The Knee

Title Page

Title: The Norwich Patellar Instability Score: validity, internal consistency and responsiveness for people conservatively-managed following first-time patellar dislocation

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Abstract

Purpose: This paper assessed the validity, internal consistency, responsiveness and floor-ceiling effects of the Norwich Patellar Instability (NPI) Score for a cohort of conservatively managed people following first-time patellar dislocation (FTPD).

Methods: Fifty patients were recruited, providing 130 completed datasets over 12 months. The NPI Score, Lysholm Knee Score, Tegner Level of Activity Score and isometric knee extension strength were assessed at baseline, six weeks, six and 12 months post-injury.

Results: There was high convergent validity with a statistically significant correlation between the NPI Score and the Lysholm Knee Score ($p<0.001$), Tegner Level of Activity Score ($p<0.001$) and isometric knee extension strength ($p<0.002$). Principal component analysis revealed the NPI Score demonstrated good concurrent validity with four components account for 70.4% of the variability. Whilst the NPI Score demonstrated a flooring-effect for 13 of the 19 items, no ceiling effect was reported. There was high internal consistency with a Cronbach Alpha value of 0.93 (95% CI: 0.91 to 0.93). The NPI Score was responsive to change over the 12 month period with an effect size of 1.04 from baseline to 12 months post-injury.

Conclusions: The NPI Score is a valid tool to assess patellar instability symptoms in people conservatively managed following FTPD.

Keywords: Patellar Dislocation; Outcome Measure; Instability; Instrument; Reliability; Validity; Physiotherapy

Level of Evidence: Level II

1.1 Introduction

The evidence-base for the management of patellar dislocation has been hampered by the lack of a dedicated scoring system to demonstrate treatment efficacy. The Norwich Patellar Instability (NPI) Score was developed based on patient-reported activities associated with instability.[1] The early validation of this tool has been reported with a cohort of patients managed surgically following recurrent patellar dislocation.[1] However, the NPI Score has not been evaluated against those following first-time patellar dislocation (FTPD), or those solely conservatively managed following this injury. Therefore it has not been previously possible to ascertain the psychometric properties of this outcome measure specifically for a FTPD cohort compared to people who have experienced recurrent dislocations. This is important as the latter group may have different experiences of instability symptoms from both physical/morphological factors in addition to health perceptions and beliefs towards instability and functional capability.[2,3] Furthermore, the responsiveness of the NPI Score over time has yet to be determined. The purpose of this study was therefore to answer the following four research questions:

1. Does the NPI Score correlate to previously validated outcome measures used to evaluate people conservatively managed following FTPD?
2. What is the internal consistency of the NPI Score for people conservatively managed following FTPD?
3. Is the NPI Score responsive to change over the first 12 months following injury for people conservatively managed following FTPD?
4. Does the NPI Score demonstrate a floor-ceiling effect for people conservatively managed following FTPD?

2.1 Materials and Methods

Fifty people participating in a pragmatic randomised controlled trial assessing two exercise programmes for people following FTPD were recruited from November 2011 to March 2013, from three centres in the East of England. Ethical approval was gained from the National Health Service Research Ethics Committee – East of England (Ref: 10/H0310/1) to conduct this trial and this sub-study of the NPI score assessment.

Study eligibility criteria included aged 16 years or over referred to out-patient physiotherapy following FTPD, presenting with a history of a single episode of patellar dislocation requiring reduction or having reported that their knee cap visibly "popped" out of joint, and one of the following physical examination findings:[4,5]

i. Apprehension when a lateral-directed force was applied to the patella
ii. Pain or tenderness along the medial retinaculum
iii. Abnormal patellar tracking or position e.g. lateralised, tilted, excursion such as J-sign.

Patients were excluded if they had: a history of two or more self-reported or documented patellar dislocations on the knee which was referred to physiotherapy anytime during a participant's lifetime; an osteochondral fracture on plain x-ray requiring surgical management; were immobilised for longer than four weeks from injury to first physiotherapy appointment; or presented with meniscal, anterior cruciate ligament, posterior cruciate ligament, lateral collateral ligament or medial collateral ligament injury on the knee referred to physiotherapy as determined through clinical examination. Those with radiological evidence of gross osteoarthritic changes of the patellofemoral joint i.e. Kellgren and Lawrence Grade 3 or above;[6] and those with previous surgical interventions on the affected knee for anterior knee pain or patellar instability symptoms were excluded.

All were enrolled on a physiotherapy programme. The mean duration of this programme was six weeks, and was predominantly exercise based. Data was collected prospectively at four time-points; baseline (pre-rehabilitation), six weeks, six months and 12 months post-commencement of rehabilitation. Data collected at each time-point included the NPI Score,[1] Lysholm Knee Score,[7] Tegner Level of Activity Score,[8] isometric knee extensor muscle strength at 0°, 30°, 60° and 90° knee flexion, assessed using a hand-held dynamometer (Basic Force Gauge, Mecmesin, Slinfold, West Sussex, UK).

