of informed consent, participants were prospectively enrolled into the study. Baseline assessments were undertaken prior to the intervention. A booster session, communicated via email, containing the summary points of the workshop with an emphasis on self-monitoring points and a reminder of the prescribed exercises was sent four weeks after the initial workshop. At eight weeks, the follow-up assessment took place. The workshops took place on three separate instances in three different locations in Ontario Canada. This study received ethics approval from the Hamilton Integrated Research Ethics Board (#2391).

Participants

Participants were recruited through local perinatal care clinics across the Greater Toronto Area of Ontario, Canada. Individuals were eligible to participate if they had a clinical presentation of DRA (IRD of at least two finger widths) and were at minimum eight weeks postpartum. Individuals were excluded if they were within the eight weeks of the postpartum period to ensure that potential improvements over the course of the study were not due to the natural healing and tissue repair that characterizes the first 8-weeks post-partum.[7]

Outcome measures

Both physical and self-report assessments were used. Physical assessments included the active straight leg raise test (ASLR), LA integrity (digital palpation), tension generating capacity of the LA with a voluntary TA contraction and IRD (via finger width). All physical assessment procedures were carried out with subjects in a supine, crook lying position. For the three LA assessments three established points were used based on established IRD protocols: at the umbilicus, two fingerbreadths above, and two fingerbreadths below the umbilicus. Self-report measures included the Pelvic Floor Distress Inventory, the global rating of change (GRC) and a feasibility survey that was developed by the research team. Given the recommendation in the literature to assess functional parameters of the LA,[14] yet a lack of established procedures to do so, we developed a standardized scale to carry out these assessments. Specifically, a 5-point Likert scale ranging from 1 representing strongly disagree to 5 representing strongly agree was used to quantify LA integrity and LA tension generation. A 5-point scale was used in order to provide a scaling method that had high test-retest reliability (0.91) and validity (r=0.87) and to maximize ease and efficiency of use.[23] The comparator point used for both these assessment techniques was the most superior aspect of the LA (under the xiphoid process) given that area it typically intact among women with DRA and thus as reasonable benchmark. All data were inputted into Microsoft Excel 2017 for analysis. Refer to Table 1.

Table 1 Data Analysis

Test	Rationale	Procedure	Psychometric Properties
1. Active Straight Leg Raise	Hypothesized to measure the integrity of load transfer function from the legs to the trunk and can be biased to test a variety of structures, such as the TA, multifidus and pelvic floor musculature.[17]	Participant asked to lift one leg at a time to a height of 6-8 inches, and then rated the task on a scale of 0-5, with zero being "no difficulty" and five being "unable to do".In the second phase of the task, the examiner approximated the LA to see if the difficulty rating changed. If subject scored a zero initially, the second phase of the measurement was not conducted.The ratings for the left and right legs were then averaged.	High test-retest reliability (ICC=0.83) Sensitivity= 0.87 Specificity= 0.94 17
2. IRD	This method is the most clinically used assessment tool for DRA.[19] Other methods of measuring IRD include calipers and ultrasound, which is considered the gold standard.[20]	Quantitatively assessed IRD using examiner's finger width. Participants were asked to perform a partial curlup while assessors palpated and measured the IRD at the three established points along the LA.	Interrater reliability= 0.53 Test-retest reliability= 0.73-0.77.19
3. LA integrity	LA integrity has been shown to be the most important contributor to the overall stability of the abdominal wall.[18] Advocated as an important measure to ascertain function of the LA.[14]	Qualitatively assessed perceived LA integrity using a five-point Likert scale of "strongly agree" to "strongly disagree" as compared to normal limits (superior aspect of LA).	N/A
4. LA tension generation	The relationship between abdominal muscle function, thoraco-pelvic stability and breathing patterns are mediated via the connective tissue of the abdominal musculature, the LA. As such, in assessing DRA it is crucial to assess the functionality of this tissue.[14]	Qualitatively assessed the degree of tension generated through the LA with a voluntary inner unit controaction (cue: imagine a clock is over your belly button and you are pulling 9 and 3 on the closk towards the milddle) using the five-point Likert scale of "strongly agree" to "strongly disagree" as compared to normal limits.	N/A

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Table Continued....

