

Aquabiking during pregnancy: Exploring intention using the Theory of Planned Behavior

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Original article

Abstract

Purpose: Physical activity during pregnancy is associated with reduced risk of obstetric complications and improved maternal wellbeing, yet many pregnant women do not meet recommended activity levels. Low-impact and accessible exercise modalities, such as stationary aquabiking, may help overcome common barriers. This study examined psychosocial determinants of pregnant women's intention to participate in aquabiking, guided by the Theory of Planned Behavior, to inform prenatal physical activity promotion.

Material and methods: A cross-sectional survey was conducted among 145 pregnant women, assessing intentions, sociodemographic and pregnancy-related characteristics, and Theory of Planned Behavior determinants.

Results: Overall, 75.8% of participants reported positive intentions to engage in aquabiking during pregnancy. Positive behavioral beliefs, and supportive subjective norms were significant psychosocial determinants of intention. Higher parity, higher education and more pregnancy complications were relevant external factors associated with a less positive intention.

Conclusion: These findings suggest substantial interest in aquabiking as a prenatal physical activity option. Integrating innovative, water-based exercise modalities into antenatal care and community health programs may support broader and more inclusive engagement in physical activity during pregnancy.

Keywords

- pregnancy
- aquabiking
- Theory of Planned Behavior
- physical activity promotion
- aquatic exercise
- immersible ergometer
- behavioral determinants

Contribution

- A – Preparation of the research project
- B – Assembly of data
- C – Conducting of statistical analysis
- D – Interpretation of results
- E – Manuscript preparation
- F – Literature review
- G – Revising the manuscript

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Approval of ethics committee

This study was carried out in line with the Code of Ethics of the World Medical Association (Declaration of Helsinki, 1964 and Declaration of Tokyo, 1975, as revised in 1983) and received ethical approval from the Maastricht University (license 565 Master HEP 2019-2020).

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Conflict of interest

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Introduction

Regular physical activity during pregnancy is associated with substantial maternal and infant health benefits, including reduced risk of excessive gestational weight gain, pre-eclampsia, gestational diabetes, hypertension disorders, caesarean delivery, and stillbirth.¹ Accordingly, international guidelines recommend that healthy pregnant women engage in at least 150 minutes of moderate-intensity physical activity per week, distributed across several days.² Despite these recommendations, adherence remains low. Internationally, only 15–23% of pregnant women meet physical activity guidelines.³ In the Netherlands, adherence is higher but still suboptimal at approximately 37%, which is about 10% lower than among non-pregnant women.⁴ The discrepancy between recommended and actual physical activity levels highlights the need to identify forms of physical activity that are not only safe, but also acceptable, and feasible in daily life for pregnant women.

Water-based exercise is particularly popular during pregnancy due to its engagement of multiple muscle groups, safety, and low risk of injury.⁵ Water temperatures between 28 to 33 degrees Celsius (~82 to ~91°F), as commonly found in community swimming pools, are considered safe for healthy pregnant women engaging in moderate-intensity aqua-aerobics exercises.⁶ In this context moderate exercise intensity is typically defined as a Borg Rating of Perceived Exertion score of 12–14 or 60–70% of maximum heart rate (220-minus-age formula).⁷

Aquabiking, defined as cycling on submerged ergometers, represents a structured, moderate-intensity exercise suitable for pregnancy. Classes are available in public swimming pools and fitness centers. Exercise intensity can be easily monitored through heart rate monitoring, perceived exertion or pedaling cadence. This form of water-based exercise may be particularly suitable for women who are non-swimmers, overweight or obese, physically inactive, experiencing balance concerns later in pregnancy, or who find land-based sports challenging or uncomfortable. Additionally, chest-deep submerged aquabiking is generally considered pelvic-floor friendly compared to conventional biking, as water buoyancy reduces effective body weight, and, consequently, pelvic-floor loading. Such unloading may be beneficial for women experiencing girdle pain or sensations of pelvic heaviness.⁷ However, it should be noted that pregnancy-specific evidence regarding aquabiking remains limited and further research is warranted.

Although submerged biking ergometers have been used in physiological research with pregnant women, prior studies have primarily focussed on measuring

cardiovascular or thermoregulatory responses, rather than evaluating aquabiking as a behavioral intervention. Nevertheless, these studies consistently demonstrate that water-based biking is safe for both mother and fetus.⁸ To date, however, no studies have explored pregnant women's perceptions, motivations, and perceived barriers related specifically to aquabiking participation.

Understanding these psychosocial determinants is essential to guide the design of effective health promoting interventions aimed at increasing physical activity during pregnancy. The Theory of Planned Behavior (TPB) provides a well-supported framework for explaining physical activity intentions in pregnancy.^{9–21} According to the TPB, intention—shaped by attitudes, perceived subjective norms, and perceived behavioral control—is the proximal determinant of behavior, with demographic and contextual variables influencing these constructs.²²

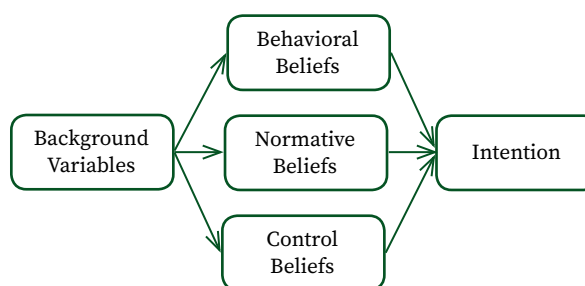


Figure 1. Theory of Planned Behavior

Source: Authors own elaboration based on Fishbein and Ajzen.²²

The present exploratory study aims to apply the TPB to examine Dutch pregnant women's perceptions and intentions regarding participation in 45-minute aquabiking classes during their pregnancy. Specifically, we examine attitudes, perceived subjective norms, perceived behavioral control, perceived barriers and relevant external variables associated with intention, with the aim of informing the development of targeted physical activity interventions for expectant mothers in the Netherlands.

Materials and methods

Design

This study employed a cross-sectional design. An online self-administered questionnaire was used to evaluate pregnant women's intention to participate in aquabiking.

Sample

Dutch-speaking pregnant women were invited via the Facebook page of five midwife practices and 21 public pregnancy-related Facebook pages. Recruitment posts included a brief description of the study purpose and a link to the online study platform. No incentives were provided. Digital informed consent was obtained from all women prior to participation. Given the limited existing research on pregnant women's perceptions of aquabiking, an exploratory approach was adopted. Eligibility criteria were intentionally kept minimal and included being pregnant and able to complete the questionnaire in Dutch. No specific exclusion criteria were applied, as restricting participation could have constrained the exploratory scope of the study and reduced the opportunity to identify a wide range of experiences, perceived barriers, and facilitators that have not yet been described in the literature.