2.1.2 Data Analysis

Descriptive statistical tests including the mean and standard deviations were calculated to assess the participant's demographic characteristics including age, gender, duration of symptoms and Beighton score for hypermobility.[9] The Shapiro Wilk W test was used to confirm that the dataset was normally distributed.

Validity was assessed in accordance with the Medical Outcomes Trust health instrument assessment criteria.[10] Convergent validity was assessed by correlating the NPI Score to the Lysholm Knee Score, Tegner Level of Activity Score and isometric knee extensor muscle strength using a Spearman's Correlation Coefficient. This was appropriate since the Lysholm Knee Score was designed to specifically assess knee instability, the Tegner Level of Activity Score specifically assesses functional capability which would be impaired through patellofemoral instability, whilst isometric muscle strength is a direct cause of patellar instability, therefore a surrogate for instability capability. Secondly, convergent validity was assessed specifically, using the knee instability domains from the Lysholm Knee Score (Item 4) using a Spearman's Correlation Coefficient. Internal consistency was evaluated by comparing the relationship of the responses to each NPI Score's individual questions to one another, using the Cronbach's Alpha Coefficient. For interpretation, values of Cronbach's alpha between 0.7 and 0.9 were considered optimal.[11] The *a priori* hypothesis was that the NPI Score would demonstrate high convergent validity and internal consistency based on previously assessment of a FTPD and recurrent patellar dislocation cohort.[1]

Responsiveness was determined for the NPI Score by calculating the mean difference (MD) in NPI Score between each of the follow-up periods. The effect size (ES) of the NPI Score between the different follow-up periods was determined through the pooled standard deviation for all data to calculate a standardised effect size. Through these two analyses, the responsiveness of the NPI Score for individuals following rehabilitation after FTPD was made for the follow-up periods. This was also undertaken for the Lysholm Knee Score, the Tegner Activity Score and the isometric knee extension strength measurements at each measured range of knee flexion. The frequency of respondents with the highest (ceiling) and lowest (floor) scores for each item and total scores was determined for the NPI Score dataset. A ceiling-effect assessed the proportion of respondents who report the highest possible response option.[11] Conversely a floor-effect indicated the proportion of respondents which reported the lowest possible response option.[7] Based on previous studies of musculoskeletal populations, a 15% threshold was adopted to indicate high floor or ceiling-effects.[12,13] A principal component analysis (PCA) was performed of the NPI Scores to assess whether the NPI Score assessed a single or multiple dimensionality to assess construct validity. Interpretation of the PCA was conducted with the varimax rotation method to simplify the interpretation of factors. A Kaiser-Meyer-Olkin value was calculated to determine the adequacy of sampling. A probability value of less than 0.05 was considered statistically significant. All analyses were performed on STATA version 11.0 (STATA Corp LP, Texas, USA).

3.0 Results

The baseline characteristics for the cohort are summarised in Table 1. Of the 50 participants (28 male, 22 female) initially recruited, completed data were available for 130 data points over the four follow-up periods. Therefore the analysis consisted of 130 NPI Scores. Participants had a mean age of 23.8 years (Standard Deviation (SD) 7.0). The groups presented with a mean Beighton hypermobility score of 2.8 (SD 2.9). Participants reported a mean interval of 26.6 days (SD 28.9) between initial dislocation and commencement of rehabilitation.

3.1 Convergent validity

A summary of the convergent validity data is presented in Table 2. The NPI Score demonstrated good convergent validity against the Lysholm Knee Score, Tegner Level of Activity Score and isometric quadriceps strength measurements. There was a good correlation between total Lysholm Knee Score (Rho=-0.63; 95% CI: -0.73 to -0.52; $p<0.001$). This was also reported against the Instability Item on the Lysholm Knee Score (Rho=-0.56; 95% CI: -0.67 to -0.44; $p<0.001$). The Tegner Level of Activity Score was also significantly correlated to the NPI Score (Rho=-0.44; 95% CI: -0.57 to -0.25; $p<0.001$). Whilst less than the other outcomes, there was a statistically significant correlation between the NPI Score and each of the isometric knee extension strength measurements (Rho=-0.27 to -0.44; $p<0.002$).

3.2 Internal consistency

The internal consistency of the 130 NPI Score was interpreted as ‘high’ with a Cronbach’s alpha value of 0.93 (95% CI: 0.91 to 0.93).

