## Abstract:

Running is a mass participation sport enjoyed by many women who participate across the globe however, there is little guidance regarding their specific needs during and after pregnancy. This paper explores the current guidance regarding physical activity given to the general non-pregnant population and relates it to what is available for women who are pregnant. It also remarks on the contraindications to physical activity during pregnancy. This article includes key information that midwives and women who run should be aware of during pregnancy and the postnatal period. There are several health benefits, metabolic and physiological changes that may be experienced as a result of running and this article also explores a number of initiatives that can be used by midwives to support women in their care who run.

## Keywords:

Pregnancy; Running; Support networks; Benefits of running; Physiological changes; Contraindications

Since Greek and Roman times running is embraced globally as a pastime to keep fit and health and yet there is little information for midwives to give to women runners. Running is, according to Audickas (2017) the most common participation sport in the United Kingdom (UK) yet there is very little evidence about the specific needs of women who run during pregnancy and return to running in the postnatal period. Midwives have a responsibility to encourage woman to adopt healthy behaviours such as exercise during pregnancy and as they move into motherhood.

## General recommendations for physical activity

The Department of Health (2011a) Start Active, Stay Active strategy recommends that adults should be active everyday and each week should have completed at least 150 minutes of moderate intensity physical activity. Alternatively, similar health benefits can be achieved through 75 minutes of vigorous intensity activity or a combination of moderate and vigorous activity. Moderate intensity activity is an activity that makes you breathe faster whereas vigorous intensity activity can be described as activity where your heart beats quickly and it is more difficult to have a conversation (DoH, 2011b).

## Physical activity in pregnancy

Pregnancy is often seen as a teachable moment where women are often more willing to adopt risk-reducing behaviours that will benefit both her and her baby (Phelan, 2010). Evenson et al (2013) compared guidelines from around the world on physical activity during pregnancy and found that the variations reflect the lack of well-designed studies on vigorous intensity activity. Midwives should be advising pregnant women that 150 minutes of moderately intense activity per week is recommended (UK Chief Medical Officers, 2017b) which is the general advice for adults in the UK (UK Chief Medical Officers, 2017a). The Chief Medical Officers of the UK (2017a) suggest the focus should be making recommendations on how to modify physical activity for women to remain comfortable as their pregnancy progresses, and adapting vigorous intensity activity such as running. Mottola and Artal (2016) propose following the FITT principle (Frequency, Intensity, Time or duration of an activity and the Type of exercise) as guidance for women who are exercising. However there is limited consensus on the optimal frequency, intensity or duration of physical activity for pregnant women. The Nuffield Department of Population Health (NPEU) (2017) found that there was no increased risk of preterm birth, small or large for gestational age babies or other newborn complications for women engaging regularly moderate intensity physical activity (NPEU, 2017).

Research has also shown that physical activity in pregnancy changes the metabolic responses in both the mother and fetus (Mottola & Artal, 2016). There is a decrease in plasma insulin levels, cortisol, glucagon and growth hormone concentrations. Exercise has been found to counteract the elevation of very-low-density-lipoprotein, low-density lipid cholesterol and triglycerides observed in late pregnancy. Mottlola at al (2013) suggest that physical activity during pregnancy may be an effective intervention in reducing the risk of developing pre-eclampsia and pre-term delivery. There are several other factors that may influence the maternal metabolic response including the duration and intensity of physical activity, fitness level of the woman and nutritional intake.

Physiological adaptations become altered during pregnancy and as a result of aerobic conditioning. Aerobic exercise in non-pregnancy causes the resting heart rate to become lowered however during pregnancy this is reversed and the resting heart rate increases (Weissgerber et al, 2006). There is also some evidence that fetal heart modulation and improved autonomic control occurs in response to aerobic exercise (May et al, 2010). Aerobic exercise that continues throughout pregnancy has also been shown to have positive effects on the variability of the fetal heart and also the adaptability of the fetal heart which are both important for a healthy fetus (May et al, 2012). These cardiovascular responses in the fetus appear to be as a result of a dose-response relationship between intensity and duration of maternal exercise (May et al 2012). Furthermore, there is some evidence to show that regular maternal aerobic weight bearing exercise, such as running, stimulates mid-pregnancy placenta growth and increases the surface area which is advantageous for the fetus (Mottola

Artal, 2016).

