External sources of health value produce greater negative impacts of high BMI on quality of life for women with pelvic-floor dysfunction

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Short title: BMI and QoL

Cite as: Osborne, L.A., Reed, P., Emery, S., & Whittall, C.M. (2025). External sources of health value produce greater negative impacts of high BMI on quality of life for women with pelvic-floor dysfunction. *Journal of Women's Pelvic Health & Physical Therapy*.

Abstract

The current study examined the relationship between pelvic-floor dysfunction (PFMD), Body Mass Index (BMI), quality of life (QoL), and health values to assess whether BMI and health values mediated and moderated the impact of PFMD symptoms on quality of life. 242 adult female patients (mean age = 55) consecutively referred to a hospital for outpatient physiotherapy treatment agreed to participate. They completed questionnaires relating their PFMD symptoms (Queensland), QoL (EQ5D), health values (Personal Values Questionnaire; PVQ), and their BMI was calculated. There were negative impacts of PFMD symptoms on QoL. BMI mediated the relationship between PFMD and QoL; higher BMI exacerbating the negative impact of PFMD on QoL. The impact of BMI was moderated by individuals' sensitivity to health values held to please others. There was no such moderating relationship of internally-held health values (although these values did impact the PFMD-BMI relationship). These data suggest that the relationship between PFMD symptoms and QoL is complex, and psychological support, tailored to an individual's needs, may be helpful in treating this complex and pervasive disorder.

Keywords; pelvic-floor muscle dysfunction; quality of life; weight; internal and external health values; mediation; moderation.

Declarations

Conflict of Interest: None declared.

Funding: There were no sources of funding

Ethical Approval: The study was organized jointly by the NHS hospital and a research group at the university. Ethical approval was granted to this study by the NRES Committee Region - East Midlands, UK (13/EM/0314). The trial was registered on clinicaltrials.gov (NCT02549157). All participants gave written informed consent for the participation, and the study adhered to the Helsinki agreements. The data from the participants recruited for this study have not previously been reported.

Artificial Intelligence (Ai) Authoring Tools. There were none.

Approximately 25% of all women experience symptoms of pelvic-floor muscle dysfunction (PFMD),[1] including stress and urge urinary incontinence, bowel incontinence, prolapse, and sexual dysfunction.[2] Women reporting PFMD symptoms also report poorer quality of life (QoL),[3,4] and report that treatments for PFMD can improve their QoL.[3,5] Taking subjective measures of PFMD symptoms and QoL, both in assessments of the condition, and in treatment outcome-effectiveness studies, is recommended by the International Continence Society[6] and the UK National institute for Health and Care Excellence.[7] PFMD also is associated with a range of factors like obesity,[8,9] which is often thought to be an important predictor for PFMD symptoms and treatment.[7,8] Obesity can negatively impact QoL.[10] It is currently unknown how obesity combines with PFMD symptoms to impact patient-rated QoL for this condition. As patient ratings of QoL and symptoms are increasingly utilized to assess PFMD and its treatment, the potentially complex interactions of such ratings with subjective assessments of additional issues, like obesity, requires investigation.

Prevalence of PFMD increases for those who are obese.[8,9,11] Although obesity is associated with PFMD, the exact manner through which obesity impacts subjective ratings of QoL for patients with PFMD is unclear.[12] Compared to those with a lower Body Mass Index (BMI), obese patients report having a lower QoL.[10,13,14] Given both PFMD and BMI are associated with lower QoL, it may be that BMI serves to mediate the relationship between PFMD symptoms and patient-reported QoL. Certainly, obesity has been found to mediate relationships between other health conditions and QoL,[15] and reducing weight sometimes, but not always, improves patient-reported PFMD symptoms.[11,16] Given these considerations, the current study investigated the relationship between PFMD, BMI, and QoL.

The potential for psychological factors to affect the manner in which BMI impacts QoL can be observed when considering weight loss programs, which are sometimes

recommended to women with PFMD.[7] Although they can be effective, weight-loss programs do not always produce a desired outcome for wide variety of reasons.[17] Recent work has identified that weight loss programs are affected by the nature of patients' health values; i.e. whether they are held for reasons connected to the self ('internal' reasons), or for reasons connected to others ('external' reasons). Placing responsibility primarily on the individual for their weight control (attempting to foster internal health values) can be counterproductive,[18] and, in turn, can lead to a sense of shame/failure[19] that can reduce ratings of QoL.[20] In fact, it is known that the health values held by a patient also impact their ratings of PFMD symptoms, and may lead to patients reporting symptoms differentially from one another, even when there is little or no objective difference in those aspects of the condition.[21] These findings suggest that the nature of the health values held by the patient may impact patients' assessments of their own conditions and QoL.

It may be that health values moderate the relationship between PFMD, BMI, and QoL. While it is generally believed that promoting internally-held health values, that is, valuing health for the individuals' own sake, is positively correlated with treatment outcomes.[22] It may be, in the context of weight loss, that internally-held health values may be detrimental when BMI is high, as having such internal health values may cause a patient to overstress the importance of any symptoms as they are important to their core values. In contrast, placing importance on others' perceptions (externally held values) may cause a patient to reduce their ratings of their QoL due to higher weight, possibly due to shame or guilt.[18,19]

Given these myriad possibilities regarding the relationship between PFMD, QoL, health values, and BMI, the current cross-sectional observational study examined three specific hypotheses derived from the existent literature that have received little, if any, direct investigation for this population. Firstly, that there will be a positive correlation between

patients' ratings of PFMD and their BMI, and both will be negatively related to QoL. Secondly, BMI will mediate the relationship between PFMD and QoL. Thirdly, the BMI-mediated relationship between PFMD and QoL will be moderated by health values, such that the negative impact of higher BMI on the negative PFMD-QoL relationship will be worse for those with higher health values, especially those who are sensitive to externally held health values. To assess this relationship, a moderated mediation analysis, examining the following model was adopted.