Aquabiking

Pregnant women are generally able to maintain body temperatures within safe limits during moderate-intensity aqua-aerobic classes conducted in pools heated up to 33° C (~91°F).⁶ Participants are typically immersed in warm water between the xiphoid process and the first rib.



Figure 2. Position on aquabike

Source: This figure was generated using ChatGPT (OpenAI) based on prompts and iterative guidance developed by the research team.

The training mainly consists of biking in a seated position while maintaining good postural control, although out-of-the-saddle movements, lower-limb exercises, and upper-body exercises may also be incorporated. Exercise intensity can be monitored using the Borg scale, heart rate and pedaling cadence, as described in more detail earlier. Aquatic training sessions commonly last between 45–60 min.⁷ A 45-minute aquabiking session includes warming up and cooling down. This timeframe is chosen for safety, time efficiency, balanced work-out (mix of cardio, strength and flexibility exercises), and effectiveness in improving heart health, burning calories and enhancing mood.²³

Measures

The questionnaire began with an explanation of the study's aim. To ensure uniform understanding of aquabiking, an image from a typical class was provided. Measures included intention, attitude, subjective norm, perceived behavioral control and sociodemographic variables. Item formulations were based on Fishbein's and Ajzen's suggestions²² and previous published TPB studies on among pregnant women.^{9,11-21,24}

The questionnaire comprised 22 items assessing Attitude, 13 assessing Social Norms, 3 assessing Perceived Behavioral Control, and 1 assessing Intention. The full questionnaire is available in the appendix for reference.

Intention

As time is often a barrier to physical activity,²⁵ participants were asked how often they expected to attend a 45-minute aquabiking class during pregnancy if offered locally. Response options were not at all, once a week, or twice weekly (or more often). Subsequent questions matched their chosen frequency (expressed as 'x' in the examples given next). Those not interested in participation answered survey questions about weekly aquabiking. Participants who reported willingness to attend "once a week" were asked with an open-ended question: "Why do you not intend to join aquabiking classes twice per week while you are pregnant?"

Attitude

Attitude was determined by calculating the average of 22 behavioral beliefs, 15 positive and 7 negative beliefs (Table 2). Items began with: "If I join a 45-minute aquabiking class 'x' a week during my pregnancy, I expect that this...". Responses were anchored on a scale from 1

(completely disagree) to 5 (completely agree) (Table 2). Higher scores indicated a more positive intention. An open-ended “other, namely...” option captured additional beliefs.

Injunctive norms

Normative expectations were measured by two statements: (a) “I expect the following people (partner, friends, midwives, family, sport instructors and other professionals that I encounter during my pregnancy) will be positive about my participation in aquabiking classes during pregnancy” (1 = completely disagree; 5 = completely agree), and (b) “How much support/pressure do you expect for participating in aquabiking classes during pregnancy, from...”. Anchors were ‘a lot of pressure’ (1) to ‘a lot of support’.

Descriptive norm

Perceived modelling was assessed with the statement “Most pregnant women I know, keep exercising during their pregnancy”, (1 = completely disagree; 5 = completely agree).

Behavioral control beliefs

Capacity and personal autonomy were measured by three items. Capacity was measured by: (a) “I am confident that I can join a 45-minute aquabiking class ‘x’ a week during my pregnancy” (1 = completely disagree; 5 = completely agree), and (b) “Joining a 45-minute aquabiking class ‘x’ a week during my pregnancy is for me...” (1 = extremely difficult; 5 = extremely easy). Autonomy was measured as “I am in control of whether I will take a 45-minute aquabiking class ‘x’ a week during my pregnancy” (1 = completely disagree; 5 = completely agree).

Barriers

Obstacles to participating in aquabiking classes included: pregnancy discomforts, lack of information about physical activity and pregnancy, childcare needs, work pressure, costs, no nearby swimming pool, and no transportation. Participants were asked to indicate the probability that these barriers would prevent them from joining aquabiking classes ‘x’ a week during their pregnancy (1 = certainly, 2 = somewhat, 3 = certainly not). An open-ended option “other, namely: ...” was added to capture additional barriers. A count-variable was computed to reflect the number of perceived barriers.

External control factors

External influencing factors were age, education,²⁶ ethnicity,¹⁶ country of origin,¹⁶ work status, weeks of gestation,¹⁴ parity,²⁶ height and pre-pregnancy weight (preconception BMI) gestational diabetes (GDM) (yes/no) and other pregnancy complications (yes/no, if yes, which: ...), and preconception physical activity.²⁶ Preconception physical activity was assessed by asking if participants met Dutch exercise guidelines²⁷ before pregnancy: (a) at least 150 minutes of moderate intense exercise per week, such as walking or biking, spread over several days (yes/no) and (b) muscle and bone strengthening activities at least twice a week, such as fitness (yes/no). Participants reflected on a typical week before pregnancy. Both conditions must be met to fulfill the guidelines. Participants’ experience with water exercise was measured by asking about their past year’s activities (e.g., swimming, aquajogging, aquayoga) with options: a lot (more than twice weekly), little (1–2 times a week), and no experience.

Preferences for group composition were assessed with the question “In which composition would you prefer to join aquabiking classes?”. Options were pregnancy group, regular group (including non-pregnant women and men), and no preference.

Data Analysis

Data were analyzed using IBM SPSS Statistics for Windows, Version 25.0. Kruskal-Wallis and Chi-square tests assessed group differences for continuous and categorical variables, respectively. Negative attitudinal beliefs were recoded to so higher scores indicated a more favorable evaluation (i.e., fatigue, muscle pain, time consuming, boring, expensive, uncomfortable, and suitable for already active women).

PCA evaluated construct validity using oblimin rotation (as factors are expected to be related) and an item threshold retention of.³⁰ Internal consistency was assessed with Cronbach’s α . The mean (M) and standard deviation (SD) were calculated for each belief and summated scales. MANOVA’s compared the summated behavioral, normative and control beliefs across participation-frequency groups. Shapiro-Wilk tests indicated nonnormality ($p < 0.05$). Preliminary assumption testing was conducted to check for normality, linearity, uni- and multivariate outliers, homogeneity of variance-covariance matrices and multicollinearity, with no serious violations noted. For this analysis, the once- and twice-a-week groups were merged due to the small size of the latter ($n = 16$). MANOVAs were deemed

acceptable as data transformation did not significantly alter distributions. Kruskal-Wallis tests confirmed result. Bonferroni correction for multiple testing was used. Hierarchical logistic regression identified the contribution of factors influencing the behavioral intention (yes/no) to participate in 45-minute aquabiking-classes during pregnancy. Before the logistic regression was conducted, mean substitution was used for missing values in age ($n = 3$), gestation ($n = 3$), parity ($n = 1$) and pre-pregnancy BMI ($n = 8$). External variables were entered first, followed by the TPB determinants. The ENTER method was used within blocks.