Test	Rationale	Procedure	Psychometric Properties
5. PFDI-20	The PFDI-20 is the short-form version of the original outcome measure which examines three different inventories: pelvic organ prolapse, colorectal-anal, and urinary distress.[21]	Consists of three inventories assessing pelvic organ prolapse, colorectal-anal, and urinary distress. Each question measures how much a symptom bothers the subject on a scale of 0-4 with zero indicating "symptom not present" and four indicating "quite a bit".	Test-retest reliability (ICC=0.86) Excellent responsiveness for women with pelvic floor disorders. [21]
6. Global Rating Of Change (GRC)	A GRC is used to quantify participant improvement over time as a way of determining the overall feasibility of an intervention.[22]	11 point scale ranging from -5 to +5, "very much worse" to "completely recovered"	Test-retest reliability and face validity (ICC=0.90) MDC= 0.45 points MCID= 2 points [22]

Intervention

The intervention consisted of a one-time multicomponent group-based workshop. The workshop was approximately two hours in length and was delivered by a women's health physiotherapist. The content of the workshop was based on the current research literature base,[8,11,13,15] including recent expert recommendations,[14] and covered information regarding the pregnancy-related DRA through the various stages of the perinatal care period. Behaviour strategies related to optimal management of intra-abdominal pressure was a focus of the workshop as was the teaching of self-monitoring strategies related to these behaviours. Finally, four specific exercises were prescribed and demonstrated and all participants had an opportunity to practice the exercises and ask questions. The intervention was founded on principles of self-management support, emphasizing strategies such as self-monitoring to facilitate participant empowerment and autonomy.[24] Further, group interventions delivered by physiotherapists have been found to be favourable specifically because of the group dynamic.[24] The four prescribed exercises were based on research demonstrating the importance of pelvic floor and deep core abdominal muscle exercises in addition to proper breathing mechanics for DRA.[6,11,15,16,25] All exercises used the cue "imagine pulling your perineum to the crown of your head" in order to elicit a pelvic floor and associated TA contraction. Refer to Table 2 for a description of the exercises. Four weeks following the initial workshop, a booster session was administered via email in order to review the key components of the workshop and a review of the prescribed exercises. This interaction also gave participants and opportunity to engage with the research team and ask questions if needed. This booster session was employed to act as a self-management support tool for participants as previous research has indicated improved self-management with such interventions.[24]

Table 2 Description of the exercises

Exercise 14,16	Description given to participants
1. Core breath	"When we inhale our diaphragm and pelvic floor lower together and the opposite happens when we exhale. With your spine in neutral alignment, try to contract your pelvic floor when you are exhaling."
2. Single leg t-position clap	"Start on your back with your arms in a t-position. Fingers are stretched and active. One leg is bent and the other leg extended with the ankle flexed. Inhale to prepare and as you exhale, you will contract your pelvic floor. Once your pelvic floor is contracted you will continue to exhale as you pull your arms together until your hands clap and simultaneously slide your extended leg up to the same position as the bent one. When you inhale you will let the pelvic floor relax with control and lower your arms and leg back to their start position."
3. Bridging	"Inhale to prepare while you are lying on your back in your start position, exhale and contract your pelvic floor. Once contracted, continue to exhale as you push up into bridge. As you inhale again you will release the pelvic floor and lower back down to the starting position."
4. Four point arm lift	"In this exercise you start on your hands and knees. Inhale to prepare. As you exhale, you will contract your pelvic floor and then as you continue to exhale, first lift your arm up and extend it forward and then lift your opposite leg and extend it backward. As you inhale you will release the pelvic floor and return back to your four point starting position. If this is too challenging, then only do the arm lift and keep the leg in four point."

Data collection

Data were collected by four examiners. Although, inter-rater reliability of the examiners was not established, congruency in acquisition of training ensures that examination methodology was standardized between each physiotherapist. Examiners participated in a training workshop prior to commencement of the study to confirm both the examination process and consistency of all assessment procedures. In addition, the examiners followed the same subjects at baseline and post-intervention.