Figure 1 about here

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Method

Participants

Two-hundred and forty-two adult female patients consecutively referred to a hospital for outpatient Urogynaecology physiotherapy treatment for pelvic floor dysfunction were invited, and all agreed to participate. The patients were referred from May, 2017, to July, 2019, from a variety of sources, who used a mixture of different techniques during diagnosis (e.g., some used urodynamics, and some did not). Patients referred for third- and fourth-degree perineal tears, post-operative rehabilitation, or other urogynaecology indications, were excluded from the study, as their treatment pathway was typically different from patients with PFMD. The mean age of the participants was 53.04 (SD±12·94, range = 25–86) years, and their mean BMI was 29.94 (±6.62; range = 19-62.90). The analysis plan was to use correlations and moderated mediation analysis to identify the relationships between the variables. Power calculations suggest that, expecting a medium effect size (*f'*=0·25), and

using an alpha level of $p<0{\cdot}05$, then, for 95% power, , a minimum sample size of 119 would be needed.

The study was organized jointly by the NHS hospital and a research group at the university. Ethical approval was granted to this study by the NRES Committee Region - East Midlands, UK (13/EM/0314). The trial was registered on clinicaltrials.gov (NCT02549157). All participants gave written informed consent for the participation, and the study adhered to the Helsinki agreements. The data from the participants recruited for this study have not previously been reported.

Materials

Queensland Pelvic Floor Questionnaire[24] is a self-administered female pelvic floor questionnaire. Sections relate to bladder dysfunction, bowel dysfunction, prolapse, and sexual dysfunction, each producing a score from 0–10, the sum gives overall pelvic floor dysfunction (0–40). Greater scores represent worse function. The internal reliability of the scales (Cronbach α) range between 0.72 and $0{\cdot}95$,[24] and α for overall scale for the present sample was 0.86 (there were no items that could be deleted to improve this value).

Personal Values Questionnaire (PVQ-II)[24] is a self-completed measure of patient values, often used in psychotherapy[25] and physiotherapy context.[22] The full-scale measures nine domains of values: Family Relationships; Friendships/Social Relationships; Couples/Romantic Relationships; Work/Career; Education-Schooling/Personal Growth and Development; Recreation/Leisure/Sport; Spirituality/Religion; Community/Citizenship; and Health/Physical Well-Being. Each domain measures the strength to which the value is held, as well as the manner (for internal or external reasons), and each domain can be assessed independently. There are three subscales for each domain (Intrinsically-held Value; Aversively-controlled Value; and Value-related Behavior). 'Intrinsically-held' represents the

individual's own commitment to the value; 'Aversively-controlled' reflects the degree of external regulation of the value; and 'Value-behavior' measures the degree to which the value is acted upon. For the current study, the health value section was used, which asks nine questions, each rated on a five-point scale. The PVQ–II has acceptable internal consistency (α = 0·71–0·80).[25] In the current sample, the internal consistency (α) of the overall scale was 0.84, and that of the subscales was: Intrinsic=0·84; Aversive=0·90; and Behavior=0·55.

EuroQol-5 Dimensional Questionnaire (EQ-5D)[26] is a measure of the impacts of disease on various aspects of health. There are 5 Likert-type, questions addressing the patient's state on the day of assessment, and an overall rating of health (0-100). A utility index between 0 (dead) and 1 (perfect health) can be calculated based on the responses. It has test-retest reliability of .80.[27]

Procedure

The patients with PFMD were referred to an outpatient physiotherapy, at a metropolitan hospital, by a range of health practitioners: General Practitioners, consultants/registrars, and continence nurses, who had made the clinical diagnoses. The study was conducted from May, 2017, to July, 2019. The referred patients were placed on a waiting list for the hospital outpatient pelvic-floor muscle training (PFMT) service, and were invited to attend the first group session of an available set of PFMT classes. At the start of this intervention, at the clinic prior to their first session, participants completed the questionnaires to assess their subjective view of their pelvic-floor problems (Queensland), their health values (PVQ), and their quality of life (EQ5D). Patients completed the questionnaires in the presence of a researcher, and could ask for help if they needed this (which reduced the amount of missing data to minimal amounts). Data relating to other demographic characteristics (e.g., age, BMI) were collected from the participants.

Data analysis

The relationships between PFMD symptoms, BMI, and EQ5D, were assessed using Pearson's correlations. The hypothesized moderated mediation model (see Figure 1) was tested using a bootstrapping approach[28] to assess the significance of the mediation effects at the differing levels of the moderator (different aspects of the health values). Pelvic-floor symptoms was the predictor variable, the outcome variable was QoL, and BMI was the mediator. The effect of having lower or higher scores for: (1) health behavior; (2) internally-held health values; and (3) externally-held health values, as the proposed moderators, were tested in three separate moderated mediation analyses (one analysis for each of the three PVQ scores). The PROCESS macro, model 59, v2.16[28] in the Statistical Package for the Social Sciences (SPSS) v.26, with bias-corrected 95% confidence intervals (n=10,000) was used to test the significance of the BMI-mediated effects (i.e. the indirect effects of PFMD on BMI) when moderated by health values (i.e. conditional indirect effects). This model explicitly tests the moderating effect on paths (i.e. predictor to outcome, predictor to mediator, and mediator to outcome). An index of moderated mediation was used to test the significance of the moderated mediation; that is, the difference between the indirect effects across the levels of health value.[28] Significant effects are supported by the absence of zero within the confidence intervals.

Results

Figure 2 about here

Figure 2 shows the Pearson correlation vales, scatterplots including 95% confidence intervals, along with the distributions for each of the variables. Inspection of these data shows that there was a significant small positive relationship between PFMD symptoms (Queensland) and BMI, r=.250, p<.001. There was significant medium negative relationship between PFMD symptoms and QoL as measured by the EQ5D utility index, r=-.303, p<.001. There was a medium-sized significant negative relationship between BMI and QoL (EQ5D utility index), r=-.379, p<.001.