Results

Descriptives

Of the 163 responders, 145 women were included in the data analysis. This exceeded the recommended sample size of 80 for exploratory TPB studies.²⁸ Early

questionnaire determination was the main reason for exclusion.

Among the included respondents, 24.1% ($n = 35$) reported no intention to join 45-minute aquabiking classes during pregnancy, while 64.8% ($n = 94$) and 11.0% ($n = 16$) intended to participate once and twice a week, respectively. Reasons for preferring weekly over bi-weekly participation included difficulty combining classes with (irregular) work schedules ($n = 25$), and lack of time ($n = 20$). Other reasons were the desire to engage in additional forms of exercise ($n = 19$), childcare responsibilities ($n = 15$), financial costs ($n = 10$), and pregnancy discomforts or complications ($n = 11$). Less frequently mentioned reasons included lack of interest in exercising ($n = 3$), difficulty combining with household tasks ($n = 1$), and no nearby swimming pool ($n = 1$). Regarding session group composition, 78.6% ($n = 114$) preferred a pregnancy group, 2.8% ($n = 4$) preferred a regular group, including non-pregnant participants, and 18.6% ($n = 27$) had no preference. No significant differences in participant characteristics were found across the three frequency groups (Table 1).

Table 1. Sociodemographic characteristics of the three intention groups and between-group differences ($n = 145$)

Variable	Total ($n = 145$)	No-AC intention ($n = 35$)	Once a week ($n = 94$)	Twice a week ($n = 16$)	<i>p</i> -value (0.05/12 = 0.004) ^a
Demographic characteristics					
Age (years)	30.30 ± 3.98	30.62 ± 2.79	30.34 ± 4.39	29.38 ± 3.69	0.518
Country of origin					
The Netherlands	86.2% (125)	88.6% (31)	86.2% (81)	81.3% (13)	0.675 ^b
Belgium	11.7% (17)	11.4% (4)	11.7% (11)	12.5% (2)	
Other	2.1% (3)	—	2.1% (2)	6.3% (1)	
Highest level of education					
Vocational	35.2% (51)	28.6% (10)	36.2% (34)	43.8% (7)	0.179
Higher education	43.4% (63)	54.3% (19)	43.6% (41)	18.8% (3)	
University	21.4% (31)	17.1% (6)	20.2% (19)	37.5% (6)	
Currently working (yes)	69.7% (101)	68.6% (24)	69.1% (65)	75.0% (12)	0.884
Pregnancy characteristics					
Gestation (weeks)	24.94 ± 9.33	26.24 ± 9.68	24.92 ± 9.14	22.31 ± 9.75	0.342
Parity (median number)	2.00 (145)	2.00 (35)	1.44 (94)	1.5 (16)	0.024 ^c
Pre-pregnancy BMI (kg/m ²)	24.43 ± 4.16	23.73 ± 4.27	24.79 ± 4.29	23.80 ± 2.85	0.200
GDM (no)	89.7% (130)	85.7% (30)	90.4% (85)	93.8% (15)	0.700 ^b
Other complications (no)	82.1% (119)	71.4% (25)	83.0% (78)	100% (16)	0.044

Variable	Total (n = 145)	No-AC intention (n = 35)	Once a week (n = 94)	Twice a week (n = 16)	p-value (0.05/12 = 0.004) ^a
PA characteristics					
Past PA behavior – Dutch exercise guidelines (not met)	64.1% (93)	65.7% (23)	66.0% (62)	50.0% (8)	0.456
Past PA behavior – single item (days/week)	4.16 ± 1.66	4.21 ± 1.52	4.17 ± 1.71	4.03 ± 1.75	0.850
Past experience exercising in a water environment (yes)	51.0% (74)	51.4% (18)	50% (47)	56.3% (9)	0.897

Data are presented as mean ± SD, % (n), unless indicated differently.

Note: ^a – Kruskal-Wallis tests (continuous variables), Chi-square tests (categorical variables), Bonferroni method to correct for multiple testing; ^b – As ≥20% of cells had an expected count less than 5, Fisher-Freeman-Halton Test was used instead of a Chi-square test; ^c – Median test (Kruskal-Wallis)

Abbreviations: BMI – Body Mass Index; GDM – gestational diabetes mellitus; PA – physical activity.

Most respondents were Dutch (86.2%, n = 125), employed (69.7%, n = 101), and not diagnosed with gestational diabetes (89.7%, n = 130) or other pregnancy complications (82.1%, n = 119). The mean age was 30.30 years (SD = 3.98). Education levels varied: 35.2% (n = 51) had a secondary vocational degree, 43.4% (n = 63) a higher education degree, and 21.4% (n = 31) a university degree. Participants were on average 4.94 (SD = 9.33) weeks pregnant, with a mean parity score of 1.85 (SD = 1.05) and a pre-pregnancy BMI of 24.43 kg/m² (SD = 4.16). Over half (64.1%, n = 93) did not meet Dutch exercise guidelines prior to pregnancy, being active for at least half an hour on 4.16 days (± 1.66) per week. In the past year, 51.0% (n = 74) reported experience with water-based exercise.

Table 2 displays TPB variables' mean scores at item level and group comparisons. No significant differences were observed between women with and without an

intention to participate in aquabiking classes for the beliefs “healthy for myself, healthy for my baby, safe, exhausting for me, causes muscle pain, too expensive, and only suitable for previously active women.” Women intending to participate once or twice a week rated aquabiking more favorable than those with no intention on the positive beliefs “makes me feel proud and satisfied, suits me, good for my condition, makes me happy, not bothered by increased weight, relaxing, faster recovery from pregnancy, provides personal time, maintains desired pregnancy weight, eases delivery, sociable, safe and reduces pregnancy complications.” They were more likely to minimize negative beliefs on time-consuming and boring. For two beliefs (“suits me, makes me happy”), all three intention–frequency groups scored significantly different from each other, with the twice-weekly scoring highest (or most favorable) followed by the once-a-week group, and then the no-intention group.

