Flow in New Zealand High-Performance Athletes and their Intentions to Use Regulated Breathing

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Abstract

Flow, or being "in the zone" (Jackson & Csikszentmihalyi, 1999, p. 12), is associated with athletes' best-perceived performance (Jackson, Thomas, Marsh, & Smethurst, 2001). Practising regulated breathing could be associated with experiencing flow; the current research sought to identify this potential relationship with New Zealand high-performance adult athletes. New Zealand high-performance adult athletes' intentions to use regulated breathing in two behaviours ('practising regulated breathing in a training routine' or 'using regulated breathing as a mental skills tool during competition') along with the components of an individual's intentions (instrumental and experiential attitudes, injunctive and descriptive norms and capacity and autonomy; Fishbein & Ajzen, 2010) were also researched. A cross-sectional survey was used to gather data. A *t*-test showed there was no statistically significant difference in the frequency flow was experienced between participants currently practising regulated breathing against those that were not, $t(40) = 0.96$, $p = .342$. Descriptive statistics and one-way ANOVAs showed the majority of the sample responded that they intended to practice regulated breathing in a training routine (64%) and use regulated breathing as a mental skills tool during competition in the future (76%) with no significant difference across the competition level competing at, $F(2,87) = 0.26$, $p = .774$ and $F(2,87) = 0.56$, $p = .575$, respectively. Finally, multiple linear regression models showed instrumental attitudes were the only significant predictor of intentions to perform regulated breathing in a training routine (Beta = .68, $p < .001$) or during competition as a mental skills tool (Beta = .82, $p < .001$). Participants' components (instrumental and experiential attitudes, injunctive and descriptive norms and capacity and autonomy) estimated 67% of the variation in their intentions to practice regulated breathing in a training routine and 70% of the variation in their intentions to use regulated breathing as a mental skills tool during competition. Further evidence is needed to confirm the relationship between practising regulated breathing and how frequently flow is experienced. However, regulated breathing interventions could be appealing to New Zealand high-performance athletes.

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Contents

List of Tables and Figures

Tables

Figures

Flow in New Zealand High-Performance Athletes and their Intentions to Use Regulated Breathing

A Flow Experience

Flow is an experience known to athletes as being "in the zone" (Jackson & Csikszentmihalyi, 1999, p. 12). The flow theory (Csikszentmihalyi, 1975) explains flow as an experience occurring when an individual is in total involvement, completely absorbed in a state of effortlessness through the actions in the activity (Csikszentmihalyi, 1975). Csikszentmihalyi theorized when an individual is experiencing flow, there is little separation between stimulus and response where awareness and thoughts play no part in an individual's actions; an individual, therefore, moulds with the environment in complete control with little differentiation between past, present and future (Csikszentmihalyi, 1975). A flow experience can also be explained using nine characteristics (Jackson & Csikszentmihalyi, 1999): the balance between skill and challenge (a trade-off from anxiety, apathy or boredom), unambiguous clear fast feedback, clear goals, concentration on the activity, being intrinsically rewarded, the merging of actions with awareness, feelings of unlimited recourses to cope with the challenges (feelings of control), loss of self-consciousness and transformation of time perceptions (Jackson & Csikszentmihalyi, 1999). Research has investigated athletes flow experiences with a personal-best performance or experience.

A Flow Experience and Athletic Performance

Researchers have investigated if a flow experience is a psychological state associated with personal-best performances (Jackson et al., 2001), best experiences (Jackson, 1992; Swann et al., 2017) along with how a totally absorbed, better than average experience is related to the nine characteristics of the flow theory (Jackson, 1996). Identifying if there is an association between a flow experience and an athlete's personal-best performance or best experience could show if a flow experience would act as the underlying theory to improve an athletes' performance from a psychological perspective.

Research focused on a state flow experience (level of flow experienced in a just-completed event; Jackson & Eklund, 2002) and its association with 16 elite level figure skaters' best experiences skating (based off personal satisfaction and if the event was memorable; Jackson, 1992). After interviewing athletes on their best experience skating, Jackson completed a content analysis on interview transcripts concluding that elite figure skaters explanations of their best experience skating was synonymous with state flow. Because an external assessor ensured raw data themes accurately depicted quotes, Jackson's conclusion using interview transcripts are interpreted as being somewhat trustworthy. Also, the results using a flow questionnaire showed, on average, participants rated items relating to six of the nine characteristics of a flow experience as being more important than others when considering their general flow experience (Jackson, 1992). However, the flow questionnaire had no documented scale validation, was applied with a small sample (increasing the chance of making a Type one error) and used no inferential statistics, suggesting the results produced using the flow questionnaire are interpreted with caution.

Research also identified if elite athletes' better than average, totally absorbed experiences (where they were rewarded by how they performed) that were aligned with flow were associated with the nine characteristics of the flow experience (Jackson, 1996). Jackson interviewed 28 elite level athletes, starting each interview by reading three quotes to familiarise the athletes with a flow experience (helping align athletes' answers on a better than average, totally absorbed experience). Using content analysis and frequency tables, Jackson showed that 97% of elite athletes accounts of a better than average, totally absorbed experience aligned with flow was synonymous with at least one of the nine characteristics of the flow experience. Further, four of the nine characteristics of a flow experience were present more in raw data themes than the other five characteristics of a flow experience. Jackson used an external assessor, peer debriefer and auditor to ensure all decisions and conclusions were justified. The breadth of information and established trustworthiness (multiple secondary person reviews) gives evidence that a flow experience is a better than average, totally absorbed experience not reflected by all nine characteristics occurring at once.

Research later attempted to identify the psychological states or characteristics (in chronological order) associated with athletes' best-perceived performances (Swann et al., 2017).

Swann et al. used a semi-structured interview process with 26 participants from varying sports and competition levels. Interviews occurred after an athlete's personal best, excellent performance or a performance where that athlete won, placed well or was nominated for an award. Swann et al. grouped themes from interviews into a flow or clutch experience (explained later in the review) and showed characteristics of a flow experience were described in athletes' descriptions of excellent, personal-best performances. Swann et al. gained trustworthiness by using constant peer debriefing by secondary authors to challenge assumptions made, give guidance through the whole process and critically evaluate themes created. Also, research participants and five additional athletes competing at the International level or International standard in their sport were used to check and confirm that the results corresponded with personal experiences in similar situations. Attempts to establish trustworthiness gives confidence that Swann et al.'s research provides evidence of a flow experience being a psychological state of personal best and excellent athletic performances.

Adding to research predominantly using interview methods to associate a flow experience with a personal best experience (Jackson, 1992), excellent performance (Swann et al., 2017) and the nine characteristics of the flow experience (Jackson, 1996), Jackson et al. (2001) used data from 231 athletes to identify associations between athletes' best-perceived performances and dispositional flow (frequency an individual experiences flow not limited to one competition; Jackson & Eklund, 2002). Jackson et al. showed quantitative correlational evidence supporting a significant relationship between dispositional flow and a best-perceived performance in athletes, $r = 0.67$, $p \leq .01$. Further, Jackson et al.'s results showed that seven of the characteristics of the flow experience had significant correlations larger than .39 with athletes' best-perceived performances (Jackson et al., 2001). Because Jackson et al. used a psychometrically validated dispositional flow scale developed by Marsh and Jackson (1999)[1]

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[1]Marsh and Jackson (1999) used 385 athletes in a confirmatory factor analysis (CFA) using the dispositional flow scale to show a model including the nine characteristics of a flow experience

across a large number of athletes from various sports, there is evidence that a flow experience (as shown using dispositional flow) is a psychological state of best-perceived performances.

In summary, research showed a flow experience (as explained using the flow theory or nine characteristics of the flow experience) is a psychological state associated with athletes' best-perceived performances (Jackson et al., 2001; Swann et al., 2017) and best experiences (Jackson, 1992); the flow experience could, therefore, form the underlying theory to improve athletes performance from a psychological perspective. Before the flow experience is used to help improve an athlete's psychological performance, another explanation of the psychological states associated with an athlete's performance should be reviewed.

Another Explanation of a Psychological Performance State

Post research on athletes' flow experiences being associated with best-perceived performances (Jackson et al., 2001) and best experiences (Jackson, 1992), the flow experience coupled with a clutch experience emerged to explain the psychological states associated with performance (Swann et al., 2017; Swann, Crust, & Vella, 2017b; Swann, Keegan, Crust, & Piggott, 2016). Reviewing research on the flow experience coupled with the clutch experience helps identify if a flow experience (as explained by the flow theory and nine characteristics of the flow experience) is a valid explanation of a psychological state associated with an athlete's best-perceived performance or best experience.

Research initially focused on identifying if a flow experience occurred with a best performance (Swann et al., 2016). Swann et al. used a multiple case-study designs with a mixed methods data collection plan on ten male professional golfers. The mixed methods collection plan combined athletes' performance data, semi-structured interviews and observations of performances (for example shot difficulty, distractions or weather) to identify if and when a

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and one higher order factor (all nine characteristics of a flow experience grouped together) had good data fit, RMSEA = .048; TLI = .904.

flow experience occurred (Swann et al., 2016). In the interview (within seven days after the golfers' performance), Swann et al. asked participants if they were familiar with a flow experience, what a flow experience was to them (to compare to definitions of a flow experience), and if, what happened, when, how or why a flow experience occurred or not in the recent performance. Performance data and observations were used as talking points for golfers to describe further the flow experience occurring (or not; Swann et al., 2016). Swann et al. initially grouped participants responses on a flow experience separately, then together, allowing the identification of themes and the order of themes. The results showed that male golfers' best performances had two psychological states (Swann et al., 2016); one state best described by some (not all) of the nine characteristics of the flow experience, with one a psychological state where heightened intensity, concentration and focus was used (common with a new view of clutch experience previously intertwined with the characteristics of the flow experience). However, Swann et al.'s study only used professional male participants competing in one sport, limiting generalisability to athletes from other genders and sports.

Swann et al. (2017) addressed Swann et al.'s (2016) lack of participant variation by using 26 participants classifying as male and females from varying sports and competition levels. Swann et al. used a semi-structured interview process similar to Swann et al. (2016) to help participants explain (in chronological order) the psychological states associated with the just completed performance. As explained previously in the above section 'identifying an association between a flow experience and a best-perceived performance', Swann et al. grouped themes created from participants' descriptions of best experiences into flow or clutch experiences; comments made by participants that were in similar chronological order were used to create higher order themes representing the experiences and the processes they occurred with. Swann et al. showed a flow experience and a clutch experience were again present as psychological states within different contexts of an athletes' best performance. Swann et al.'s participants experienced flow in novelty situations, situations of uncertainty, or situations where experimentation was present; clutch experiences were present in intentional changes of effort, challenging situations and when pressure or end goals were present (Swann et al., 2017).

Although the results from research (Swann et al., 2017) supported a relationship between a flow and clutch experience and best performance, Swann et al. (2017) stated findings produced in research using various athletes from various competition levels that the model of flow and clutch experience cannot yet be generalised. Although Swann et al. (2017b) reviewed the model of flow and clutch experiences, Swann et al.'s (2017) statement on the lack of generalisability the flow and clutch experience model has suggests there is not enough evidence that the model of a flow and clutch experience is in the position to better explain a psychological state associated with best performances than a flow experience (as explained using the flow theory and nine characteristics of the flow experience).

To conclude, it is suggested the flow experience (explained using the flow theory or nine characteristics of a flow experience) remains a better explanation of a psychological state associated with an athlete's best-perceived performance or best experience compared to the flow and clutch experience. As evidence suggested an athlete's flow experiences were associated with best-perceived performances (Jackson et al., 2001; Swann et al., 2017), and best experiences (Jackson, 1992), there is reason to research a mental skills tool to help aid athletes experience flow more frequently.

The Practice of Regulated Breathing

Regulated breathing is a potential mental skills tool to aid the frequency of experiencing flow. Regulated breathing, controlled breathing or 'pranayama' in its Indian translation refers to an individual controlling air moving through the lungs by controlling inhalations, breath holds and exhalations with each technique using different breath ratios (in seconds; Iyengar, 1997). Historically, regulated breathing has identified in Eastern tradition since 2008 BC with its introduction into Western society through the United States of America in 1893 AD (Sengupta, 2012). The practice of regulated breathing is well researched in areas associated with the autonomic nervous system, the performance on tasks and anxiety. Research on the practice of regulated breathing could provide rationale towards using the practices as a tool to aid the frequency athletes' experience flow.

Effects of practising regulated breathing on the autonomic nervous system and anxiety. The autonomic nervous system (ANS)[2] and anxiety are areas of interest in regulated breathing research. When reviewing literature on regulated breathing and how it affects the ANS (Bertisch, Hamner, & Taylor, 2017; Laborde, Allen, Göhring, & Dosseville, 2017; Pal, Velkumary, & Madanmohan, 2004) or anxiety (Toschi-Dias et al., 2017), any benefits of the practice and how it could be applied to future research may be identified.

Research measured the effects of the long-term practice of regulated breathing on ANS control (Bertisch et al., 2017). Bertisch et al. used 26 participants with five years' experience practising regulated breathing (yoga practitioners or experimental group), to compare against 26 matched controls with no prior controlled breathing experience in a one-off five minute controlled breathing intervention. Bertisch et al. used *t*-tests and Pearson correlations to show respiratory sinus arrhythmia when resting was higher (larger parasympathetic nervous system [PNS] activation) in yoga practitioners compared to controls (average 50% higher; $p = .03$) while taking significantly ($p = .03$) fewer breaths per minute; no significant differences in the ANS response between groups after the five-minute intervention was seen (as shown using respiratory sinus arrhythmia; Bertisch et al., 2017). Bertisch et al.'s results showed little support on the effects of the long-term practice of regulated breathing to aid an ANS response.

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[2]The ANS is made up of constantly active neurons controlling equilibrium (balance) in a person's body by controlling organs and reacting to internal and external changes from his or her environment (Cardinali, 2018). Three responses of the ANS help produce balance within an individual's body; the enteric nervous system response (control of the intestines and stomach; Cardinali, 2018), the sympathetic nervous system response (SNS; a survive response used in the face of danger; Cardinali, 2018) and the parasympathetic nervous system response (PNS; a response to protect organs from overuse, decreasing the heart rate; Cardinali, 2018). Common ways to test changes in the ANS are measuring the respiratory sinus arrhythmia (RSA; the difference in vagal activity over inspiration and expiration; Pal et al., 2004), heart rate variability (HRV; variability the R-R interval produced by the heart; Loni, 2015) and testing the Valsalva ratio (measuring the heart rate response to the ANS through changes in blood pressure; Loni, 2015).

Instead, the results showed that yoga practitioners had larger PNS activations while taking fewer breaths per minute when rested. Bertisch et al.'s research shows future studies require a plan to analyse comparisons between the practice of regulated breathing and other variables in a research project.

Research also partially focused on the effects of practising regulated breathing on a PNS response (shown using heart rate variability) in reaction to a stressful cognitive task (Laborde et al., 2017). Laborde et al. used 14 adolescents (15-19 years) with mental disabilities completing a standardised cognitive test (Kaufman Assessment Battery of Children) pre and post interventions. Intervention one was practising regulated breathing for 17 minutes with intervention two having participants' listen to an audiobook for 17 minutes; each intervention was spaced one-week apart at the participants' school. Laborde et al. used repeated measures ANOVAs and *t*-tests to show a significant increase in PNS activation after practising regulated breathing compared to the control while completing a stressful cognitive task, $t = 2.62$, $p = .021$. However, Laborde et al. used a small sample size while inflating the Familywise error rate[3] as *t*-tests were used instead of specific post hoc pairwise comparison tests. Although the amount of follow-up *t*-tests Laborde et al. used in the post hoc analyses of ANOVA results is unknown, a standard two-by-two ANOVA (like that used by Laborde et al.) can use up to six follow up *t*-tests to test an interaction, potentially increasing the type one error rate from .05 (5%) to .265 (27%). Therefore, Laborde et al. may have claimed the presence of an effect when none was present. Consequently, Laborde et al.'s research provides tentative evidence towards further studies investigating the psychological benefits of practising regulated breathing.

Research measured the effects of practising regulated breathing for 30-minutes, two times daily over three months on an ANS response (Pal et al., 2004). Pal et al. used 30 healthy

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[3] Using *t*-tests on two or more independent variables to show the difference between each independent variable on dependent variable increases familywise error rate because each *t*-test does not correct the level of significance to ensure the probability of making a type one error stays at .05 (Field, 2013).

male participants split evenly into control (no regulated breathing) and experimental groups (practising regulated breathing). Using *t*-tests and ANOVAs, Pal et al. concluded the practice of regulated breathing improved a PNS response and activity as participants in the experimental group had significantly ($p < .05$) lower basal heart rates in response to standing and a significant ($p < .01$) increased difference in heart rate over deep inspiration and maximum expiration from pre to post intervention. However, Pal et al.'s participants had a non-significant difference in Valsalva ratio[4] between control and experimental conditions and pre and post-experimental conditions, suggesting to the researcher that there could be no significant difference in the ANS response between groups. Pal et al.'s conclusions, therefore, only give tentative evidence on the effects of practising regulated breathing; Pal et al. does show the need to consider all psychological variables tested, ensuring conclusions match the tests.

Finally, research measured the effects of practising regulated breathing, light physical yoga exercises and meditation on the ANS in 46 participants suffering from anxiety or depression (Toschi-Dias et al., 2017). Participants' ANS responses were measured using pre and post comparisons between a control group (usual therapy education, 22 participants) and an experimental group (ten, two-hour sessions of regulated breathing, light physical yoga and meditation over 15 days, 24 participants). The results from *t*-tests showed the practice of regulated breathing, light yoga and meditation significantly ($p < .05$) changed ANS responses (more balance between PNS and SNS responses) in participants with anxiety and depression from pre to post-treatment and compared to the control group post-intervention. Also, the practice of regulated breathing, light yoga and meditation significantly reduced anxiety ($p < .05$) compared to the baseline of the experimental group and the control group post-treatment (Toschi-Dias et al., 2017). Toschi-Dias et al. did not randomise control and treatment groups (affecting internal validity), had a reduced documented effect of practising regulated breathing

[4] The Valsalva ratio measuring the heart rate response to the ANS through changes in blood pressure (Loni, 2015).

(intervention also used light yoga and meditation) and did not state internal consistency reliability tests for psychometric measures of anxiety and depression on their sample. Regardless of some minor limitations, Toschi-Dias et al.'s results form the rationale to research further the relationship between practising regulated breathing and psychological states associated with less anxiety.

To conclude, because the practice of regulated breathing reduced anxiety simultaneously with balancing the ANS (Toschi-Dias et al., 2017), increased a PNS response (Pal et al., 2004), and increased a PNS response in a stressful cognitive task (Laborde et al., 2017) there is reason to apply the practice of regulated breathing further to improve performance, from a psychological perspective. Second, future research should use post hoc pairwise comparison tests with corrections for Familywise error rate to reduce the probability of making a Type one error. Lastly, an instruments inclusion in a study clearly stating why it is included should be identified before the data collection phase to keep conclusions and analyses clear and correct; completing a pre-registration document before the data collection phase could aid this problem.

Practising regulated breathing to help reaction time, anxiety and performance accuracy. Research has focused on the effects of practising regulated breathing on performance (Khng, 2016; Nemati, 2013; Page, Asken, Zwemer, & Guido, 2016), anxiety (Khng, 2016; Nemati, 2013) and reaction times (Sharma et al., 2014; Shashikala et al., 2011; Telles, Yadav, Gupta, & Balkrishna, 2013); research on the practice could form rationale towards using regulated breathing along with how it could be applied to future research.

Research partially focused on the effects of practising mental skills tools (regulated breathing, imagery, attentional focus) in police cadet training to increase memory recall accuracy (Page et al., 2016). Page et al. compared police cadets split into a control group (education session with no mental skills education, 30 participants) and an intervention group (education session with mental skills education, 33 participants); both groups completing two education sessions placed one week apart. Page et al. used *t*-tests to show memory for cadets given mental skills education was significantly more accurate than police cadets not receiving mental skills education, $t = 2.48$, $p \leq .05$. Also, police cadets who stated they used regulated breathing remembered more things compared to those who did not, $t = 2.07$, $p \leq .05$. Page et al. showed regulated breathing was used by 23% of the control group as a mental skills tool because of prior police cadet education on mental skills. Also, no signs of scale validation were included in the research publication for self-reported stress, confidence, memory, performance and pain scales. Page et al.'s potential problems with scale reliability, validity and adequate separation between control and experimental groups suggest results are interpreted with some caution. Future research should, therefore, ensure valid, reliable scales are used to measure the effects of practising regulated breathing.

Research also focused on if mental skills tools (practising regulated breathing, positive self-talk and visualisation strategies all under one intervention) affected foreign language test performance and test anxiety (measured using the Sarason Anxiety Scale; Nemati, 2013). Fifty-eight Iranian students completed the intervention for an increased period of three to 30-minute sessions at the start of each class for one full semester. Students completing the intervention were compared against 49 students not practising controlled breathing using a final examination language test and anxiety tests pre and post-semester. Nemati used an independent samples *t*-test and Pearson correlational analyses to show the performance of participants practising mental skills tools throughout the semester significantly improved in the final examination compared to those not practising mental skills tools, $t = 2.23$, $p = .027$; also seen was a significant negative correlation between test anxiety and test performance, $r = -.204$, $p < .05$ (Nemati, 2013). Nemati used a translated version of the Sarason Anxiety Scale (alpha = .79) with no evidence of pre-validation occurring on the scale with the translated language; Nemati, therefore, may not be documenting the reduction in anxiety accurately. Also, the use of positive self-talk and visualisation strategies reduced the individual documented effect of practising regulated breathing on test performance (Nemati, 2013). Consequently, Nemati's research provides tentative evidence towards further studying the practice of regulated breathing and the potential association it has with psychological states of performance.

Research that measured the effects of practising regulated breathing on state anxiety (anxiety caused by a one-off event) and test performance in adolescents (Khng, 2016) may provide more evidence towards furthering research on controlled breathing and psychological states. Khng used data from 122 adolescents split across an experimental (practising regulated breathing for 10 minutes) and control group (not practising regulated breathing for 10 minutes); participants completed the State Trait Anxiety Inventory for Children anxiety scale[5] (alpha = .91- .92) and the adapted version of the Wechsler Individual Achievement Test-Third Edition (mathematics test) pre and post intervention. Using either post hoc pairwise comparisons or *t*-tests (unstated by Khng) on the significant results from repeated measure ANOVAs, Khng showed the practice of regulated breathing significantly reduced anxiety compared to not practising (11% compared to 4% respectively), $t(119) = 2.28$, $p = .02$. The practice of regulated breathing also significantly improved math scores compared to not practising, $t(117) = 2.05$, $p = .04$; however, Khng's differences between experimental and control group maths scores were small (13% and 9% respectively). Khng's use of an anxiety scale previously acknowledged for identifying benefits of using a treatment suggests results provide evidence towards the practice of regulated breathing reducing anxiety; future research should, therefore, apply the practice of regulated breathing with psychological states of performance that require reductions in anxiety.

Research measured 35 males with six months regulated breathing experience to compare differences in reaction times (using the Multi-Operational Apparatus for Reaction Time test) between practising controlled breathing and using breath awareness (meditation; Telles et al., 2013). The participants completed an 18-minute practice of regulated breathing against the same length practice of breath awareness (meditation) on two separate days; half the participants completed the intervention in reverse order. Telles et al. concluded from the

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[5] Seligman, Ollendick, Langley and Baldacci (2004) produced a meta-analysis on child anxiety measures. Seligman et al. results show the State Trait Anxiety Inventory for Children is a scale that identifies improvements post-treatment in anxiety trait scores, $k = 7$, Hedges $D = 0.74$, 95% CI [0.47, 1.01], and state scores, $k = 6$, Hedges $D = 0.76$, 95% CI [0.46, 1.07].

experiment with the results from a Bonferroni alpha test that the 18-minute practice of regulated breathing caused significantly (p = .04) less unnecessary anticipatory responses in participants. However, Telles et al.'s conclusion on differences in anticipatory responses between pre and post-tests was based off using a Bonferroni alpha test on an initial non-significant repeated measures ANOVA result (p = .084 [one-tailed]). Telles et al.'s conclusion was, therefore, somewhat questionable, providing only tentative evidence towards further studying the effect of practising regulated breathing on psychological performance states; future research should ensure post hoc pairwise comparison tests only occur when ANOVA results are significant (p < .05).

Other research also focused on the effects of practising regulated breathing on reaction times (Shashikala et al., 2011). Shashikala et al. had 50 male participants practice regulated breathing for 30 minutes a day, five times a week for 12 weeks while measuring reaction times pre and post-intervention. Shashikala et al. used paired *t*-tests to show participants had significantly ($p \leq 0.001$) faster auditory reaction times and motor performance (as shown in visual and hand response time) with the practice of regulated breathing. Shashikala et al. ensured the participants were familiar with the reaction time apparatus, so a practice effect did not create the difference between pre and post regulated breathing trails. However, Shashikala et al. used only male participants with no control group comparison; therefore, Shashikala et al.'s results were only generalisable to one gender and may be due to confounding variables.

Sharma et al. (2014) addressed Shashikala et al.'s (2011) lack of generalisability to females and no comparison against a control group. Sharma measured the effects of practising regulated breathing on reaction time and performance using experimental groups (practising regulated breathing; nine males, 47 females) and a control group (not practising controlled breathing; 28 participants) at pre and post-intervention. Using *t*-tests, Sharma et al. showed participants using regulated breathing had a significant increase (p < .05) in computer test performance from pre-test to post-test in five out of eight testing situations (depending on the type of regulated breathing and computer test). Also, significantly (p < .05) faster visual and auditory reaction times pre to post-test when practising regulated breathing were seen (Sharma et al., 2014); no significant changes in the matched control groups pre and post computer test performance and reaction times were shown (Sharma et al., 2014). Like Shashikala et al., Sharma et al.'s research ensured that participants were familiar with the reaction time apparatus, so a practice effect did not create the difference between pre and post regulated breathing trails. Because Sharma et al. and Shashikala et al.'s research complimented each other, it is suggested Sharma et al. and Shashikala et al.'s results show evidence to research the psychological benefits of practising regulated breathing for performance further.

In summary, research showed practising regulated breathing aids performance (Khng, 2016; Nemati, 2013; Sharma et al., 2014), reduces anxiety (Khng, 2016; Nemati, 2013; Toschi-Dias et al., 2017) and betters reaction times (Shashikala et al., 2011; Sharma et al., 2014). Practising regulated breathing for performance reasons along with its practice affecting ANS responses in individuals (Laborde et al., 2017; Pal et al., 2004; Toschi-Dias et al., 2017) gives the rationale to further research an association between practising regulated breathing and experiencing flow (a psychological state associated with an athletes' excellent, best-perceived performance or best experience).

Practising Regulated Breathing and Experiencing Flow

Practising regulated breathing could be associated with the frequency flow is experienced (a psychological state associated with best-perceived, excellent performances). There is reason to expect that regulated breathing could affect the frequency with which individuals experience five of nine characteristics of a flow experience.

The balance of skill and challenge. The potential association between practising regulated breathing and experiencing flow could be through helping achieve skill and challenge balance. The balance between skill and challenge is the balance between an individual's perceived challenge of a task and the perceived skill level to complete the challenge (a characteristic of having a flow experience; Jackson & Csikszentmihalyi, 1999). When a challenge is too hard for an individual's skill level, anxiety is experienced instead of flow (Jackson & Csikszentmihalyi, 1999).

Practising regulated breathing could help an individual experience flow by reducing levels of anxiety in a challenging situation. Research suggested the practice of regulated breathing reduced anxiety (Khng, 2016; Nemati, 2013), reduced anxiety simultaneously with a significant increase in ANS control (balancing of PNS and SNS responses; Toschi-Dias et al., 2017) and bettered performance (Khng, 2016; Nemati, 2013; Sharma et al., 2014). The reductions in anxiety, increased arousal control (shown through control of the ANS) and better performances in a task after the practice of regulated breathing could be related to an individual experiencing challenge and skill balance because that individual has more control over the factors that trade-off with a flow experience, namely anxiety. Therefore, the potential association between practising regulated breathing and experiencing flow could be through helping achieve a balance between skill and challenge.

Concentration on the activity performing. The potential association between practising regulated breathing and experiencing flow could be through aiding concentration on the activity performing (a characteristic of the flow experience). Concentrating on the activity performing is an individual's ability to concentrate and tune into the task without interruption from distractions or irrelevant thoughts (one of the nine characteristics of the flow experience; Jackson & Csikszentmihalyi, 1999). Jackson and Csikszentmihalyi (1999) suggest in their book 'Flow in Sports' that focusing on breathing helps an athlete listen to his or her body, one of the best ways to aid concentration. By practising regulated breathing, it is suggested the attentional processes of the individual are trained to provide focus on the activity, nothing else.