Table 1 about here

Table1 shows the Pearson correlations between the health value indices (strength of values, strength of internal values, strength of external values), with PFMD symptoms (Queensland), BMI, and QoL (EQ5D utility index). Inspection of these data shows that the strength of health values per se did not relate to any of PFMD symptoms, the BMI, or the QoL, which was also true for the strength of the internally-held values. However, the strength of the externally-held values correlated positively with both PFMD symptoms and with BMI, and negatively with QoL.

Figure 3 about here

Figure 3 shows the visualizations for the moderated mediation of the relationships between PFMD symptoms (Queensland) and QoL (EQ5D utility index), with BMI as the mediator, and health behavior (PVQ-II) as the moderator. These data were analyzed using the moderated mediation analysis (model 59) from the SPPS PROCESS program.[28] The overall moderated mediation analysis revealed the index of moderated mediation to be

insignificant, *index* = 0.001, *se* = 0.002, *95%CI* [-0.003:0.004]. Inspection of the top panel shows the moderated effect of PFMD (-1, 0, and +1SDs from the mean) on BMI, and reveals an insignificant effect of increasing PFMD associated with increasing BMI (β = 0.188, *se* = 0.256; *95%CI* [-0.395:0.770]), and this was not moderated by health values (β = 0.002, *se* = 0.019; *95%CI* [-0.036:0.040]). Inspection of the middle panel shows the moderated effect of BMI on QoL. It reveals an insignificant effect of decreasing QoL with increasing BMI (β = -0.010, *se* = 0.013; *95%CI* [-0.035:.015]), which was not moderated by health values (β = 0, *se* = 0.001; *95%CI* [-0.016:0.016]). The bottom panel shows an insignificant effect of increasing PFMD being associated with decreasing QoL (β = 0.013, *se* = 0.008; *95%CI* [-0.004:0.030]), but that this was moderated by health values, being more pronounced for the higher values (β = -0.002, *se* = 0.001; *95%CI* [-0.002:-0.001]).

Figure 4 about here

Figure 4 shows the visualizations for the moderated mediation of the relationships between pelvic-floor dysfunction symptoms (PFMD; Queensland) and quality of life (QoL: EQ5D utility index), with BMI as the mediator, and internally-held values (PVQ-II) as the moderator. These were analyzed using the moderated mediation analysis (model 59) from the SPPS PROCESS program.[28] The overall moderated mediation analysis revealed the index of moderated mediation was not significant, *index* = -0.002, *se* = 0.002, *95%CI* [-0.005:0.001]). Inspection of the top panel shows the moderated effect of PFMD (-1, 0, and +1SDs from the mean) on BMI, and reveals an insignificant effects of increasing PFMD associated with increasing BMI (β = -0.480, *se* = 0.267; *95%CI* [-1.006:0.045]), but that this relationship was significantly more pronounced with higher internally held health values than with lower (β = 0.169, *se* = 0.063; *95%CI* [0.045:0.234]). Inspection of the middle panel

shows the moderated effect of BMI on QoL. There was an insignificant effect of decreasing QoL with increasing BMI (β = -0.001, *se* = 0.007; *95%CI* [-0.024:0.005]), which was not moderated by internally held health values (β = 0.001, *se* = 0.002; *95%CI* [-0.003:0.003]). The bottom panel shows an insignificant effect of increasing PFMD being associated with decreasing QoL (β = 0.010, *se* = 0.007; *95%CI* = [0.006:0.026]), but that this was moderated by internally held values, being more pronounced for the higher held internal values (β = -0.004, *se* = 0.002; *95%CI* [-0.008:-0.001]).

Figure 5 about here

Figure 5 shows the visualizations for the moderated mediation of the relationships between pelvic-floor dysfunction symptoms (PFMD; Queensland) and quality of life (QoL: EQ5D utility index), with BMI as the mediator, and externally held values (PVQ-II) as the moderator. These were analyzed using the moderated mediation analysis (model 59) from the SPPS PROCESS program.[28] The overall moderated mediation analysis revealed the index of moderated mediation to be insignificant, *index* = 0.002, *se* = 0.001, *95%CI* [-0.004:-0.001]. Inspection of the top panel shows the moderated effect of PFMD (-1, 0, and +1SDs from the mean) on BMI, and reveals an insignificant effect of increasing PFMD associated with increasing BMI (β = -0.067, *se* = 0.176; *95%CI* [-0.280:0.414], and this relationship was not moderated by externally held health values (β = 0.038, *se* = 0.051; *95%CI* [-0.062:0.138]). Inspection of the middle panel presents the moderated effect of BMI on QoL, and shows an insignificant effect of decreasing QoL with increasing BMI (β = -.004, *se* = .007; *95%CI* [-0.017:0.009]), which was not moderated by externally held health values (β = 0.001, *se* = 0.002; *95%CI* [-0.005:0.003]). The bottom panel shows an insignificant effect of increasing PFMD being associated with decreasing QoL (β = 0.007, *se* = 0.005; *95%CI* [-

0.004:0.017]), but that this was moderated by externally held values, being more pronounced for the higher held external values (β = -0.004, *se* = 0.002; *95%CI* [-0.007:-0.001]).

Discussion

The current study identified some manners in which holding a particular health value (i.e. internal or external reasons) impacts the degree to which factors, like BMI, interact with subjective ratings of PFMD symptoms, to determine subjective ratings of QoL. The data corroborated the suggestion that there would be negative impacts of PFMD symptoms on QoL (as measured by the EQ5D utility index), for a population with PFMD.[3-5] These findings extend the argument that such health-related QoL measures are important to include in studies of this population.[3,5] One reason this is important to establish that the inclusion of such QoL measures allows further assessment of the economic effects of PFMD.[6,29] Health-economic effects are often calculated on the basis of Quality of Life Adjusted Years, which assign an economic value to the existence of a particular level of health as measured by a QoL scale (often the EQ-5D). If PFMD is shown to improve QoL as measured by scales such as the EQ-5D, then the improvement in functioning can be assigned an economic value, which can be helpful in arguing for the importance of a particular treatment.