3.3 Responsiveness

Table 3 presents the responsiveness to change outcomes. Whilst the NPI Score demonstrated a high responsiveness to change in the cohort between the baseline to six week follow-up period (MD: 15.5; ES: 0.74), six month (MD: 15.5; ES: 0.69) and 12 month period (MD: 20.9; ES:

1.04). Whilst there was a low responsiveness between the six weeks to six months (MD: 1.1; ES: 0.01), there was a greater responsiveness between the six weeks to 12 months (MD: 3.7; 0.39) and six months to 12 months (MD: 4.8; ES: 0.39) intervals. The trend in responsiveness of the NPI Score mirrors that for the Lysholm Knee Score, Tenger Activity Score and isometric knee extension strengths in the assessed ranges of motion (Table 3).

3.4 Floor-Ceiling Effect

A summary of the floor-ceiling frequency analysis is presented in Table 4. The NPI Score baseline data indicated a high risk of a floor-effect. A floor-effect was present in all 19 items. Specific questions where this was particularly evident included those related to descending (Item 9) or ascending stairs (Item 13), walking in a straight line on uneven (Item 12) or even surfaces (Item 16), getting in and out of a car (Question 17), and looking over a shoulder (Item 19).

The data suggested less of a ceiling-effect. None of the items reached the 15% threshold for interpretation of a ceiling effect. The highest frequency of highest scores indicating greatest instability symptoms was for kneeling causing instability (Item 11), but this represented 6.2% of the cohort.

3.5 Principal Component Analysis

Firstly, an initial PCA was conducted which revealed four factors using Kaiser's criterion. Figure 1 shows the Scree plot. These four components account for 70.4% of the variability. All of the questions scored a weight of at least 0.2 on one component suggesting that none of the questions needed to be removed. The component loadings are given in Table 5. The first component is a measure of "total instability"; individuals who score high on the second component have more instability doing the tasks in Questions 4, 9, 12 to 19 compared to 1 to 3, 5 to 8 and 10 and 11; the third component compares Question 1 to 5, 12 and 17 to 7, 10, 11 and 15; and the fourth component compares Questions 3 to 5, 8, 12, 18 to 19 to 1, 2, 10, 13 to 17.

4.0 Discussion

The findings of this study suggest that the NPI Score is a valid tool to assess patellar instability symptoms in people conservatively managed following FTPD, and is responsive to change over the initial 12 post-injury months. The data indicates the NPI Score has high convergent validity, internal consistency and good concurrent validity. Whilst a flooring effect for the 19 items was evident, no ceiling-effect was reported. The data also demonstrated the NPI Score was responsive to change over a 12 month period with ES measurements of 0.69 to 1.04 from baseline to six month and 12 months post-commencement of physiotherapy respectively. The NPI Score demonstrated a high degree of correlation between each of the 19 items posed (Cronbach's alpha: 0.86-1.00). A Cronbach's alpha value of 0.70 to 0.90 has been considered optimal to indicate that the items posed assessed a similar domain and do not repeat themselves.[11]

This is the first paper to present data on the responsiveness to change of the NPI Score. The findings suggest that this outcome is capable of reflecting clinical changes for people following FTPD after conservative management. This trend in the clinical findings from non-operative treatment agrees with previous literature on the early recovery of people conservatively managed following FTPD.[14] All three previous case-studies detailing the early outcomes of physiotherapy for this population reported reduced subjective instability and enhanced recovery at five to nine weeks post-FTPD.[15-17] An important findings from this study was that the NPI Score was responsive to change at all time-point, but particularly at the longer follow-up interval of six and 12 months. This is interesting as it is considered that the therapeutic benefits of non-operative management in this population is generally apparent as early as six to 12 weeks, the majority discharged from physiotherapy clinicians between seven weeks to three months.[18] Therefore, either this population demonstrates continued clinical improvement for longer than it has been perceived they do, or, for instability rather than other symptoms, patients continue to improve following discharge and early management. Further assessment of the recovery profiles of this population may therefore be warranted to examine this further in the FTPD population.

The results indicate that the NPI Score did not possessed a ceiling-effect but did possess a high floor-effect, where a high proportion of respondents reported the lowest possible score for a number of less physically demanding activities such as getting into and out of a car and turning to look over their shoulder. Consequentially, these items may reduce the NPI Score's ability to demonstrate clinical changes.[11] A high floor-effect can lower the capacity of a score to detect a minimally clinically important difference (MCID) in status.[19] The appearance of a floor-effect can also be a major weakness as it can impair the ability of an outcome to determine the central tendency of a dataset.[20] It may reduce the sensitivity of a score to distinguish between change in an individual's physical capabilities when they have recorded the lowest possible score on an outcome measurement.[11,20] Future study is therefore recommended to assess the appropriateness of including questions which demonstrated a floor-effect. The instrument should however be further explored with other cohorts including those following recurrent patellar dislocation or those with a confirmed medial patellofemoral ligament rupture or severe trochlear dysplasia. This is of note given that MRI was not routinely undertaken in this cohort and therefore it is not possible to ascertaining whether diagnoses of coexistent injuries such as medial patellofemoral ligament rupture, associated small osteochondral lesions or severe predisposing dysplasia made the cohort heterogeneous. This would indicate whether specific questions are required to distinguish between different severities of patellar instability. If these too demonstrated that lower-energy activities are frequently cited as asymptomatic, then consideration to removing these items may be appropriate.