Table 2. TPB beliefs (Mean ± SD) and statistical comparison across three aquabiking groups (no, once a week, twice or more a week) and between no-intention vs other intention levels (No intention vs once/ twice or more a week)

Category	Total (n = 145)	No intention (n = 35)	Once a week (n = 94)	Twice or more a week (n = 16)	Group differences among the 3 groups	3 groups comparison ^a p-value	No intention vs intention com- bined (N = 110) KW-tests 0.05/22 = = 0.002 (p < 0.01)
Behavioral beliefs							
Healthy for myself	4.77 ± 0.59	4.74 ± 0.51	4.73 ± 0.66	5.00 ± 0.00	No (0.242)	–	0.131
Healthy for my baby	4.59 ± 0.73	4.49 ± 0.85	4.60 ± 0.71	4.75 ± 0.58	No (0.481)	–	0.558
Exhausting for me – rec.	2.35 ± 1.02	2.43 ± 1.27	2.35 ± 0.97	2.19 ± 0.75	No (0.740)	–	0.869

Category	Total (n = 145)	No intention (n = 35)	Once a week (n = 94)	Twice or more a week (n = 16)	Group differences among the 3 groups	3 groups comparison ^a p-value	No intention vs intention com- bined (N = 110) KW-tests 0.05/22 = = 0.002 (<i>p</i> < 0.01)
Makes me feel proud and satisfied	4.44 ± 0.81	3.91 ± 1.07	4.59 ± 0.65	4.75 ± 0.45	Yes (<0.001*)	0-1: <0.001* 0-2: 0.002* 1-2: 0.721	<0.001*
Causes muscle pain – rec.	2.67 ± 1.18	3.05 ± 1.26	2.52 ± 1.11	2.69 ± 1.18	No (0.073)	–	0.094
Time consuming – rec.	3.34 ± 1.18	2.86 ± 1.19	3.51 ± 1.12	3.44 ± 1.16	Yes (0.018*)	0-1: 0.019* 0-2: 0.254 1-2: 0.973	0.024 [#]
An activity that suits me	3.46 ± 1.32	2.14 ± 1.29	3.78 ± 1.02	4.50 ± 0.89	Yes (<0.001*)	0-1: <0.001* 0-2: <0.001* 1-2: 0.049*	<0.001*
Good for my condi- tion (keep fit)	4.54 ± 0.67	4.20 ± 0.76	4.61 ± 0.63	4.88 ± 0.34	Yes (0.001*)	0-1: 0.007* 0-2: 0.003* 1-2: 0.301	<0.001*
Boring – rec.	3.92 ± 1.11	3.26 ± 1.22	4.07 ± 1.00	4.50 ± 0.89	Yes (<0.001*)	0-1: 0.001* 0-2: 0.001* 1-2: 0.325	<0.001*
Is something that makes me happy	3.73 ± 1.04	2.74 ± 1.15	3.96 ± 0.78	4.56 ± 0.63	Yes (<0.001*)	0-1: <0.001* 0-2: <0.001* 1-2: 0.038*	<0.001*
Helps me to move without being bothered by my increased weight	4.16 ± 0.79	3.66 ± 0.77	4.31 ± 0.73	4.38 ± 0.72	Yes (<0.001*)	0-1: <0.001* 0-2: 0.007* 1-2: 0.946	<0.001*
Helps to relax	4.06 ± 1.06	3.26 ± 1.20	4.27 ± 0.90	4.62 ± 0.50	Yes (<0.001*)	0-1: <0.001* 0-2: <0.001* 1-2: 0.381	<0.001*
Helps to recover from pregnancy faster	4.06 ± 0.94	3.43 ± 1.07	4.23 ± 0.80	4.44 ± 0.81	Yes (<0.001*)	0-1: <0.001* 0-2: 0.001* 1-2: 0.688	<0.001*
Provides a moment for myself	4.26 ± 0.87	3.63 ± 1.00	4.47 ± 0.71	4.44 ± 0.73	Yes (<0.001*)	0-1: <0.001* 0-2: 0.004* 1-2: 0.990	<0.001*
Helps to maintain the desired pregnan- cy weight	3.99 ± 0.94	3.29 ± 0.93	4.17 ± 0.84	4.44 ± 0.81	Yes (<0.001*)	0-1: <0.001* 0-2: <0.001* 1-2: 0.516	<0.001*
Makes my delivery easier	3.54 ± 1.12	2.83 ± 1.12	3.68 ± 1.03	4.25 ± 0.86	Yes (<0.001*)	0-1: <0.001* 0-2: <0.001* 1-2: 0.131	<0.001*
Sociable (contact with other pregnant women)	4.17 ± 0.91	3.66 ± 1.06	4.30 ± 0.81	4.56 ± 0.63	Yes (<0.001*)	0-1: 0.001* 0-2: 0.003* 1-2: 0.526	<0.001*
Safe	4.35 ± 0.73	4.34 ± 0.68	4.29 ± 0.76	4.75 ± 0.58	No (0.064)	–	0.035
Too expensive (a single lesson in a swimming pool costs about 7 euros) – rec.	3.23 ± 1.10	2.86 ± 1.17	3.32 ± 1.05	3.50 ± 1.12	No (0.061)	–	0.067

Category	Total (n = 145)	No intention (n = 35)	Once a week (n = 94)	Twice or more a week (n = 16)	Group differences among the 3 groups	3 groups comparison ^a <i>p</i> -value	No intention vs intention com- bined (N = 110) KW-tests 0.05/22 = = 0.002 (<i>p</i> < 0.01)
Uncomfortable – rec.	3.38 ± 1.03	3.00 ± 1.14	3.37 ± 0.94	4.25 ± 0.77	Yes (<0.001*)	0–1: 0.159 0–2: <0.001* 1–2: 0.005*	<0.001*
Only suitable for women who already exercised before pregnancy- rec.	3.71 ± 1.00	3.57 ± 1.20	3.72 ± 0.92	3.93 ± 1.00	No (0.471)	–	0.614
Less chance of com- plications during pregnancy	3.39 ± 1.01	2.97 ± 0.92	3.48 ± 0.97	3.81 ± 1.17	Yes (0.008*)	0–1: 0.036* 0–2: 0.020* 1–2: 0.456	0.002*
Behavioral Control Beliefs							
Behavioral control: Confidence	3.99 ± 1.21	3.37 ± 1.46	4.11 ± 1.04	4.63 ± 1.03	Yes (0.001*)	0–1: 0.007* 0–2: 0.002* 1–2: 0.254	<0.001*
Behavioral control: Difficulty	3.25 ± 1.00	2.89 ± 1.05	3.30 ± 0.99	3.75 ± 0.68	Yes (0.011*)	0–1: 0.108 0–2: 0.016* 1–2: 0.236	0.009*
Autonomy	4.47 ± 0.82	4.49 ± 0.82	4.44 ± 0.84	4.63 ± 0.72	No (0.690)	–	0.610
Injunctive norm: norm important others							
People who are important to me	4.15 ± 0.82	3.71 ± 0.79	4.26 ± 0.78	4.50 ± 0.82	Yes (0.001*)	0–1: 0.003* 0–2: 0.005* 1–2: 0.514	0.001*
My partner	4.35 ± 0.81	3.86 ± 0.85	4.45 ± 0.77	4.88 ± 0.34	Yes (<0.001*)	0–1: 0.001* 0–2: 0.000* 1–2: 0.116	<0.001*
My friends	4.06 ± 0.86	3.66 ± 0.73	4.12 ± 0.87	4.56 ± 0.81	Yes (0.001*)	0–1: 0.022* 0–2: 0.002* 1–2: 0.143	0.001*
Midwife & other professionals	4.39 ± 0.73	4.11 ± 0.76	4.46 ± 0.68	4.56 ± 0.81	No (0.054)	–	0.021
My Family	4.14 ± 0.85	3.66 ± 0.84	4.26 ± 0.79	4.50 ± 0.82	Yes (<0.001*)	0–1: 0.001* 0–2: 0.003* 1–2: 0.532	<0.001*
Sport instructors	4.12 ± 0.94	3.66 ± 0.91	4.21 ± 0.93	4.56 ± 0.73	Yes (0.001*)	0–1: 0.009* 0–2: 0.005* 1–2: 0.361	0.001*
Injunctive norm: pressure –support							
People who are important to me	3.82 ± 0.99	3.49 ± 0.74	3.96 ± 1.00	3.75 ± 1.29	No (0.054)	–	0.028
My partner	4.08 ± 1.11	3.80 ± 0.90	4.20 ± 1.10	3.94 ± 1.48	No (0.165)	–	0.058
My friends	3.76 ± 0.98	3.51 ± 0.74	3.86 ± 1.01	3.69 ± 1.20	No (0.193)	–	0.089
Midwife & other professionals	3.78 ± 1.08	3.49 ± 0.92	3.90 ± 1.08	3.69 ± 1.30	No (0.136)	–	0.068