Beyond this, the current study established that BMI served to mediate the relationship between PFMD symptoms and QoL; with the negative impact of PFMD on QoL being stronger at higher levels of BMI. This suggests a dual strategy of direct treatment of PFMD, along with weight loss program, may be beneficial.[11,12] However, care is needed in adopting this tactic, as it is also apparent from the current data that the impact of BMI is moderated by individuals' sensitivity to health values held to please others (external values). Holding a health value because it seems appropriate to others, or to allow the person to care for others, makes the impact of BMI on QoL even worse. There was no such moderating relationship of

internally-held health values (although these values did impact the PFMD-BMI relationship). It may be that holding externally-held health values makes individuals more sensitive to feelings of failure and/or judgment if they feel their BMI is high. Holding an internal health-value may suggest less sensitivity to external judgment. This is speculative and will require further investigation.

When health values are held because of what others might think (i.e. external values are held), then individuals with PFMD are particularly susceptible the negative effects of BMI on QoL. The impact of external considerations for weight has been considered in other contexts, where people's sensitivity to others' judgment is negatively associated with the success of weight loss programs.[18] By extension, this may suggest that the reasons for the health values held by individuals are as important to target as the weight itself. Reducing the importance that women place on others' judgments, and/or reducing the degree to which they do things so that they can help others, may be an important aspect of a concurrent psychological treatment for women with PFMD. Holding values for external reasons may make those women particularly susceptible to feelings of failure and shame, should weight loss not occur, or not occur quickly.[18] In turn, this can generate depression and anxiety, which can also negatively impact the outcomes of PFMD treatments.[30]

It is less clear based on the current data whether establishing health values held for internal reasons (for the benefit of the self) is as important in this regard, as reducing a reliance on other's acceptance. Of course, there is good evidence that holding health values for internal reasons can help with patient compliance and outcomes with treatments such as PFMT,[5] and to this extent they can be developed. However, where weight loss is a goal, focus on the self as the agent of change can lead to feelings of failure if the weight loss is not achieved,[18,19] and this may undermine the PFMD treatment, largely through impacting the PFMD-QoL relationship.

Limitations and future studies

There are limitations to this work that do need to be considered. The design was cross-sectional in nature, and a future longitudinal design would give more strength to the explorations of the relationship as they develop over time. The sample was a relatively heterogenous sample comprising women with a mixture of PFMD symptoms, and it is unclear whether these results would be replicated in group each type of symptom (urinary, bowel, prolapse, and sexual functioning). However, this is a sample typical of many populations referred for PFMD, and it is sometimes hard to delineate 'pure' examples of each of the forms of PFMD. The sample was recruited from a single institution, which introduce bias into the sample and limit generalization; future studies may include a multi-site component. They were also volunteers, which may also introduce some degree of participant bias. The completion of patient reported outcomes measures, in the presence of the researcher, can potentially lead to participant bias. This could be addressed in future studies, but it may be that completion rates are higher when there is a researcher present. The QoL measure was derived from the EQ5D, and other measures such as the SF-36 could also be examined to extend and generalize the results reported. It should also be noted that the health values measures were dichotomized for the current purposes of explored, but more complex mediated mediation models could also be appropriate for these data – but would require a greater sample size. Any such greater sample size may also allow the possibility of future variables that could potentially confound the mediation analysis (such as comorbidities like diabetes) to be examined. For example, it may be interesting to examine smoking, age, parity, and analyze the impact of these variables along with BMI.

Clinical Relevance

The relevance for physical therapy, such as PFMT, of the current results resides in the recognition that many factors may impact the patients' subjective outcomes (e.g., QoL), and how consideration of these factors may work alongside the PFMT. Weight loss programs have been used alongside PT (indeed, as part of this approach), and can be positive aspect of treatment for PFMD.[7] However, the effectiveness of such recommendations is not always successful nor taken well or acceptable by the patients.[18-20] Assessment and consideration of psychological factors may be a way forward in individualizing such treatment regimes. The current data suggest a simple assessment of the nature of the patient's values may predict how suggestions about weigh modification will be received, and impact QoL outcomes.

Conclusion

These data suggest that the relationship between PFMD symptoms and QoL is complex, and is dependent on many factors such as BMI, and the manner in which the patient holds their health values. It suggests that psychological support, tailored to an individual's needs, can be helpful in treating this complex and pervasive disorder.

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Figure Captions

Figure 1: Schematic representation of the examined model between pelvic-floor muscle dysfunction symptoms (PFMD) and quality of life (QoL), with body mass index (BMI) as the mediator, and health values as the moderator.

Figure 2: Pearson correlations between Pelvic-floor Dysfunction symptoms (PFMD; Queensland), Body Mass Index (BMI), and quality of life (QoL; EQ5D utility index), along with scatterplots and 95% confidence intervals, and distributions of each variable.

Figure 3: Visualizations for moderated mediation for the relationships between pelvic-floor dysfunction symptoms (PFMD; Queensland) and quality of life (QoL: EQ5D utility index), with Body Mass Index (BMI) as the mediator, and health values (PVQ-II) as the moderator.

Figure 4: Visualizations for moderated mediation for the relationships between pelvic-floor dysfunction symptoms (PFMD; Queensland) and quality of life (QoL: EQ5D utility index), with Mody Mass Index (BMI) as the mediator, and internally held values (PVQ-II) as the moderator.