Data analysis

Descriptive statistics of subject's characteristics were presented as frequencies or mean and standard deviations (SD). Two data sets were analyzed; one for the all participants who completed the pre-intervention assessment (N=30) and another for only the participants who completed the post-intervention follow-up assessment (N=16). The average change was determined for each continuous measure: age, duration of DRA, and PFDI-20. Non-parametric ranksumex statistics were calculated using Stata 14.2 for ASLR, LA integrity, LA

tension generating capacity and LA width (IRD) as these measures were not normally distributed and the study sample size was less than 25.

Feasibility was assessed to determine the potential of this mode of intervention in order to gain insight prior to further testing in more rigorous research designs.[26] Feasibility was determined by analyzing the number of participants who enrolled in the study, completed and complied with the intervention. Participant data regarding loss to follow up was recorded in a research log and data pertaining to compliance was collected via a survey completed post-intervention. The GRC scores were also determined and these were analyzed using mean and standard deviation.

Results

Response and participant characteristics

There was a high interest among potential participants for this study with 147 respondents to calls for participation. Resource and space constraints translated to a maximum number of 40 participants. Of these, 30 (n=30) participants completed baseline measures and the intervention and 16 completed both baseline and post-intervention measures. Refer to Figure 1. Characteristics of the final sample included a mean age of 38 years (SD±5.0), mean number of previous births was 2.1 (SD±0.9) and mean duration with DRA was 4.3 years (SD±4.6). Refer to Table 3.

Table 3 Baseline characteristics

	Overall*	**Completed****	**Drop outs*****
Age (years)	38.03 (5.03)	37.5 (5.57)	38.96 (4.60)
Number of previous births	2.10 (0.94)	2.06 (0.85)	2.15 (1.07)
Duration of DRA (years)	4.37 (4.64)	3.92 (5.14)	4.98 (4.01)
Previously received treatment for DRA	36.70%	18.80%	57.10%
Medical Conditions	Crohn's Disease (2), RA, iritis, Hashimotos (2), umbilical hernia (2), splenectomy, ovarian cysts, microdisectomy, L4/L5 disc herniation, spinal stenosis, hypothyroidism	Crohn's disease (2), RA, iritis, Hashimotos (2), umbilical hernia, splenectomy, ovarian cysts	Microdisectomy, L4/L5 disc herniation, spinal stenosis, hypothyroid, umbilical hernia (2)
PFDI-20, median (IQR)	60.42 (15.62-95.31)	54.17 (13.15-93.23)	73.37 (25-121.88)
ASLR, median (IQR)			
Before approximation	0.25 (0-1)	0 (0-0.5)	1 (0-1.75)
After approximation	0 (0-0.5)	0 (0)	0.25 (0-0.5)
Integrity of LA, median (IQR)			
at umbilicus	2 (1-2)	1 (1-2)	2 (2-3)
2cm above umbilicus	2.5 (2-3)	2.5 (1.25-2)	2.5 (2-3)
2cm below umbilicus	2 (2-3)	1.75 (1.5-2)	2.5 (2-3)
Width of LA, median (IQR)			
at umbilicus	2 (2)	2 (2-2.25)	2 (1.5-2)
2cm above umbilicus	2 (1-2)	2 (1.25-2)	1.75 (1-2)
2cm below umbilicus	1.75 (1-2)	1.75 (1.5-2)	1.5 (1-2)
Tension Generation, median (IQR)			
at umbilicus	2 (2-3)	2 (1-3)	2 (2-4)
2cm above umbilicus	3 (2-4)	3 (2-4)	2.5 (2-3)
2cm below umbilicus	2 (2-3)	2 (2-3)	2 (2-3)

DRA, Diastasis Rectus abdominis; IQR, Interquartile Range; PFDI-20, Pelvic Floor Disability Index-20; ASLR, Active Straight Leg Raise; LA, Linea Alba; RA, rheumatoid arthritis