There are also recommendations about different types of physical activity to avoid during pregnancy (see table 1) and key health messages about the benefits of physical activity for pregnant women that midwives should be aware of (NPEU, 2017) (see table 2). However there are several contraindications to exercise in pregnancy that women should be made aware of (see table 3). Women should be advised to stop exercising immediately and seek advice from their midwife or lead clinician if they experience any changes to fetal movements, vaginal bleeding, suspected amniotic fluid leakage, contractions that start to increase in frequency, chest pain, irregular heartbeat, shortness of breath, syncope or dizziness, calf pain or swelling in the calf.

## Running and pregnancy

Running in pregnancy is not exclusive to the elite athlete. More women are participating regularly in running, however there are no accurate figures specifically relating to the number of pregnant women who are participating in running. With a growing interest in healthy lifestyles and fitness, running is accessible to many as it requires very little equipment. In fact, the demographic of runners has changed and more that 60% of marathon runners are women and in other running events participation rates are higher for women than men. Therefore it is important for midwives and other clinicians to recognise that more women are running whether that is before, during or after pregnancy (Kuhrt et al, 2018, Blyholder et al,2016).

There are many physiological benefits for women who run including stronger pelvic floor muscles, lower resting heart rate, improved triglycerides, increase in high density lipoproteins and increased oxygen uptake. Runners also benefit from improved mental health, emotional and social support as well as weight management (Hitchings and Latham, 2017) yet there is still little guidance to support the needs of women during pregnancy who run.

Current guidance from both the Royal College of Obstetricians and Gynaecologist (RCOG) (2017) and the American College of Obstetricians and Gynecologists (ACOG) (2015) both recommend that women who exercise regularly prior to pregnancy and have no contraindications can safely continue to participate in vigorous intensity activities such as running. However, Ohlendorf et al (2018) found that women are often advised to stop running or reduce the amount of running they do during pregnancy despite the evidence that physical activity is a healthy activity during pregnancy.

Running is seen by many women as a sense of identity, but also provides many physical and mental health benefits (Ohlendorf et al, 2018). Indeed, Little (2017) recognised that one benefits of running is mental relaxation. Running gave women ‘me time’ and this was noted for some as being more important than the actual running itself (Little, 2017). There is also a suggestion that women who run have a heightened awareness of the physical changes occurring in their body during and after pregnancy and will make adjustments to their exercise regime if they felt any discomfort during exercise or they felt they were putting themselves or their fetus at risk (Ohlendorf et al, 2018).

However, the Chief Medical Officers (2017a) suggest that women should be advised to modify their physical activity as there is insufficient evidence to support a recommendation for vigorous intensity activity during pregnancy. Ohlendorf et al (2018) found that women in their study would often withhold information about their running activities particularly if they perceived the advice given by health care providers to be incorrect or old-fashioned. Increasingly women are turning to social media sites for information and support to self-manage their health during pregnancy particularly about running (Ohlendorf et al, 2018, Little, 2017). Several initiatives set up in the UK by women to support like-minded women who run. Run Mummy Run (Davies, 2018) and This Mum Runs (Bound, nd) launched social media pages and both have seen these networks grow into large online running communities dedicated to supporting women who run or who are to run. These support networks bring women together from all backgrounds via social media to enjoy the social and emotional wellbeing benefits that running offers.

Hadfield (2014) offers several recommendations to women runners who are pregnant: re-framing training goals to adapt to the pregnancy by running regularly rather than increasing distance; focusing on the quality of the run; using a treadmill which gives a more safe and consistent terrain and therefore decreasing the risk of falls; adjusting goals to reflect the change in role as a mother; and enable the physiological changes in the body to return to normal after pregnancy, before returning to maximum effort running.

## Postnatal advice

Midwives need to be aware that there is no specific information for women runners about the postpartum period and when to return to their pre-pregnancy running schedule. However women should be advised to return gradually. General advice includes pelvic floor exercises to prevent incontinence issues. Up to 40% of women may experience some degree of urinary incontinence during the postpartum period, however most can be resolved with simple pelvic floor exercises. In addition, women runners can experience aching in the pelvic area. Blyholder et al (2016) reported 1 in 3 women experienced musculoskeletal pain on returning to running with the majority of pain in the lumbopelvic area. This can often be attributed to the action that the hormone relaxin has on the joints and ligaments during pregnancy so they should be advised to build up their return to running gradually.