Category	Total (n = 145)	No intention (n = 35)	Once a week (n = 94)	Twice or more a week (n = 16)	Group differences among the 3 groups	3 groups comparison ^a p-value	No intention vs intention com- bined (N = 110) KW-tests 0.05/22 = = 0.002 (<i>p</i> < 0.01)
My Family	3.73 ± 1.04	3.29 ± 0.83	3.87 ± 1.03	3.88 ± 1.26	Yes (0.013 [*])	0-1: 0.016 [*] 0-2: 0.159 1-2: <0.001	0.005 [#]
Sport instructor	3.66 ± 1.14	3.46 ± 0.89	3.71 ± 1.19	3.81 ± 1.33	No (0.452)	–	0.225
Descriptive norm							
Modeling by others	3.25 ± 1.00	3.40 ± 1.01	3.24 ± 0.99	2.94 ± 1.00	No (0.308)	–	0.268

Note: ^a – post-hoc analyses, Scheffe's test was used instead of the default Tukey test as there were unequal group sizes; ^{*} – significant difference at *p* < 0.05. Note that for KW-tests a corrected p-value was used; [#] – contradictory results MANOVA – KW-tests.

Abbreviations: KW-tests – Kruskal-Wallis-tests; rec. – recoded, higher score reflects a more favorable perception of AC.

Significant group differences were also observed in control beliefs. Women intending to join twice weekly had the highest favorable capacity score, followed by the once-a-week group and the no-intention groups. All groups reported positive autonomy scores, indicating that most women perceived participation as their own choice.

Table 2 shows that the responders intending to participate in aquabiking once a week or twice a week, perceived a more positive social influence from important others to participate in aquabiking compared to those with no intention. This pattern was observed also for the injunctive norm pressure-support from significant persons, with higher scores for the once- and twice-weekly groups compared to the no-intention group. No significant differences were found for descriptive norms (i.e., modelling by others), with most women selecting neutral responses.

Determinants of the TBP-model

A Principal Component Analysis (PCA) with oblimin rotation was conducted on 22 items. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy, KMO = 0.87, and Bartlett's Test of Sphericity $\chi^2(231) = 1522.20$, *p* < 0.001, indicating that the data were suitable for PCA. An initial extraction revealed six components with eigenvalues greater than 1. Together, these components explained 67% of the total variance. The first eigenvalue (7.81) was more than three times larger than the second eigenvalue. The behavioral beliefs construct was therefore considered unidimensional; internal consistency $\alpha = 0.89$). Deletion of any item decreased the Cronbach's alpha.

Social norms were split into two factors based on the eigen values 6.26 and 2.78. Separate analyses revealed an eigenvalue for the subjective norm scale of 4.30 (item loading range 0.79–0.93, explained variance was 72%, $\alpha = 0.95$, KMO = 0.87, and Bartlett's Test of Sphericity $\chi^2(15) = 639.51$, *p* < 0.001). The pressure – support scale had an eigenvalue of 4.72, variance explained was 77% (KMO = 0.89, and Bartlett's Test of Sphericity $\chi^2(15) = 803.98$, *p* < 0.001), item loadings 0.86–0.91, $\alpha = 0.94$). Although the behavioral control beliefs loaded on one construct (eigenvalue 1.57, KMO = 0.54, and Bartlett's Test of Sphericity $\chi^2(3) = 42.06$, *p* < 0.001, variance explained 52%), the loading of autonomy was low (0.22) compared to the other two items (0.67–0.68). The scree plot also indicated the option of two constructs. Separating autonomy from the capacity construct increased the internal consistency (from $\alpha = 0.54$ to $\alpha = 0.64$). Autonomy will be analyzed as a single item.

Intention (yes/no) was positively correlated with attitude ($r_s = 0.45$, *p* < 0.001), social norm ($r_s = 0.35$, *p* < 0.001), social support/pressure ($r_s = 0.24$, *p* < 0.01), and behavioral control-capacity ($r_s = 0.26$, *p* < 0.001). Neither modeling ($r_s = -0.09$, *p* < 0.27), nor autonomy ($r_s = -0.02$, *p* < 0.83) was significantly correlated with intention. Attitude correlated positively with behavioral control-capacity ($r = 0.52$, *p* < 0.001), autonomy $r = 0.24$, *p* < 0.01, social norm ($r = 0.54$, *p* < 0.001) and social support/pressure ($r = 0.26$, *p* < 0.001), and not significantly with modeling ($r = -0.004$, *p* < 0.96). Social norm and social support/pressure were positively correlated ($r = 0.49$, *p* < 0.001), however, only social norm was positively correlated with autonomy ($r = 0.35$, *p* < 0.001). Behavioral control-capacity was significantly correlated with social norm ($r = 0.31$, *p* < 0.001), social pressure ($r = 0.22$, *p* < 0.01) and modeling $r = 0.25$, *p* < 0.01).

A one-way between-intention-groups multivariate analysis of variance (MANOVA) revealed a significant multivariate effect, [$F(6, 138) = 8.42, p < 0.001$] Pillai's trace = 0.27, partial $\eta^2 = 0.27$. Follow-up analyses showed statistically significant group differences on all constructs, except for modeling ($p < 0.30$) and autonomy ($p < 0.89$), using a bonferroni adjusted alpha of 0.008: behavioral beliefs, $F(1, 444) = 42.0, p < 0.001$, partial $\eta^2 = 0.23$, subjective norm from others, $F(1, 444) = 8.67, p < 0.001$, partial $\eta^2 = 0.12$, and behavioral control capacity, $F(1, 444) = 13.19, p < 0.001$, partial $\eta^2 = 0.08$. Inspection of the mean scores indicated that women with

an intention ($n = 110$) expressed more positive behavioral beliefs ($M = 3.97, SD = 0.05$) than those without an intention ($M = 3.38, SD = 0.08$). Similarly, subjective norm from others scores were higher among women with an intention ($M = 4.34, SD = 0.06$) than women with no intention ($M = 3.78, SD = 0.11$). Consistent with the other cognitive variables, capacity beliefs were more favorable in the intention group ($M = 3.77, SD = 0.09$) than in the no-intention group ($M = 3.13, SD = 0.16$).