Previous research could show that an individual has increased focus in the activity; the practice of regulated breathing decreased individuals' reaction times (Sharma et al., 2014; Shashikala et al., 2011), and bettered their performance (Khng, 2016; Nemati, 2013; Sharma et al., 2014), suggesting better concentration on the external stimuli or test. Sharma et al. and Shashikala et al. explain in their discussions that the practice of regulated breathing could help remove distracting stimuli, give more enhanced arousal and more focus on the task at hand. Previous research provides reasons to suggest that practising regulated breathing could cause a training effect of experiencing flow by increasing concentration on the activity performing.

Loss of self-consciousness. The potential association between practising regulated breathing and experiencing flow could be through helping the experience of loss of self-consciousness (one of the nine characteristics of experiencing flow). Loss of self-consciousness is the loss of an individual's self-concern or negative thoughts (caused by the individual's ego) to the experience (Jackson & Csikszentmihalyi, 1999). Jackson and Csikszentmihalyi suggest an individual's ego (cause for questioning and critiquing of performance) is forgotten by focusing on his or her body; focusing on breathing is a way to shift focus to the body (Jackson & Csikszentmihalyi, 1999). Therefore, athletes practising to shift focus to the body using the practice of regulated breathing could experience flow through helping experience the loss of self-consciousness.

The merging of actions and awareness in an activity. The potential association between practising regulated breathing and experiencing flow could be through helping experience the merging of actions and awareness (a characteristic of the flow experience). The merging of actions and awareness occurs when an individual's body and mind work and move as one with feedback being processed spontaneously, allowing feelings of total absorption (Jackson & Csikszentmihalyi, 1999). Practising regulated breathing could help an individual experience the merging of actions and awareness by helping he or she let go of the ego, losing self-consciousness and freeing the mind to move as one with the body, allowing feelings of complete absorption in the activity.

Research showed that practising regulated breathing decreased individuals' reaction times to external stimuli (Sharma et al., 2014; Shashikala et al., 2011). Faster reaction times could be because each individual's mind and body may be closer to moving as one in the environment with feedback from the external stimuli processing more spontaneously. Therefore, potential associations between practising regulated breathing and experiencing flow could be through helping experience the merging of actions and awareness.

Unambiguous clear-fast feedback. Finally, the potential association between practising regulated breathing and experiencing flow could be through helping experience unambiguous clear-fast feedback (a characteristic of the flow experience). Unambiguous clear-fast feedback is the immediate during-performance knowledge an individual receives about the performance and whether he or she is currently on target with goals set (Jackson & Csikszentmihalyi, 1999).

A relationship between unambiguous clear-fast feedback and practising regulated breathing could be because the practice of regulated breathing may provide the user with clearer decisions on a task while performing the task at a faster speed. First, clearer decision making after practising regulated breathing is suggested because research showed an increase in task performance during tests (Khng, 2016; Nemati, 2013; Sharma et al., 2014). Second, faster feedback and processing from practising regulated breathing is suggested because research showed the practice helped speed up reaction times (Sharma et al., 2014; Shashikala et al., 2011). As information could be clearer being processed faster after the practice of regulated breathing (potentially aiding the feedback process), research should study the potential association between a flow experience and the practice of regulated breathing.

To summarise, a potential association could be present between practising regulated breathing and experiencing flow through five of the nine characteristics of flow experience. Therefore, an investigation using a long-term intervention (commonly used in regulated breathing research reviewed) on the relationship between practising regulated breathing and the frequency of experiencing flow should occur. However, resource deposits available for a Master's level research project may not allow for such an intervention because of time, costs or room space (explained in more detail in the methods section). Consequently, to continue preparations towards completing a long-term intervention on the practice of regulated breathing, identifying athletes' intentions to use regulated breathing and what predicts intentions could show if and why practising controlled breathing would be appealing to athletes.

The Reasoned Action Approach

The Reasoned Action Approach (RAA) is a model attempting to explain an individual's intentions and the role intentions play in the performance of a behaviour (Fishbein & Ajzen, 2010). The RAA is an update of the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975 as cited in Madden, Ellen, & Ajzen, 1992) and Theory of Planned Behaviour (TPB; Ajzen, 1985 as cited in Madden et al., 1992; Ajzen, 1991).[6]

Briefly, the RAA theorises an individual's background factors (personality, demographic characteristics, social environments and the way information exposed to is understood and consolidated) affects the spontaneous and planned performance of a behaviour (Fishbein & Ajzen, 2010). It is suggested influencing background factors form the base of three beliefs leading on to two types of attitudes (instrumental and experiential attitudes), perceived norms (injunctive and descriptive norms) and perceived behavioural control factors (capacity and autonomy) acting as components of the RAA and affecting the individual's intentions to perform a behaviour. Intentions to perform the behaviour then has a suggested effect on the actual performance of the behaviour (Fishbein & Ajzen, 2010).

Each component of the RAA has different effects on intentions to perform a behaviour. First, instrumental attitudes are the positive or negative consequences of performing the behaviour; second, experiential attitudes are the positive or negative effects of performing the behaviour; third, descriptive norms are the perceptions affected by what important others are doing (Fishbein & Ajzen, 2010). Forth, injunctive norms are the attitudes towards the action of interest when considering important others views, time, and the context in which the action takes place (Fishbein & Ajzen, 2010). Fifth, capacity is an individual's capacity to perform the behaviour; finally, autonomy is the level of control an individual has to perform the behaviour (Fishbein & Ajzen, 2010). The RAA suggests a combination of the RAA components

[6]The TRA and TPB are models explaining intentions (Ajzen, 1991; Fishbein and Ajzen, 1975, as cited in Madden et al., 1992). The TRA is a model developed by Fishbein and Ajzen (1975) theorising intentions to perform a behaviour are made up from two components, attitudes and subjective norms (as cited in Madden et al., 1992). The TPB adds to the TRA theorising perceived behavioural control is also an underlying component to intentions (Ajzen, 1991). Both the TRA and TPB theorise that an individual's intentions to perform a behaviour cause the behaviour to be performed (Ajzen, 1991; Fishbein and Ajzen, 1975, as cited in Madden et al., 1992).

(instrumental and experiential attitudes, injunctive and descriptive norms and capacity and autonomy) when high work together to create a larger intention to act on a behaviour, with the importance of each component being different between behaviours and populations (Fishbein & Ajzen, 2010). Some components of the RAA have a second suggested role.

Like intentions, capacity, autonomy and actual control of the behaviour (an individual's actual ability, skills and environment) directly affect the performance of a behaviour (Fishbein & Ajzen, 2010); actual control, therefore, works as a mediator between performing the behaviour and intending to perform the behaviour. When actual control cannot be measured, capacity and autonomy then act as the construct (Fishbein & Ajzen, 2010). Capacity and autonomy, therefore, influence intentions to perform a behaviour along with performing the behaviour itself.

When summarised, Fishbein and Ajzen (2010) explain the RAA considers the importance of background factors and beliefs in shaping the six components affecting an individual's intentions to perform a behaviour. Intentions to perform a behaviour along with the actual ability to perform a behaviour cause the performance of the behaviour (Fishbein & Ajzen, 2010). Finally, it is theorised the RAA accounts for all spontaneous and calculated decisions that apply to many different cultural settings (Fishbein & Ajzen, 2010).

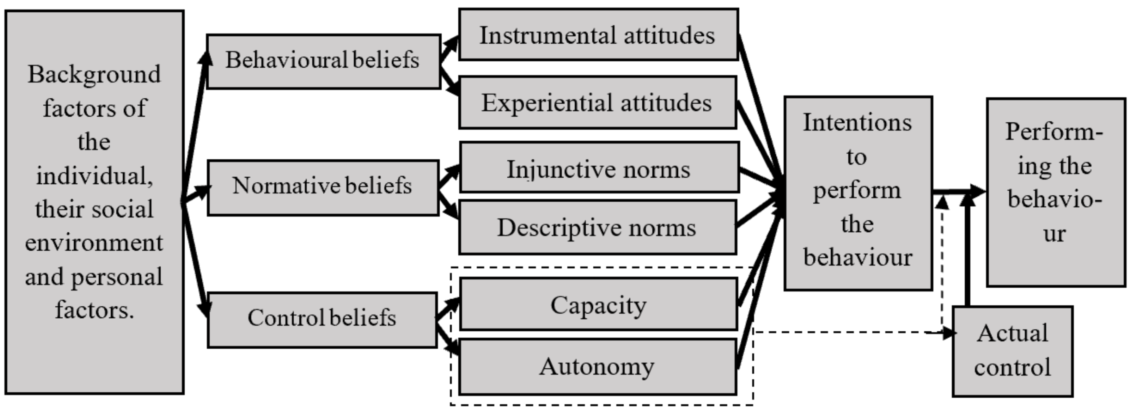

Figure 1. The Reasoned Action Approach (RAA).

Note: The above figure is based on Figure 1.1 in Fishbein and Ajzen (2010).

The Reasoned Action Approach and Other Intention Models

The RAA and other intention models are well researched. The RAA has been used in agriculture (Van Hulst & Posthumus, 2016), health (McEachan et al., 2016) and binge-drinking research (Elliott & Ainsworth, 2012); the TRA and TPB (predecessors of the RAA) have been applied in sport settings (Anderson, Hodge, Lavallee, & Martin, 2004; Anderson & Lavallee, 2008; Barkoukis, Lazuras, Tsorbatzoudis, & Rodafinos, 2013). Reviewing the RAAs application across different settings, along with the TRA and TPBs application within sport could help show if the RAA can be applied with athletes as a model to measure intentions and components underlying those intentions.

Literature using the Reasoned Action Approach. Application of the RAA occurred in research identifying the shift to conservation agriculture (used to rework farming methods to cater for climate change) from conventional farming on 77 farms across one district in Kenya (Van Hulst & Posthumus, 2016). Van Hulst and Posthumus concluded that attitudes and perceived behavioural control significantly predicted intentions to perform conservation agriculture. Although Van Hulst and Posthumus' results reflected a model blurring the RAA with the TPB (three components replicating the TPBs attitudes, perceived norms and perceived behavioural control were used to show the results), the RAA measures could be applied in conservation agriculture research.

Another research study identified if there were any benefits of using the RAA over the TPB with binge-drinking behaviours (Elliott & Ainsworth, 2012). Elliott and Ainsworth used data from 120 University students in Scotland to measure binge-drinking behaviours; each student completed an RAA and TPB questionnaire at time one, and binge-drinking questionnaire at time two (two-weeks after time one). Elliott and Ainsworth used a path-analysis to show intentions to engage in binge-drinking predicted participants' binge-drinking or not (Beta = 0.53, $r = 0.70$), with the RAA accounting for more variance in participants' binge-drinking behaviour than the TPB (90% and 82% respectively). Also, participants' intentions to engage in binge-drinking were significantly predicted ($p < .01$) by their instrumental attitudes (Beta = .22, $r = .69$), experiential attitudes (Beta = .57, $r = .86$) and capacity to engage in binge-drinking behaviours (Beta = .24, $r = .75$; Elliott & Ainsworth, 2012). Elliott and Ainsworth's results suggest the RAA accounts for more variance than the TPB in explaining participants' intentions to perform a behaviour, potentially making the RAA a more suitable model to identify individuals' intentions to perform other behaviours than the TPB.

A meta-analysis on health behaviours (protection, risk avoidance, detection and curative) was also completed on the RAA using 74 research articles (McEachan et al., 2016). McEachan et al.'s meta-analysis on health behaviours showed intentions significantly predicted the use of health behaviours (protection, risk avoidance, detection and curative; Beta = .435, $p < .01$). Also, all RAA components (excluding autonomy) significantly predicted intentions of using health behaviours (Betas > .74, $p < .01$) with the six components of the RAA explaining 59% of the variance in intentions to perform health behaviours. McEachan et al.'s results show I^2 statistics for the correlations between intentions and using health behaviours, along with each of the six RAA components and intentions were above 85.04%. Higgins and Thompson (2002) state that the I^2 statistic estimates heteroskedasticity by estimating the proportion of the total variation caused by between study variation. Therefore, some 85.04% or more variability between intentions and using health behaviours along with each of the six RAA component and intentions was attributed to between-study variation. Regardless of evidence suggesting major heteroskedasticity, the RAA has been heavily applied in health behaviour research (74 research articles), providing rationale towards using the RAA to identify individuals' intentions to perform other behaviours.

In summary, intentions significantly predicted the performance of a behaviour (Elliott & Ainsworth, 2012; Van Hulst & Posthumus, 2016). Also, the RAA explained more variance in performing a behaviour than the TPB (Elliott & Ainsworth, 2012). Therefore, the six component structure of the RAA may be a suitable model to identify athletes' intentions to practice regulated breathing.

Intention models used in sports environments. The TRA and TPB are intention models that were applied with athletes in their sports environments. Identifying how the TRA and TPB were applied with athletes could show if the intentions of athletes can be identified using intention models and how research could apply the RAA to sports environments.

Using the TRA and TPB, a research study measured the compliance 46 athletes had with a new seven-week training programme (Anderson & Lavallee, 2008). Anderson and Lavallee used hierarchical multiple regressions to show intentions was a significant predictor of completing a seven-week training programme (Beta = .29, $p < .05$); perceived behavioural control was a significant predictor of completing a seven-week training programme (Beta = .48, $p < .01$) in a model including attitudes, perceived norms and intentions. Although Anderson and Lavallee gave limited knowledge on the sport and the levels athletes competed at (reducing specificity to certain sports), results showed intention models could identify athletes' intentions and predict why athletes performed the behaviour. Further, future research could include the sports, and the levels athletes compete at to help the specificity of the study.

Research also applied the TRA and TPB on athletes' attitudes and other factors towards using a sports psychologist (Anderson et al., 2004). Anderson et al. researched 112 athletes from the New Zealand Academy of Sport. Using hierarchical regression analysis, Anderson et al. showed elite New Zealand athletes' intentions to use a sports psychologist were significantly predicted by perceived norm (Beta = .412, $p < .01$) and perceived behavioural control (Beta = .170, $p < .05$). Along with results showing intentions and predictors of intentions can be measured using intention models, high response rates shown by almost half the athletes invited to participate in the study (45%; Anderson et al., 2004), New Zealand athletes could be receptive to completing research involving intention models. Therefore, the effective application of the RAA could occur with a sample of New Zealand athletes.

Finally, previous research measured athletes' intentions to dope (use prohibited substances to enhance performance) in sports and what predicted those intentions when using a questionnaire based on the TPB on 750 elite athletes (Barkoukis et al., 2013). Barkoukis et al. used hierarchical regression modelling and showed attitudes were the only significant predictor of intentions to dope in those that had previously doped (Beta = .284, $p \leq .005$); intentions to dope in those that never doped before was significantly predicted positively by attitudes (Beta =

.133, $p \leq .001$) and significantly predicted negatively by perceived behavioural control (Beta = -.166, $p \leq .001$; Barkoukis et al., 2013). Barkoukis et al. states athletes in a team had a member of the team ("team manager, assistant coach, conditioning trainer, etc."; p. e334) collect the sealed envelope with the questionnaire containing previous doping information. Although confidentiality was reassured (Barkoukis et al., 2013), the handling of the questionnaire by another member of the team (regardless of being in a sealed envelope) could pressure participants who previously doped to lie and answer that they had not previously doped. Therefore, along with the evidence that intention models can be applied with athletes in sports environments, future research should ensure athletes perceptions of confidentiality are maintained; using an online survey where no members of an athlete's team handle responses could control for problems of maintaining confidentiality.

To conclude, intention models have been applied with athletes in sports environments (Anderson et al., 2004; Anderson & Lavallee, 2008; Barkoukis et al., 2013), suggesting the application of the RAA could occur with athletes. Applying the RAA with athletes could help validate it while identifying athletes' intentions to practice regulated breathing in the future.

Hypothesis One

Hypothesis one is proposed to identify if the practice of regulated breathing is associated with the frequency New Zealand high-performance athletes experience flow. As explained, there could be an association between a flow experience (defined by the flow theory and the nine characteristics of the flow experience) and practising regulated breathing. The potential relationship between practising regulated breathing and frequently experiencing flow is shown between five of the nine characteristics of the flow experience and forms the argument for hypothesis one:

1. New Zealand high-performance adult athletes that currently practice regulated breathing will have higher levels of dispositional flow than those with either previous experience or no experience.

The analysis will split participants into two groups to test hypothesis one. New Zealand high-performance adult athletes currently practising regulated breathing will form group one;

New Zealand high-performance adult athletes not currently practising regulated breathing or having no regulated breathing experience will form group two. For more detail on the analyses, see Appendix E.

Research Questions

Alongside preliminary investigations on the association between practising regulated breathing and experiencing flow, seven research questions (two research questions having six sub-hypotheses) are asked in the current research to identify athletes' intentions to use regulated breathing in the future and components that predict those intentions. A section of the RAA (Fishbein & Ajzen, 2010) is used as the theoretical foundation to research questions one through seven (see Figure 2).

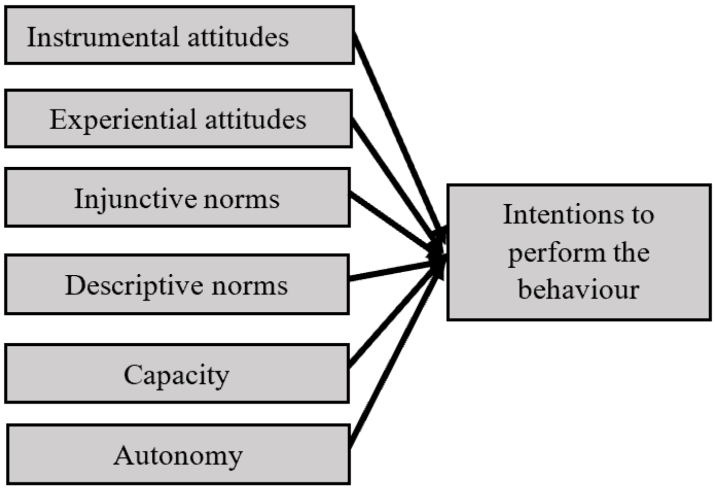

Figure 2. Areas of the Reasoned Action Approach applied to the current research.

Note: The above figure is based on information on intentions and the six components of the RAA stated in Fishbein and Ajzen (2010).

Research questions one through seven are as follows:

1. What are New Zealand high-performance adult athletes' intentions to practice regulated breathing as a training routine?
2. What are New Zealand high-performance adult athletes' intentions to use regulated breathing inside competition as a mental skills tool?

3. To what extent do the intentions of practising regulated breathing as a training routine change across the level a New Zealand high-performance adult athlete competes at?
4. To what extent do the intentions of using regulated breathing as a mental skills tool inside of competition change across the level a New Zealand high-performance adult athlete competes at?
5. What sports that a New Zealand high-performance adult athlete competes in are associated with the highest intention levels of using regulated breathing as a mental skills tool inside of competition?
6. To what extent can the Reasoned Action Approach components explain the variation in intentions of New Zealand high-performance adult athletes' practising regulated breathing as a training routine?
    a. There is a positive relationship between the instrumental attitudes towards practising regulated breathing as a training routine and the intentions to practice regulated breathing as a training routine.
    b. There is a positive relationship between the experiential attitudes towards practising regulated breathing as a training routine and the intentions to practice regulated breathing as a training routine.
    c. There is a positive relationship between the descriptive norms towards practising regulated breathing as a training routine and the intentions to practice regulated breathing as a training routine.
    d. There is a positive relationship between the injunctive norms towards practising regulated breathing as a training routine and the intentions to practice regulated breathing as a training routine.
    e. There is a positive relationship between the capacity towards practising regulated breathing as a training routine and the intentions to practice regulated breathing as a training routine.

f. There is a positive relationship between the autonomy towards practising regulated breathing as a training routine and the intentions to practice regulated breathing as a training routine.

7. To what extent can the Reasoned Action Approach components explain the variation in intentions of New Zealand high-performance adult athletes' using regulated breathing as a mental skills tool during competition?
    a. There is a positive relationship between the instrumental attitudes towards using regulated breathing as a mental skills tool during competition and the intentions to use regulated breathing as a mental skills tool during competition.
    b. There is a positive relationship between the experiential attitudes towards using regulated breathing as a mental skills tool during competition and the intentions to use regulated breathing as a mental skills tool during competition.
    c. There is a positive relationship between the descriptive norms towards using regulated breathing as a mental skills tool during competition and the intentions to use regulated breathing as a mental skills tool during competition.
    d. There is a positive relationship between the injunctive norms towards using regulated breathing as a mental skills tool during competition and the intentions to use regulated breathing as a mental skills tool during competition.
    e. There is a positive relationship between the capacity towards using regulated breathing as a mental skills tool during competition and the intentions to use regulated breathing as a mental skills tool during competition.
    f. There is a positive relationship between the autonomy towards using regulated breathing as a mental skills tool during competition and the

intentions to use regulated breathing as a mental skills tool during competition.

Methods

Participants

The participants of this study were 90 New Zealand high-performance adult athletes from 17 different sports (see results section; Table 7). New Zealand high-performance adult athletes were defined as athletes that were 16 years or older, New Zealand citizens or competing in New Zealand while competing at International, National, Provincial (Regional) or Open Age Premier Club Grade level.[7] Table 1 shows the gender (39% of participants were female and 61% male) and competition level demographic information of participants. Table 2 shows the regulated breathing experience participants had when considering the competition level competing at; participants were approximately evenly divided between having no experience with regulated breathing, having previous regulated breathing experience (but not using regulated breathing as part of their current training programme) and currently using regulated breathing as part of their training programme. Also, participants competing at National level had previously or currently used regulated breathing in their training programme less than participants competing at International or Provincial (regional)/Open Age Premier Club Grade Level.

The recruitment for the current research was via email and social media posts using a snowball and purposive sample of New Zealand high-performance adult athletes. The research used a snowball approach to recruit New Zealand high-performance adult athletes as a social media post was shared to the public, inviting those that qualify to complete the research. The public could then re-share the social media post with athletes or groups they thought would qualify. Second, the purposive approach was implemented using a recruitment message

[7] New Zealand high-performance athletes were classified as athletes competing at International, National, Provincial (Regional) or Open Age Premier Club Grade Level because it was suggested these levels of competition contained important factors of a high-performance environment.

forwarded to specific New Zealand high-performance adult athletes or posted at competitions where athletes who qualify as New Zealand high-performance adult athletes were competing.

Table 1

Gender and Competition Level Demographic Information

		Gender	
		Female (%)	Male (%)
Competition level	International Level	11 (12%)	16 (18%)
	National Level	9 (10%)	22 (24%)
	Provincial (Regional) Level/ Open Age Premier Club Grade	15 (17%)	17 (19%)
	Total	35 (39%)	55 (61%)

Table 2

Experience Using Regulated Breathing when Considering Competition Level

		Experience Using Regulated Breathing		
		Never Used (%)	Previously Used (%)	Currently Using (%)
Competition level	International Level	5 (6%)	12 (13%)	10 (9%)
	National Level	18 (20%)	9 (10%)	4 (4%)
	Provincial (Regional) Level/ Open Age Premier Club Grade	14 (16%)	7 (8%)	11 (12%)
	Total	37 (41%)	28 (31%)	25 (28%)

For significance tests to have sufficient statistical power, or the probability the rejection of the null hypothesis occurs when it is false (Faul, Erdfelder, Lang, & Buchner, 2007), 260 participants had to complete and submit the questionnaire. Statistical power was computed using G*Power 3.0 using hypothesis one. Since hypothesis one was measured using a two-tailed *t*-test, an effect size (*d*) of 0.35 (a cross between small/medium Cohen's *d)* was set. Following this, alpha (α) and power were set as 0.05 and 0.8 respectively. The Allocation Ratio N2/N1 was set at one as there was not a strong basis to assume a particular allocation ratio. Because 90 New Zealand high-performance adult athletes participated in the questionnaire, statistical power was low, meaning the probability of rejecting the null hypothesis when it was false was low.

There was one unexpected problem with the sample of New Zealand high-performance athletes. It came to the researcher's attention on Tuesday 13th August 2018 (two weeks after the start of the data collection phase) after emailing the recruitment message and questionnaire link to Scott Goodman (High-Performance Director at Athletics New Zealand). Mr Goodman explained that to involve HPSNZ athletes receiving funding through time or finances in the research as participants, the HPSNZ Research Support Committee headed by Dr Matt Driller had to approve before initiation. An application was not submitted to use HPSNZ funded athletes with the HPSNZ Research Support Committee before data collection. Therefore, as of August 15th, 2018 (after discussing the problem with Dr Diller), HPSNZ funded athletes were not individually approached for participation. An application to use HPSNZ funded athletes was later made and presented to the HPSNZ Research committee and declined on 11th September 2018.

Materials and Measures

Standardised Measure - Short Dispositional Flow Scale. The Short Dispositional Flow Scale (sDFS) is a standardised scale developed by Jackson, Martin and Eklund (2008). The sDFS contains nine items from the 36-item Dispositional Flow Scale (DFS-2). The sDFS contains one item representing each of the nine characteristics of the flow experience and measures the global dispositional flow of an athlete (combination of all nine characteristics of the flow theory; Jackson et al., 2008). Each item in the sDFS used a 5-point Likert scale with options 'Never – Always' (scoring 1-5).

The sDFS had previously undergone reliability testing (Jackson et al., 2008). Jackson et al. used 1,653 participants completing physical activity once a week to validate long and short version dispositional and state flow scales with item-identification and cross-validation on data sets of Jackson and Eklund (2002; as cited in Jackson et al., 2008). Jackson et al.'s Cronbach's alpha level from item-identification was .81; cross-validation with data-sets from Jackson and Eklund's data-sets showed the sDFS had Cronbach's alpha levels of .74 (Jackson et al., 2008). Cronbach's alpha measures internal consistency reliability using the lower bound consistency between items (Sijtsma, 2009). Cronbach alpha estimates of 0.7 were considered sufficient in early construct and predictive validation research, with 0.95 being the desired standard (Nunnally & Bernstein, 1994). The Cronbach's alpha level for the global measure of dispositional flow using the sDFS in the current sample was .61. The sDFS in the current sample, therefore, had low internal consistency reliability.

The sDFS was not included in this thesis for copyright reasons. The order the sDFS appears was noted in the questionnaire (see Appendix D).

Demographic variable item. The questionnaire included one demographic variable. Gender was included in the questionnaire and coded 1 = Female, 2 = Male, 3 = Gender diverse and 4 = Prefer not to disclose. Other demographic variables (age and location) were not included in the questionnaire to maintain participants anonymity. Anonymity was threatened as it could be easy to identify participants from sports with low participation rates when the quantitative dataset was made public for the reproduction of analyses. Therefore, compulsory qualifier questions were included to ensure that participants were within the population researching. Gender item (1.a) and compulsory qualifier questions (Q1, Q2 and Q3) are found in Appendix D.

Athletic factor items. Three items measured athletic factors. The first athletic item measured athlete sports type using the statement "The sport I compete in at high-performance level is…". The sports type item used a multiple-choice format with 32 different sports and one 'other' option.

The second athletic item measured the level of competition the participant competes at. The level of competition was measured using a multiple-choice item with the statement "I compete in my high-performance sport at...". Three levels of competition made up the multiple-choice ratings: 1 = International level, 2 = National level and 3 = Provincial (regional) level/ open age premier club grade level.

The final athletic item asked participants to select what option best represented their experience using regulated breathing. Participants could choose from three multiple choice options to show experience practising regulated breathing: ‘I have never used regulated breathing’, ‘I have used regulated breathing in the past, but am not using it in my current training programme’ and ‘I am using regulated breathing as part of my current training programme’. The three options were coded into two groups (1 = ‘I am using regulated breathing as part of my current training programme’, 2 = ‘I have never used regulated breathing’ and ‘I have used regulated breathing in the past, but am not using it in my current training programme’) to perform the Welch’s independent samples *t*-test for hypothesis one. All three athletic items (1.b, 1.c, 2.a) are found in Appendix D.

Regulated breathing brief. The questionnaire had a regulated breathing brief to explain what regulated breathing was and the benefits of its practice to help each participant identify if he or she practised regulated breathing. The research presented in the literature review was used to develop the regulated breathing brief; the brief was included the questionnaire before the start of section three. The regulated breathing brief was as follows:

> “Regulated breathing is regulating or controlling your breath as a mental skills training tool. Regulated breathing can be in the form of speeding up or slowing down your breath, while also focusing on how the air moves through your lungs. Research suggests that regulated breathing can:
>
> 1. Provide control of your arousal levels (making you more relaxed, or more alert).
> 2. Reduce stress and test anxiety (nerves or butterflies).
> 3. Speed up your reaction times.
> 4. Improve your performance.”

The wording ‘arousal levels (making you more relaxed, or more alert)’ was used instead of the ‘autonomic nervous system’ as there was the potential participants might not understand what the autonomic nervous system is. Instead, stating the practice of regulated breathing can control arousal levels gives participants an indication that practising regulated breathing helps alter the autonomic functions seen in the face of danger or seen with a decreased heart rate.