Women may experience some degree of diastasis recti (a gap between the longitudinal abdominal muscles) and this can lead to abdominal and pelvic issues. A midwife should refer women with this condition to an obstetric physiotherapist for specific advise.

Women runners are usually aware of the benefits of supportive and correctly fitting footwear which helps to reduce the risk of injury and muscle pain. But it may come as a surprise to find that their running shoes are no longer comfortable or fitting correctly after having a baby. This is thought to be from the action of relaxin causing a change to the arches of the feet triggering the feet to flatten and widen, so women runners should seek advice from a reputable running shoe provider where they can get a gait analysis and running shoes fitted correctly to provide proper support (Bachelor, 2017).

## Support networks for women runners

Physical activity with other healthy behaviours has the potential can change patterns of disease such as obesity, diabetes, heart disease and cancer and to deliver improvements in morbidity and mortality. It is well documented that physical activity decreases abdominal fat and plays a role in long term weight maintenance and cardiovascular fitness (Townsend & Scriven, 2014). The Royal College of General Practitioners (RCGP) has recently partnered with parkrun UK to promote health and wellbeing for their staff and patients (2018). The RCGP’s (2018) are supporting a UK wide move to increase social prescribing activities as an alternative to medical treatment which will benefit the long term health of individuals and ease some of the pressures on general practices. Parkrun is in international network of free weekly timed 5km runs with over 1650 events in 20 countries worldwide (parkrun, 2018a, 2018b). Many parkruns are buggy friendly enabling women to continue to run with their families. Parkrun provides a supportive community event run by volunteers to promote physical activity for all (Stevinson, Wiltshire and Hickson, 2015). Many studies have explored the benefits of mass participation community running events and women’s running networks in reducing physical inactivity along with boosting self-esteem, physical and mental fitness (Wiltshire, Fullagar and Stevinson (2018).

A more specific running based initiative set up by England Athletics called RunTogether (nd). is also based online and signposts people who want to start running or those who already run to groups local in their area, and builds a community networks, friendships and an opportunity to keep physically active. RunTogether has set up other initiatives such as #RunAndTalk where running groups help with motivation, mental health and wellbeing. RunTogether's aim is to provide a fun, friendly and inclusive environment for everyone in England. RunWales/Rhedeg Cymru is a similar organisation based in Wales. Furthermore, Sport England funded by the National Lottery set up an initiative called This Girl Can in 2015 (This Girl Can, 2015). This initiative persuaded more than 3 million women to get more active by the use of clever online marketing campaigns which has seen women from all backgrounds, all abilities and all shapes and sizes celebrate their activity achievements through clear brand marketing that is accessible to all.

## Conclusion

Women choosing to run during pregnancy is an outcome of the popularity of running generally and it is important that health professionals feel confident to give women the best advice based on the most up to date evidence available. Midwives are best placed to give care and advice to women to meet their individual circumstances through the trusting relationships they build. Midwives and other health care professionals can signpost women in their care towards the growing number of support networks available. Physical activity should generally be encouraged during pregnancy for the many benefits that it provides but, there are some occasions where women should be advised to either refrain from exercise or modify their running patterns. There does however, remain a gap in knowledge around guidance specifically for women who run which warrants further research.

## Key points

* There are many health benefits to remaining physically active during pregnancy and midwives should be made aware of these.
* The number of women participating in running is continuing to increase and midwives need to recognise that women are running at all stages of pregnancy and in the postnatal period and be able to offer individualised advice.
* Midwives should discuss the contraindications to physical activity and running and give women information about how to modify their physical activity to remain healthy.
* Midwives should be aware of the wide variety of online and community support networks available for women who run (see Box 1).