*n = 30, **n=16, ***n=14

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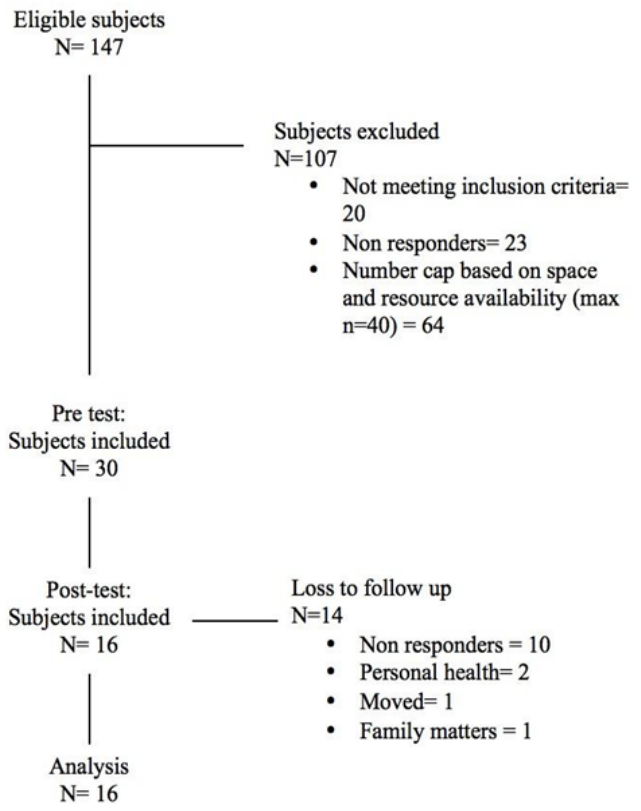

Figure 1 Response and participant characteristics.

Primary outcome: LA width (IRD)

Given that IRD is the established primary method of diagnosing and tracking change related to DRA in the literature, IRD (figure width) was the primary outcome measure in this study. At baseline, the median width at the umbilicus was 2 with an interquartile range (IQR) of 2-2.25. Following intervention, the median width at the umbilicus was 1.5 with an IQR of 1.25-2. This change was statistically significant (p=0.001). At baseline, the median width at 2cm above the umbilicus was 2 with an IQR of 1.25-2. Following intervention, the median width at 2cm above the umbilicus was 1 with an IQR of 1-1.5. This change was statistically significant (p=0.007). At baseline, the median width at 2cm below the umbilicus was 1.75 with an IQR of 1.5-2. Following intervention, the median width at 2cm below the umbilicus was 1 with an IQR of 0.5-1.5. This change was statistically significant (p=0.002).

Secondary outcomes: LA integrity and LA tension generation, ASLR, PFDI-20 and GRC

The secondary outcomes of this study were: LA integrity, and LA tension generation as well as ASLR, PFDI-20 and GRC. Refer to Table 3.

At baseline, the median integrity of the LA at the umbilicus was 1 with an IQR of 1-2. Following intervention, the median integrity of the LA at the umbilicus was 2 with an IQR of 2-3. This change was statistically significant (p=0.001). At baseline, the median integrity of the LA at 2 cm above the umbilicus was 2.5 with an IQR of 1.25-2. Following intervention, the median integrity of the LA at 2 cm above the umbilicus was 4 with an IQR of 2.5-4. This change was statistically significant (p=0.034). At baseline, the median integrity of the LA at 2cm below the umbilicus was 1.75 with an IQR of 1.5-2. Following intervention, the median integrity of the LA at 2cm below the umbilicus was 3 with an IQR of 2-4. This change was not statistically significant (p=0.091).

At baseline, the median tension generation of the LA (with voluntary TA contraction) at the umbilicus was 2 with an IQR of 1-3. Following intervention, the median tension generation of the LA at the umbilicus was 3 with an IQR of 3-4. This change was statistically significant (p=0.006). At baseline, the median tension generation of the LA at 2 cm above the umbilicus was 2 with an IQR of 1.25-2. Following intervention, the median tension generation of the LA at 2cm above the umbilicus was 4 with an IQR of 3-4. This change was not statistically significant (p=0.064). At baseline, the median tension generation of the LA at 2cm below the umbilicus was 2 with an IQR of 2-3. Following intervention, the median tension generation of the LA at 2 cm below the umbilicus was 4 with an IQR of 3-4. This change was statistically significant (p=0.002).