Reasoned Action Approach (RAA) items. Twenty-items were developed using RAA measurement guidelines formed from examples and information in Fishbein and Ajzen (2010) and Mummery and Wankel (1999). The 20 items measured two behaviours; behaviour one was ‘practising regulated breathing in a training routine’ with behaviour two ‘using regulated breathing as a mental skills tool during competition’. Fishbein and Ajzen (2010) stated a behaviour is made up of four constructs: action, target, context and time. Behaviours one and two incorporated all four elements of a behaviour; behaviour ones elements were ‘practising (action) regulated breathing (target) as a training routine (context and time)’ with behaviour two being ‘using (action) regulated breathing (target) as a mental skills tool (context) during competition (time)’. When defining a behaviour, time is usually referred to as a time of day, month or year (Fishbein & Ajzen, 2010); because the current research did not involve set times for potential future intervention periods, referring to specific times was not done. Instead, items referred to the situation (practising regulated breathing in a training routine or during competition as a mental skills tool) as the time construct.

The items associated with the RAA were on participants’ intentions to perform each behaviour along with participants’ instrumental attitudes, experiential attitudes, instrumental norms, descriptive norms, capacity and autonomy (see Figure 2). The items associated with the RAA were presented to participants in the questionnaire (see Appendix D; the questionnaire).

Behaviour clarification briefs. Behaviour clarification briefs were used in the questionnaire to help participants clarify the difference between practising regulated breathing in a training routine and using regulated breathing as a mental skills tool during competition. Behaviour clarification brief one was included in the questionnaire before each participant was asked to respond to items based on the RAA model about practising regulated breathing in their training routine or using regulated breathing as a mental skills tool during their competition. Behaviour clarification brief one was as follows:

“The following two pages are aimed at two different settings:

The first page (10 questions) will be asking you about practising regulated breathing in your training routine.

The second page (also containing 10 questions) asks you about using regulated breathing as a mental skills tool during your competition.

Note: These questions may seem similar. However, they are asking about different things." (see Appendix D; Brief 2).

The second behaviour clarification brief was included in the questionnaire after participants had responded to items on practising regulated breathing in a training routine and before participants responded to items on using regulated breathing as a mental skills tool during competition. Behaviour clarification brief two was as follows:

"The next few questions will be asking you about regulated breathing and using it as a mental skills tool during your competition:

Note: As said earlier, these questions are different from the previous page. This is because the previous page was asking you about using regulated breathing in your training routine and not in competition." (see Appendix D; Brief 3).

Intention items. Participants' intentions to practice regulated breathing in a training routine and use regulated breathing as a mental skills tool during competition were measured using one item per behaviour. Intention item statements were:

"In the future, I intend to practice regulated breathing in my training routine."

"In the future, I intend to use regulated breathing as a mental skills tool during my competition."

Intention items used a 5-point Likert scale with rating responses 'Strongly disagree – Strongly agree' (scoring 1-5). Intention items were based on intention item templates and information presented in Fishbein and Ajzen's (2010); 'In the future' was added to the start of each item to ensure participants knew they were reflecting on future, not current practice.

Qualitative items. Each behaviour ('practising regulated breathing in a training routine' and 'using regulated breathing as a mental skills tool during competition') had one open-ended qualitative question to accumulate more information about why participants would or would not practice regulated breathing in a training routine or as a mental skills tool during competition. The two qualitative open-ended questions were as follows:

> "Why would you practice/not practice regulated breathing in your training routine?"
>
> "Why would you use/not use regulated breathing as a mental skills tool during your competition?"

Instrumental attitude items. Participants' instrumental attitudes towards practising regulated breathing in a training routine or using regulated breathing as a mental skills tool during competition were measured using the following items:

> "In the future, using regulated breathing in my training routine would be..."
>
> "In the future, using regulated breathing as a mental skills tool during my competition would be...."

Participants rated each item once with both semantic differential adjective pairs 'Has no value - Has lots of value' and 'Very unproductive - Very productive' on a 5-point rating scale (scoring 1-5). Responses to items were averaged within each behaviour separately to create behaviour specific instrumental attitudes for each participant. The Cronbach's alpha for instrumental attitude items on the behaviour practising regulated breathing in a training routine was .907; the Cronbach's alpha for instrumental attitude items on the behaviour using regulated breathing as a mental skills tool during competition was .922.

Semantic differential adjective pairs used in Mummery and Wankel's (1999) research on competitive swimmers helped guide the formation of instrumental attitude items in the current research. However, many of Mummery and Wankel's pairs were unable to be presented in a rating scale format as some pairs were absolute adjectives (e.g. Useless – Useful) or could be simplified further to aid the current samples understanding (simplifying 'Worthless – Valuable' to 'Has no value - Has lots of value').

Experiential attitude items. Participants' experiential attitudes towards practising regulated breathing in a training routine or using regulated breathing as a mental skills tool during competition were measured using the same item statements as instrumental attitudes with different semantic differential adjective pairs. Experiential attitude items were as follows:

"In the future, using regulated breathing in my training routine would be..."

"In the future, using regulated breathing as a mental skills tool during my competition would be...."

Participants rated each item once with both semantic differential adjective pairs 'Very boring - Very fun' and 'Very unenjoyable - Very enjoyable' on a 5-point rating scale (scoring 1-5). Responses to items were averaged within each behaviour separately to create behaviour specific experiential attitudes for each participant. The Cronbach's alpha for experiential attitude items on the behaviour practising regulated breathing in a training routine was .884; the Cronbach's alpha for experiential attitude items on the behaviour using regulated breathing as a mental skills tool during competition was .827.

Mummery and Wankel's (1999) semantic differential adjective pairs were used as a guide to creating experiential attitude items but were changed to fit the format of a rating scale. Changes included altering Mummery and Wankel's semantic differential adjective pair 'Painful – Enjoyable' to 'Very unenjoyable - Very enjoyable' and 'Boring – Fun' to 'Very boring – Very fun'.

Injunctive norms items. Participants' injunctive norms towards practising regulated breathing in a training routine or using regulated breathing as a mental skills tool during competition were measured using one item per behaviour. Injunctive norm items were as follows:

"Most people who are important to me think I should not practice regulated breathing in my training routine in the future."

"Most people who are important to me think I should not use regulated breathing during my competition as a mental skills tool in the future."

Injunctive norm items used a 5-point Likert scale with rating responses 'Strongly agree – Strongly disagree' (scoring 1-5).

Descriptive norm items. Participants' descriptive norms towards practising regulated breathing in a training routine or using regulated breathing as a mental skills tool during competition were measured using one item for each behaviour. Descriptive norm items were as follows:

> "Most people I respect, that are like me, currently practice, have previously practised or would consider practising regulated breathing in their training routine in the future.".
>
> "Most people I respect, that are like me, currently use, have previously used or would consider using regulated breathing as a mental skills tool during their competition in the future."

Descriptive norm items used a 5-point scale with the rating response 'Very unlikely – Very likely' (scoring 1-5). Ratings for the descriptive norm items were presented in reverse order. Creators of the RAA, Fishbein and Ajzen (2010) state someone performing a behaviour is influenced by perceptions of others performing the behaviour either in the past, present or future. Therefore, referring to past, present and the future practice of regulated breathing occurred in the descriptive norm items.

Capacity items. Participants' capacity to practice regulated breathing in a training routine or use regulated breathing as a mental skills tool during competition was measured using one item for each behaviour. The capacity items were as follows:

> "For me to practice regulated breathing in my training routine would be...."
>
> "For me to use regulated breathing during my competition as a mental skills tool would be..."

Capacity items used a 5-point scale with rating responses 'Extremely difficult – Extremely easy' (scoring 1-5). Ratings for capacity items were presented in reverse order.

Autonomy items. Participants' autonomy to practice regulated breathing in a training routine or use regulated breathing as a mental skills tool during competition was measured using one item for each behaviour. The autonomy items were as follows:

> "I feel in complete control over whether I would practice regulated breathing in my training routine in the future."
>
> "I feel in complete control over whether I use regulated breathing during my competition as a mental skills tool in the future."

Autonomy items used a 5-point Likert scale with the response ratings ‘Strongly disagree – Strongly agree’ (scoring 1-5). Ratings for autonomy items were presented in reverse order.

Research Design

The research used a between-subjects mixed method cross-sectional correlation design. Data was collected using an online survey.

The rationale for using a correlational design. Previous research using interventions to measure the effects of practising regulated breathing showed that regulated breathing interventions could require intensive longitudinal designs and extensive resource deposits. First, regulated breathing research used interventions with participants practising regulated breathing for up to three months with each session lasting up to 30 minutes (Nemati, 2013; Pal et al., 2004; Sharma et al., 2014; Shashikala et al., 2011), participants practising regulated breathing for 14 days with ten very intensive two-hour sessions (Toschi-Dias et al., 2017), or using participants with large amounts of regulated breathing or yoga experience (six months to five years) if measuring participants in one-off studies (Bertisch et al., 2017; Telles et al., 2013). Second, within regulated breathing research, qualified yoga, regulated breathing teachers or experts in the area were used to teach participants correct regulated breathing technique over an intervention period (Sharma et al., 2014) or monitor participants’ technique over the intervention period (Pal et al., 2004). Third, some studies used facilities daily to carry out regulated breathing interventions; facilities included yoga centres (Shashikala et al., 2011) and lecture theatres (Nemati, 2013). Costs to employ an expert in regulated breathing, facility hire, the length of an experiment needed and recruiting athletes with enough regulated breathing experience could be too resource heavy for a Master’s research project incorporating an intervention to test effects of practising regulated breathing on experiencing flow. Therefore, measuring an association between practising regulated breathing and experiencing flow could provide evidence for future research to complete a longitudinal experiment.

Procedure

Participants were recruited using emails, social media posts and posters shared by social media platforms, high-performance institutes, sports teams, sports competitions and individuals.

The email, social media post and poster contained a recruitment message followed by a Qualtrics link or QR code to access the information sheet and questionnaire. The recruitment message (see Appendix A, B) was used to engage the reader and recruit New Zealand high-performance adult athletes to complete the anonymous questionnaire.

Once engaged, New Zealand high-performance adult athletes read the information sheet accessed via the QR code and Qualtrics link found in the recruitment message. The information sheet explained all necessary information needed for participation along with the guidelines for what a New Zealand high-performance adult athlete was (see Appendix C). If the athlete qualified as a New Zealand high-performance adult athlete, they could either accept or decline the invitation to complete the 15-minute questionnaire. If the invitation were accepted, participants would move on to completing the questionnaire in their own time. It was noted that by submitting the questionnaire, participants were thereby giving consent to participate.

Three compulsory qualifier items clarifying future participants level of competition, age and citizenship or competition location (New Zealand) were included after the information sheet to ensure athletes were New Zealand high-performance adult athletes. The three qualifier items were created using the definition of a New Zealand high-performance adult athlete for the current research (see Appendix D; Q1, Q2, Q3). When passing qualifier items, participants could then complete the questionnaire.

After completing the questionnaire, participants had the option to go into the draw for one of twelve $20 (USD) Amazon vouchers and provide an email to receive the summary of the research in early 2019. Using a separate Qualtrics link for the prize draw and research summary ensured participants' email addresses and data provided in the questionnaire was kept separate, keeping questionnaire response anonymous (see Appendix D; Lucky Draw and Summary).

The data collection period closed on the 21st of September 2018 at 24.00 (24-hour clock). The research project took a low-risk ethics status after being peer-reviewed by a Massey University staff member using guidelines put in place by Massey University, New Zealand.

Data Analysis

Data analysis computation. Analysis of regression, ANOVA and descriptive statistic models were performed using IBM SPSS Statistics 25. Power analysis was performed using G*Power 3.0 with the content analysis using Excel.

Pre-Registration of quantitative analyses. The researcher uploaded a pre-registration document (see Appendix E) on the Open Science Framework (OSF). A pre-registration in psychology is a document explaining the research hypotheses, questions, methods and analysis strategies before the research occurs (van ’t Veer & Giner-Sorolla, 2016). A pre-registration allows research transparency (clear acknowledgement of research methods, analyses, hypotheses tested and questions asked) making research conclusions more reliable (van ’t Veer & Giner-Sorolla, 2016).

Completing and following a pre-registration also mitigates against a false-positive occurring (Simmons, Nelson, & Simonsohn, 2011). First, Simmons et al. reflected on the problem of creating hypotheses and statistical analyses based on a significant outcome in the data. Second, Simmons et al. (2011) showed having undisclosed flexibility in an approach increased false positive *p*-values in the data (producing a significant result that is not significant). Using a pre-registration in the current research mitigated or reduced the chance of a false-positive occurring while ensuring the researcher acted responsibly with research transparency.

The pre-registration for the current research was completed and posted on the OSF website on 27th July 2018 (five days before data collection commenced). A detailed account of the data analyses for the current research is found in the pre-registration (see Appendix E). Information accounted for in the pre-registration was:

- Hypothesis and research question structure.
- Eligibility requirements for participation.
- Independent and dependent variables to develop answers for the hypothesis and research questions.
- Data exclusion criteria.

- Specific analysis and post hoc tests for the hypothesis and research questions.
- The distributional assumption checks of the models.
- Missing data.
- outlier treatment.
- Length of time for the data collection phase.

Data exclusion criteria. Exclusion of duplicate responses and participants not providing data on any of the independent or dependent variables occurred; similar surveys were compared using the qualitative comments and demographic data. If the qualitative responses and demographic data were a match across surveys, the last duplicate surveys (based on time) complete case of data was deleted (as judged by the conductor of the research). A 'prevent ballot box stuffing' function on Qualtrics was not applied because some participants may be using the same computer, tablet or smart device at their sporting institute. No duplicate responses in the data were identified by the researcher, with the removal of 28 participants because they failed to provide data on any of the independent or dependent variables used in the current research.

Missing data. Missing item responses for participants providing data for at least one independent or dependent variable in the research while giving consent was completed using expectation maximisation (EM). A total of 21 missing item responses were computed using expectation maximisation.

Changes made after uploading the pre-registration. The researcher made some changes to the data collection and analysis procedures after pre-registering. First, the finished date of the project was extended from 31st August 2018 to 21st September 2018 to increase participant numbers as participation was slower than expected. Second, it was suggested that Nvivo would be used to complete qualitative analyses; instead, Microsoft Excel was used as it was more cost effective and could accommodate a conventional content analysis. Third, the scales used to collate data for the research were ordinal and nominal scales using an integer value coding scheme; EM performed on missing quantitative data produced non-integer values in missing responses; all variables (items) used to collate quantitative data in the questionnaire were rounded to the nearest integer using the 'compute= rnd (variable)' function in IBM SPSS Version 25 on the EM dataset.

Assumption checks. Assumption checks on the analyses used to test hypothesis one and answer research questions three, four, six and seven occurred. As stated in the pre-registration "I will report exploratory analyses of distribution assumptions, but I will not change my analysis methods based on the results of these assumption checks" (see Appendix E; Pre-registration). Therefore, no alterations of analyses in the current research occurred regardless of any suggestions of distributional assumption violations. The presentation of distributional assumption checks along with associated graphs is in Appendix F.

Quantitative datasets and syntax. The researcher uploaded quantitative data not posing a threat to participants anonymity along with the syntax used to analyse each dataset on the OSF website:

https://osf.io/tyv75/files/

The researcher uploaded two datasets to the OSF; dataset one contained the raw data with dataset two containing data after the completion of expectation maximisation. Dataset two was uploaded because the expectation maximisation on dataset one could not be performed (due to the removal of one column of data to maintain participant anonymity). One syntax file was uploaded for each dataset to develop the results in alignment with hypothesis one and research questions one through seven.

Qualitative item analysis. A conventional content analysis (Hsieh & Shannon, 2005) was used to analyse qualitative items "Why would you practice/ not practice regulated breathing in your training routine?" and "Why would you use/ not use regulated breathing as a mental skills tool during competition?" separately using Microsoft Excel. First, to code responses into coding categories, responses were read to understand the meaning of the comment. Notes were developed which then formed the labels of the codes that grouped into categories. From the labels, definitions for the codes and categories were created to help the researchers understanding when reading the results (Hsieh & Shannon, 2005). Because qualitative items were not used to test a pre-existing theory, a conventional content analysis on qualitative items could help identify why New Zealand high-performance adult athletes would or would not practice regulated breathing in a training routine or as a mental skills tool during competition. Finally, a frequency distribution is not part of a conventional content analysis (Hsieh & Shannon, 2005); therefore, frequency distributions on responses to either of the qualitative items were not included.

The researcher completed four content analyses (two for each qualitative item). Responses to each open-ended question were categorised into two groups (participants who would practice regulated breathing and participants who would not practice regulated breathing) using participants' responses to the intention Likert scale item relevant to each behaviour. Using the behaviour 'practising regulated breathing in a training routine' as an example, participants were categorised into the group 'participants who would practice regulated breathing in a training routine' if they agreed with the statement 'In the future, I intend to practice regulated breathing in a training routine'. Participants were categorised into the group 'participants who would not practice regulated breathing in a training routine' if they disagreed or were unsure with the statement 'In the future, I intend to practice regulated breathing in a training routine'. In the peculiar case a comment was made by a participant that did not reflect that participant's intention to practice regulated breathing, or the behaviour commenting about (practising regulated breathing in a training routine or as a mental skills tool during competition), that comment, or part of the comment was shifted to the relevant content analysis.

Results

Descriptive Statistics

Table 3 shows descriptive statistics for variables from the statistical analyses used to test hypothesis one and answer research questions one through seven. Table 3 shows New Zealand high-performance adult athletes had less intent to practice regulated breathing in a training routine than to use regulated breathing as a mental skills tool during competition. There were differences between the descriptive statistics of the RAA components associated with each behaviour (‘practising regulated breathing in a training routine’ and ‘using regulated breathing as a mental skills tool during competition’; see Table 3).

Table 3

Descriptive Statistics and Cronbach's Alpha Coefficient Estimates from Variables

	M	Std. Deviation	Alpha
sDFS	4.00	0.38	0.61
Intention to Practice Regulated Breathing in a Training Routine	3.80	0.90	
Instrumental Attitudes towards Using Regulated Breathing in a Training Routine	4.06	0.79	0.91
Experiential Attitudes towards Practising Regulated Breathing in a Training Routine	3.41	0.77	0.88
Injunctive Norms towards Practising Regulated Breathing in a Training Routine	3.68	0.97	
Descriptive Norms towards Practising Regulated Breathing in a Training Routine	3.26	0.82	
Capacity to Practice Regulated Breathing in a Training Routine	3.61	0.84	
Autonomy to Practice Regulated Breathing in a Training Routine	3.78	0.97	
Intention to use Regulated Breathing as a Mental Skills Tool During Competition	4.13	0.99	
Instrumental Attitudes towards using Regulated Breathing as a Mental Skills Tool During Competition	4.15	0.78	0.92
Experiential Attitudes towards using Regulated Breathing as a Mental Skills Tool During Competition	3.46	0.71	0.83
Injunctive Norms towards using Regulated Breathing as a Mental Skills Tool During Competition	3.46	1.18	
Descriptive Norms towards using Regulated Breathing as a Mental Skills Tool During Competition	3.39	0.88	
Capacity to use Regulated Breathing as a Mental Skills Tool During Competition	3.54	0.81	
Autonomy to use Regulated Breathing as a Mental Skills Tool During Competition	3.88	0.83	

Note: Alpha = Cronbach's alpha coefficient for variables with one or more items, sDFS = short dispositional flow scale. All response scales were measured using scales valued 1 – 5.

The Relationship between Practising Regulated Breathing and Dispositional Flow

As specified in the pre-registration for the current study (see Appendix E), to test hypothesis one, the relationship between New Zealand high-performance adult athletes practising regulated breathing and the frequency they experience flow was measured using a Welch's independent samples *t*-test. Distributional assumptions of the independent samples *t*-test used to test hypothesis one where checked; there was limited evidence assumptions were violated. For details on the distributional assumption checks, see Appendix F.

The results show group one (New Zealand high-performance adult athletes currently using regulated breathing in their training programme) had 25 participants compared to group twos (New Zealand high-performance adult athletes that have previously practised regulated breathing in their training programme or have no experience with regulated breathing) 65 participants (see Table 4). Both group one and group two had similar mean scores on the sDFS, and standard deviations of each mean respectively (see Table 4).

The results from the Welch's independent samples *t*-test show on average, within the sample, the New Zealand high-performance adult athletes who practice regulated breathing in their current training programme reported higher levels of dispositional flow than those who do not, but this difference was not statistically significant, $t(40) = 0.96$, $p = .342$, 95% CI [-0.099, 0.278], $d = 0.23$.

Table 4

Dispositional Flow by Regulated Breathing Experience

Measurement Instrument	Group	*n*	*M*	Std. Deviation	Std. Error Mean
sDFS	Group 1	25	4.06	0.41	0.08
	Group 2	65	3.97	0.37	0.05

Note: sDFS = short dispositional flow scale scored 1-5, Group 1 = New Zealand high-performance adult athletes currently practising regulated breathing in their training programme, Group 2 = New Zealand high-performance adult athletes that have previously practised regulated breathing in their training programme or have no experience with regulated breathing.

Intentions to Practice Regulated Breathing

As specified in the pre-registration (see Appendix E), descriptive statistics were used to show participants' intentions to practice regulated breathing in a training routine (research question one) and use regulated breathing in as a mental skills tool during competition (research question two). No assumption checks were performed as research questions one and two used descriptive statistics.

Research question one. The results show a majority of participants intended to practice regulated breathing in a training routine in the future (see Table 2; Mean and SD), where the mode is equal to a participant somewhat agreeing to the statement 'In the future, I intend to practice regulated breathing in a training routine'. Figure 3 shows a frequency distribution of New Zealand high-performance adult athletes' intentions to practice regulated breathing in a training routine. Figure 3 shows that 64% of participants intended to practice regulated breathing in a training routine in the future as 41% of participants somewhat agreed and 23% of participants strongly agreed with the statement 'In the future, I intend to practice regulated breathing in my training routine'. Figure 3 also shows that 36% of participants did not intend to practice regulated breathing in a training routine in the future (or were indecisive); 1% of participants strongly disagreed, 6% of participants somewhat disagreed and 29% of participants answered unsure to the statement 'In the future, I intend to practice regulated breathing in my training routine'.

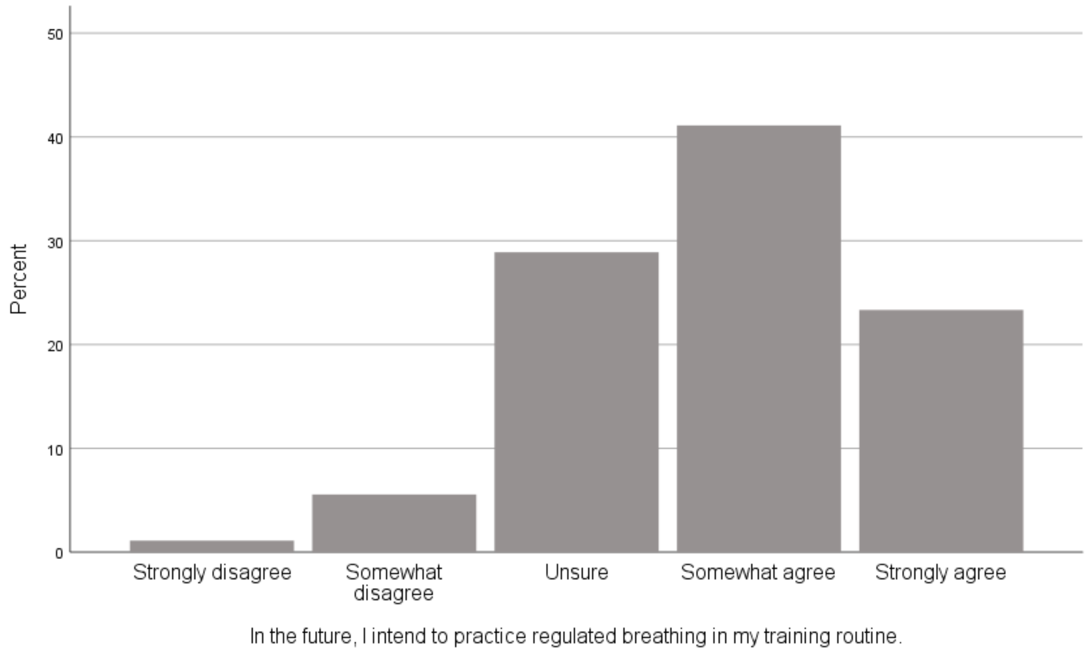

Figure 3. Participants' Intentions to Practice Regulated Breathing in a Training Routine.

Research question two. The results show a majority of participants intended to use regulated breathing during competition as a mental skills tool in the future (see Table 2; mean and SD), where the mode is equal to a participant strongly agreeing with the statement 'In the future, I intend to use regulated breathing as a mental skills tool during my competition'. Figure 4 shows the frequency distribution of participants' intentions to use regulated breathing as a mental skills tool during competition in the future. Figure 4 shows that 76% of participants intended to use regulated breathing as a mental skills tool during competition in the future as 30% of participants somewhat agreed, and 46% of participants strongly agreed with the statement 'In the future, I intend to use regulated breathing as a mental skills tool during my competition'. Figure 4 also shows that 24% of participants did not intend to use regulated breathing as a mental skills tool during competition in the future (or were indecisive); 2% of participants strongly disagreed, 3% somewhat disagreed and 19% answering unsure to the statement 'In the future, I intend to use regulated breathing as a mental skills tool during my competition'.

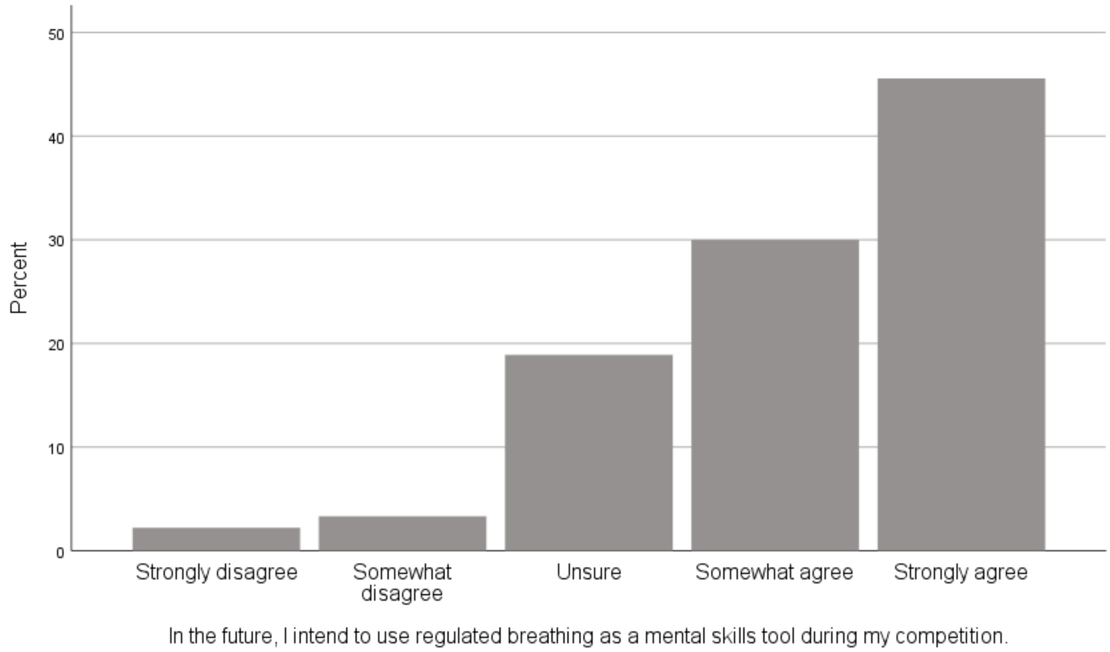

Figure 4. Participants' Intentions to Use Regulated Breathing as a Mental Skills Tool During Competition.

Intentions to Practice Regulated Breathing by Competition Level

Research question three. A one-way ANOVA was used to investigate any difference between the competition level participants compete at and participants' intentions to practice regulated breathing in a training routine. As specified in the pre-registration (see Appendix E), to answer research question three, the one-way ANOVA used the independent variable 'level of competition the New Zealand high-performance adult athlete competes at' and the dependent variable 'intention to practice regulated breathing in a training routine'.

The distributional assumptions of a one-way ANOVA were checked. For details on the distributional assumption checks, see Appendix F.

The results from the one-way ANOVA used to answer research question three show there was a non-significant difference in participants' intentions to practice regulated breathing in a training routine across the level of competition competing at, $F(2,87) = 0.26$, $p = .774$. As such, no post hoc pairwise comparison tests were conducted.