Figure 5: Visualizations for moderated mediation for the relationships between pelvic-floor dysfunction symptoms (PFMD; Queensland) and quality of life (QoL: EQ5D utility index), with Body Mass Index (BMI) as the mediator, and externally held values (PVQ-II) as the moderator.

Table1: Pearson correlations between the health value indices (PVQ strength of values, strength of internal values, and strength of external values), with PFMD symptoms (Queensland), BMI, and QoL (EQ5D utility index). PVQ = Personal Values Questionnaire; PFMD = pelvic-floor muscle dysfunction; BMI = body mass index; QoL = quality of life.

	Mean (SD)	PFMD	BMI	QoL (EQ5D index)
Health Values	14.78 (2.66)	-.059	-.048	-.033
Internally-held values	3.92 (1.00)	-.105	-.069	-.069
Externally-held values	3.19 (1.19)	.130*	.283***	-.304***

*p<.05;**p<.01;***p<.001

Figure 1: Schematic representation of the examined model between pelvic-floor muscle dysfunction symptoms (PFMD) and quality of life (QoL), with body mass index (BMI) as the mediator, and health values as the moderator.

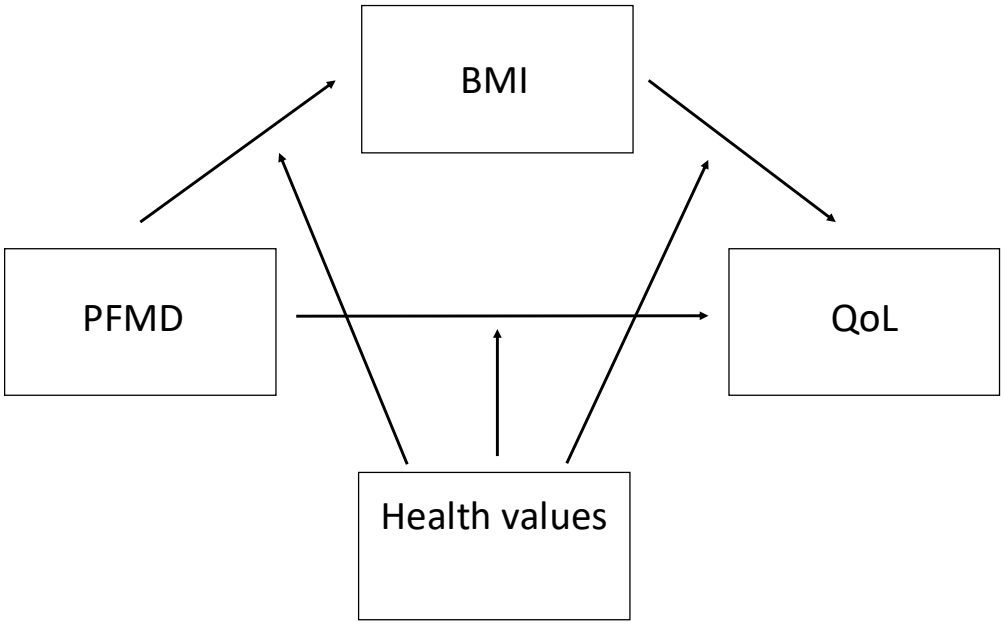


Figure 2: Pearson correlations between Pelvic-floor Dysfunction symptoms (PFD; Queensland), BMI, and quality of life (QoL; EQ5D utility index), along with scatterplots and 95% confidence intervals, and distributions of each variable. PFD = Pelvic-floor muscle dysfunction; BMI = body mass index; QoL = quality of life.