At baseline, the median ASLR before approximation was 0 with an IQR of 0-0.5. Following intervention, the median ASLR before approximation was 0 with an IQR of 0-0.5. This change was not statistically significant (p=0.872). At baseline, the median ASLR after approximation of the two sides of the rectus abdomins muscles was 0 with an IQR of 0. Following intervention, the median ASLR after approximation was 0 with an IQR of 0. This change was not statistically significant (p=1.000).

At baseline, the median PFDI-20 was 54.17 with an IQR of 13.15-93.23. Following intervention, the median PFDI-20 was 52.09 with an IQR of 11.97-100. This change was not statistically significant (p=0.910). Of those subjects that completed the reassessment, the average GRC score was 1.7 (SD±0.97). The minimal detectable change of the GRC scale is 0.45.

Feasibility

There were 16 subjects that completed the post-intervention follow-up assessment for a total attrition rate of 46.7%. When subjects were asked whether they followed the advice and instruction from the workshop, 81.3% (13/16) indicated yes and 18.8% (3/16) indicated no. Reasons stated for not following advice and instruction included travel, stress, lack of time, and not performing the exercises as often as they should have. When subjects asked how often they made changes to how they performed daily activities, 0% stated never, 0% stated rarely, 31.3% (5/16) stated sometimes, 56.3% (9/16) stated often, and 12.5% (2/16) stated always. When subjects were asked whether they did the four exercises, 0% stated never, 6.3% (1/16) stated rarely, 50% stated sometimes (8/16), 37.5% (6/16) stated often, and 6.3% (1/16) indicated always. As such there was more compliance with the daily behavioural strategies than with the prescribed exercises. Given the initial interest in the study (n=147), but only 16 participants completed the study the intervention in its current form is not considered to be feasible.

Discussion

To date, this study is the first to investigate the feasibility and effect on outcomes on an evidence-based multicomponent group workshop for pregnancy-related DRA. We found that a one-time workshop founded on self-management support principles translated to improvements on all study outcomes. Statistically significant improvements included: LA width (IRD), LA integrity, and LA tension generation with the exception of integrity 2 cm below the umbilicus and tension 2cm

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above the umbilicus, although a trend towards improvement was determined for both. Notably, the improvement in LA integrity and LA tension generating capacity were found to parallel improvements in IRD, the most widely used outcome measure to assess DRA in the literature.[1,3,6,7,11,12] In addition, since the minimal detectable change of the GRC scale is 0.45. We feel confident that a true and potentially clinically significant change occurred due to the intervention.

These results suggest that parameters outside the widely used IRD, including LA integrity and LA tension generation, may be useful to more comprehensively assess pregnancy-related DRA. Findings from this study maintain that IRD is a valuable measure and should be continued to be used in clinical practice however, other measures of different LA characteristics are likely important to capture. Using LA integrity and LA tension generation in conjunction with IRD may more fully the changes to the LA and subsequent abdominal wall dysfunction relevant to pregnancy-related DRA.[1,8,9,10,14] More research is needed related to the validity and reliability of these assessments is needed.

The results of this study study are discordant with results found in a recent RCT by Gluppe et al. whose study found no statistically significant differences between an exercise intervention and control group for DRA prevalence.[8] The protocol consisted of a 16-week intervention focused on strengthening exercises of the TA, pelvic floor and other common abdominal exercises. However, the intervention in this study did not include a self-management component to facilitate behaviour change.[14] Moreover, the intervention commenced 6 weeks post-pregnancy which falls within the period of natural postpartum healing and thus perhaps additional confounding factors exist at this time.[1,7] Since abdominal sit-ups were performed in this study, the LA may not have been ready to be loaded in this manner, for some participants.[14] Moreover, an RCT is limited in its ability to individualize exercise protocols due to the rigor in standardization, limiting the potential to maximize outcomes. This holds true in the perinatal population where certain exercises can compromise the LA in some individuals but not in others.[1] Further research is needed to stratify not only which exercises might optimally load the abdominal wall but also attend to how IAP is managed among individuals performing those exercises and account for when these exercises are being implemented and what are the other contextual factors at play at that time.