Research question four. A one-way ANOVA was used to investigate any difference between the competition level participants compete at and participants' intentions to use regulated breathing as a mental skills tool during competition. As specified in the pre-registration (see Appendix E), to answer research question four, the one-way ANOVA used the independent variable ‘level of competition New Zealand high-performance adult athletes compete at’ and the dependent variable ‘intention to use regulated breathing as a mental skills tool during competition’.

The distributional assumptions of the one-way ANOVA were checked. For details on the distributional assumption checks, see Appendix F.

The results of the one-way ANOVA used to answer research question four show there was a non-significant difference in participants’ intentions to use regulated breathing as a mental skills tool during competition across the level of competition competing at, $F(2,87) = 0.56$, $p = .575$. As such, no post hoc pairwise comparison tests were conducted.

Intentions by Sport Type

Research question five. Descriptive statistics were used to investigate participants’ intentions to use regulated breathing as a mental skills tool during competition when split by sport competing in (see Table 5). As specified in the pre-registration, research question five used only descriptive statistics (see Appendix E); no inferential statistics were used because of the unlikely chance each sport would be represented by enough participants to produce reliable evidence.

Table 5 shows the descriptive statistics of participants answers to item ‘In the future, I intend to use regulated breathing as a mental skills tool during my competition’ when split by the sports competing in. Hockey followed by Rugby Union had the most participants complete the questionnaire. Participants competing in Surfing and Surf Life Saving had the strongest intentions to use regulated breathing as a mental skills tool during competition, with Cricket the least. However, the small subsample sizes make it impossible to draw strong conclusions about the differences in participants’ intentions to use regulated breathing as a mental skills tool during competition across the sports they compete in.

Table 5

Intentions to Use Regulated Breathing as a Mental Skills Tool During Competition when Split by Sport Type

Sport	*M*	*n*	Std. Deviation
Surfing	5.00	3	0.00
Surf Life Saving	5.00	1	
Golf	4.67	3	0.58
Track Cycling	4.50	2	0.71
Ski and Snowboard Racing	4.50	4	0.58
Other	4.50	2	0.71
Mountain Biking	4.43	7	0.79
Hockey	4.25	20	0.97
Rugby Union	4.18	17	0.88
Athletics Track and Field Events (excluding long distance athletic events [800 meters and longer]).	4.17	6	0.75
Netball	4.13	8	0.99
Rowing	4.00	1	
Horse Racing and Equestrian	4.00	1	
Canoeing	3.50	2	0.71
Volleyball	3.40	5	1.52
Soccer	3.25	4	1.26
Cricket	3.00	4	1.63
Total	4.13	90	0.99

Tests of the Reasoned Action Approach

Research question six. As specified in the pre-registration (see Appendix E), a multiple linear regression model was used to estimate the amount of variation in participants' intentions to practice regulated breathing in a training routine explained by their six components of the RAA (instrumental attitudes, experiential attitudes, injunctive norms, descriptive norms, capacity, autonomy). Participants' RAA components (instrumental attitudes, experiential attitudes, injunctive norms, descriptive norms, capacity and autonomy towards practising regulated breathing in a training routine) significantly correlated with their intentions to practice regulated breathing in a training routine (see Table 6). Of those significant correlations, instrumental attitudes had the largest correlation with intentions to practice regulated breathing in a training routine and autonomy the smallest (see Table 6).

To answer research question six, the multiple linear regression model used the independent variables of instrumental attitudes, experiential attitudes, injunctive norms, descriptive norms, capacity and autonomy to practice or use regulated breathing in a training routine; the dependent variable of intentions to practice regulated breathing in a training routine was also used.

The distributional assumptions of the multiple linear regression model were checked. There was some evidence of slight heterogeneity of variances of the residuals (see Appendix F; Figure 8). Some evidence of slight skewness in the error terms was also present (see Appendix F; Figure 9), meaning residuals could be non-normally distributed. Hayes and Cai (2007) state heterogeneity of variances (depending on severity and form) can cause standard errors of the estimate across the regression model to be inconsistent and biased, inflating the chances of making a Type 1 error and causing inaccurate confidence interval estimates. The presence of slight heterogeneity of error variances in conjunction with non-normality of residuals may have combined to cause some distortion to the Type I and Type II error rates in this analysis. As such, the possibility of assumption breaches adds some additional uncertainty to the reported results. For a detailed description of assumption checks, see Appendix F.

The results from the multiple regression show instrumental attitudes of participants were the only significant predictor (of the six RAA components) of participants' intentions to practice regulated breathing in a training routine. If two New Zealand high-performance adult athletes had the same levels of experiential attitudes, descriptive norms, injunctive norms, capacity and autonomy, with instrumental attitudes that are one unit apart, we would expect the athlete with the stronger instrumental attitudes towards practising regulated breathing to have stronger intentions to practice regulated breathing in a training routine by .78 on a scale from 1 to 5 (see Table 5). If the true slope for instrumental attitudes towards practising regulated breathing in a training routine in the population was zero, the probability of seeing a *t*-statistic larger than 8.33 (as a positive or negative) is less than .001.

The multiple regression model used to answer research question six explains 67% of the variance in intentions to practice regulated breathing in a training routine in this sample. If the true value of all slopes in the multiple regression model were zero, the probability the multiple regression model would explain this much variance in the sample is less than 0.001, $F(6, 83) = 28.357$, $p < .001$.

Table 6

Pearson Correlations between Intentions to Practice Regulated Breathing in a Training Routine and the Six Components of the RAA

		Intentions	Instrumental Attitudes	Experiential Attitudes	Injunctive Norms	Descriptive Norms	Capacity	Autonomy
R	Intentions	1.00	0.80*	0.43*	0.44*	0.19*	0.47*	0.18*
	Instrumental Attitudes	0.80*	1.00	0.46*	0.44*	0.25*	0.46*	0.15
	Experiential Attitudes	0.43*	0.46*	1.00	0.28*	0.15	0.24*	0.09
	Injunctive Norms	0.44*	0.44*	0.28*	1.00	0.12	0.26*	0.13
	Descriptive Norms	0.19*	0.25*	0.15	0.12	1.00	0.28*	0.10
	Capacity	0.47*	0.46*	0.24*	0.26*	0.28*	1.00	0.26*
	Autonomy	0.18*	0.15	0.09	0.13	0.10	0.26*	1.00

Note: * = $p < 0.05$, Intentions = intention to practice regulated breathing in a training routine, Instrumental Attitudes = instrumental attitudes towards using regulated breathing in a training routine, Experiential Attitudes = experiential attitudes towards using regulated breathing in a training routine, Injunctive Norms = injunctive norms towards practising regulated breathing in a training routine, Descriptive Norms = descriptive norms towards practising regulated breathing in a training routine, Capacity = capacity to practice regulated breathing in a training routine, Autonomy = autonomy to practice regulated breathing in a training routine.

Table 7

Multiple Linear Regression Coefficient Table to Answer Research Question Six

						95% CI		
	B	Std. Error	Beta	*t*	Sig.	Lower Bound	Upper Bound	VIF
(Constant)	-0.38	0.41		-0.94	.350	-1.188	0.426	
Instrumental Attitudes	0.78	0.09	0.68	8.33	.000	0.590	0.960	1.692
Experiential Attitudes	0.07	0.08	0.06	0.84	.404	-0.096	0.236	1.284
Injunctive Norms	0.09	0.07	0.09	1.34	.184	-0.042	0.218	1.255
Descriptive Norms	-0.04	0.07	-0.03	-0.49	.626	-0.181	0.110	1.107
Capacity	0.13	0.08	0.12	1.68	.097	-0.024	0.289	1.379
Autonomy	0.03	0.06	0.03	0.48	.635	-0.092	0.150	1.080

R = .82, R Square = .672, Adjusted R Square = .648.

Dependent variable: Intention to practice regulated breathing in a training routine.

Note: VIF = variance inflation factor, Instrumental Attitudes = instrumental attitudes towards using regulated breathing in a training routine, Experiential Attitudes = experiential attitudes towards using regulated breathing in a training routine, Injunctive Norms = injunctive norms towards practising regulated breathing in a training routine, Descriptive Norms = descriptive norms towards practising regulated breathing in a training routine, Capacity = capacity to practice regulated breathing in a training routine, Autonomy = autonomy to practice regulated breathing in a training routine.

Research question seven. As specified in the pre-registration (see Appendix E), a multiple linear regression model was used to estimate the amount of variation in participants' intentions to use regulated breathing as a mental skills tool during competition explained by their six components of the RAA (instrumental attitudes, experiential attitudes, injunctive norms, descriptive norms, capacity and autonomy). Participants' RAA components (instrumental attitudes, experiential attitudes, injunctive norms, descriptive norms, capacity and autonomy) significantly correlated with intentions towards using regulated breathing as a mental skills tool during competition. Of those significant correlations, instrumental attitudes had the largest correlation with intentions to use regulated breathing as a mental skills tool during competition with injunctive norms the smallest (see Table 8).

To answer research question seven, the multiple linear regression model used the independent variables of instrumental attitudes, experiential attitudes, injunctive norms, descriptive norms, capacity and autonomy to use regulated breathing as a mental skills tool during competition; the dependent variable of intentions to use regulated breathing as a mental skills tool during competition was also used.

The distributional assumptions of the multiple linear regression model were checked. There was some evidence of slight heterogeneity of variances of the residuals (see Appendix F; Figure 10). Also, there was evidence of major skewness in the error terms, suggesting residual terms may not be normally distributed (see Appendix F; Figure 11). The presence of some heterogeneity of error variances with non-normality of residuals may combine to distort some of the Type I and Type II error rates in this analysis. As such, the possibility of assumption breaches adds some additional uncertainty to the reported results. For a detailed description of assumption checks, see Appendix F.

The results from the multiple linear regression show participants' instrumental attitudes were the only significant predictor (of the six RAA components) of participants' intentions to use regulated breathing as a mental skills tool during competition. If two New Zealand high-performance adult athletes had the same levels of experiential attitudes, descriptive norms, injunctive norms, capacity and autonomy, with instrumental attitudes that are one unit apart, we would expect the athlete with the stronger instrumental attitudes towards using regulated breathing as a mental skills tool during competition to have stronger intentions to use regulated breathing as a mental skills tool during competition by 1.03 on a scale from 1 to 5 (see Table 9). If the true slope for instrumental attitudes towards using regulated breathing as a mental skills tool during competition in the population was zero, the probability of seeing a *t*-statistic larger than 9.67 (as a positive or negative) is less than .001.

The multiple regression model used to answer research question seven explains 70% of the variance in intentions to use regulated breathing as a mental skills tool during competition in this sample. If the true value of all slopes in the multiple regression model were zero, the probability that the multiple regression model would explain this much variance in the sample is less than 0.001, $F(6, 83) = 32.439$, $p < .001$.

Table 8

Pearson Correlations Between Intentions to Use Regulated Breathing as a Mental Skills Tool During Competition and the Six Components of the RAA

		Intent-ions	Instru-mental Attitudes	Exper-iential Attitudes	Injun-ctive Norms	Descri-ptive Norms	Capac-ity	Autonomy
R	Intentions	1.00	0.84*	0.48*	0.25*	0.26*	0.46*	0.46*
	Instrumental Attitudes	0.84*	1.00	0.58*	0.31*	0.27*	0.51*	0.53*
	Experiential Attitudes	0.48*	0.58*	1.00	0.20*	0.37*	0.47*	0.34*
	Injunctive Norms	0.25*	0.31*	0.20*	1.00	0.05	0.09	0.26*
	Descriptive Norms	0.26*	0.27*	0.37*	0.05	1.00	0.31*	0.17
	Capacity	0.46*	0.51*	0.47*	0.09	0.31*	1.00	0.50*
	Autonomy	0.46*	0.53*	0.34*	0.26*	0.17	0.50*	1.00

Note: * = $p < 0.05$, Intentions = intention to use regulated breathing as a mental skills tool during competition, Instrumental Attitudes = instrumental attitudes towards using regulated breathing as a mental skills tool during competition, Experiential Attitudes = experiential attitudes towards using regulated breathing as a mental skills tool during competition, Injunctive Norms = injunctive norms towards using regulated breathing as a mental skills tool during competition, Descriptive Norms = descriptive norms towards using regulated breathing as a mental skills tool during competition, Capacity = capacity to use regulated breathing as a mental skills tool during competition, Autonomy = autonomy to use regulated breathing as a mental skills tool during competition.

Table 9

Multiple Linear Regression Coefficient Table to Answer Research Question Seven

						95% CI		
	B	Std. Error	Beta	*t*	Sig.	Lower Bound	Upper Bound	VIF
(Constant)	-0.35	0.39		-0.90	.371	-1.130	0.426	
Instrumental Attitudes	1.03	0.11	0.82	9.67	.000	0.821	1.246	1.992
Experiential Attitudes	-0.03	0.11	-0.02	-0.31	.759	-0.248	0.181	1.691
Injunctive Norms	-0.01	0.05	-0.01	-0.15	.879	-0.115	0.098	1.145
Descriptive Norms	0.04	0.07	0.04	0.54	.592	-0.106	0.185	1.193
Capacity	0.04	0.09	0.04	0.46	.646	-0.144	0.231	1.667
Autonomy	0.01	0.09	0.01	0.15	.881	-0.165	0.191	1.587

R = .837, R Square = .701, Adjusted R Square = .679

Dependent Variable: Intention to use regulated breathing as a mental skills tool during competition.

Note: VIF= variance inflation factor, Intentions = intention to use regulated breathing as a mental skills tool during competition, Instrumental Attitudes = instrumental attitudes towards using regulated breathing as a mental skills tool during competition, Experiential Attitudes = experiential attitudes towards using regulated breathing as a mental skills tool during competition, Injunctive Norms = injunctive norms towards using regulated breathing as a mental skills tool during competition, Descriptive Norms = descriptive norms towards using regulated breathing as a mental skills tool during competition, Capacity = capacity to use regulated breathing as a mental skills tool during competition, Autonomy = autonomy to use regulated breathing as a mental skills tool during competition.

Conventional Content Analyses

Qualitative open-ended questions were used to understand why participants did (or did not) intend to practice regulated breathing either in a training routine (see Appendix D; Question 3.b) or as a mental skills tool during competition (see Appendix D; Question 4.b). Two conventional content analyses were performed on each question using the method explained by Hsieh and Shannon (2005); codes, categories and examples were presented for each content analysis. Codes represented what participants specifically referred to in their responses; some responses reflected more than one code. Categories then grouped all codes within a broader cluster.

Why athletes would or would not practice regulated breathing in a training routine. ***Why athletes would practice regulated breathing in a training routine.*** Forty-seven responses were made relevant to why New Zealand high-performance adult athletes would practice regulated breathing in training routine. Of the 47 responses, three responses were included from participants who disagreed or were unsure with the statement ‘In the future, I intend to practice regulated breathing in my training routine’ (for example “Increase reaction time” or “Understand my breathing”). Two comments were also moved from participants responses to ‘In the future, I intend to use regulated breathing as a mental skills tool during my competition’ as responses were more relevant to why participants would practice regulated breathing in a training routine (for example “Because it can be a useful skill to have, when things become difficult [mentally or physically] during a training…”).

Table 10 shows codes, categories and examples for why participants would use regulated breathing in a training routine. There were five categories developed from 35 codes representing participants using regulated breathing in training routines to better physical responses, improve psychological characteristics involved in a performance, better general performance and a range of other reasons not part of any of the above categories. See Table 10 for all codes, categories and examples for why participants would use regulated breathing in a training routine.

Table 10

Conventional Content Analysis on Why Participants Would Practice Regulated Breathing in a Training Routine

Codes	Categories	Examples
To relax the body. Increase lung capacity. Try help remove the effects of asthma. Lower heart rate. To be physically more efficient. Help energy and temperature levels.	To better physical responses	"As a form of meditation, to relax the body and mind…." "…Also helps me with my energy and temperature levels"
Help concentration. Help focus on the present task. Help bring focus into the present moment. Help calm thoughts. Help calm self-down. Help calm down in pressure or stressful situations. Help calm nerves. To relax the mind. Help remove or reduce anxiety. Help be optimally aroused. Help improve reaction times. Remove distractions during preparation. To aid decision making. To remove external pressures.	Improve psychological characteristics involved in a performance	"To remain calm in stressful times" "To focus and prepare to perform without distraction" "It should be beneficial for focus/concentration" "Because it can help you to relax and gain focus back on the task at hand." "It places you in the present and takes away external pressures"
Better training performance. Help overall performance and success. Help improve rhythm during a task. Help in mentally or physically difficult situations.	Better general performance	"If it can improve my performance then I would give it a go."

Help specific task performance. Give an edge. Help role clarity.		"Helps me to be clear on my role" "Because our sport is very rhythmic and if the breath isn't in tune with your rhythm it can make you anxious…."
Make the most of every breath. Help visualisation. To see how effective practising regulated breathing is. Understand breathing. Identify the right regulated breathing techniques for your body. Love for sports. Less intense testing it in training compared to competition. Practice regulated breathing so when you need it while competing it is a habit.	Other reasons not part of previous categories	"Not as intense as in a competition situation" "If you train using it then its is easier to automatically use it when needed while racing"

Why participants would not practice regulated breathing in a training routine. Thirty-one responses were made relevant to why participants would not practice regulated breathing in a training routine. Of the 31 responses, seven responses were included from participants who somewhat agreed or strongly agreed with the statement 'In the future, I intend to practice regulated breathing in my training routine' (for example "coach doesn't lead it").

Table 11 shows codes, categories and examples for why participants would not practice regulated breathing in a training routine. Nineteen codes formed four categories; lack of knowledge on regulated breathing, resource and coaching restrictions, not seeing regulated breathing as important or questioning the use of regulated breathing along with other reasons not categorised into any of the above categories explain why participants would not practice regulated breathing in a training routine. See Table 11 for the codes, categories and the examples of the responses for why participants would not practice regulated breathing in a training routine.

Table 11

Conventional Content Analysis on Why Participants Would Not Practice Regulated Breathing in a Training Routine

Codes	Categories	Examples
Needs to see further research or evidence. Lack of knowledge on safe and proper technique. Not enough information given about regulated breathing. Do not know the benefits. Do not know enough about it. Never thought about it. Never heard of regulated breathing. Never used regulated breathing before. Lack of understanding.	Lack of knowledge on regulated breathing	"I don’t know how to do it correctly" "I heard it is beneficial however, I have not seen any evidence and do not have enough information to infer it’s benefits" "I am not sure how to properly perform the regulated breathing"
Focus placed elsewhere on other training techniques or activities. Do not have time to. Depends on the training plan. Not advised to use regulated breathing.	Resource and coaching restrictions	"time taken practicing that could be applied to other (maybe more productive) activities" "Depending on periodisation and session content"
Will not remember to use regulated breathing. Currently using regulated breathing and have not seen any rewards from using it.	Not seen as important or questioning the use of	"I am new to it, we're pitched the idea as “mindfulness”, a form of visualisation. Haven’t yet received any rewards from it, but will soon see." "Don't see the relevance"

No relevance is seen. Think it is good but not using regulated breathing anymore.	regulated breathing	
Not sure. Saving it only for games.	Other reasons	"?" "…saving breathing for games increases it's impact for those games."

Why athletes would or would not use regulated breathing as a mental skills tool during competition. ***Why athletes would use regulated breathing as a mental skills tool during competition.*** Fifty-six responses were made relevant to why participants would use regulated breathing as a mental skills tool during competition. Of the 56 responses, three responses were included from participants who disagreed or were unsure with the statement 'In the future, I intend to use regulated breathing as a mental skills tool during my competition' (for example "To clear the mind" or "Increase my level of play"). Also, two comments were moved from participants responses to 'In the future, I intend to practice regulated breathing in my training routine' as responses were interpreted as being more relevant to why participants would use regulated breathing as a mental skills tool during competition (for example "Because it can help with anxiety before the game.").

Table 12 shows codes, categories and examples for why participants would use regulated breathing as a mental skills tool during competition. Forty-two codes formed four categories; reasons for why participants would use regulated breathing as a mental skills tool during competition include helping psychological characteristics and physical responses wanted during a performance, helping performance characteristics wanted during competition along with other reasons not categorised into the above. See Table 12 for the codes, categories and the examples of the responses for why participants would use regulated breathing as a mental skills tool during competition.

Table 12

Conventional Content Analysis on Why Participants Would Use Regulated Breathing as a Mental Skills Tool During Competition

Codes	Categories	Examples
To calm the mind.	Help psychological characteristics wanted during a performance	"It is a great tool to relax and calm the mind while competing. It slows everything down allowing you to make better decisions" "Mostly it helps me keep control of my nerves and emotions before competing..." "In moments of stress to remain calm..." "i think there is no reason not to use it as its a good tool to help finding the zone on race day"
To stay calm during stressful moments.		
To stay calm in pressure situations.		
To keep calm during the performance of a skill.		
To clear the mind.		
Use as a reset mind strategy.		
Regulate thoughts.		
To relax the mind.		
Slow perceptions down.		
Help decision making.		
Help regulate feelings of control.		
Help find a flow experience (generally).		
To mentally prepare before a performance.		
Mentally prepare (in general).		
To control emotions before a competition.		
Control nerves.		
Help with pre-game anxiety.		
Calms nerves.		
Focus on the job or task at hand.		
Clearer focus.		
Re-focus.		
Removes unnecessary distractions.		
To stay in the present or get in the moment.		
Help confidence in a task.		

Control breathing. To calm the body. To relax (generally) or stay loose. To feel physically better. Help energy levels and feel balanced. To lower heart rate. Improve reflexes. To enhance the senses.	Help physical responses wanted during a performance	"…Lowers heart rate…" "if it works for calming me down and enhancing my senses, i would definitely use it" "By doing regulating breathing it helps with my balance and energy…"
To control performance. To keep in rhythm with the team. Help performance (generally)/ increase level of play. Pre-competition preparation. To have an advantage over other competitors. Useful skill to have when in mentally or physically difficult situations. Help with intense competition environments. To help handle all situations during a performance.	Help performance characteristics wanted during a competition	"It can help with the high intensity competition environment you're facing" "Start line prep…."
Use with visualisation. Because it is a habit.	Other uncategorised reasons	"Have always kind of done it will continue under a practised technique. Like to visualize scenarios before the game"

Why athletes would not use regulated breathing as a mental skills tool during competition. Twenty-two responses were made relevant to why participants would not use regulated breathing as a mental skills tool during competition. Included in these responses were five comments from participants who somewhat agreed or strongly agreed with the statement 'In the future, I intend to use regulated breathing as a mental skills tool during my competition' (for example, “don't have enough time to take a deep breath in continuous play” or “Haven't been taught when or how”). Also, one comment was moved from a participants response to ‘In the future, I intend to practice regulated breathing in my training routine’ as it was interpreted as being more relevant to why participants would not use regulated breathing as a mental skills tool during competition (“It's another thing to think about and potentially distract myself from the game”).

Table 13 shows codes, categories and examples of why participants would not use regulated breathing as a mental skills tool during competition. Thirteen codes formed five categories; needing more knowledge or education on regulated breathing, needing support from key members of sport or coaching staff, environmental restrictions, needing further thought and being unsure of why reflect participants responses to why they would not use regulated breathing as a mental skills tool during competition. See Table 13 for codes, categories and the examples of the responses for why participants would not use regulated breathing as a mental skills tool during competition.

Table 13

Conventional Content Analysis on Why Participants Would Not Use Regulated Breathing as a Mental Skills Tool During Competition

Codes	Categories	Example
Need more information on benefits. Do not know enough about it. Do not know how to perform regulated breathing. Lack of knowledge on when to use it. Never thought about it.	Need more knowledge or education on regulated breathing	"Again, I need more information about what the benefits are…." "I don't know enough about it"
Not advised to use. Need more promotion from role models and high-performance athletes.	Needs support from key members of sport or coaching staff	"...Also maybe having more role models or high performance athletes promoting its benefits may entice me to give it more of a go"
Restricted by time. Not needing another thing to think about. Too concentrated on the competition.	Restricted by environment	"Just time and one more thing to think about before or during a race" "…I need to be relaxed and performing regulated breathing would feel like a chore at times" "It's another thing to think about and potentially distract myself from the game"
Need to apply in training first. Need to identify a time (pre-competition) it can be used.	Need further thought	"Pre-game timing, if there is a window for it or not."
Unsure.	Unsure of why	"?"

Discussion

Summary of Findings in Relation to Study Objectives

Hypothesis one. Hypothesis one proposed New Zealand high-performance adult athletes currently practising regulated breathing in a training programme would have higher levels of dispositional flow than those not currently practising regulated breathing in a training programme. There is no support for hypothesis one because the Welch's independent samples *t*-test showed there was no statistically significant difference in dispositional flow levels between New Zealand high-performance adult athletes that currently practice regulated breathing in their training programme or not, $t(40) = 0.96$, $p = .342$, 95% CI [-0.099, 0.278], $d = 0.23$.

Research questions one and two. Research questions one and two explored if New Zealand high-performance adult athletes intend to practice regulated breathing in either a training routine or as a mental skills tool during competition in the future.

Research question one asked if New Zealand high-performance adult athletes intend to practice regulated breathing in a training routine. Descriptive statistics showed the majority of participants intend to practice regulated breathing in their training routine as 64% of participants agreed with the statement 'In the future, I intend to practice regulated breathing in my training routine'.

Research question two asked if participants intend to use regulated breathing as a mental skills tool during competition. Descriptive statistics showed the majority of participants intend to use regulated breathing during competition as a mental skills tool as 76% of participants agreed with the statement 'In the future, I intend to use regulated breathing as a mental skills tool during my competition'.

Research questions three and four. Research questions three and four asked if there are differences in New Zealand high-performance adult athletes' intentions to use regulated breathing when considering competition level competing at (International, National or Provincial [Regional]/ Open Age Premier Club Grade level). ANOVA models used to answer research questions three and four showed similar results.

Research question three asked if there are differences in New Zealand high-performance adult athletes' intentions to practice regulated breathing in a training routine across competition levels. A one-way ANOVA showed there was no statistically significant difference in participants' intentions to practice regulated breathing in a training routine across competition levels, $F(2,87) = 0.26$, $p = .774$.

Research question four asked if there are differences in New Zealand high-performance adult athletes' intentions to use regulated breathing as a mental skills tool during competition across the levels competing at. A one-way ANOVA showed there was no statistically significant difference between participants' intentions to use regulated breathing during competition across the levels competing at, $F(2,87) = 0.56$, $p = .575$.

Research question five. Research question five asked if there are differences between New Zealand high-performance adult athletes' intentions to use regulated breathing as a mental skills tool during competition when considering sports type. Descriptive statistics showed Surfers, and Surf Life Savers followed by Golfers had the most intent to use regulated breathing as a mental skills tool during competition in the sample of New Zealand high-performance adult athletes. However, each sport only had a small amount of New Zealand high-performance adult athletes complete the questionnaire (New Zealand high-performance adult athletes in each sport ranged from one to twenty; see Table 5). Low completion rates and no inferential statistics means no firm conclusions can be drawn.

Research questions six and seven. Research questions six and seven asked how much variation in New Zealand high-performance adult athletes' intentions to practice regulated breathing was explained by their instrumental attitudes, experiential attitudes, injunctive norms, descriptive norms, capacity, autonomy in two different behaviours.

Research question six. A multiple linear regression model was used and estimated that the six components of the RAA explained 67% of the variance in the sample of New Zealand high-performance adult athletes' intentions to practice regulated breathing in a training routine.

Included with research question six were six sub-hypotheses on the individual relationship each component of the RAA (instrumental attitudes, experiential attitudes, injunctive norms, descriptive norms, capacity and autonomy towards using regulated breathing in a training routine) had with intentions to practice regulated breathing in a training routine (research question six sub-hypotheses [6. a - f]). The multiple linear regression model used to answer research question six was, again, used to test sub-hypotheses 6.a – f. The results showed support for research question six sub-hypothesis 6.a as New Zealand high-performance adult athletes' instrumental attitudes towards practising regulated breathing in a training routine significantly predicted and were positively associated with New Zealand high-performance adult athletes' intentions to practice regulated breathing in a training routine, Beta = 0.68, $t(83) = 8.33$, $p < .001$. Results did not show support for research question six sub-hypotheses 6.b - f as non-significant relationships between New Zealand high-performance adult athletes' experiential attitudes, injunctive norms, descriptive norms, capacity and autonomy separately with their intentions to practice regulated breathing in a training routine were present. Research question seven had similar results.

Research question seven. A multiple linear regression model was used and estimated that the six components of the RAA explained 70% of the variance in the sample of New Zealand high-performance adult athletes' intentions to use regulated breathing as a mental skills tool during competition.