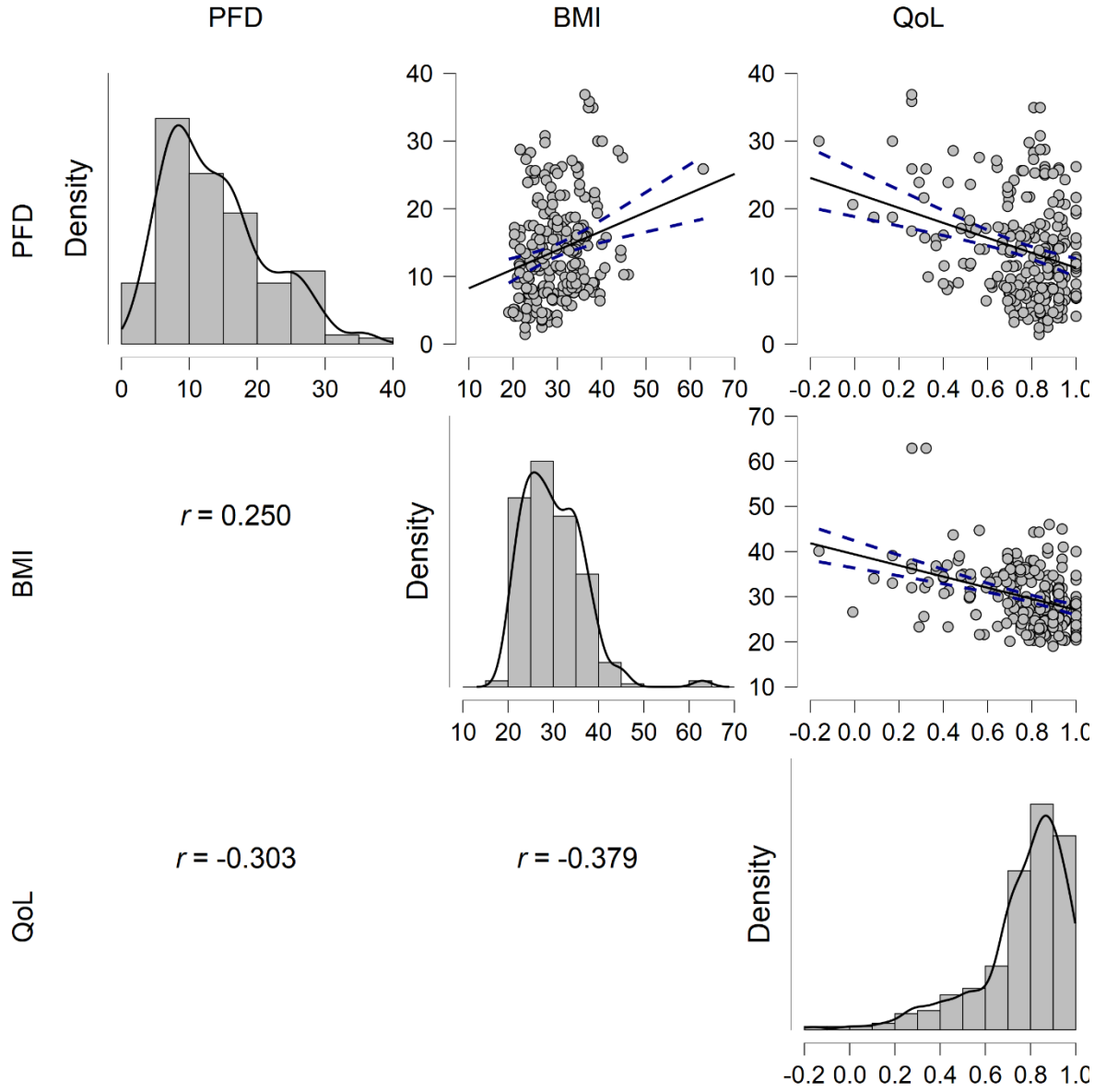
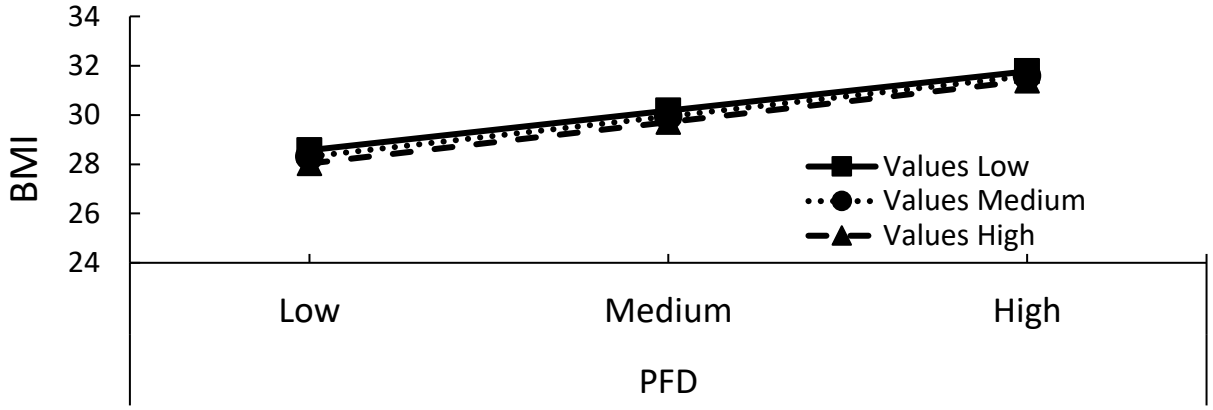
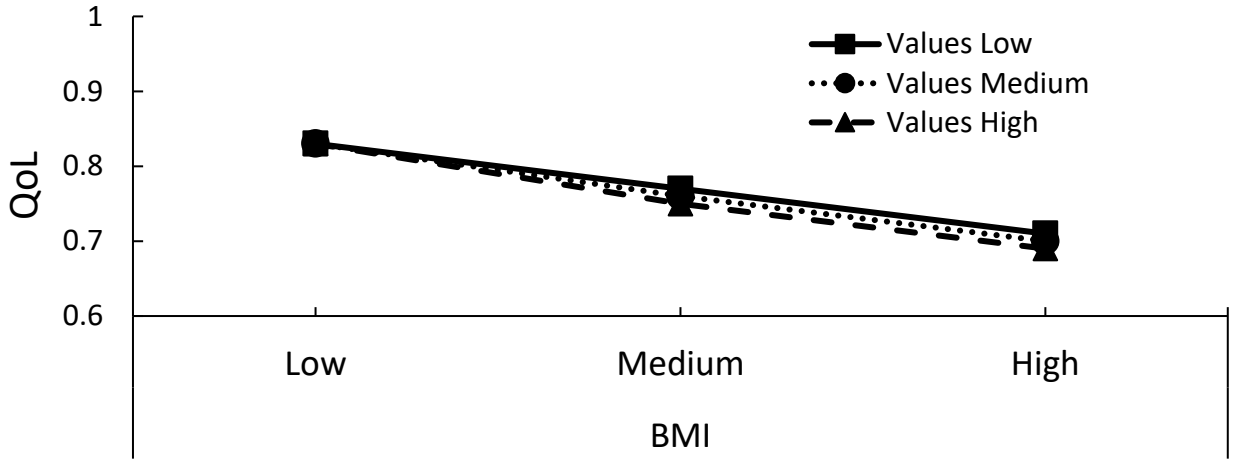