Hierarchical logistic regression identified predictor of intention results (Table 3).

Table 3. Determinants of intention to join aquabiking classes

Determinants of intention	B	SE	Wald statistic	df	p-value	OR [95% CI]
Age	0.11	0.08	1.73	1	0.188	1.12 [0.95–1.32]
Country of origin						
The Netherlands (ref.)			0.49	2	0.783	
Belgium	−0.67	0.96	0.49	1	0.485	0.51 [0.08–3.33]
Other	23.65	17946.22	0.01	1	0.999	1.86 ¹⁰ [0.00]
Highest level of education						
Vocational (ref.)			8.47	2	0.014*	
Professional	−2.42	0.85	8.03	1	0.005*	0.09 [0.02–0.48]
University	−1.23	1.06	1.35	1	0.245	0.29 [0.04–3.33]
Currently working	−0.16	0.68	0.06	1	0.809	0.85 [0.23–3.20]
Gestation	−0.35	0.04	0.51	1	0.473	0.98 [0.91–1.04]
Parity	−0.81	0.33	6.47	1	0.011*	0.45 [0.24–0.83]
Pre-pregnancy BMI	0.02	0.08	0.084	1	0.773	1.02 [0.88–1.19]
GDM	−0.35	1.01	0.123	1	0.725	0.70 [0.10–5.06]
Other complications	2.25	0.83	7.39	1	0.007*	9.46 [1.87–47.84]
Past PA behaviour	0.81	0.64	1.58	1	0.209	2.24 [0.64–7.85]
Past experience exercising in water environment	−0.74	0.61	1.48	1	0.224	0.48 [0.14–1.58]
Behavioural beliefs	3.70	0.95	15.35	1	<0.001*	40.58 [6.37–258.71]
Capacity	0.184	0.35	0.27	1	0.602	1.20 [0.60–2.41]
Autonomy	−0.92	0.43	4.52	1	0.033*	0.40 [0.17–0.93]
Norm environment	0.27	0.49	0.306	1	0.580	1.31 [0.51–3.38]
Pressure/support	0.73	0.37	3.97	1	0.046*	2.09 [1.01–4.32]
Descriptive norm	−0.42	0.31	1.79	1	0.181	0.66 [0.36–1.22]
Constant	−13.02	4.32	9.09	1	0.003	0.00

Note: $p < 0.05$; * – for post-hoc analyses, Scheffe's test was used instead of the default Tukey test as there were unequal group sizes; * – significant difference at $p < 0.05$. Note that for KW-tests a corrected p-value was used; * – contradictory results MANOVA-KW tests.

Abbreviations: B – beta-coefficient; BMI – Body Mass Index; CI – confidence interval; df – degrees of freedom; GDM – gestational diabetes mellitus; KW-tests – Kruskal-Wallis tests; OR – Odds Ratio; PA – physical activity, ref. – reference category, SE – standard error.

The non-significant Hosmer and Lemeshow test statistic (0.843) indicated a good model fit. The first step containing all background variables was statistically nonsignificant, $\chi^2(8, N = 145) = 4.2, p < 0.09$. A higher number of complications and a higher number of pregnancies were the only significant determinants associated with a more positive intention. The full model containing all predictors, including the TBP variables in step 2, was statistically significant $\chi^2(19, N = 145) = 69.17, p < 0.001$. The model as a whole explained between 37.9% (Cox and Snell R square) and 56.7% (Nagelke R square) of the variance in intention, and correctly classified 84.8% of the cases.

As shown in Table 3 educational level, parity, pregnancy complications, behavioral beliefs, autonomy and injunctive norm 'support vs. pressure' from significant others, significantly affected the intention to participate in 45-minute aquabiking classes during pregnancy. The strongest predictor of reporting a positive intention to join aquabiking classes was the behavioral beliefs variable (OR = 40.6, 95% CI [6.37, 258.71]). Higher scores on injunctive norm 'pressure/support' increased the likelihood of participation as well (OR = 2.09; 95% CI [1.01, 4.32]). Higher autonomy scores decreased the likelihood of a positive intention (OR = 0.41, 95% CI [0.17, 0.96]). Women without pregnancy complications were nine times more likely to intend to join classes than women who reported complications (OR = 9.23; 95% CI [1.82, 46.8]). Women with relatively higher education were less likely to have a positive intention than those women with a secondary vocational education degree or lower (OR = 0.09; 95% CI [0.02–0.48]). Women with more pregnancies were also less likely to have a positive intention (OR = 0.45; 95% CI [0.24, 0.83]), controlling for other factors in the model.

Discussion

Overview of key findings

This exploratory study showed substantial willingness among Dutch speaking pregnant women to join 45-minute aquabiking classes, with most intending to join at least weekly. Intention was positively associated with attitude, injunctive norms, and perceived behavioral control – consistent with the Theory of Planned Behavior. Behavioral beliefs emerged as the strongest predictor of intention, while norms and capacity variables showed no meaningful association. As the first study to examine psychosocial determinants of aquabiking during pregnancy within the Theory of Planned Behavior Framework, findings were compared with

TPB research on general physical activity during pregnancy.^{11,17,26,29,30}

Determinants of intention

Women with more positive beliefs – particularly regarding enjoyment, suitability, physical benefits, and relaxation – were more likely to intend participation. This aligns with TPB-based research on prenatal physical activity, where affective and instrumental beliefs consistently predict intention.^{11,26,30} Beliefs regarding physical activity during pregnancy appear to have shifted since 2011,²⁶ from perceptions of unsafety to viewing physical activity as safe among participants in the current study.

Support from partners, friends, and healthcare professionals increased intention, underscoring the social embeddedness of physical activity during pregnancy. This finding aligns with other studies.^{11,30} The stronger influence of injunctive norms over descriptive norms suggests that approval matters more than modelling for this unfamiliar activity.

Capacity beliefs (confidence and perceived ease) were higher among women intending to participate. Reviews support capacity beliefs to be relevant for predicting intention.^{26,30} The negative association between perceived autonomy and intention was unexpected but has been reported previously among Chinese pregnant women.²¹ This finding may reflect overconfidence in self-initiated activity or reduced reliance on structured programs.²² Nevertheless, this finding should be interpreted cautiously due to the wide confidence interval.