Included with research question seven were six sub-hypotheses on the individual relationship each component of the RAA (instrumental attitudes, experiential attitudes, injunctive norms, descriptive norms, capacity and autonomy towards using regulated breathing as a mental skills tool during competition) has with intentions to use regulated breathing as a mental skills tool during competition (research question seven sub-hypotheses [7.a – f]). The multiple linear regression model used to answer research question seven was, again, used to test sub-hypotheses 7.a – f. The results show support for research question seven sub-hypothesis 7.a as New Zealand high-performance adult athletes' instrumental attitudes towards using regulated breathing as a mental skills tool during competition significantly predicted and were positively associated with New Zealand high-performance adult athletes' intentions to use regulated breathing as a mental skills tool during competition, Beta = 0.82, $t(83) = 9.67$, $p <$

.001. Results did not support research question seven sub-hypotheses 7.b - f as non-significant relationships between New Zealand high-performance adult athletes' experiential attitudes, injunctive norms, descriptive norms, capacity and autonomy separately with their intentions to use regulated breathing as a mental skills tool during competition were present.

The Relationship between Practising Regulated Breathing and the Frequency of Experiencing Flow

The relationship between practising regulated breathing and how frequently New Zealand high-performance adult athletes experience flow was researched to investigate if New Zealand high-performance adult athletes currently practising regulated breathing experience flow more regularly than those not currently practising regulated breathing. No support for hypothesis one could be because there was no significant relationship between practising regulated breathing and the frequency flow was experienced, the study used a small sample size, regulated breathing affects state-like flow not dispositional flow, no guidelines on the minimum amount of experience needed practising regulated breathing was present and the sDFS was not a sensitive enough instrument to the nine characteristics of the flow experience. Each potential reason for the lack of support for hypothesis one is discussed in turn.

The practice of regulated breathings relationship with dispositional flow. The lack of support for hypothesis one could be because there may not be a large enough relationship between practising regulated breathing and experiencing dispositional flow. Instead, an individual when practising regulated breathing could just be experiencing improved performance (Khng, 2016; Nemati, 2013; Sharma et al., 2014) improved ANS balance (Toschi-Dias et al., 2017), reduced anxiety (Khng, 2016; Nemati, 2013; Toschi-Dias et al., 2017), reduced reaction times (Sharma et al., 2014; Shashikala et al., 2011) or increased PNS responses (Laborde et al., 2017; Pal et al., 2004), without experiencing flow.

Using a small sample size. The non-significant difference between participants who do and who do not currently practice regulated breathing in a training programme could be due to the small sample size. As stated in the power analysis presented in the Methods section, for sufficient statistical power to test hypothesis one, 260 New Zealand high-performance adult athletes had to complete the study. Because only 90 New Zealand high-performance adult athletes gave consent to use their questionnaire data for the study, statistical power was low, meaning the probability of rejecting the null hypothesis when it was false was low. Low statistical power, therefore, means the Welch's independent samples *t*-test used to test hypothesis one only had adequate power to detect relatively large differences, affecting the results and conclusions made from hypothesis one.

Regulated breathing affecting state-like flow, not dispositional flow. Using the frequency flow is experienced to develop hypothesis one may have been the less favourable method of measuring an association between a flow experience and practising regulated breathing. Jackson and Csikszentmihalyi's (1999) suggest that an individual forgets the ego (cause for questioning and critiquing of performance) by focusing on his or her body; focusing on breathing is a way to shift focus to the body (Jackson & Csikszentmihalyi, 1999). Using dispositional flow measures to identify regulated breathings association with experiencing flow may not be the best method as subtle changes in a flow experience (as explained by Jackson and Csikszentmihalyi) may not be identified. Instead, Jackson and Csikszentmihalyi's suggestions may be more easily identified by an athlete with state (one-off) flow experiences. Focusing on a one-off flow experience could help athletes use a more memorable flow experience as opposed to how often characteristics of the flow experience occur, making it easier for athletes to identify subtle changes in a flow experience.

Not stating the minimum amount of experience or time needed to practice regulated breathing. No statistically significant difference in dispositional flow levels of New Zealand high-performance adult athletes who and who do not currently practice regulated breathing in their training programme could be due to the amount and experience participants had with regulated breathing. The current study asked New Zealand high-performance adult athletes if they currently use regulated breathing in their training programme with no indication of how long or the level of experience participants had with regulated breathing. Theoretically, New Zealand high-performance adult athletes stating they currently use regulated breathing in their training programme could have only one day experience practising regulated breathing, where one day regulated breathing practice may not be enough to develop training effects.

Some regulated breathing research explained the length or intensity of regulated breathing practice used in an intervention, suggesting the length or intensity of regulated breathing practice could be important. Previous research had participants complete regulated breathing interventions for a least three months with regulated breathing sessions lasting up to 30-minutes (Pal et al., 2004; Sharma et al., 2014; Shashikala et al., 2011), 15 days with very intensive interventions (ten, two-hour sessions; Toschi-Dias et al., 2017), or including participants with a large amount (six months or five years') experience practising regulated breathing or yoga (Bertisch et al., 2017; Telles et al., 2013). Because some previous regulated breathing research used long-term interventions, intensive interventions or participants with lots of experience, it is suggested the long-term practice of regulated breathing might be needed to develop training effects. Not stating the length of regulated breathing practice needed in the current study could, therefore, affect the results and conclusions made on hypothesis one.

Not splitting the nine characteristics of a flow experience. The lack of support for hypothesis one could be due to the sDFS not being a sensitive enough instrument to measure the flow experience as each of the nine characteristics of the flow experience are not considered separately. A flow experience (as defined using the flow theory; Csikszentmihalyi, 1975) can be explained using the nine characteristics of the flow experience (Jackson & Csikszentmihalyi, 1999). Five of the nine characteristics of the flow experience (concentration on the activity performing, loss of self-consciousness, merging of actions and awareness, the balance of skill and challenge and unambiguous clear-fast feedback) were used as the rationale to provide initial testing on the association between practising regulated breathing and the frequency of experiencing flow. The potential relationship the practice of regulated breathing could have (either positive or negative) with the four other characteristics of the flow experience (clear goals, being intrinsically rewarded by the activity, having feelings of unlimited recourses to cope with the challenges of the activity and transformation of time perceptions) was not referred to in the literature review; the relationship between these four characteristics and the practice of regulated breathing could, therefore, potentially affect the results. Consequently, using the sDFS over measures separating the characteristics of the flow experience may limit research findings on the association between practising regulated breathing and experiencing flow, potentially explaining the lack of support for hypothesis one.

To conclude, hypothesis one not being supported could be a direct result of no statistically significant relationship between practising regulated breathing and the frequency of experiencing flow. Also, a small sample size, regulated breathing affecting state-like flow not dispositional flow, no guidelines on the minimum amount of experience needed on the practice of regulated breathing and no separation between the nine characteristics of the flow experience could have contributed to the lack of support for hypothesis one.

Intentions to Practice Regulated Breathing

New Zealand high-performance adult athletes' intentions were measured to understand if the New Zealand high-performance adult athletes would intend to engage in the practice of regulated breathing in the future.

The results showed that a majority of participating New Zealand high-performance adult athletes agreed on intending to practice regulated breathing in a training routine or during their competition in the future; no significant differences were seen between the levels New Zealand high-performance adult athletes compete at (International, National or Provincial [Regional]/ Open Age Premier Club Grade level). However, the survey being completed by New Zealand high-performance adult athletes more interested in the topic or the practice of regulated breathing being seen as socially desirable could have affected results.

Athletes more interested in the research topics completed the questionnaire. A reason for the results showing that the majority of participating New Zealand high-performance adult athletes agreed on intending to practice regulated breathing in a training routine or during their competition could be because athletes more interested in regulated breathing completed the questionnaire.

Earlier research focused on an individual's interest in a topic and cooperation in a phone survey on that topic (Groves, Presser, & Dipko, 2004). Researching the odds of cooperating in a phone survey using 2,330 interviews, Groves et al. showed using the odds ratio that participants were 38% more likely to cooperate in a survey if they had interest in a topic ($p < .05$). When adding an incentive of $5 (USD), Groves et al. increased the odds participants would complete the phone survey with no significant difference between those not interested and those interested in the topic from the full sample. Groves et al.'s results suggest the results in the current study could favour those New Zealand high-performance adult athletes more interested in regulated breathing and a flow experience than from the entire population. Therefore, the results could favour New Zealand high-performance adult athletes interested in practising regulated breathing in a training routine or during competition, potentially explaining why most participants agreed on intending to practice regulated breathing in a training routine or during their competition in the future.

Social desirability bias affected the results. Social desirability bias may have also affected the results in the current research. Social desirability bias occurs when participants responses are not based on true thoughts and feelings but instead on the perception of what is thought to be socially desirable (Grimm, 2010). The inclusion of a regulated breathing brief could have potentially altered participants' answers because the regulated breathing brief provided the positive training effects of practising regulated breathing. Also, participants could presume the practice of regulated breathing was a desirable behaviour to the researcher as the researcher created the positively worded regulated breathing brief. Therefore, social desirability bias could explain why most New Zealand high-performance adult athletes agreed on intending to practice regulated breathing in a training routine or during their competition in the future.

In summary, the majority of New Zealand high performance adult athletes agreeing on intending to practice regulated breathing in a training routine or during their competition in the future could be because they intend to practice regulated breathing in the future, athletes with more interest in regulated breathing completed the questionnaire or athletes responded in a socially desirable way.

Variation of Intentions Explained by the Components of the Reasoned Action Approach

The variation in participants' intentions to practice regulated breathing in a training routine and during competition explained by their RAA components was measured, along with the predictors of those intentions.

The high percentage of estimated variance in New Zealand high-performance adult athletes' intentions to practice regulated breathing in a training routine or during competition could be because the six components of the RAA accurately estimate their intentions. The RAA components have been formed using the previous models the TRA (Fishbein & Ajzen, 1975, as cited in Madden et al., 1992) and the TPB (Ajzen, 1991). Because the RAA is a model that has been developed and improved from intention and behaviour models since 1975, the variance explained may have also increased. The development of intention models into the RAA could, therefore, explain why the RAA components account for a large amount of variance in participants' intentions to practice regulated breathing in a training routine or during competition.

A previous meta-analysis also showed large amounts of variation in intentions estimated using the six components of the RAA (instrumental attitudes, experiential attitudes, descriptive norms, injunctive norms, capacity and autonomy; McEachan et al., 2016). McEachan et al. showed that 59% of the variance in intentions was estimated in health behaviours using the six-component structure of the RAA. Therefore, it is suggested the RAA components (instrumental attitudes, experiential attitudes, injunctive norms, descriptive norms, capacity and autonomy) explain a large amount of variance in intentions to perform a behaviour.

Components significantly predicting intentions. The RAA components oriented towards practising regulated breathing were estimated to identify if the RAA components significantly predicted intentions to practice regulated breathing in a training routine or during competition. Of the RAA components, instrumental attitudes towards practising regulated breathing (in a training routine or during competition) were the only significant predictors positively associated with intentions to practice regulated breathing in a training routine or during competition. Instrumental attitudes are the perceptions that there are positive or negative consequences of performing a behaviour (Fishbein & Ajzen, 2010); therefore, the perceptions of the positive or negative consequences of practising regulated breathing could be the main reason for why New Zealand high-performance adult athletes would intend to practice regulated breathing in a training routine or during competition in the future.

The results could be an accurate representation of participating New Zealand high-performance adult athletes' RAA components that predict their intentions to perform regulated breathing. Fishbein and Ajzen (2010) explain different behaviours across different populations place different levels of importance on instrumental attitudes, experiential attitudes, injunctive norms, descriptive norms, capacity and autonomy; therefore, there is no set relationship between the components on a behaviour. Previous research on other behaviours showed different combinations of RAA components significantly predicted intentions to perform a behaviour (Elliott & Ainsworth, 2012; McEachan et al., 2016) supporting Fishbein and Ajzen's (2010) explanation. Elliott and Ainsworth's research showed instrumental attitudes, experiential attitudes and capacity significantly predicted intentions to binge-drink; McEachan et al. showed all components of the RAA excluding autonomy significantly predicted intentions to perform health behaviours. Therefore, instrumental attitudes being the only significant predictor of intentions to practice regulated breathing in the current study could be an accurate representation of why New Zealand high-performance adult athletes would practice regulated breathing in a training routine or during competition.

Research using the TRA and TPB in sport settings also showed there is no set relationship between the components predicting athletes intentions to perform a behaviour; however, only general similarities and differences can be identified due to the current research using the RAA (six components split from the three components structure of the TPB). First, Barkoukis et al. (2013) showed attitudes were significant predictors of intentions to dope in sport for athletes that had previously doped or not doped; perceived behavioural control had a significant negative predictive relationship with intentions to dope in athletes that had not previously doped. Second, Anderson et al.'s (2004) research on New Zealand athletes' intentions to use a sports psychologist showed perceived norms and perceived behavioural control significantly predicted intentions to use a sports psychologist. Again, differences shown between the current study (instrumental attitudes being the only significant predictor of intentions to practice regulated breathing in two separate behaviours) and research on athletes' intentions to dope or use a sports psychologist supports the idea that in different behaviours, athletes have different intentions to perform those behaviours.

In summary, research shows different populations use a different combination of RAA components (or more general TPB type sections) towards intending to perform different behaviours. Therefore, results from the current research could be an accurate reflection of why New Zealand high-performance adult athletes intend to practice regulated breathing in a training routine or during competition, supporting Fishbein and Ajzen's (2010) explanation of different behaviours across different populations placing different levels of importance on each component.

Limitations and Future Direction of Research

There are limitations to the current research. Limitations range from the small sample size, using a correlational survey design, sample recruitment strategies, the use of the term 'high-performance' and other limiting factors mentioned throughout the discussion. Limitations provide direction for research on the flow experience and implementing regulated breathing.

A small sample size limited the current research by limiting the statistical power of the study. Low statistical power occurred because the research had a small sample size (N = 90) compared to the projected sample size needed to have sufficient statistical power (N = 260). Low statistical power meant the probability of rejecting the null hypothesis when it was false was low in the current research. Contributing factors of the small sample size could be that the research was recruiting from a relatively small population (New Zealand high-performance adult athletes), making recruiting challenging. Adding to the challenges of recruiting from a small population, New Zealand high-performance adult athletes receiving HPSNZ funding had limited participation in the current research as the HPSNZ research committee did not approve the use of HPSNZ funded athletes. HPSNZ funded athletes make up over three hundred New

Zealand athletes that could have been part of the current research as participants. Also, poor wording used in the information sheet limited the amount of data included (from participants) in the data analysis. The information sheet for the current research stated: “Completion and return of the questionnaire implies consent” (see Appendix C). Only those New Zealand high-performance adult athletes that pressed submit at the end of the questionnaire implied consent, reducing the sample size from 115 participants who completed at least one of the independent or dependent variable items to 90.

The current research used correlational analyses, meaning conclusions cannot be made on the causal effects of practising regulated breathing on dispositional flow. Most research presented in the literature review could provide the rationale for implementing an intervention to test the effects of practising regulated breathing on experiencing flow. However, resource and time constraints of a Master’s research project meant using an intervention to test the effects of practising regulated breathing on dispositional or state flow experiences was not possible. Therefore, only providing correlational evidence has limited the current research and knowledge on the practice of regulated breathings role in affecting dispositional or state flow experiences.

Future research should implement an intervention to test the effects of practising regulated breathing on athletes’ flow experiences. Previous literature could be used as a guide to planning the length of the regulated breathing intervention and the amount of regulated breathing experience required. For example, future research could use Nemati (2013), Pal et al. (2004), Sharma et al. (2014), Shashikala et al.’s (2011) research where participants practised regulated breathing for at least three months with each session lasting up to 30 minutes. Toschi-Dias et al. (2017) research where participants practised regulated breathing for 15 days with very intensive sessions (ten, two-hour sessions), or Bertisch et al. (2017) and Telles et al.’s (2013) research where participants had a large amount of experience (six months or five years) practising regulated breathing or yoga if measuring athletes in a one-off questionnaire could also be used as a guide.

New Zealand high-performance adult athletes may be poorly represented in the sample used for the current research. The current research used snowball and purposive sampling methods to recruit participants. Using snowball and purposive sampling could mean the sample of New Zealand high-performance adult athletes do not accurately reflect the population because participants are only from certain groups within the population. Biernacki and Waldorf (1981) reviewed problems of using snowball sampling where they question the snowball samplings reliance on social networks. The current research could not reflect the population of New Zealand high-performance adult athletes because those that participated received an invitation from the researcher's social network or sports teams, organisations and individuals the researcher reached out too. Therefore, adjusted variance measures may not provide an accurate variance estimate of the population of New Zealand high-performance adult athletes, limiting the generalisability of the research.

A limiting factor which had relatively small impacts was the classification of a high-performance athlete for the current research. A New Zealand high-performance adult athlete for the current research was an athlete that is 16 years or older, a New Zealand citizen or competing in New Zealand while competing at International, National, Provincial (Regional) or Open Age Premier Club Grade Level. The current research used a definition based on the researcher's perceptions of what environments contained high-performance athletes. By creating a definition of what a high-performance athlete is off subjective experience, the results may not be a correct reflection of 'high-performance' athletes. Future research could focus on defining what a high-performance adult athlete is, ensuring the term high-performance is used correctly with the correct population of athletes.

Three limiting factors brought to attention in the discussion also need brief mentions as limitations. First, the regulated breathing brief may have increased socially desirable responses. As explained previously, participants could assume the researcher sees regulated breathing as a beneficial behaviour to complete; therefore, responses could be changed to meet perceptions of what the researcher might think.

Second, there was no investigation into the amount (in time or intensity) of regulated breathing experience New Zealand high-performance adult athletes had in the current study, limiting results. Previous literature using regulated breathing interventions had participants complete long-term (up to three months) interventions (Nemati, 2013; Pal et al., 2004; Sharma et al., 2014; Shashikala et al., 2011), very intensive two week interventions (Toschi-Dias et al., 2017) or used participants with large amounts of regulated breathing or yoga experience (Bertisch et al., 2017; Telles et al., 2013) to research training effects. Therefore, it may take a long-term practice or very intense practice of regulated breathing to cause training effects. The limited knowledge on regulated breathing experience (in time or intensity) means New Zealand high-performance adult athletes stating they use regulated breathing in their training programme may not have enough regulated breathing experience to cause training effects, limiting results.

Finally, a potential association between the practising regulated breathing and how frequently flow is experienced may only be with five of the nine characteristics of the flow experience. Therefore, researching the global flow experience (all nine characteristics of the flow experience averaged into one value) may have limited findings associating the flow experience with the practice of regulated breathing. It is suggested that the future research on potential intervention strategies associated with experiencing flow uses the long version quantitative flow experience scales[8] to measure the flow experience, allowing analyses on each of the nine characteristics of the flow experience separately.

Other directions for future research. Other directions for future research include providing more variance testing of the RAA in sports situations, comparing the variance of the RAA explained in sports settings with other intention models, researching other areas associated with athletes' psychological performance and measuring the whole RAA in one study.

To identify how effective the RAA is at explaining variance in intentions to perform a behaviour, research should provide a comparison of the RAA with the TPB and TRA in athletic populations. By researching the variation in intentions explained by the RAA in comparison to the TPB, benefits of using the RAA over the TPB with athletic populations could be identified.

[8] The long versions of the flow experience scales are the Flow State Scale (FSS-2) and Dispositional Flow Scale (DFS-2; Jackson et al., 2008).

Future research could measure the practice of regulated breathing with other areas associated with athletes' psychological performance. Research showed the practice of regulated breathing reduced reaction times (Sharma et al., 2014; Shashikala et al., 2011), bettered performance (Khng, 2016; Nemati, 2013; Sharma et al., 2014), reduced anxiety (Khng, 2016; Nemati, 2013), reduced anxiety simultaneously with balancing the ANS (Toschi-Dias et al., 2017) or increased a PNS response in a stressful cognitive task (Laborde et al., 2017) in participants not identifying as athletes. Therefore, future research could attempt to replicate research findings on the practice of regulated breathing using athletic populations.

Finally, research could attempt to apply the whole RAA model in one research project. The RAA is very complex, having lots of background factors, beliefs and components acting on intentions to perform a behaviour. Therefore, research should attempt to involve all parts of the RAA in one research project to identify how background factors, beliefs, components, intentions and actual control affects performance. By measuring the whole RAA using one behaviour, more knowledge would be gained on how the RAA predicts intentions and behaviour.

In summary, the current research has some limiting factors. However, limitations provide directions for future research in the areas of a flow experience, practising regulated breathing and using the RAA.

Conclusions and Implications

The current research allows the formation of three conclusions with implications.

Conclusion one. There is not enough evidence to suggest a relationship (or not) between practising regulated breathing and frequently experiencing flow. The results suggest there was no statistically significant difference in dispositional flow levels of New Zealand high-performance adult athletes that do and do not currently practice regulated breathing in their training programmes. However, the small sample size, lack of knowledge about participants' regulated breathing practices, and the use of a correlational design suggests no strong conclusions can be made about if the practice of regulated breathing increases the frequency of experiencing flow.

Conclusion two. The majority of participants agreed on intending to practice regulated breathing in a training routine or use regulated breathing as a mental skills tool during competition in the future with no significant differences between the level of competition competing at (International, National or Provincial [Regional]/ Open Age Premier Club Grade level). However, because no inferential statistics were used when investigating the relevant research questions and the research having a small sample size, the results are only reflective of the sample, limiting generalisability.

If more compelling evidence arises on the practice of regulated breathing affecting athletes, the results could provide tentative evidence towards researchers and practitioners having confidence New Zealand high-performance adult athletes would use a regulated breathing intervention or programme in a training routine or as a mental skills tool during competition. It is noted that because no strong conclusions can be made about the association between practising regulated breathing and frequently of experiencing flow, the implications of conclusion two do not relate to regulated breathing being applied to help New Zealand high-performance adult athletes' experience flow more frequently.

Conclusion three. New Zealand high-performance adult athletes' instrumental attitudes, experiential attitudes, injunctive norms, descriptive norms, capacity and autonomy towards practising regulated breathing in a training routine or using regulated breathing as a mental skills tool during competition explain large amounts of variation in intentions to each corresponding behaviour. Instrumental attitudes of New Zealand high-performance adult athletes also predicted their intentions to practice regulated breathing in a training routine or use regulated breathing as a mental skills tool during competition. Again, the small sample size in the current research along with the sample potentially being a poor representation of the population means conclusion three comes with substantial uncertainty attached.

The tentative evidence used to develop conclusion three could suggest that if more compelling evidence arises on the practice of regulated breathing in sports, practitioners and sports psychologists could pitch the practice of regulated breathing to New Zealand high-performance adult athletes using information targeting instrumental attitudes.

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Appendix A: Recruitment Messages

- Recruitment message one: Facebook post.
- Recruitment message two: Email.
- Recruitment message three: General recruitment message.

Note: Recruitment messages formatting has changed (font and size) to fit the margins.

Recruitment message one: Facebook post.

Are you a New Zealand high-performance adult athlete?

I am currently completing my Master's Thesis in Psychology at Massey University.

For this project I am looking at two topics. The first topic is about New Zealand high-performance adult athletes being in flow (also known as being 'in the zone'), with the second topic being about New Zealand high-performance adult athletes using regulated breathing.

This post is to those that are a **New Zealand high-performance adult athlete**, which is an athlete that is 16 years of age or older, and a New Zealand citizen or in a New Zealand competition while competing at one of the following levels:

- Competing competitively at a national or an international level.
- Competing in an open age group at provincial (regional) level.
- Competing in the open age premier club grade where competition involves facing other clubs at the same level.

If you are a New Zealand high-performance adult athlete and would like to complete my research consisting of a **15-minute survey**, the **link** below takes you to this survey along with the information sheet that contains a **formal invitation to participate**, and other relevant information.

If you are interested or want more information, please click the link below. Also, if you know of anyone that might be interested, please share the link to that person or group.

The survey is anonymous.

Thanks in advance,

Jay

(Qualtrics link)

Recruitment message two: Email.

Dear high-performance institute, manager, coach or player, I am currently completing my Master's Thesis in Psychology at Massey University.

For this project I am looking at two topics. The first topic is about New Zealand high-performance adult athletes being in flow (also known as being 'in the zone'), with the second topic being about New Zealand high-performance adult athletes using regulated breathing.

To sportspersons receiving this: This email is to those that are a **New Zealand high-performance adult athlete**, which is an athlete that is 16 years of age or older, and a New Zealand citizen or in a New Zealand competition while competing at one of the following levels:

- Competing competitively at a national or an international level.
- Competing in an open age group at provincial (regional) level.

- Competing in the open age premier club grade where competition involves facing other clubs at the same level.

If you are a New Zealand high-performance adult athlete and would like to complete my research consisting of a **15-minute survey**, the **link** below takes you to this survey along with the information sheet that contains a **formal invitation to participate**, and other relevant information.

To the coaches, managers and sports institutes receiving this, it is asked that you forward this email to the athletes you train or the athletes in your system.

If you would be interested or want more information, please click the link below or forward the email as necessary. The survey is anonymous.

Thanks in advance,

Jay

(Qualtrics link)

Recruitment message three: General recruitment message.

Heard of Flow or Regulated Breathing?

This is an invitation for athletes that are 16 years of age or older, and a New Zealand citizen or in a New Zealand competition while competing at one of the following levels:

- Competing competitively at a national or an international level.
- Competing in an open age group at provincial (regional) level.
- Competing in the open age premier club grade where competition involves facing other clubs at the same level,

to complete a 15-minute survey for my master's thesis in sports psychology.

Please follow the link attached or share, like and invite those that qualify:

(Qualtrics link)

Appendix B: Recruitment Poster

- Recruitment poster.

Note: The recruitment poster is one of many posters used in the recruitment process. The recruitment poster is presented in its original format.

Recruitment poster:

Athletes and Coaches:

Heard of Flow or Regulated Breathing?

Jay Barrett is currently completing his master's in sports psychology on two different topics: Flow and Regulated Breathing.

This is an invitation for athletes that are 16 years of age or older, and a New Zealand citizen or in a New Zealand competition while competing at one of the following levels:

- Competing competitively at a national or an international level.
- Competing in an open age group at provincial (regional) level.
- Competing in the open age premier club grade where competition involves facing other clubs at the same level,

to complete his 15-minute survey for his master's thesis in sports psychology. This survey involves giving you the option to enter a prize draw for one of twelve $20USD Amazon vouchers as a compensation for your time.

If you would like to participate please take a picture of the square code at the bottom of the flyer and click the link that pops up. Alternatively, share and invite those that qualify:

Appendix C: Information Sheet

- Information sheet.

Note: The format of the information sheet has been changed to fit the margins.

Information sheet:

Hello my name is Jay Barrett. I am currently completing my Master's Thesis in Psychology at Massey University. For this project I am looking at two topics. The first topic is about New Zealand high-performance adult athletes being in flow (also known as being 'in the zone'), with the second topic being about New Zealand high-performance adult athletes using regulated breathing.

This information sheet is an **invitation** to complete the project where you can both accept or decline participation.

If you meet the criteria below and are interested, please keep reading through the information sheet. From this sheet, you can make your final decision to accept and participate in this project made up of a 15-minute survey.

Participant Identification and Recruitment:

The recruitment for this survey is via email and social media post. The email has been forwarded to high-performance sporting institutes, coaches, managers and athletes in New Zealand. The social media post is initially posted by the researcher (student) on Facebook where it can be further shared.

To participate in this project you must be a New Zealand high-performance adult athlete. Because this research is targeting New Zealand high-performance adult athletes, there is a selection criterion.

If you are 16 years or older, and a New Zealand citizen or competing in New Zealand while answering yes to one of the following questions:

- I am competing competitively at a national or an international level.
- I am competing in an open age group at provincial (regional) level.
- I am competing in the open age premier club grade where competition involves facing other clubs at the same level.

You qualify as a New Zealand high-performance adult athlete. If you meet this criterion, you can participate in this study.

At the end of the survey, all athletes will have the chance to go into the draw for one of twelve $20 USD Amazon vouchers as a thank you for your time. This voucher will be drawn on the 5th September 2018, and if you are one of the winners you will be notified via email.

Procedure:

This research is made up of one survey with 35 questions. This survey should take you around 15 minutes to complete and is open from the 1st August 2018 to 21st September 2018.

To those athletes that I am currently working with as a mental skills coach, your choice to complete the survey or not has no effect on our relationship.

Remember, this is not a competition. Because of this, it is helpful if you answer questions honestly.

When completing the survey it is asked that you do not discuss your answers with any other New Zealand high-performance adult athlete. To add, it is recommended that you complete the survey in one go using a space that is comfortable and quiet.

What happens to your results?

You will not be asked to provide your name in this survey. You will be asked to provide your email address if you wish to enter the prize draw and/or receive a summary of findings, but your email address will be collected in a separate survey after you have finished responding to the survey questions. This will help to ensure your responses are anonymous.