Table 1 - Activities to avoid during pregnancy

* Activities with risk of falling or having high impact injuries e.g. skiing, horse riding, surfing, gymnastics, off road cycling and contact sports such as football, basketball, ice hockey (NPEU, 2017)
* Activities such as scuba diving due to the possibility of decompression sickness and gas embolism and sky diving due to the possibility of lowering uterine blood flow (NPEU, 2017)
* Activities that involve lying in the supine position after the first trimester. If women take part in yoga or pilates the exercise must be specific to pregnancy (NPEU, 2017)
* Activities that pregnant women who are not already active should avoid are running, jogging, racquet sports and intense strength training. Evidence suggests that these are less suitable for women who are not already active as they have a reduced capacity to cope with the level of intensity that these types of exercise are associated with. (ACOG, 2015)

Table 2 – Key health benefits to physical activity during pregnancy

* Reduction in hypertensive disorders
* Improved cardiorespiratory fitness
* Lower gestational weight gain
* Reduction in risk of gestational diabetes
* Improves sleep
* Improves mood

(UK Chief Medical Officers, 2017b)

BOX 1 – Further sources of online information for women about running

RunTogether <https://runtogether.co.uk/>

parkrun <http://www.parkrun.org.uk/>

Run Mummy Run <https://www.runmummyrun.co.uk/>

This Mum Runs <http://www.thismumruns.co.uk/>

This Girl Can <http://www.thisgirlcan.co.uk/>

Table 3 Contraindications to exercise in pregnancy

* Short cervix or cervical cerclage
* Fetal growth restriction
* Multiple pregnancy
* Preeclampsia
* Previous history of ≥2 preterm births or a history of preterm labour in current pregnancy
* Placenta praevia
* Premature rupture of membranes
* Vaginal bleeding after 24 weeks
* Haemoglobinopathies
* Heart disease
* Cardiomyopathy
* Marfan or Ehler-Dalos syndrome

Adapted from Newton and May (2017)

References

Amercian College of Obstetricians and Gynecologists. Committee Opinion No. 650: Physical Activity and Exercise During Pregnancy and the Postpartum Period. Obstet Gynecol 126(6):e135-42. doi: 10.1097/AOG.0000000000001214

Audickas, L (2017) Briefing Paper – Number CBP8181, 14 December 2017, Sport participation in England, London: House of Commons Library Research Service

Bachelor, B. (2017) 10 weird things no one tells you about when returning to running post-baby. Available https://www.runnersworld.com/health-injuries/a20866684/10-weird-things-no-one-tells-you-about-when-returning-to-running-post-baby/ [Accessed 12/12/18]

Blyholder, L., Chumanov, E., Carr, K and Heiderscheit, B. (2017) Exercise behaviors and health conditions of runners after childbirth. *Sports Health,* 9(1):45-51

Bound, M. (nd) This Mum Runs - Our Story. Available at <http://www.thismumruns.co.uk/our-story> [Accessed 14/12/18]

Davies, L. (2018) Run Mummy Run – Our story. Available at <https://www.runmummyrun.co.uk/our-story/> [Accessed 14/12/18]

Department of Health, (2011a). Start Active, Stay Active: A report on physical activity from the fours home countries’ Chief Medical Officers. Available at <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/216370/dh_128210.pdf> [Accessed 10/01/19]

Department of Health (2011b). Factsheet 4: Physical activity guidelines for adults (19-64 years). Available at: <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/213740/dh_128145.pdf> [Accessed 14/12/18]

Department of Health (2011) Start Active, stay active. Available at: <https://www.gov.uk/government/publications/start-active-stay-active-a-report-on-physical-activity-from-the-four-home-countries-chief-medical-officers> [Accessed 03/01/19]

England Athletics (nd). RunTogether Available at: <https://runtogether.co.uk/about/> [Accessed 14/12/18]

Evenson, K.R., Barakat, R., Brown, W.J, Dagent-Molina, P., Haruna, M., Mikkelsen, E.M., Mottola, M.F., Owe, K.M., Rousham, E.K. and Yeo, S. (2013) Guidelines for Physical Activity During Pregnancy: Comparisons From Around the World. *American Journal of Lifestyle Medicine,* 8 (2), pp 102-121 <https://doi.org/10.1177/1559827613498204>

Hadfield, J. (2014) Running and pregnancy. Runners World. Available online: <https://www.runnersworld.com/uk/health/a772515/running-and-pregnancy/> [accessed 14/12/18]

Hitchings R,. and Latham, A. (2017) How ‘social’ is recreational running? Findings from a qualitative study in London and implications for public health promotion. *Health Place,* 46:334-343

Kuhrt, K, Harmon, M., Hezelgrave, N.L., Seed, P.T. & Shennan, A.H. (2018) Is recreational running associated with earlier delivery and lower birth weight in women who continue to run during pregnancy? An international retrospective cohort study of running habits of 1293 female runners during pregnancy. *BMJ Open Sports Exerc Med.* 4:e000296[*http://d*oi:10.1136/bmjsem-2017-000296](http://doi:10.1136/bmjsem-2017-000296)