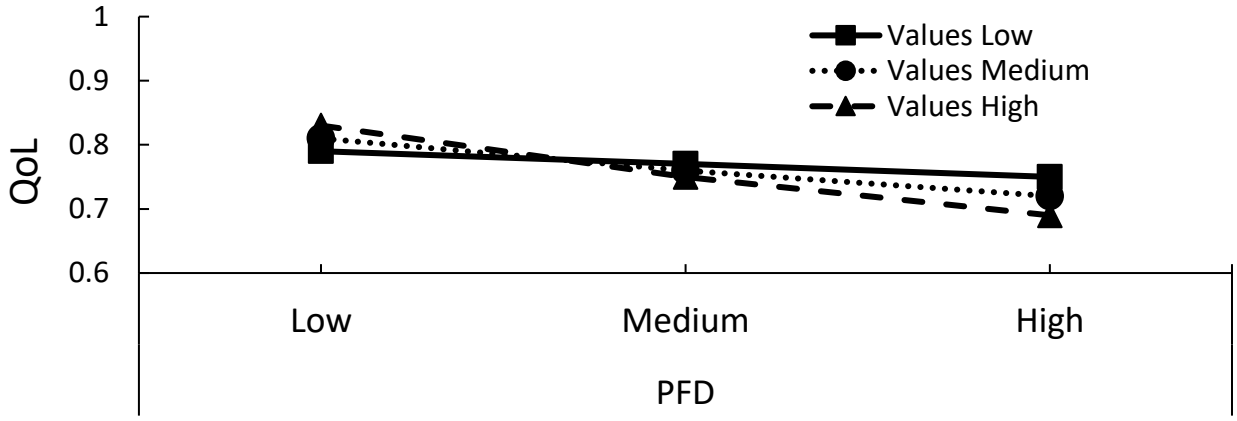
Figure 3: Moderated mediation for relationships between pelvic-floor muscle dysfunction (PFD; Queensland) and quality of life (QoL: EQ5D), with body mass index (BMI) as the mediator, and health values (PVQ-II) as the moderator.



(a) Moderated effect of PFD and BMI.

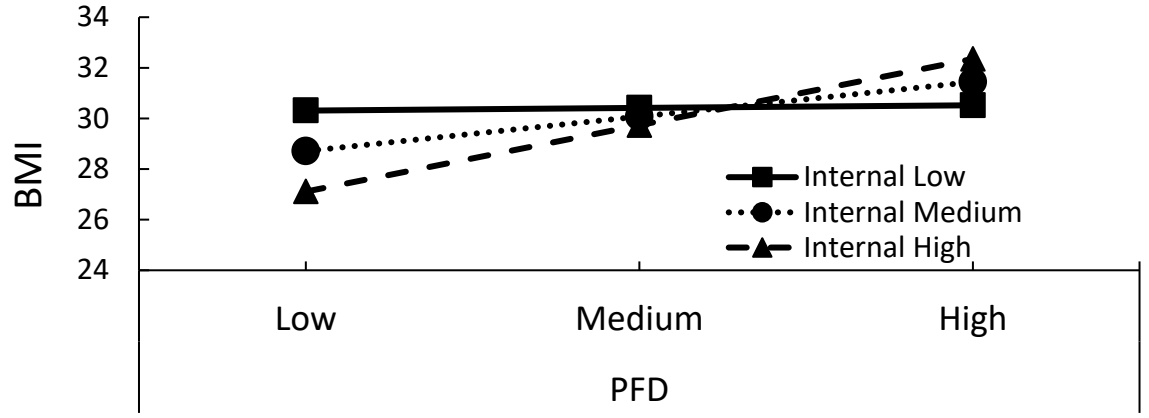


(b) Moderated effect of BMI on QoL.

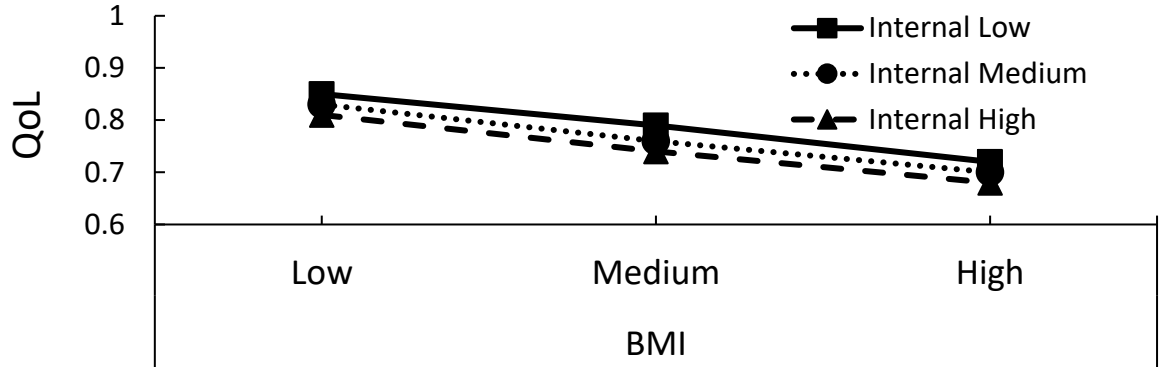


(c) Moderated effect of PFD on QoL.

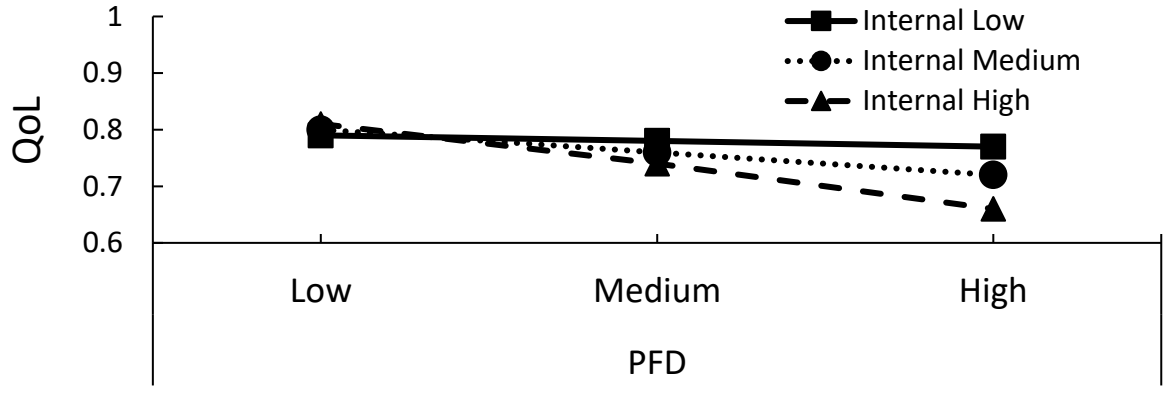
Figure 4: Moderated mediation for relationships between pelvic-floor muscle dysfunction symptoms (PFD; Queensland) and quality of life (QoL: EQ5D), with body mass index (BMI) as the mediator, and internally held values (PVQ-II) as the moderator.