The data that you provide will initially be accessible only to me, my supervisor, and any IT staff at Massey University involved in administering the survey. Once the data has been analysed, a *de-identified* copy of data will be made publicly available for cross-examination by other researchers. Any personally identifying information (e.g., answers from the open-ended questions or your email address, if you provide it) are either removed from this public data set or not associated with the public data set. This is to ensure that it is not possible to identify who you are.

Any identifying information will be stored on a password-protected computer until the project is complete in early 2019 and then deleted. The public dataset that has no information to identify you with will be stored indefinitely.

Your rights and things you must know:

Completion and return of the questionnaire implies consent. You have the right to decline to answer any particular question or to stop answering questions at any time.

You have the right to receive a summary of the findings once the research is finished. The projected finish date will be in early 2019. You will be given the opportunity to provide your email address if you wish to be emailed this summary of findings.

There is no external pressure (e.g. from the research team, coaches or managers) to complete the survey. Since the survey is attached to this forwarded email/ social media post, you do not need to confirm to anyone that you are completing it. This makes this survey completely anonymous.

Your participation is kept confidential by the research team. With this, your confidentiality cannot be fully guaranteed. Instead, full accountability will be held by the research team to maintain this.

Finally, regulated breathing should be performed under the guidance of a trained professional. Because of this, this research does not suggest that you should try practising regulated breathing without first being taught specific techniques by a trained professional of regulated breathing.

Contact Details:

If you have any questions, feel free to contact the researcher or the supervisor with the contact details below:

Researcher:

Jay Barrett

Jay.Barrett.1@uni.massey.ac.nz

Supervisor:

Matt Williams

+64 (09) 414 0800 ext. 43117

M.N.Williams@massey.ac.nz

This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact A/Prof Tracy Riley, Acting Director, Research Ethics, telephone 06 356 9099 x 84408, email humanethics@massey.ac.nz.

If you accept the conditions of the research outlined in this information sheet and wish to complete the survey, please start by clicking the arrow below.

Thanks in advance,

Jay Barrett

Appendix D: Questionnaire and Research Summary and Lucky Draw Entry

- The questionnaire.
- Research summary and lucky draw entry.

Note: The questionnaire, research summary and lucky draw entry font and size has been changed to fit the margins. Included in the questionnaire is the initial qualifying information and items used to try ensure participants eligibility. The sDFS items part of the questionnaire are not included in Appendix D because of the copyright restriction put in place by Mind Garden Inc.

The questionnaire:

Qualifiers

Once again, to complete this survey you must be a New Zealand high-performance adult athlete. Because[9] of this, below are the qualifiers for what is classed as a New Zealand high-performance adult athlete for this survey:

Q1: Firstly, which of these categories below apply to you:

I am competing at a national or an international level.
I am competing in an open age group at provincial (regional) level.
I am competing in the open age premier club grade where competition involves facing other clubs at the same level.
I am not competing at any of the above levels of competition.

Q2: I am 16 years or older.

Yes.
No.

Q3: I am...

A New Zealand Citizen.
Competing in New Zealand.
None of the above.

Because you are 16 years or older, a New Zealand citizen or competing in New Zealand while competing at international, national, provincial (regional) or open age premier club grade level, you are classed as a New Zealand high-performance adult athlete. Because of this, you are eligible to complete the rest of this survey.
Please press the arrow to continue.

The survey has three sections:

Section one has 3 questions.
Section two has 9 questions.

[9] Once the questionnaire was active, there was one change made to the New Zealand high-performance adult athlete qualifier brief. Twenty-six responses to the brief were affected by one spelling mistake ‘becuase’ instead of the correct spelling ‘because’. This typo was changed to match the correct spelling at 11.56 am, Wednesday 8th August 2018, seven days after the questionnaire went live. This spelling mistake was considered in the recruitment process however, since it was part of the qualifier items, it did not affect the hypotheses or research questions.

Section three has 21 questions.

Please move through the sections one at a time. Remember, there are no wrong answers and answering honestly will be very helpful.

Please carry on to section one.

Demographic Information

Section One:

1.a) I am...

Female
Male
Gender diverse
Prefer not to disclose

1.b) The sport I compete in at a high-performance level is...

Rugby Union	Rugby League	Road Cycling	Track Cycling
Mountain Biking	BMX	Netball	Soccer
Basketball	Cricket	Rowing	Canoeing
Ski and Snowboard Racing		Freestyle Skiing and Snowboarding	
Surfing	Volleyball	Boxing	MMA
Swimming	Hockey	Sailing	Tennis
Squash	Indoor Bowls	Motorsport	Golf
Surf Life Saving	Softball	Triathlons	

Horseracing and Equestrian
Long Distance Athletic Track Events (800 meters and longer).
Athletics Track and Field Events (excluding long distance athletic events outlined above).
Other

1.c) I compete in my high-performance sport at...

International Level
National Level
Provincial (Regional) Level/ Open Age Premier Club Grade Level

The SHORT Dispositional Flow Scale (sDFS) was the nine item measure used to identify global dispositional flow. The sDFS was located in this section of the questionnaire, however, was removed for copyright reasons put in place by Mind Garden Inc. this scale was validated by Jackson, Martin and Eklund (2008).

Regulated Breathing

Section Three:

Brief 1) Please read and take some time to consider the following statement about regulated breathing:

Regulated breathing is regulating or controlling your breath as a mental skills training tool. Regulated breathing can be in the form of speeding up or slowing down your breath, while also focusing on how the air moves through your lungs. Research suggests that regulated breathing can:

1. Provide control of your arousal levels (making you more relaxed, or more alert).
2. Reduce stress and test anxiety (nerves or butterflies).
3. Speed up your reaction times.
4. Improve your performance.

Please take some time to understand what regulated breathing is and answer question 1 when ready.

2.a) Question 1: Please select one of the following options:

I have never used regulated breathing.

I have used regulated breathing in the past, but am not using it in my current training programme.

I am using regulated breathing as part of my current training programme.

Section three continued:

Brief 2: The following two pages are aimed at two different settings:

The first page (10 questions) will be asking you about practising regulated breathing in your training routine.

The second page (also containing 10 questions) asks you about using regulated breathing as a mental skills tool during your competition.

Note: These questions may seem similar. However, they are asking about different things.

Practising Regulated Breathing as a Training Routine

The next few questions will be asking you about regulated breathing and practising it in your training routine:

3.a) In the future, I intend to practice regulated breathing in my training routine.
Strongly disagree - Somewhat disagree - Unsure - Somewhat agree - Strongly agree

3.b) Why would you practice/ not practice regulated breathing in your training routine?

____

3.c) In the future, using regulated breathing in my training routine would be...
Very unproductive - Somewhat unproductive - Unsure - Somewhat productive - Very productive

3.d) In the future, using regulated breathing in my training routine would be....
Has no value - Has little value - Unsure - Has some value - Has lots of value

3.e) In the future, using regulated breathing in my training routine would be....
Very boring - Somewhat boring - Unsure - Somewhat fun - Very fun

3.f) In the future, using regulated breathing in my training routine would be....
Very unenjoyable - Somewhat unenjoyable - Unsure - Somewhat enjoyable - Very enjoyable

3.g) Most people who are important to me think I should not practice regulated breathing in my training routine in the future.
Strongly agree - Somewhat agree - Unsure - Somewhat disagree - Strongly disagree

3.h) Most people I respect, that are like me, currently practice, have previously practised or would consider practising regulated breathing in their training routine in the future.
Very likely - Likely - Unsure - Unlikely - Very unlikely

3.i) For me to practice regulated breathing in my training routine would be....
Extremely easy - Somewhat easy - Unsure - Somewhat difficult - Extremely difficult

3.j) I feel in complete control over whether I would practice regulated breathing in my training routine in the future.
Strongly agree - Agree - Unsure - Disagree - Strongly disagree

Using Regulated Breathing as a Mental Skills Tool Inside of Competition

Brief 3) The next few questions will be asking you about regulated breathing and using it as a mental skills tool during your competition:

Note: As said earlier, these questions are different from the previous page. This is because the previous page was asking you about using regulated breathing in your training routine and not in competition.

4.a) In the future, I intend to use regulated breathing as a mental skills tool during my competition.
Strongly disagree - Somewhat disagree - Unsure - Somewhat agree - Strongly agree

4.b) Why would you use/ not use regulated breathing as a mental skills tool during competition?
____

4.c) In the future, using regulated breathing as a mental skills tool during my competition would be....
Very unproductive - Somewhat unproductive - Unsure - Somewhat productive - Very productive

4.d) In the future, using regulated breathing as a mental skills tool during my competition would be....
Has no value - Has little value - Unsure - Has some value - Has lots of value

4.e) In the future, using regulated breathing as a mental skills tool during my competition would be....
Very boring - Somewhat boring - Unsure - Somewhat fun - Very fun

4.f) In the future, using regulated breathing as a mental skills tool during my competition would be...
Very unenjoyable - Somewhat unenjoyable - Unsure - Somewhat enjoyable - Very enjoyable

4.g) Most people who are important to me think I should not use regulated breathing during my competition as a mental skills tool in the future.
Strongly agree - Somewhat agree - Unsure - Somewhat disagree - Strongly disagree

4.h) Most people I respect, that are like me, currently use, have previously used or would consider using regulated breathing as a mental skills tool during their competition in the future.
Very likely - Likely - Unsure - Unlikely - Very unlikely

4.i) For me to use regulated breathing during my competition as a mental skills tool would be...
Extremely easy - Somewhat easy - Unsure - Somewhat difficult - Extremely difficult

4.j) I feel in complete control over whether I use regulated breathing during my competition as a mental skills tool in the future.
Strongly agree - Agree - Unsure - Disagree - Strongly disagree

By clicking the arrow below you are finishing the survey. Because of this, pressing the below arrow means that you are implying consent as you have completed and returned the survey.

This arrow also takes you to the prize draw and summary of research invitation.

Lucky draw entry and summary:

Lucky Draw and Summary

5.a) If you would like to go into the draw for one of the twelve $20 USD Amazon vouchers please leave your email below:

(Just a reminder, this question is not connected to the survey you have just completed. Instead, this question is part of another survey that is separate. This means that any questions you have filled out already cannot be identified with you, keeping everything anonymous).

____

5.b) If you would like to receive a summary of the research in early 2019, please leave your email address below:

(Again, this question is not connected to the survey you have just completed. Instead, this is part of another survey that is separate. This means that the questions you have filled out already on the previous survey cannot be identified with you, keeping everything anonymous).

Appendix E: Pre-registration

- OSF Registration titled 'Regulated Breathing in New Zealand High-Performance Athletes'.

Reference:

Barrett, J., & Williams, M. (2018, July 27). Regulated Breathing in New Zealand High-Performance Athletes. Retrieved from osf.io/v45z3

Pre-registration:

Project working title:

Regulated Breathing in New Zealand High-Performance Athletes.

Authors: leave this out for blind review of the pre-registration

Affiliation: leave this out for blind review of the pre-registration

A. Hypotheses

Description of essential elements

1. Describe the (numbered) hypotheses in terms of directional relationships between your (manipulated or measured) variables.

Hypothesis One:

New Zealand high-performance adult athletes that currently practice regulated breathing will have higher levels of dispositional flow than those with either previous experience or no experience.

Research Questions (1-5):

1. What are New Zealand high-performance adult athlete's intentions to practice regulated breathing as a training routine? **(exploratory)**
2. What are New Zealand high-performance adult athlete's intentions to use regulated breathing inside competition as a mental skills tool? **(exploratory)**
3. To what extent do the intentions of practising regulated breathing as a training routine change across the level a New Zealand high-performance adult athlete competes at? **(exploratory)**
4. To what extent do the intentions of using regulated breathing as a mental skills tool inside of competition change across the level a New Zealand high-performance adult athlete competes at? **(exploratory)**
5. What sports that a New Zealand high-performance adult athlete competes in are associated with the highest intention levels of using regulated breathing as a mental skills tool inside of competition? **(exploratory)**

Theory confirmation Research Questions:

6. To what extent can the Reasoned Action Approach components explain the variation in intentions of New Zealand high-performance adult athletes practising regulated breathing as a training routine?
    a. I hypothesise a positive relationship between the *instrumental attitudes* towards practising regulated breathing as a training routine and the intentions to practice regulated breathing as a training routine.
    b. I hypothesise a positive relationship between the *experiential attitudes* towards practising regulated breathing as a training routine and the intentions to practice regulated breathing as a training routine.
    c. I hypothesise a positive relationship between the *descriptive norms* towards practising regulated breathing as a training routine and the intentions to practice regulated breathing as a training routine.
    d. I hypothesise a positive relationship between the *injunctive norms* towards practising regulated breathing as a training routine and the intentions to practice regulated breathing as a training routine.
    e. I hypothesise a positive relationship between the *capacity* towards practising regulated breathing as a training routine and the intentions to practice regulated breathing as a training routine.

f. I hypothesise a positive relationship between the *autonomy* towards practising regulated breathing as a training routine and the intentions to practice regulated breathing as a training routine.

7. To what extent can the Reasoned Action Approach components explain the variation in intentions of New Zealand high-performance adult athletes using regulated breathing as a mental skills tool during competition?
    a. I hypothesise a positive relationship between the *instrumental attitudes* towards using regulated breathing as a mental skills tool during competition and the intentions to use regulated breathing as a mental skills tool during competition.
    b. I hypothesise a positive relationship between the *experiential attitudes* towards using regulated breathing as a mental skills tool during competition and the intentions to use regulated breathing as a mental skills tool during competition.
    c. I hypothesise a positive relationship between the *descriptive norms* towards using regulated breathing as a mental skills tool during competition and the intentions to use regulated breathing as a mental skills tool during competition.
    d. I hypothesise a positive relationship between the *injunctive norms* towards using regulated breathing as a mental skills tool during competition and the intentions to use regulated breathing as a mental skills tool during competition.
    e. I hypothesise a positive relationship between the *capacity* towards using regulated breathing as a mental skills tool during competition and the intentions to use regulated breathing as a mental skills tool during competition.
    f. I hypothesise a positive relationship between the *autonomy* towards using regulated breathing as a mental skills tool during competition and the intentions to use regulated breathing as a mental skills tool during competition.

2. For interaction effects, describe the expected shape of the interactions.

    N/A

3. If you are manipulating a variable, make predictions for successful check variables or explain why no manipulation check is included.

    There will be no manipulation check needed because this is not an experiment.

Recommended elements

4. A figure or table may be helpful to describe complex interactions; this facilitates correct specification of the ordering of all group means.

    N/A

5. For original research, add rationales or theoretical frameworks for why a certain hypothesis is tested.

Purpose of research:

Flow is a state associated with an athlete's best-perceived performance (Jackson et al., 2001). By providing an intervention that can help an athlete more frequently experience flow (also known as dispositional flow), that athlete can perform more consistently at their perceived best. Regulated breathing shows potential to work as an intervention and aid the frequency of flows occurrence. However, because an intervention demands lots of resources, the overall goal of this research is to instead prepare and identify whether a regulated breathing intervention will be worth pursuing. There are three stages of analysis. Firstly, this research will identify any difference in dispositional flow when using regulated breathing in no defined intervention. The purpose of this is to help recognise if regulated breathing influences dispositional flow. Secondly, this research will look to understand whether the athletic population will complete regulated breathing in their sport by identifying an athlete's intentions to perform regulated breathing in their training and in competition. By identifying the athletic samples intentions, it will help recognise whether athletes would be likely to complete an intervention when in the real-world sporting environment. Lastly, this research also aims to identify the components that makeup intentions when defined by the Reasoned Action Approach to help further Fishbein and Ajzen's (2011) theory. By doing these preliminary analyses, there will be more clarity around whether a regulated breathing intervention in this athletic population will be beneficial.

References:

Fishbein, M., & Ajzen, I. (2011). *Predicting and changing behavior: The reasoned action approach.* Psychology Press.

Jackson, S. A., Thomas, P. R., Marsh, H. W., & Smethurst, C. J. (2001). Relationships between flow, self-concept, psychological skills, and performance. *Journal of applied sport psychology*, *13*(2), 129-153.

6. If multiple predictions can be made for the same IV-DV combination, describe what outcome would be predicted by which theory.

   N/A

B. Methods

Description of essential elements

Design

This research will be a mixed method cross-sectional design with a quantitative priority over qualitative.

List, based on your hypotheses from section A:

1. Independent variables with all their levels

   Hypothesis One:

   Experience with regulated breathing (2 conditions):

   1. Currently practising regulated breathing.
   2. Previously practised regulated breathing or have no experience with regulated breathing.

For this hypothesis, the second condition ('previously practised regulated breathing and have no experience with regulated breathing') is made up from two options that can be selected in the item on the survey asking for the New Zealand high-performance adult athletes level of experience with regulated breathing. The reason these options have been collapsed into a single dichotomous variable is that the hypothesis does not require them to be separated.

Research Questions:

1. N/A
2. N/A
3. Level the New Zealand high-performance adult athletes compete at:

3 levels - International level, National level, Provincial (regional) level /Open age premier club grade level.

4. Level the New Zealand high-performance adult athletes compete at:
    i. 3 levels - International level, National level, Provincial (regional) level/ Open age premier club grade level.
5. N/A
6. Components of the RAA (instrumental and experiential attitudes, descriptive and injunctive norms, capacity and autonomy) that relate to practising regulated breathing in a training routine.
7. Components of the RAA (instrumental and experiential attitudes, descriptive and injunctive norms, capacity and autonomy) that relate to using regulated breathing as a mental skills tool during competition.

2.

a. whether they are within- or between-participants

This research uses a between participants approach as all participants are answering the same questionnaire at one-time point.

b. the relationship between them (e.g., orthogonal, nested).

N/A

3. Dependent variables, or variables in a correlational design

Hypothesis one: Dispositional flow.

Research Question 3 and 6: Intentions to practice regulated breathing as a training routine.

Research Question 4 and 7: Intentions to use regulated breathing inside competition as a mental skills tool.

4. Third variables acting as covariates or moderators.

N/A

Planned sample

5. If applicable, describe pre-selection rules.

For this research a New Zealand high-performance adult athlete will be an athlete that is 16 years of age or older, and a New Zealand citizen or in a New Zealand competition while competing at one of the following levels:

- Competing competitively at a national or an international level.
- Competing in an open age group at provincial (regional) level.
- Competing in the open age premier club grade where competition involves facing other clubs at the same level.

6. Indicate where, from whom and how the data will be collected.

Data will come from New Zealand high-performance adult athletes that wish to participate. These athletes will receive an invitation via email or social media post and will choose to accept or decline to answer the 35-item survey. These items are administered via an internet survey on Qualtrics. This internet survey can be answered at any time and place over the data collection period (four weeks). However, it is recommended that it is completed in one sitting in a quiet place with limited interruptions. Participants will access this survey via their smart device or computer from where they will answer the 35 items. Once complete or submitted, data from each survey will be collated from Qualtrics and transferred to SPSS and Nvivo for data analysis.

7. Justify planned sample size (if applicable, you can upload a file related to your power analysis here (e.g., a protocol of power analyses from G*Power, a script, a screenshot, etc.).

   - Power analysis:

   To gain a reliable sample size for the quantitative analysis, power analysis using G*Power 3.0 was performed. Since hypothesis one will be measured using a two-tail *t*-test, an effect size (*d*) of 0.35 (cross between small/medium Cohens *d)* was set. Following this, alpha (α) and power were set as 0.05 and 0.8 respectively. Allocation Ratio N2/N1 was set at one as there is no knowledge of how many athletes currently use regulated breathing. From this, the estimated sample size for power to be maintained is:

     - 260 participants.

8. Describe data collection termination rule.

   Either when N reaches 300 or the 31st August 2018, whichever comes first.

Exclusion criteria

9. Describe anticipated specific data exclusion criteria. For example:
   a. missing, erroneous, or overly consistent responses;

   Overly consistent responses: This is not an explicit problem that needs to be controlled for.

   Duplicate responses: To stop duplicate responses from participants completing the survey more than once, similar surveys will be compared using the qualitative comments and demographic data. If the qualitative responses and demographic data are a match across surveys, the latter duplicate surveys entire data will be deleted. This is judged by the conductor of the research (the student). The reason the setting ‘prevent ballot box stuffing’ from Qualtrics will not be applied is because some participants may be using the same computer, tablet or smart device at their sporting institute.

   Missing Responses: Expectation Maximization will be performed on item nonresponses. However, participants data will be excluded if they do not provide any data for any of the independent or dependent variables.

   Erroneous Responses: This is not an explicit problem that needs to be addressed. This is because this survey predominately gives its items in Likert scales.

b. failing check-tests or suspicion probes;

N/A

c. demographic exclusions;

Any participant that is not 16 years of age at the time of completing the survey, not of New Zealand citizenship or not competing in their sport in New Zealand will be excluded.

To add, if the participants answer no to the above (meaning they are eligible to complete the research based on the above demographics), but are not:

- Competing competitively at a national or an international level.
- Competing in an open age group at provincial (regional) level.
- Competing in the open age premier club grade where competition involves facing other clubs at the same level.

They will also be excluded from this research. This will be outlined in the information sheet.

d. data-based outlier criteria;

N/A

e. method-based outlier criteria (e.g. too short or long response times).

N/A

Procedure

10. (Recommended element, in the online form see next page) Set fail-safe levels of exclusion at which the whole study needs to be stopped, altered, and restarted. If applicable, you can upload any files related to your methods and procedure here (e.g., a paper describing a scale you are using, experimenter instructions, etc.).

 N/A- this is a student project, so stopping and restarting is not feasible.

11. Describe all manipulations, measures, materials and procedures including the order of presentation and the method of randomization and blinding (e.g., single or double blind), as in a published Methods section.

Materials:

The materials used for this project include:

1. An information sheet containing all aspects central to the guidelines set at Massey University New Zealand. These guidelines include:
   - Researcher details and personal introduction.
   - The purpose of the proposed research along with an invitation to complete it.
   - Recruitment details.
   - A brief overview of what regulated breathing is, and the purpose of each research procedure.
   - Their role and ethical rights if they complete the internet survey along with the time it takes to complete each section (15minutes total) while also outlining their reward for completing the survey.
   - How the data is stored, retrieved and disposed of.
   - Any compulsory statements.

2. A brief explaining regulated breathing and its effects on both psychological and psychophysiological processes in the body. This brief will be made available in the *appendix.*
3. A 35-item survey containing:
    - The Short Dispositional Flow Scale developed by Jackson, Martin and Eklund (2008) which has nine items.
    - 26-items constructed by the conductor of the research. These items include: 20-items developed in conjunction with the framework given in the Reasoned Action Approach (Fishbein & Ajzen, 2011), four items developed to identify demographic factors such as sports type, gender, level of competition the New Zealand high-performance adult athlete competes at and their experience with regulated breathing. Where finally, two items loading onto a separate survey ask for the participant's email. The purpose of these is to go into the draw for Amazon vouchers or to receive a summary of the research in early 2019.

Procedure:

Firstly, a forwarded email and social media post containing an invitation, the information brief and the link to complete the survey will be sent around social media platforms, high-performance institutes, sports teams, and individuals to recruit participants for this project. Once an athlete receives the forwarded email or sees the social media post and think they could comply with the criterion of what a New Zealand high-performance adult athlete is, they are asked to follow the link and read through the information sheet where there is more clarity around what a New Zealand high-performance adult athlete is. After reading the information sheet and the person agrees that they are a New Zealand high-performance adult athlete based on the criterion, they can either accept or decline the invitation to complete the survey. If the invitation is accepted, the New Zealand high-performance adult athlete can move on to the survey. It will be noted that by submitting the survey the New Zealand high-performance adult athlete's are here-by complying and giving consent.

This survey is split into three sections. Section one contains demographic information about the participant's sport, level of competition and gender. Section two contains the dispositional flow scale to measure the New Zealand high-performance adult athlete's dispositional flow. With section three containing measures that will ask for the athlete's experience with regulated breathing and their intentions (and components that influence intentions) to complete regulated breathing both as a training routine and as a mental skills tool inside of competition.

Section three will start with a preface of what regulated breathing is. After reading this, the participants will be asked to take a couple of minutes to ensure they understand what regulated breathing is before carrying on to the questions from this section.

Each participant is instructed to work through each section of the internet survey from start to finish, starting in section one, and finishing at section three. Each participant is asked to complete the questionnaire honestly to help produce accurate results.

At the end of the survey, the participants will have the chance to go into the draw for one of twelve $20 (USD) Amazon vouchers (used a time compensation) or provide an email to receive the summary of the research in early 2019. Because this internet survey is anonymous, these items containing the participant's contact details are part of a separate survey (ensuring answer anonymity). From here, all data will be available for analysis in SPSS and Nvivo.

C. Analysis plan

Confirmatory analyses

Describe the analyses that will test each main prediction from the hypotheses section. For *each one*, include:

1. the relevant variables and how they are calculated;
2. the statistical technique;
3. each variable's role in the technique (e.g., IV, DV, moderator, mediator, covariate);
4. rationale for each covariate used, if any;
5. if using techniques other than null hypothesis testing (for example, Bayesian statistics), describe your criteria and inputs toward making an evidential conclusion, including prior values or distributions.

(the online form asks the above for the first, second, third, fourth and further predictions separately)

Hypothesis One:

- IV: New Zealand high-performance adult athletes experience with regulated breathing (2 conditions)
    1. New Zealand high-performance adult athletes currently practising regulated breathing.
    2. New Zealand high-performance adult athletes that have both previously practised regulated breathing or have no experience with regulated breathing.
- DV: Dispositional flow of New Zealand high-performance adult athletes.
- Statistical Technique: Independent Samples *t*-test (two-tailed).
    - Statistics table: Contains mean, number of participants per group, standard deviation and standard error of the mean.
    - A Welch's independent samples *t*-test will be used to identify any differences in the means.
    - Significance level: An alpha level of 0.05 will be used.

Research Questions

1. Descriptive Statistics:

Based on responses to the item identifying the level of intention a New Zealand high-performance adult athlete has to practice regulated breathing in a training routine.

Included in the results field and analysis:

Number of Participants.

Mean: Will be displayed as a number from 1 → 5 with 1= strongly disagree and 5= strongly agree. The standard deviation of the data will also be included and interpreted as how much a participant differs from the group mean.

Mode: Will display the most selected option in the question using a frequency distribution bar chart. This graph will show:

- The total value per option. For example, how many participants selected 1 (strongly disagree), 2 (somewhat disagree) all the way to 5 (strongly agree).
- The percentage per option. For example, how many people (in the form of a percentage) selected 1 (strongly disagree), 2 (somewhat disagree) all the way to 5 (strongly agree).

2. Descriptive Statistics:
Based on responses to the item identifying the level of intention a New Zealand high-performance adult athlete has to use regulated breathing inside competition as a mental skills tool.

Included in the results field and analysis:
Number of responses.
Mean: Will be displayed as a number from 1 → 5 with 1= strongly disagree and 5= strongly agree. The standard deviation of the data will also be included and interpreted as how much a participant differs from the group mean.
Mode: Will display the most selected option in the question using a frequency distribution bar chart. This graph will show:

- The total value per option. For example, how many participants selected 1 (strongly disagree), 2 (somewhat disagree) all the way to 5 (strongly agree).
- The percentage per option. For example, how many people (in the form of a percentage) selected 1 (strongly disagree), 2 (somewhat disagree) all the way to 5 (strongly agree).

3. IV: The competition level the New Zealand high-performance athlete performs at (3 Levels) - International Level, National Level, Provincial (Regional) Level/ Open Age Premier Club Grade Level.
DV: Level of intention to practice regulated breathing as a training routine.
Statistical Techniques: One-way ANOVA

- Statistical Testing: F Test and Confidence Intervals.
- An omnibus F test using alpha = 0.05 and 95% confidence intervals will be conducted. From this, a pairwise comparison of means will be performed only if the omnibus F test is significant. This post hoc measure will use the Bonferroni alpha test as there are three pairwise comparisons to complete.
- The Bonferroni alpha will be used to assess where the differences lie between means. As alpha is set at 0.05 and three groups/levels are present, the Bonferroni corrected alpha level used for the pairwise comparison will be 0.05/3 = 0.017.
- In regards to confidence intervals, if the pairwise comparison is performed, the confidence interval of 1 - 0.017 = 0.983 or 98.3% will be used.

4. IV: The competition level the New Zealand high-performance athlete performs at (3 Levels) - International Level, National Level, Provincial (Regional) Level/ Open Age Premier Club Grade Level.
DV: Level of intention to use regulated breathing as a mental skills tool inside of competition.
Statistical Techniques: One-way ANOVA

- Statistical Testing: F Test and Confidence Intervals.
- An omnibus F test using alpha = 0.05 and 95% confidence intervals will be conducted. From this, a pairwise comparison of means will be performed only if the omnibus F test is significant. This post hoc measure will use the Bonferroni alpha test as there are three pairwise comparisons to complete.