Little, J. (2017) Running, health and the disciplining of women’s bodies: The influence of technology and nature. *Health & Place,*  46:322-327 <http://dx.doi.org/10.1016/j.healthplace.2016.11.011>

May L., Glaros, A., M., Yeh, H., Clapp J.F. & Gustafson, K.M. (2010) Aerobic exercise during pregnanct influences fetal cardia autonomic control of the heart rate and heart rate variability. *Early Hum Dev,* 86:213-217

May, L.E., Suminski, R., Langaker, M, Yeh, H. & Gustafson, K.M. (2012) Regualr maternal exercise does and fetal heart outcome. *Med Sci Sports Exerc*. 44:1252-1258

Mottole, M.F., Inglis, S., Brun, C.R. & Hammond, J. (2013) Physiological and metabolic responses of late pregnant women to 40 min of steady-state exercise followed by oral glucose tolerance perturbation. *J Appl Physiol.* 115:597-604 doi:10.1152/japplphysiol.00487.2013

Mottola, M. F. and Artal R. (2016) Fetal and maternal metabolic responses to exercise during pregnancy. *Early Hum Dev.*  94:33-41

Newton E.R. and May, L. (2017) Adaptation of Maternal-Fetal Physiology to Exercise in Pregnancy: The Basis Guidelines for Physical Activity in Pregnancy. *Clin Med Insights Womens Health.* 1-12

NPEU, (2017). New Physical Activity and Pregnancy Guidelines. Available at: <https://www.npeu.ox.ac.uk/npeu-news/1385-new-physical-activity-and-pregnancy-guidelines> [Accessed 10/01/19]

Ohlendorf, J.M, Anklam, A.L & Gardner, L. (2018) “I am a runner”: A qualitative analysis of women-runners’ pregnancy experiences. *Women Birth, 851* <https://doi.org/10.1016/j.wombi.2018.07.021>

Parkrun (2018a) Available at <https://blog.parkrun.com/uk/2018/10/03/pioneer-parkruns/>

Parkrun (2018b) Available at <http://www.parkrun.org.uk/> [Accessed 14/12/18]

Phelan, S. (2010) Pregnancy: A “teachable moment” for weight control and obesity prevention. *Am J Obstet Gynecol, 202 (2):135.e1* Available at:  <https://doi.org/10.1016/j.ajog.2009.06.008>

Royal College of General Practitioners (2018) Parkrun on prescription - Royal College of GP's Available at: <http://www.rcgp.org.uk/clinical-and-research/our-programmes/clinical-priorities/parkrun-practice.aspx> [Accessed 14/12/18]

Royal College of Obstetricians and Gynaecologists, (2017) Physical activity and pregnancy. Available at: <https://www.rcog.org.uk/en/patients/patient-leaflets/physical-activity-pregnancy/> [Accessed 03/01/19]

Stevinson, C., Wiltshire G. and Hickson, M. (2015) Facilitating participation in health-enhancing physical activity: a qualitative study of parkrun. *International Journal of Behavioural Medicine,* 22 (20), pp 170-177

This Girl Can, (2018). Available at <http://www.thisgirlcan.co.uk/> [Accessed 14/12/18]

Townsend, N. & Scriven, A. (2014) Obesity. Public Health Mini Guide. Edinburgh: Churchill Livingstone.

UK Chief Medical Officers, (2017a). Physical activity in pregnancy infographic: guidance. Available at; <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/622623/Physical_activity_pregnancy_infographic_guidance.pdf> [Accessed 14/12/18]

UK Chief Medical Officers, (2017b) Physical Activity for pregnant women. Available at: <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/622335/CMO_physical_activity_pregnant_women_infographic.pdf> [Accessed 14/12/18]

Weissgerber, T. L., Wolfe, L.A., Davies, G.A., Mottola, M.F. (2006) Exercise in the prevention and treatment of maternal-fetal disease: a review of the literature. *Appl Physiol Nutr Metab*, 31:661-674

Wilshire, G.R., Fullagar, S. and Stevinson, C. (2018) Exploring parkrun as a social context for collective health practices: running with and against the moral imperatives of health responsibilisation. *Sociol Health Illn.* 40(1):3-17