Overall, associations between attitude, social norms and perceived behavioral control were largely consistent with previous research.^{12,13,21,24,26,29} However, inconsistencies across studies remain, with some reporting null associations for attitude, social norms or perceived behavioral control,^{15–20} and others identifying perceived behavioral control as the sole determinant of intention.¹⁶

Sociodemographic and contextual factors

Parity emerged as determinant of intention, in line with earlier research.²⁶ Higher parity reduced intention. Highly educated Dutch women often combine paid employment with a disproportionate share of unpaid caregiving responsibilities, frequently within part-time work arrangements.²² These structural and gendered labor patterns may constrain opportunities for participation

in scheduled group activities such as aquabiking, illustrating how broader social and economic contexts shape health-related behavior. The association between higher educational level and lower intention aligns with mixed findings in previous reviews²⁶ and suggests that educational attainment may influence engagement in different types of exercise behavior in distinct ways.

Women with complications were less likely to intend participation, underscoring the role of healthcare providers in offering tailored, evidence-based reassurance about safe activity options. Although limited research has examined pregnancy complications in relation to aquabiking intention, the observed association is plausible. Women experiencing complications may perceive higher risks or receive more cautious advice regarding physical activity. In this context, obstetric care providers may play a key role in translating evidence-based guidelines into individualized advice, thereby reducing uncertainty and supporting informed decision-making about safe participation.

Women with multiple children may anticipate greater time constraints and caregiving demands, which can limit the feasibility of engaging in organized out-of-home activities, such as aquabiking. This finding emphasizes the need for health promotion strategies that acknowledge competing responsibilities and provide flexible, family-friendly options.

Limitations

Several limitations should be considered when interpreting these findings. First, beliefs may vary by exercise type, context, time, and population.²² No Dutch elicitation study preceded the questionnaire development, which may have resulted in the omission of context-specific beliefs. But, most items were derived from established research on physical activity among pregnant women,^{13,19} and participants were given the opportunity to add unmentioned beliefs, none of which were identified. Second, the self-selected sample limits generalizability. Third, the cross-sectional design precludes causal inference. Fourth, although the data was not normally distributed, transformations did not meaningfully alter the distributions, and logistic regression does not require normally distributed predictors. Regarding measurement, behavioral beliefs and social norms showed good internal consistency, whereas control beliefs demonstrated lower internal consistency. Previous studies on physical activity during pregnancy reported stronger correlations among control beliefs.^{14,16,18,19,21} Control beliefs may be weaker predictors for unfamiliar behaviors such as aquabiking,

as women may find it challenging to accurately assess their capacity to engage in an activity that they have not previously experienced. Finally, the strong predictive value of attitude may have contributed to high model accuracy (85%), while wide confidence intervals for some determinants indicated limited precision, requiring caution in interpretation. Larger and more diverse samples are needed in future studies to improve estimate precision.

Implications for health promotion

From a health promotion perspective, these findings highlight the importance of multilevel strategies to support physical activity during pregnancy. Interventions promoting aquabiking should not only aim to strengthen positive attitudes but also foster supportive social environments involving partners, family members, peers, and healthcare professionals. Encouragement from trusted professionals may be particularly influential in legitimizing participation and addressing safety concerns.

At the same time, several structural and practical barriers may impede participation, including pregnancy-related discomfort, work pressure, limited time, financial costs, childcare needs, restricted access to swimming facilities, insufficient information, and transportation barriers. Addressing these challenges requires coordinated action at the community and health system level, such as integrating aquabiking into antenatal care pathways, offering flexible scheduling, providing financial support or reimbursement, and partnering with local facilities. Actively involving pregnant women in identifying feasible solutions may further enhance intervention relevance and uptake.³⁰

Conclusion

This study provides the first TPB-based examination of psychosocial determinants of aquabiking intention during pregnancy. Most participants expressed willingness to attend weekly classes, and intention was shaped by attitudes, perceived support, control beliefs, and contextual factors such as parity, education, and pregnancy complications. For health promotion and physical activity practice, these findings highlight the importance of strengthening positive beliefs about aquabiking, fostering supportive social environments involving partners, peers, and healthcare professionals, addressing structural barriers through flexible scheduling, childcare support, financial accessibility,

and facility availability, integrating aquabiking into antenatal care pathways, and providing individualized guidance for women with pregnancy complications.

Although intention does not always translate into behavior, these findings offer promising directions for designing theory-informed, context-sensitive interventions, that promote safe, enjoyable, and feasible physical activity during pregnancy.

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Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Appendix 1. Questionnaire: Physical activity during pregnancy

Dear expectant mother,

My name is ..., I am a researcher from ... at ...

Thank you for participating in our project about physical activity during pregnancy.

I would like to learn how pregnant women feel about aquabiking. This is cycling in water ("aqua") on a special stationary bike.

Not familiar with aquabiking? A drawing will show you what aquabiking looks like.

No cycling experience is required!

Aquabiking may be a way to become and/or stay fit during pregnancy.

Research has shown that fit pregnant women and their babies are less likely to experience health problems during and after pregnancy.

However, organizing aquabiking programs for pregnant women is only worthwhile if pregnant women are interested in this form of exercise.

That is why we are asking for your opinion.

Completing this questionnaire is entirely voluntary.

You may stop at any time without giving a reason.

Your data will not be shared with third parties.

If you have questions, comments, or would like more information about the study, feel free to email: ...

The questionnaire consists of 24 questions and will take approximately 15 minutes to complete.

There are no right or wrong answers – only your opinion matters!

You will be asked to indicate how much you agree with statements about aquabiking. For each statement, you can select one of the following answers:

- ☐ Totally disagree
- ☐ Slightly disagree
- ☐ Neutral
- ☐ Slightly agree
- ☐ Totally agree

If you do not have an opinion about a statement, you may select "Neutral".

Questions about pregnancy characteristics and demographic variables will also be asked. This helps us better understand the group of women who completed the questionnaire.

- ☐ I have read the information above and feel sufficiently informed about participation in this study.
- ☐ I agree to the conditions described above.

Start questionnaire

The drawing below provides an impression of a typical aquabiking class.



Note. This drawing was generated using ChatGPT (OpenAI) based on prompts and iterative guidance developed by the research team).