- The Bonferroni alpha will be used to assess where the differences lie between means. As alpha is set at 0.05 and three groups are present, the Bonferroni corrected alpha level used for the pairwise comparison will be 0.05/3 = 0.017.
- In regards to confidence intervals, if the pairwise comparison is performed, the confidence interval of 1 - 0.017 = 0.983 or 98.3% will be used.

5. Descriptive statistics

Comparing results from two items.

- Item used to identify the sport a New Zealand high-performance adult athlete competes in (33 conditions).
- Item used to identify the level of intention a New Zealand high-performance adult athlete has to use regulated breathing as a mental skills tool inside of competition.

Statistics being used and how they are displayed:

Number of participants.

Mean: The mean will be separate for each sport to identify the differences between the sports the sample competes in. The results will be displayed as a number from 1 → 5 with 1= strongly disagree and 5= strongly agree. These results will be present in a table format.

Also in the table will be the standard deviation of the data. The standard deviation of the data will be taken and interpreted as how much a participant differs from the group mean.

6. IVs: Instrumental and experiential attitudes, descriptive and injunctive norms, and capacity and autonomy components that relate to practising regulated breathing as a training routine.

DV: Level of intention a New Zealand high-performance adult athlete has to practice regulated breathing in a training routine.

Statistical Techniques: Multiple Regression Analysis.

Included in this multiple regression analysis is:

- Descriptive statistics: Mean, standard deviation (SD), number of observations.
- F Ratio: If the F ratio is larger than 1, this is a good model.
- R: identify the correlation between the IVs and DV.
- R^2: To identify the variance explained by this model.
- Adjusted R^2: Steins equation will be used to identify the variance explained by this model if it was applied with a different sample of New Zealand high-performance adult athletes.
- Unstandardised B and standard error: The relationship between each IV and the DV (Unstandardised B), and how that varies across samples of New Zealand high-performance adult athletes.
- T-statistic: Identifying the contribution made from each IV on the model.
- Standardised Beta: Allows the comparison of change between IV’s on the DV to identify each IV’s importance in the model.

- Significance level:
    - Hypothesis 6a will be considered to be supported if the coefficient for instrumental attitudes is positive and has $p < 0.05$ (when controlling for the effects of the other five IVs).
    - Hypothesis 6b will be considered to be supported if the coefficient for experiential attitudes is positive and has $p < 0.05$ (when controlling for the effects of the other five IVs).
    - Hypothesis 6c will be considered to be supported if the coefficient for descriptive norms is positive and has $p < 0.05$ (when controlling for the effects of the other five IVs).
    - Hypothesis 6d will be considered to be supported if the coefficient for injunctive norms is positive and has $p < 0.05$ (when controlling for the effects of the other five IVs).
    - Hypothesis 6e will be considered to be supported if the coefficient for capacity is positive and has $p < 0.05$ (when controlling for the effects of the other five IVs).
    - Hypothesis 6f will be considered to be supported if the coefficient for autonomy is positive and has $p < 0.05$ (when controlling for the effects of the other five IVs).

7. IVs: Instrumental and experiential attitudes, descriptive and injunctive norms, and capacity and autonomy components that relate to the use of regulated breathing as a mental skills tool inside of competition.

DV: Level of intention a New Zealand high-performance adult athlete has to use regulated breathing inside of competition as a mental skills tool.

Statistical Techniques: Multiple Regression Analysis.
Included in this multiple regression analysis is:

- Descriptive statistics: Mean, standard deviation (SD), number of observations.
- F Ratio: If the F ratio is larger than 1, this is a good model.
- R: identify the correlation between the IVs and DV.
- R^2: To identify the variance explained by this model.
- Adjusted R^2: Steins equation will be used to identify the variance explained by this model if it was applied with a different sample of New Zealand high-performance adult athletes.
- Unstandardised B and standard error: The relationship between each IV and the DV (Unstandardised B), and how that varies across samples of New Zealand high-performance adult athletes.
- T-statistic: Identifying the contribution made from each IV on the model.
- Standardised Beta: Allows the comparison of change between IV's on the DV to identify each IV's importance in the model.
- Significance level:
    - Hypothesis 7a will be considered to be supported if the coefficient for instrumental attitudes is positive and has $p < 0.05$ (when controlling for the effects of the other five IVs).

- Hypothesis 7b will be considered to be supported if the coefficient for experiential attitudes is positive and has $p < 0.05$ (when controlling for the effects of the other five IVs).
- Hypothesis 7c will be considered to be supported if the coefficient for descriptive norms is positive and has $p < 0.05$ (when controlling for the effects of the other five IVs).
- Hypothesis 7d will be considered to be supported if the coefficient for injunctive norms is positive and has $p < 0.05$ (when controlling for the effects of the other five IVs).
- Hypothesis 7e will be considered to be supported if the coefficient for capacity is positive and has $p < 0.05$ (when controlling for the effects of the other five IVs).
- Hypothesis 7f will be considered to be supported if the coefficient for autonomy is positive and has $p < 0.05$ (when controlling for the effects of the other five IVs).

How the analysis of assumptions is carried out:
I will report exploratory analyses of distributional assumptions, but I will not change my analysis methods based on the results of these assumption checks.
Recommended elements
Specify contingencies and assumptions, such as:

6. Method of correction for multiple tests.
7. The method of missing data handling (e.g., pairwise or listwise deletion, imputation, interpolation).
   Missing data will be handled by:
   - Expectation Maximization.
   - Excluding participants if they do not provide any data for any of the independent or dependent variables.
8. Reliability criteria for item inclusion in scale.
   N/A
9. Anticipated data transformations.
10. Assumptions of analyses, and plans for alternative/corrected analyses if each assumption is violated.

Optionally, upload any files here that are related to your analyses (e.g., syntaxes, scripts, etc.).
Answer the following final questions:
Has data collection begun for this project?

- No, data collection has not begun.
- Yes, data collection is underway or complete

If data collection has begun, have you looked at the data?

- Yes
- No

The (estimated) start and end dates for this project are (optional):
31st July 2018- 31st August 2018.
Any additional comments before I pre-register this project (optional):
Actual start date and projected finish date:
1st August 2018 - 31st August 2018

Appendix F: Assumption Checks

- Assumption checks on the model used to test hypothesis one.
- Assumption checks on the model used to answer research question three.
- Assumption checks on the model used to answer research question four.
- Assumption checks on the model used to answer research question six.
- Assumption checks on the model used to answer research question seven.

Assumption checks on the model used to test hypothesis one:

The distributional assumptions of the independent sample *t*-test were checked. First, normal Q-Q plots are used to identify normality in the error terms (Field, 2013). The normal Q-Q plot shows evidence that the plots of residuals from the *t*-test were approximately normally distributed (see Figure 5). Second, there was limited evidence of heterogeneity of variance as the Levene's test was not significant (F = .39, p = .532).

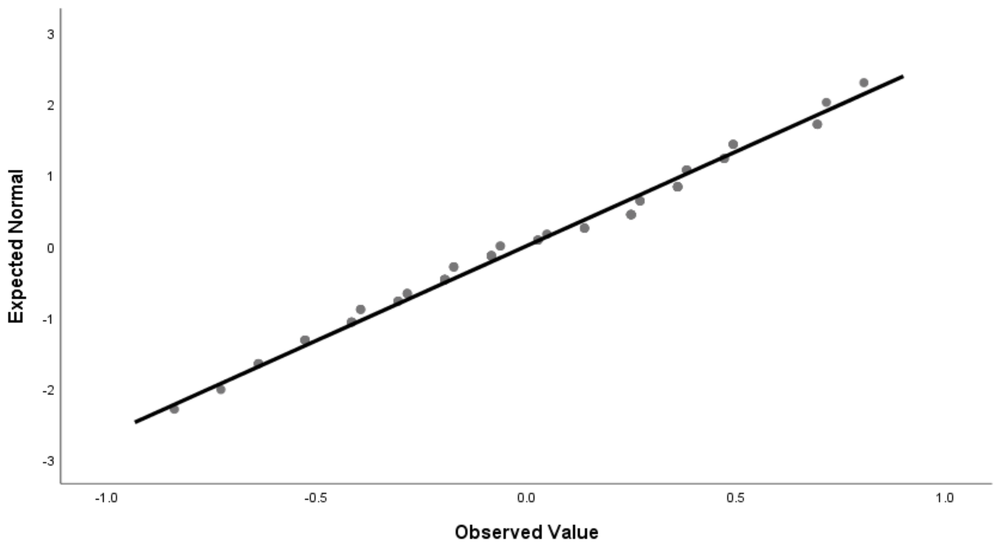

Figure 5. Normal Q-Q plot of residuals from the *t*-test used to test hypothesis one.

Note: Dependent variable: short dispositional flow scale.

Assumption checks on the model used to answer research question three:

The distributional assumptions of the one-way ANOVA used in research question three were checked. First, there was limited evidence for heterogeneity of variance as the Levene's statistic was not significant (p = .774). Second, a normal Q-Q plot of residuals in the one-way ANOVA used to answer research question three showed evidence of residuals having slight kurtosis (see Figure 6). However, Gelman and Hill (2007) state in their book 'Data Analysis Using Regression and Multilevel/ Hierarchical Models' the assumption of normality is generally the least important assumption of multiple regression; Gelman and Hill do not even recommend using diagnostic tests to identify normality. Because of Gelman and Hill's recommendations, evidence of residuals having slight kurtosis from the one-way ANOVA model used to answer research question three is not applied further.

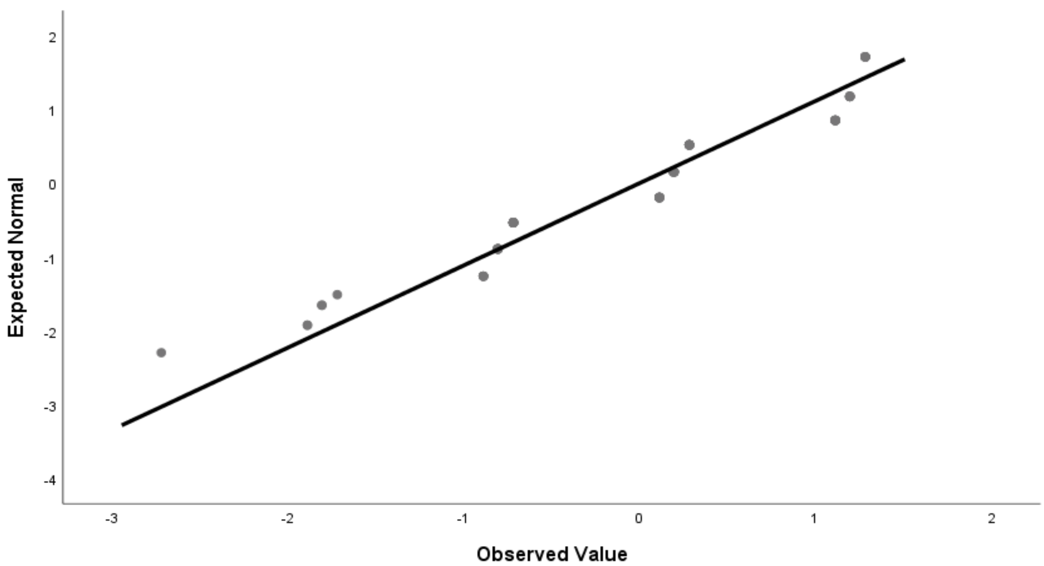

Figure 6. Normal Q-Q plot of residuals from the one-way ANOVA model used to answer research question three.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to practice regulated breathing in a training routine.

Assumption checks used to test the model used to answer research question four:

The distributional assumptions of the one-way ANOVA used to answer research question four were checked. First, there was limited evidence of heterogeneity of variances as the Levene's statistic was not significant (*p* = .127). Second, a normal Q-Q plot of residuals from the one-way ANOVA model used to answer research question four showed evidence of residuals having slight kurtosis (see Figure 7). Gelman and Hill (2007) do not recommend using diagnostics tests to identify normality; because of Gelman and Hill's recommendations, the evidence of residuals from the one-way ANOVA model having slight kurtosis is not applied further.

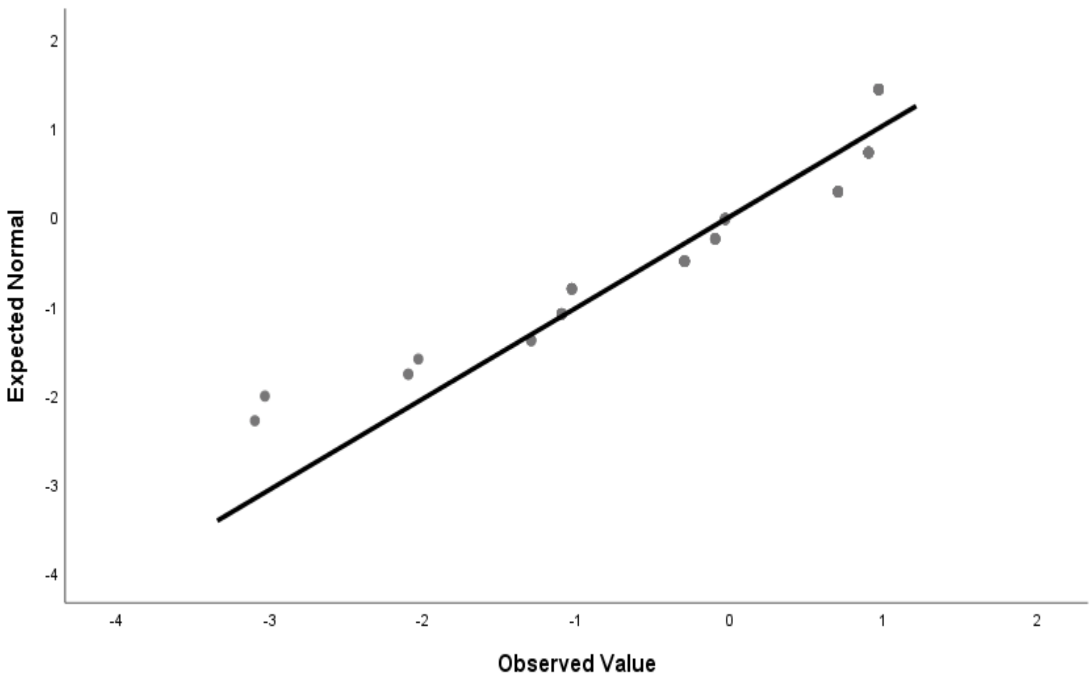

Figure 7. Normal Q-Q plot of residuals from the one-way ANOVA model used to answer research question four.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to use regulated breathing inside of competition as a mental skills tool.

Assumption checks on the model used to answer research question six:

The distributional assumptions of the multiple linear regression used in research question six were checked. The regression standardised residuals against the regression standardised predicted values scatter plot showed evidence of intentions to practice regulated breathing in a training routine being linearly related to all RAA components associated with practising regulated breathing in a training routine (see Figure 8). Figure 8 also showed some evidence of standardised residuals being affected by slight heterogeneity of variances (evidence of standardised residuals changing or having a slight systematic relationship with the standardised predicted value by funnelling to both sides). Finally, the normal P-P plot of regression standardised residuals in the model used to answer research question six showed some evidence of residuals being skewed (S shape produced by residuals when compared to the perfect normal distribution; see Figure 9). Because assumption checks on the model used to answer research question six were based on the researcher's interpretation of graphs, certainty is not guaranteed.

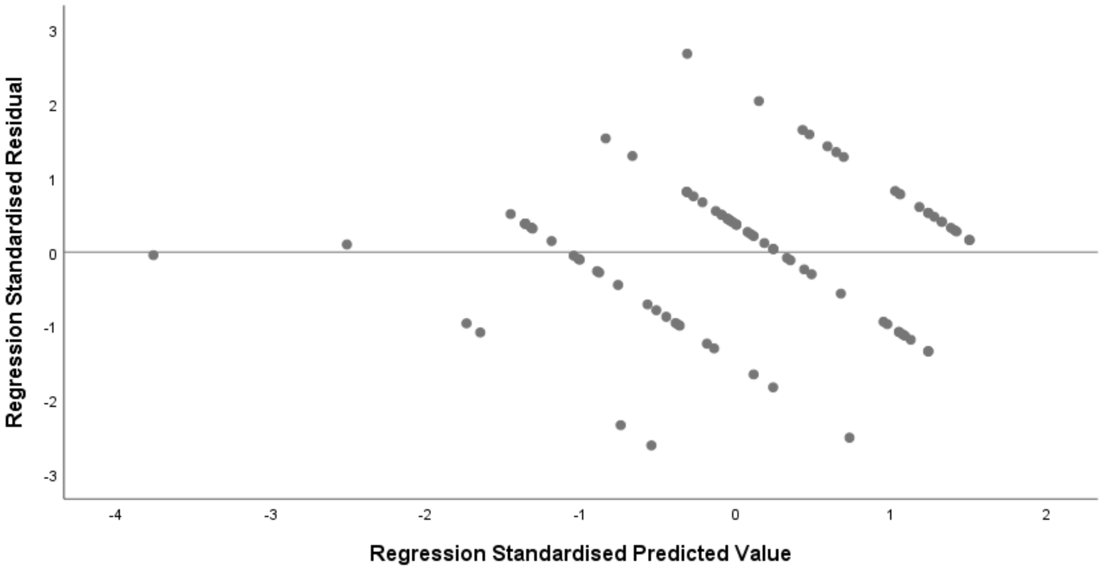

Figure 8. Regression standardised residuals against regression standardised predicted values for intention to practice regulated breathing in a training routine.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to practice regulated breathing in a training routine.

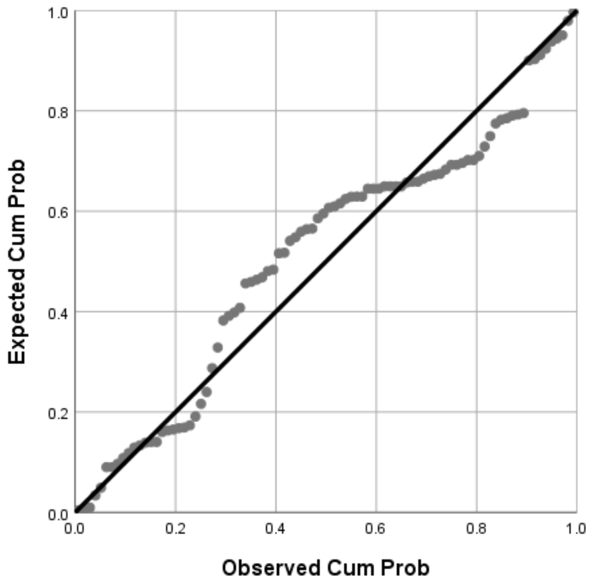

Figure 9. Normal P-P plot of the regression standardised residuals from the multiple linear regression model used to answer research question six.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to practice regulated breathing in a training routine.

Assumption checks on the model used to answer research question seven:

The distributional assumptions of the multiple linear regression used in research question seven were checked. The regression standardised residuals against the regression standardised predicted value scatter plot showed evidence of intentions to use regulated breathing as a mental skills tool during competition being linearly related to all RAA components associated with using regulated breathing as a mental skills tool during competition (see Figure 10). Figure 10 also shows evidence of standardised residuals having slight heterogeneity of variance as there is some evidence of standardised residuals changing or having a slight systematic relationship with the standardised predicted values (residuals narrowing to one end of the scatterplot). Finally, a normal P-P plot of the regression standardised residuals in the model used to answer research question seven shows evidence of major skewness being present as residuals are shaped like an 'S' around the line of the perfect normal distribution (see Figure 11). Because assumption checks on the model used to answer research question seven were based on the researcher's interpretation of graphs, certainty is not guaranteed.

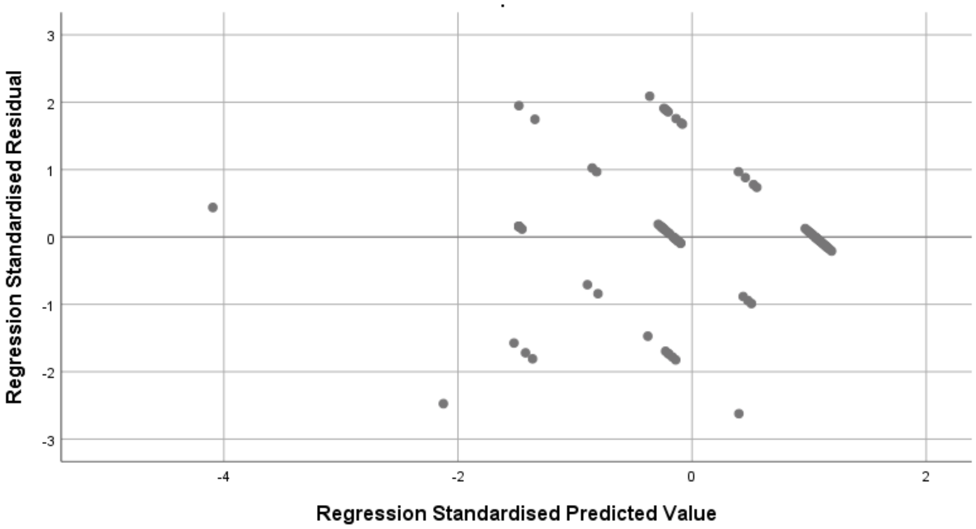

Figure 10. Regression standardised residuals against regression standardised predicted values for intention to use regulated breathing as a mental skills tool during competition.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to use regulated breathing inside of competition as a mental skills tool.

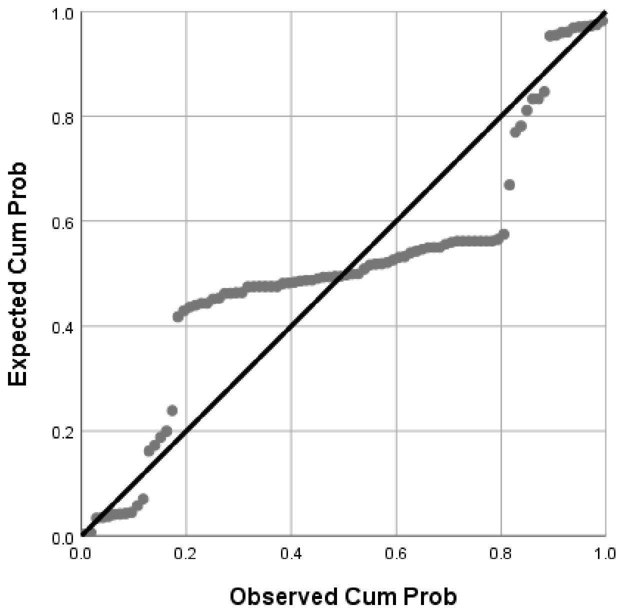

Figure 11. Normal P-P plot of the regression standardised residuals from the multiple linear regression model used to answer research question seven.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to use regulated breathing inside of competition as a mental skills tool.

Appendix G: Other Checks Associated with Linear Regression

- Box plot on data used to test hypothesis one.
- Box plot on data used to answer research question three.
- Box plot on data used to answer research question four.
- Multicollinearity checks and partial regression plots on data used to answer research question six.
- Multicollinearity checks and partial regression plots on data used to answer research question seven.

Rules for outlier and multicollinearity checks.

Outliers and multicollinearity are problems of multiple linear regression models (Williams, Grajales, & Kurkiewicz, 2013). Outlier checks were not necessary for the current research as the pre-registration for the current research project stated 'N/A' in the data-based outlier criteria (see Appendix E) as scores should not be outside the range of the Likert or rating scales. Although no immediate apparent outlying cases were identified using box plots or partial regression plots, box plots and partial regression plots were included only for the reader's interest.

Problematic levels of multicollinearity were checked using Pearson's correlations and variance inflation factors (VIF). Correlations above .80 between independent variables are considered a rough indicator of problematic levels of multicollinearity (Field, 2013); VIF values below five or ten means there are low levels of multicollinearity (Belsley, Kuh, & Welsch, 1980).

Box plot on data used to test hypothesis one:

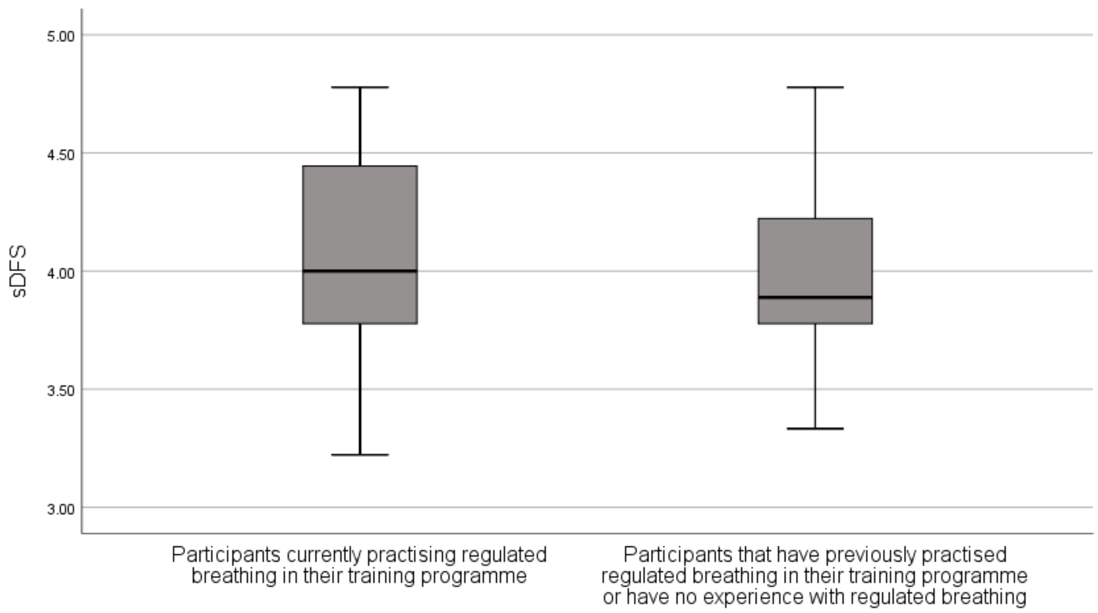

Figure 12. Box plot on data used to test hypothesis one.

Note: sDFS = short dispositional flow scale.

Box plot on data used to answer research question three:

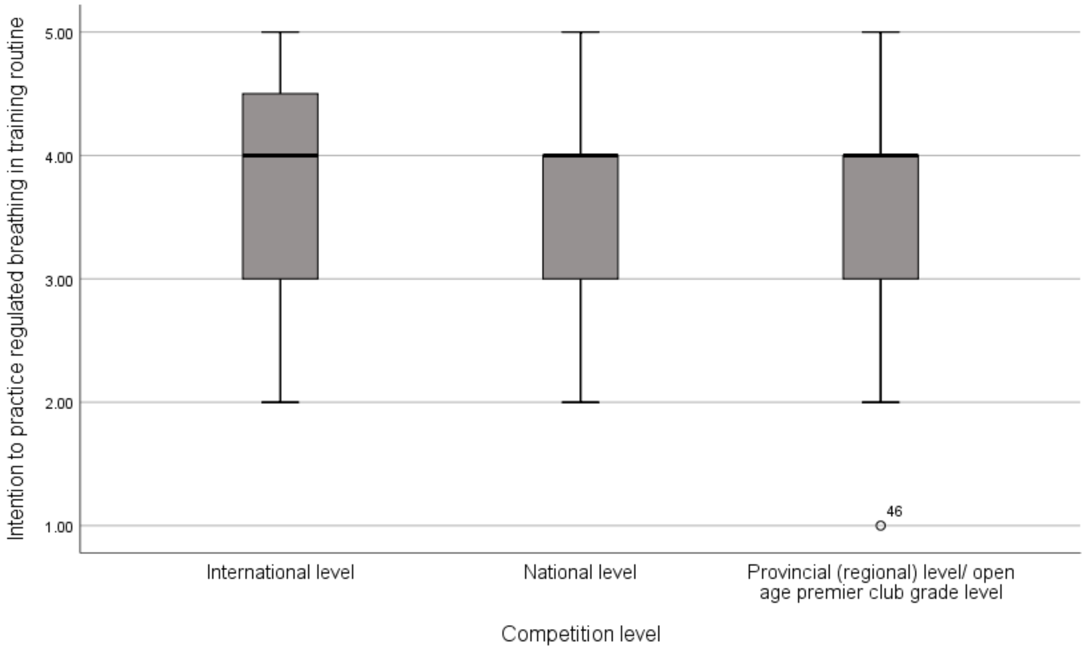

Figure 13. Box plot on data used to answer research question three.