Moderate support for exercise has been found in a systematic review by Benjamin et al. whose findings supported trends towards a decrease in IRD by 13% in an exercise group compared to 5% for controls. Unfortunately, due to lack of high quality literature, findings did not reach significance. Finally, in line with our findings, exercise and education has been supported in non-RCT studies. This includes a case report by Gitta and colleagues using an intervention emphasizing education on proper activity mechanics in combination with strengthening exercises that resulted in a 26% reduction of the IRD after a three month intervention.[27] Support was also found for exercise in a pre-post study design by Khandale et al.[28] using strengthening exercises with statistically significant improvements in IRD above and below the umbilicus measured using finger width and calipers.[28] Our study adds to this body of research, suggesting that more education and self-management principles may need to be included in future studies and that perhaps the standardized exercise protocols used in RCTs are not appropriate and need to be individualized in order to maximize outcomes. ertainly established.

While participant recruitment was no issue in this study, retention and compliance with follow-up proved challenging. We elicited interest from 147 eligible participants with minimal recruitment effort which highlights the clinical and importance of the issue of pregnancy-related DRA. Also a one-time, one hour workshop represents a resourceful approach that shows promise in term of efficacy. However, the support for feasibility was not maintained throughout the study with a loss to follow-up of 46.7%. This lack of retention shows that there were significant limitations with the study and or intervention design and protocol used. Reasons for loss to follow-up did not appear to be related to the intervention, such as adverse events, but rather were most often reported as personal reasons (Figure 1). The MDC of 0.45 points for the GRC was met, proving that overall perceived change was statistically significant and was not due to measurement error. However, the improvement did not reach a clinically meaningful change and as such it is suggested that the protocol be modified prior to testing in a fully-powered randomized controlled trial.

Limitation and future directions

While the effects of this pilot study demonstrated a consistent trend towards improvement, there were several limitations that warrant discussion. The largest limitation was the loss to follow-up of 46.7%. This introduces a large threat to validity and reduces the ability to determine significance of results. While the reasons for drop-out were recorded in an attempt to control for bias, we acknowledge that this speaks largely to a lack of feasibility within the current study. Perhaps an incentive for follow-up would have mitigated such gross loss and it is suggested that future studies take this into account during protocol design. Another limitation was the small sample size, despite high interest in the study, due to resource constraints. This reduces generalizability of results and reduces power as a non-parametric analysis had to be utilized. The authors hence considered that behaviour change may have been more robust if there were more tailored self-management principles utilized in the intervention. Detailed action planning and measurement of self-efficacy have been shown to be important components in reducing the intention-behaviour change gap and therefore, future studies should consider these individualized approaches to enhance self-management.[29] These changes might be considered in future studies. Also behavior strategies in addition to exercise prescription are included in interventions that confirm efficacy for both prevention and management of pelvic organ prolapse.[30] Given the findings from this study in light of the multi-dimensional nature of pregnancy-related DRA more attention to behavior and lifestyle strategies in future trials is needed.

Conclusion

Pregnancy-related DRA represents a common problem among women and direction for for the best conservative care strategies is lacking. Our study supports the emerging notion that the assessment of DRA may need to be reconsidered to encompass the relationship between the LA and abdominal muscle function in addition to IRD. Moreover, our results speak to the potential effectiveness of a group-based intervention for DRA outcomes related to both LA parameters and GRC. Finally the inclusion of education and exercises founded on principles of self-management support warrants further consideration. However, the lack of feasibility in terms of follow-up cannot be ignored. Authors suggest that modifications be made to the current trial including more attention to self-management principles and incentives for follow-up prior to testing for efficacy in a fully-powered RCT.

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None.

Conflicts of interest

The authors declare that there is no conflict of interest.

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