- Suppose this type of exercise were offered in your area. How often would you intend to attend a 45-minute aqua cycling class during your pregnancy? Tick one box only.
 - ☐ I wouldn't participate in this
 - ☐ 1 time a week
 - ☐ 2 times a week (or more)
- If I were to take a 45-minute aqua-cycling lesson 1 time a week/ 2 times* a week during my pregnancy, I would expect this:

*Depending on what was chosen in question 1

	Totally disagree	Slightly disagree	Neutral	Slightly agree	Totally agree
Is healthy for me	☐	☐	☐	☐	☐
Is healthy for my baby	☐	☐	☐	☐	☐

	Totally disagree	Slightly disagree	Neutral	Slightly agree	Totally agree
Is exhausting for me	☐	☐	☐	☐	☐
Makes me feel satisfied and proud	☐	☐	☐	☐	☐
Provides muscle pain	☐	☐	☐	☐	☐
Is time-consuming	☐	☐	☐	☐	☐
Is an activity that suits me	☐	☐	☐	☐	☐
Is good for my condition (staying fit)	☐	☐	☐	☐	☐
Is boring	☐	☐	☐	☐	☐
Is something that makes me happy	☐	☐	☐	☐	☐
Helps me to move without burden of my increased weight	☐	☐	☐	☐	☐
Helps me to relax	☐	☐	☐	☐	☐
Helps to recover faster from pregnancy	☐	☐	☐	☐	☐
Provides a moment for myself	☐	☐	☐	☐	☐
Helps to stay on the desired pregnancy weight	☐	☐	☐	☐	☐
Makes my delivery easier	☐	☐	☐	☐	☐
Is cozy (contact with other pregnant women)	☐	☐	☐	☐	☐
Is safe	☐	☐	☐	☐	☐
Is too expensive (a single lesson in a swimming pool costs about 7 euros)	☐	☐	☐	☐	☐
Is uncomfortable	☐	☐	☐	☐	☐
Is only suitable for women who already exercised before pregnancy	☐	☐	☐	☐	☐

	Totally disagree	Slightly disagree	Neutral	Slightly agree	Totally agree
May give me less chance of complications during my pregnancy	☐	☐	☐	☐	☐
Other, namely	☐	☐	☐	☐	☐

3. I think I would succeed in taking a 45-minute aqua bike lesson 1 time a week/ 2 times a week.*
- ☐ Totally disagree
- ☐ Slightly disagree
- ☐ Neutral
- ☐ Slightly agree
- ☐ Totally agree
4. I decide whether or not I want to participate in a 1 time a week/ 2 times a week* aqua-cycling class of 45 minutes during my pregnancy.
- ☐ Totally disagree
- ☐ Slightly disagree
- ☐ Neutral
- ☐ Slightly agree
- ☐ Totally agree
5. During my pregnancy participating in a 45-minute aqua bike class 1 time a week/ 2 times a week* is up to me.
- ☐ Totally disagree
- ☐ Slightly disagree
- ☐ Neutral
- ☐ Slightly agree
- ☐ Totally agree
6. I expect the following people to be positive about my participation in aqua cycling classes during my pregnancy.

	Totally disagree	Slightly disagree	Neutral	Slightly agree	Totally agree
People who are important to me	☐	☐	☐	☐	☐
My partner	☐	☐	☐	☐	☐
My friends	☐	☐	☐	☐	☐
My midwife and other professionals that I come into contact with during pregnancy	☐	☐	☐	☐	☐
My family	☐	☐	☐	☐	☐

	Totally disagree	Slightly disagree	Neutral	Slightly agree	Totally agree
My gym instructors	☐	☐	☐	☐	☐

7. How much support or pressure do you expect to get for joining aqua cycling classes during the pregnancy of ...

	A lot of support	Somewhat support	Neutral	Somewhat pressure	A lot of pressure
People who are important to me	☐	☐	☐	☐	☐
My partner	☐	☐	☐	☐	☐
My friends	☐	☐	☐	☐	☐
My midwife and other professionals that I come into contact with during pregnancy	☐	☐	☐	☐	☐
My family	☐	☐	☐	☐	☐
My gym instructors	☐	☐	☐	☐	☐

8. Indicate whether the following factors would be a barrier for you to take a 45-minute aqua cycling lesson 1 time a week/ 2 times a week.*

	Surely yes	Somewhat	Certainly no
Pregnancy discomfort (such as nausea and fatigue)	☐	☐	☐
Lack of information about exercise and pregnancy	☐	☐	☐
Need care for other children	☐	☐	☐
Working pressure	☐	☐	☐
Costs	☐	☐	☐
No swimming pool nearby	☐	☐	☐
No transport	☐	☐	☐
Other, namely	☐	☐	☐

9. In which composition would you prefer to take aqua-bike classes?
 - ☐ In a pregnancy group
 - ☐ In a regular group (also non-pregnant women and men)
 - ☐ I don't care
 10. How many weeks are you pregnant? ... weeks.
 11. How many times have you been pregnant? (fill in 1, 2 or 3 etc.) ...
 12. What is your height? (in cm) ... cm.
 13. What was your weight before pregnancy? (in kg) ... kg.
Please enter a dash (-) if you prefer not to answer it.
 14. Has a medical professional diagnosed you with diabetes during your pregnancy?
 - ☐ Yes
 - ☐ No
 15. Has a medical professional diagnosed you with other complications?
 - ☐ Yes, namely ...
 - ☐ No
- The next three questions you can think of a normal week in the months before your pregnancy.*
- 16.a. Before my pregnancy, I did at least 150 minutes a week of moderately intensive exercise (such as walking and cycling), spread over several days. (This does not only have to take place in leisure time, but also, for example, in the household, at work or during transport).
 - ☐ Yes
 - ☐ No
 - 16.b. Before my pregnancy, I did muscle and bone strengthening activities (such as fitness) at least twice a week. (This does not only have to take place in leisure time, but also, for example, in the household, at work or during transport).
 - ☐ Yes
 - ☐ No
 - 16.c. On average, how many days a week did you spend at least half an hour before your pregnancy, doing odd jobs, gardening, exercising or other strenuous activities?
Days per week: ... days.
 17. What forms of exercise are you currently participating in? ...
 18. Most pregnant women I know continue to exercise during their pregnancy
 - ☐ Totally disagree
 - ☐ Slightly disagree
 - ☐ Neutral
 - ☐ Slightly agree
 - ☐ Totally agree
 19. Looking at the past year; how much experience do you have with exercise in the water (e.g. swimming, aqua-jogging, aqua-yoga)
 - ☐ A lot (more than 2 times a week)
 - ☐ Little (1-2 times a week)
 - ☐ No experience
 20. Have you swum or participated in other water activities (such as aqua-jogging, aqua-yoga) during previous pregnancies?
 21. What is your age? (in years) ... years
Please enter a dash (-) if you prefer not to answer it
 22. What is your country of origin?
 - ☐ The Netherlands
 - ☐ Turkey
 - ☐ Morocco
 - ☐ Indonesia
 - ☐ Suriname
 - ☐ Another country, namely ...
 23. What is your highest level of education?
 - ☐ Primary school
 - ☐ High school
 - ☐ Secondary vocational education (MBO)
 - ☐ Higher vocational education (HBO)
 - ☐ University
 24. Which of the options below best describes your employment status?
 - ☐ Non-working, not looking
 - ☐ Non-working, looking
 - ☐ Part-time paid work
 - ☐ Full-time paid work
 - ☐ Incapacitated for work
 - ☐ Maternity leave
 - ☐ Currently not working due to pregnancy-related complaints

This is the end of the questionnaire. Thank you for participating! Please don't forget to click send!