Box plot on data used to answer research question four:

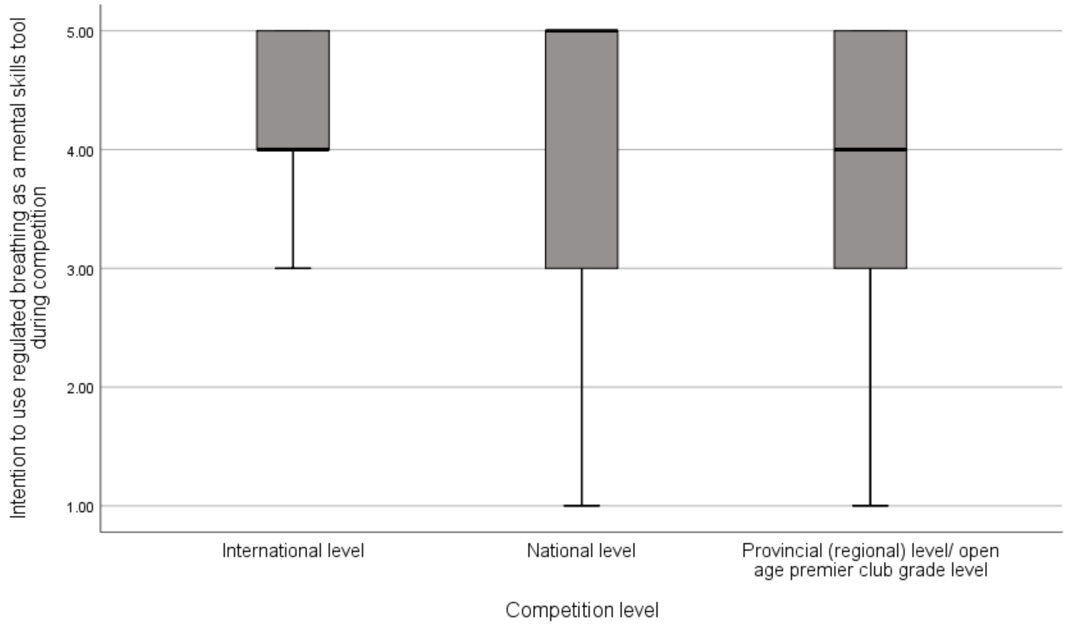

Figure 14. Box plot on data used to answer research question four.

Multicollinearity checks and partial regression plots on data used to answer research question six:

Multicollinearity in the data used to answer research question six and sub-hypotheses 6. a - f were checked. Multicollinearity was checked using Pearson's correlations and the VIF. Correlations above .80 between independent variables are considered a rough indicator of problematic levels of multicollinearity (Field, 2013). When checking Pearson's correlations (see Table 6), it is suggested there were no problematic levels of multicollinearity present between independent variables as no correlations were above .80. VIF was also used as a secondary test to identify problematic levels of multicollinearity. A VIF value lower than five or ten means there are low levels of multicollinearity (Belsley et al., 1980). Table 7 shows the largest and closest VIF value to five was 1.692, again suggesting minimal problematic levels of multicollinearity being present between the independent variables.

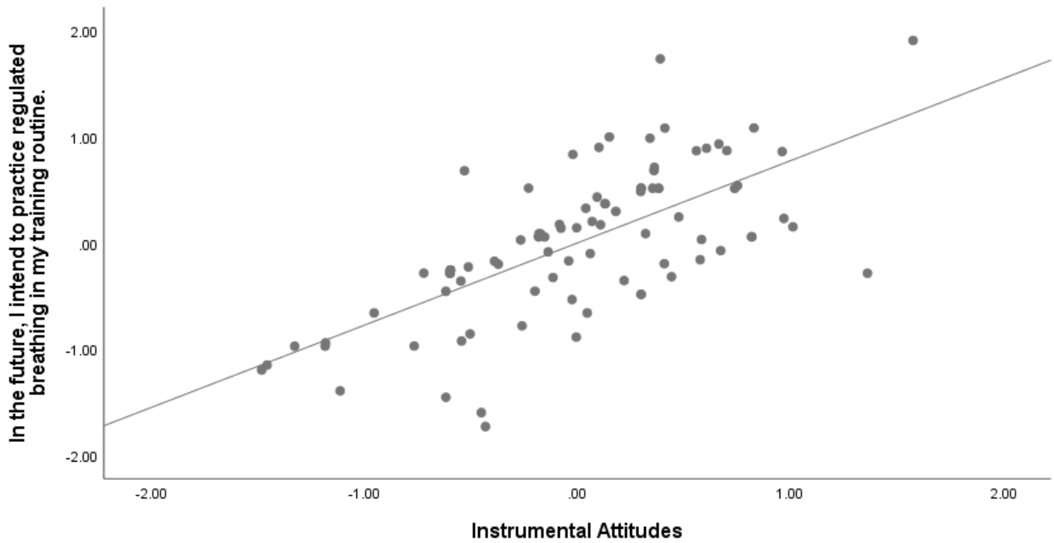

Figure 15. Partial regression plot of instrumental attitudes against the dependent variable in the multiple linear regression model used to answer research question six.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to practice regulated breathing in a training routine.

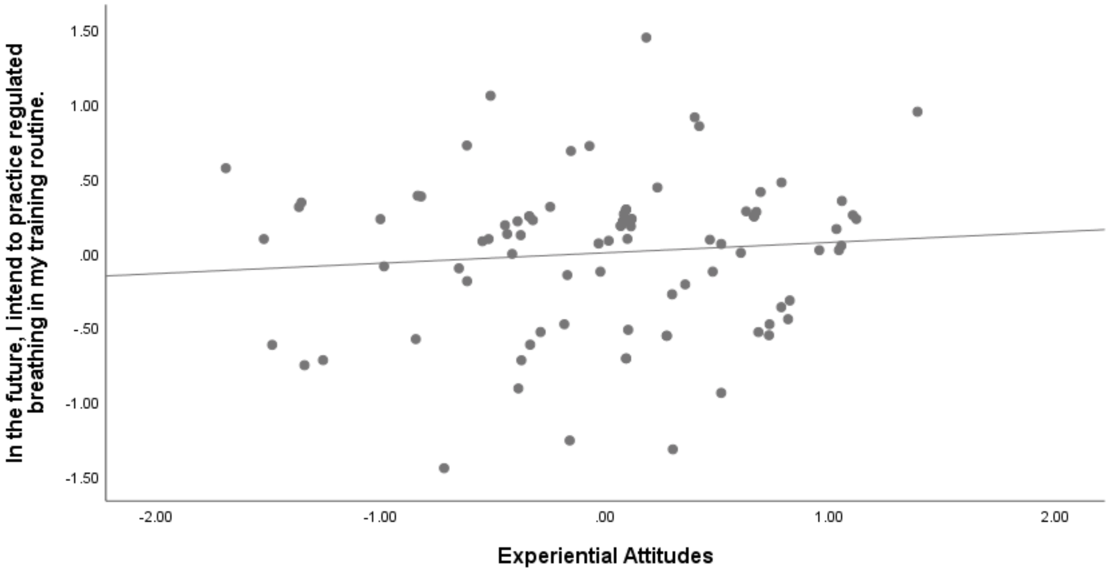

Figure 16. Partial regression plot of experiential attitudes against the dependent variable in the multiple linear regression model used to answer research question six.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to practice regulated breathing in a training routine.

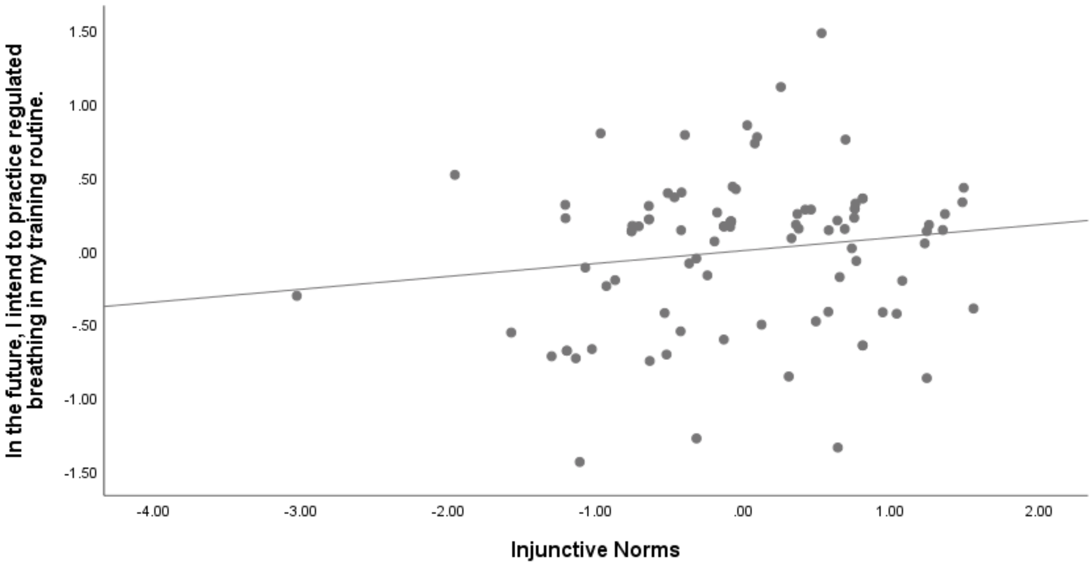

Figure 17. Partial regression plot of injunctive norms against the dependent variable in the multiple linear regression model used to answer research question six.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to practice regulated breathing in a training routine.

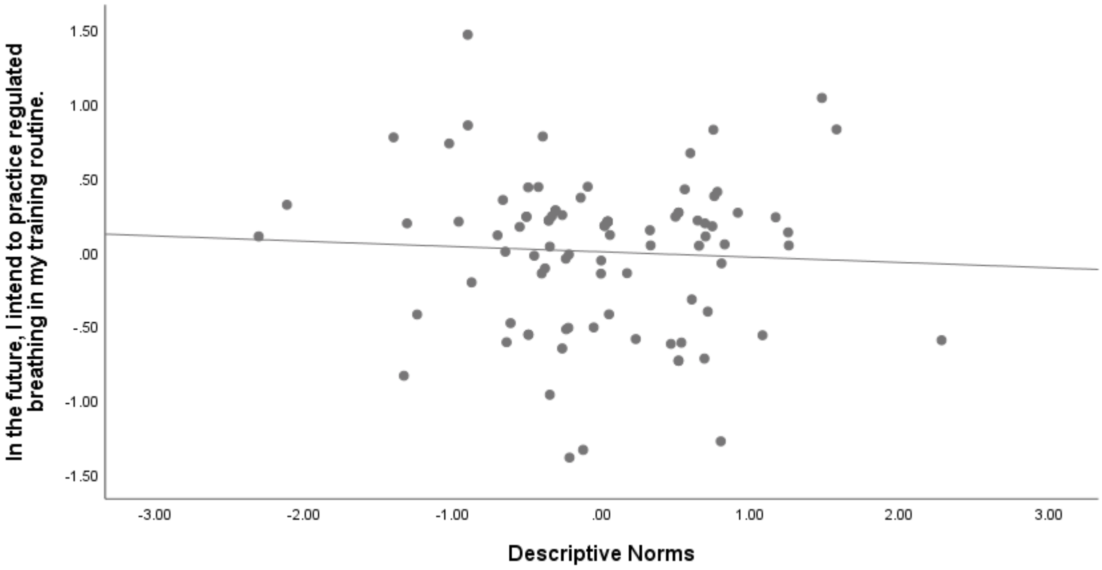

Figure 18. Partial regression plot of descriptive norms against the dependent variable in the multiple linear regression model used to answer research question six.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to practice regulated breathing in a training routine.

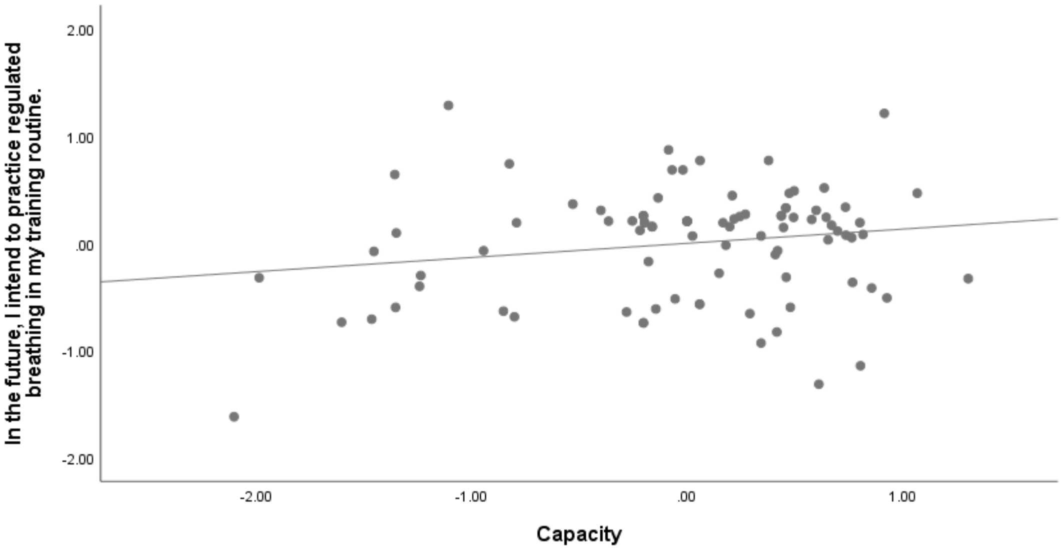

Figure 19. Partial regression plot of participants capacity against the dependent variable in the multiple linear regression model used to answer research question six.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to practice regulated breathing in a training routine.

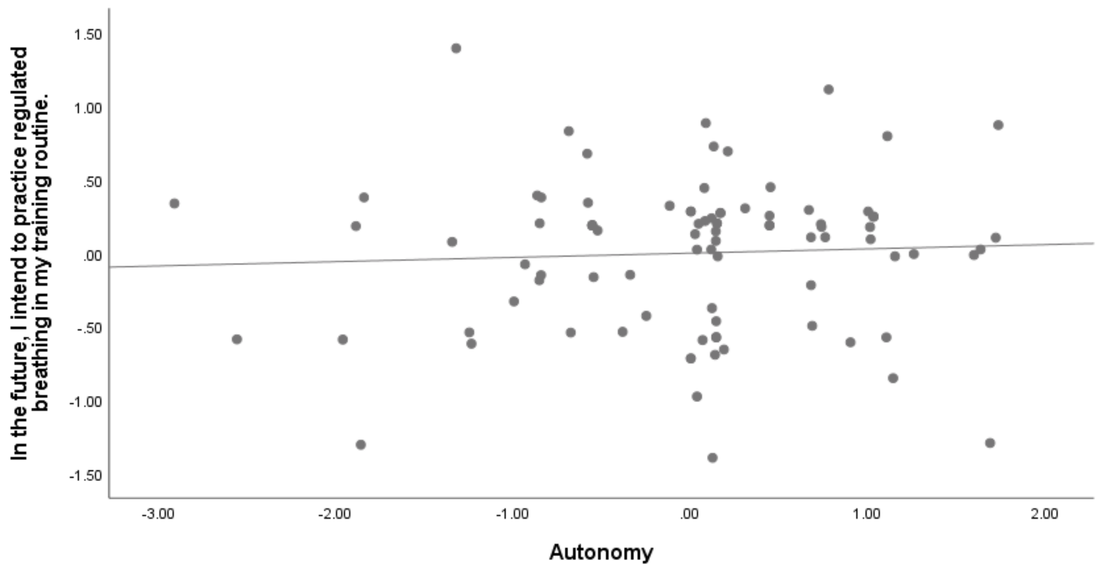

Figure 20. Partial regression plot of participants autonomy against the dependent variable in the multiple linear regression model used to answer research question six.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to practice regulated breathing in a training routine.

Multicollinearity checks and partial regression plots on data used to answer research question seven:

Multicollinearity checks were completed on the data used to answer research question seven and sub-hypotheses 7. a - f. Multicollinearity was checked using Pearson's correlations and the VIF. When checking Pearson's correlations (see Table 8), it is suggested there were no problematic levels of multicollinearity present between independent variables as no correlations were above .80. Correlations above .80 between independent variables are considered a rough indicator of problematic levels of multicollinearity (Field, 2013). VIF was used as a secondary test to identify problematic levels of multicollinearity between the independent variables. VIF values below five or ten means there are low levels of multicollinearity (Belsley et al., 1980). Table 9 shows 1.992 was the largest and closest VIF value to five, again suggesting minimal problematic levels of multicollinearity being present between the independent variables.

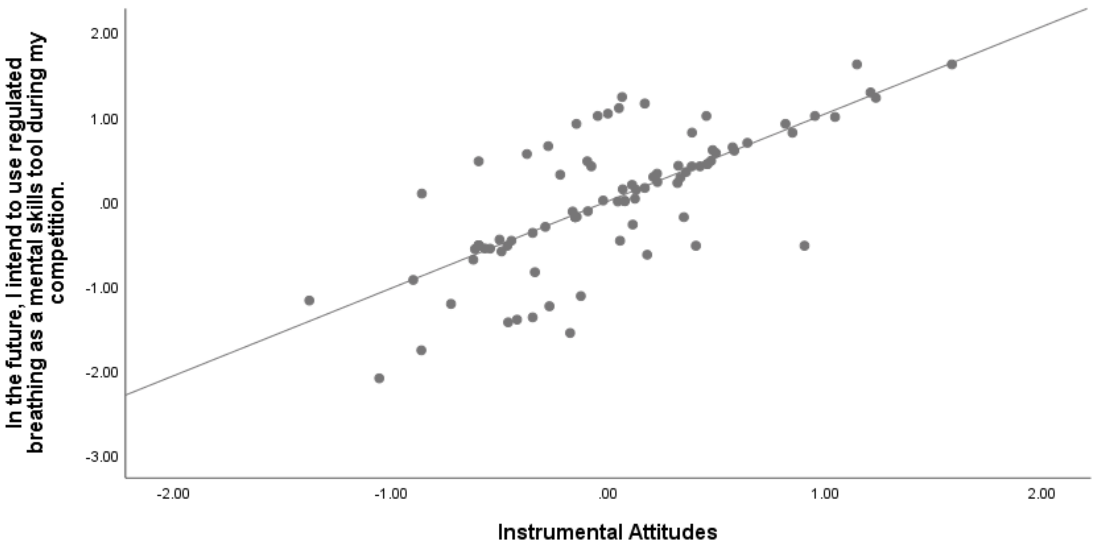

Figure 21. Partial regression plot of instrumental attitudes against the dependent variable in the multiple linear regression model used to answer research question seven.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to use regulated breathing inside of competition as a mental skills tool.

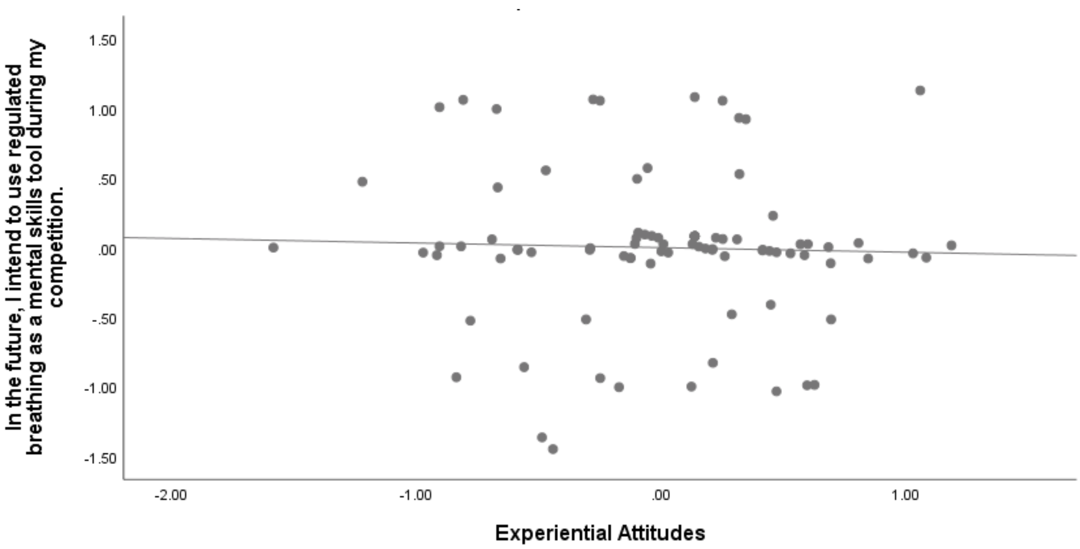

Figure 22. Partial regression plot of experiential attitudes against the dependent variable in the multiple linear regression model used to answer research question seven.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to use regulated breathing inside of competition as a mental skills tool.

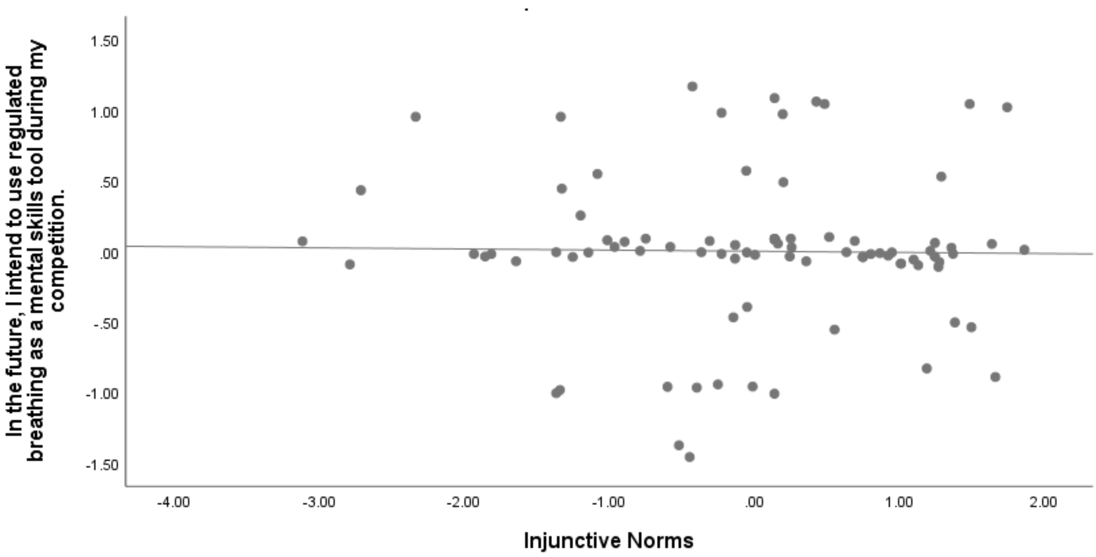

Figure 23. Partial regression plot of injunctive norms against the dependent variable in the multiple linear regression model used to answer research question seven.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to use regulated breathing inside of competition as a mental skills tool.

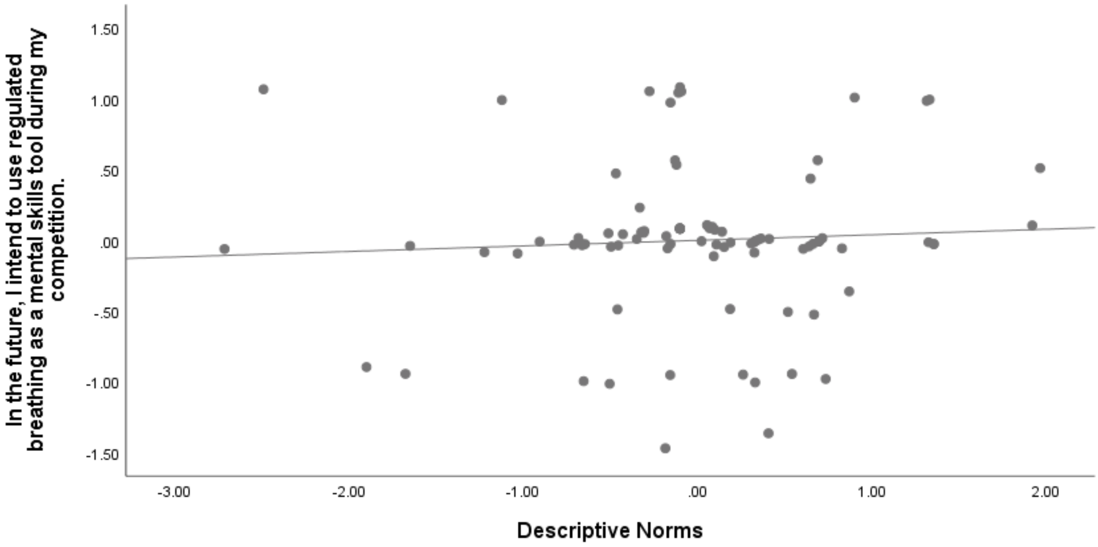

Figure 24. Partial regression plot of descriptive norms against the dependent variable in the multiple linear regression model used to answer research question seven.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to use regulated breathing inside of competition as a mental skills tool.

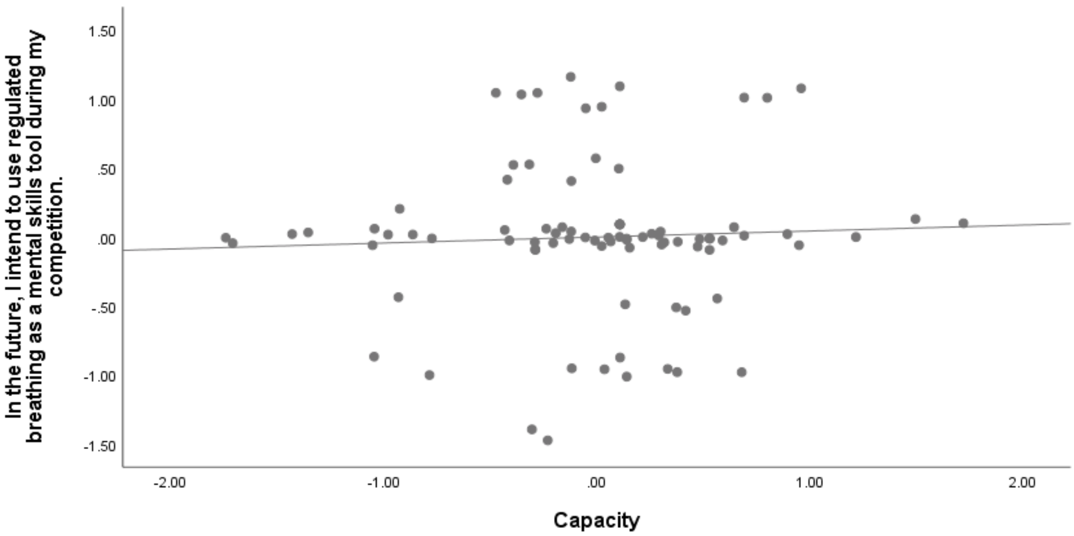

Figure 25. Partial regression plot of participants capacity against the dependent variable in the multiple linear regression model used to answer research question seven.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to use regulated breathing inside of competition as a mental skills tool.

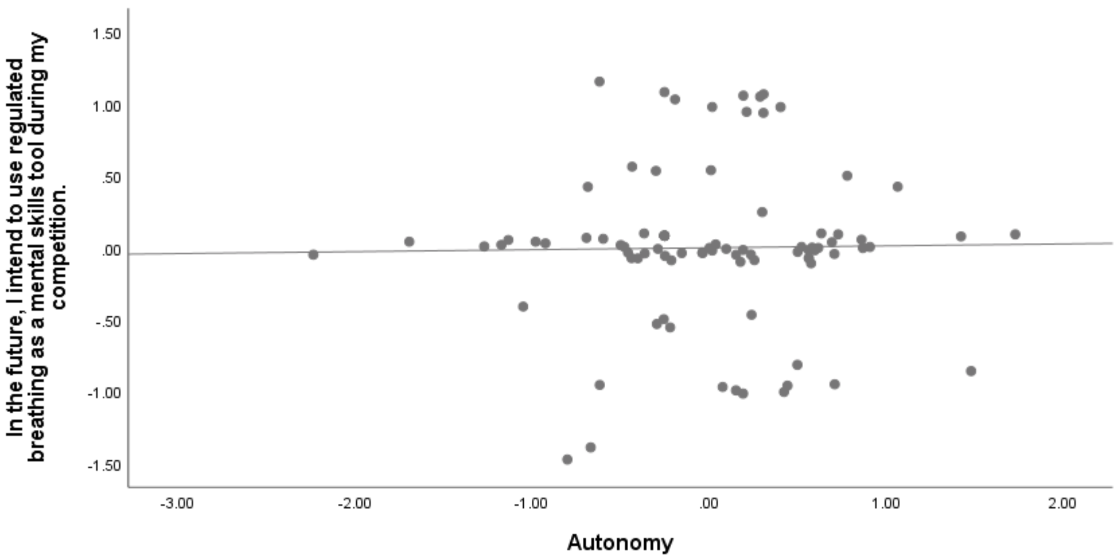

Figure 26. Partial regression plot of participants autonomy against the dependent variable in the multiple linear regression model used to answer research question seven.

Note: Dependent variable: Level of intention a New Zealand high-performance adult athlete has to use regulated breathing inside of competition as a mental skills tool.