(a) Moderated effect of PFD and BMI.

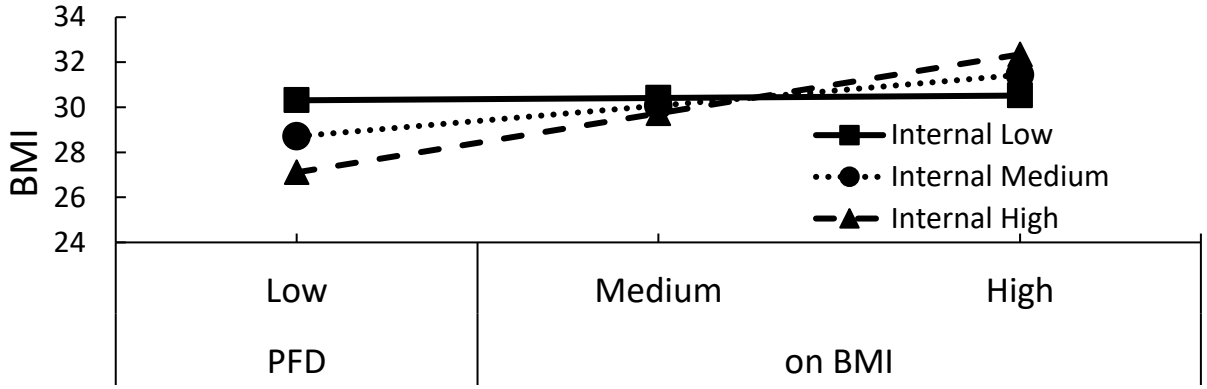


(b) Moderated effect of BMI on QoL.

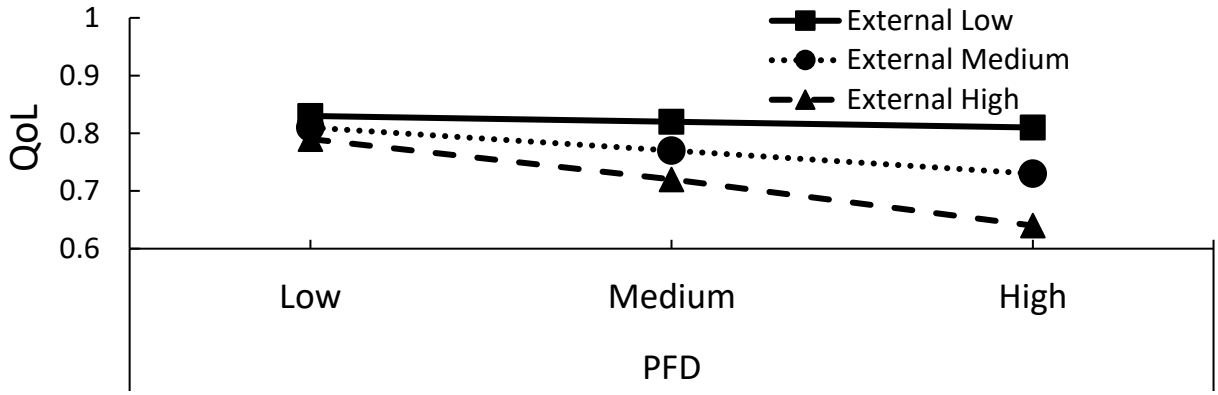


(c) Moderated effect of PFD on QoL.

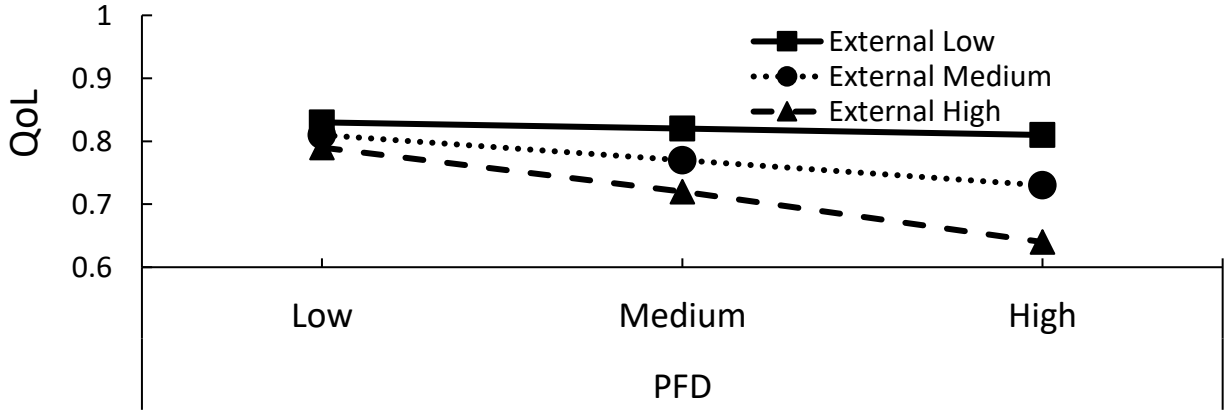
Figure 5: Moderated mediation for relationships between pelvic-floor muscle dysfunction symptoms (PFD; Queensland) and quality of life (QoL: EQ5D), with body mass index (BMI) as the mediator, and externally held values (PVQ-II) as the moderator.



(a) Moderated effect of PFD and BMI.



(b) Moderated effect of BMI on QoL.



(c) Moderated effect of PFD on QoL.