Forty-three respondents out of the 50 used the "don't do" option at the baseline assessment. This suggests that the NPI Score may not necessarily reflect the status of individuals who had recently experienced a FTPD. The "don't do" response was considered important to minimise the risk of respondents not completing every question posed.[1] However this opinion may make the interpretation of the NPI Score more difficult, particularly in those who are severely functionally limited.

Previous literature has suggested that shorter, more concise outcome measures present higher response rates without loss of validity or reliability.[21,22] Questionnaires such as the DASH and SF-12 have been shortened to maintain validity, reliability and responsiveness whilst reducing respondent burden. Two of the assessing physiotherapists in this trial anecdotally acknowledged that they felt the NPI Score was burdensome. Whether this was a widely held belief is unclear as this was not specifically assessed. However calculating the NPI Score was time-consuming, particular when respondents frequently used the "don't do" response. This may detract from the ease with which the NPI Score can be completed, reducing attraction for clinical adoption. Nonetheless with increased computer and handheld tablet usage in clinical practice.[23,24] such calculations may be less of an issue in the future. Nonetheless future simplification of the calculation method may be required to enhance the accessibility of NPI Score data. Further analyses of NPI score dataset using a Rasch model analysis is proposed to assist in identifying which items are most valid for this score [25]. This may then help to reduce the floor effect reported in these results.

Based on the design of the current NPI Score, participants may experience greater instability symptoms with increased participation in more physically demanding tasks. This reflects the normal phenomenon of this population where multi-directional activities are associated with perceived instability.[2] Therefore it was predicted that as people recovered and returned to more physical activities, their patellar instability may have increased, reflected through a greater NPI Score. This may have directly affected the convergent validity finding as well as the responsiveness results. However, this did not appear to be the case in this dataset (Table 2; Table 3).

Whilst this study reported convergent validity of the NPI Score with the Lysholm Score, we did not assess this against other patellofemoral outcome measures such as the Kujala Patellofemoral Disorders Score [26] or the Banff Patellar Instability Instrument.[27] The latter was not assessed since this was not in existence at the time of undertaking this study. The Kujala Patellofemoral Disorders Score was not selected since this measure was developed to assess anterior knee pain rather than patellar dislocation where instability is the predominant symptom. Accordingly, since the Lysholm Score [8] was developed for people following anterior cruciate injury, where knee instability is the predominant symptom,[8] this measure was selected. Nonetheless, further study may be warranted to assess the convergent validity of the NPI Score with these patellofemoral-specific outcome measures, particularly with the newer Banff Patellar Instability Instrument which examines similar domains to the NPI Score.

The NPI Score demonstrated lower convergent validity for the total Lysholm Knee Score compared to the Instability item alone (Rho: 0.56 vs. 0.63). This was a surprising finding since it was expected that since both principally assess the same domain (i.e. knee instability) there would be higher correlation for the Instability item alone. Whether this can be attributed to a chance event, or whether the NPI Score actually assesses more than perceived instability alone in FTPD, should be monitored in future evaluations of this outcome measure.

5.0 Conclusions

The findings of this study indicate that the NPI Score can be considered a valid and responsive outcome measure to assess patellar instability symptoms for people conservatively managed following FTPD. Further study is warranted to explore the use of this outcome in people following recurrent dislocation. Furthermore, the high floor-effects reported in this study need further exploration to improve the ability of the NPI Score to detect people with lower perceived instability symptoms.

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7.0 Declarations

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Conflicts of Interest: No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

Ethical Considerations: This study was approved by the National Health Service Research Ethics Committee – East of England (Ref: 10/H0310/1), the Norfolk and Norwich Research Governance Committee (2010ORTH04 62-03-10), Norfolk Primary Care Research Governance (2010ORTH04) and Queen Elizabeth Hospital, Kings Lynn Research Governance (07/10-10/H0310/1).

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Table 4: Summary of Floor-Ceiling Effect results for NPI Score

Table 5: Component loadings for the first four factors on Principal Component Analysis

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Figure 1: Scree test from the NPI Score

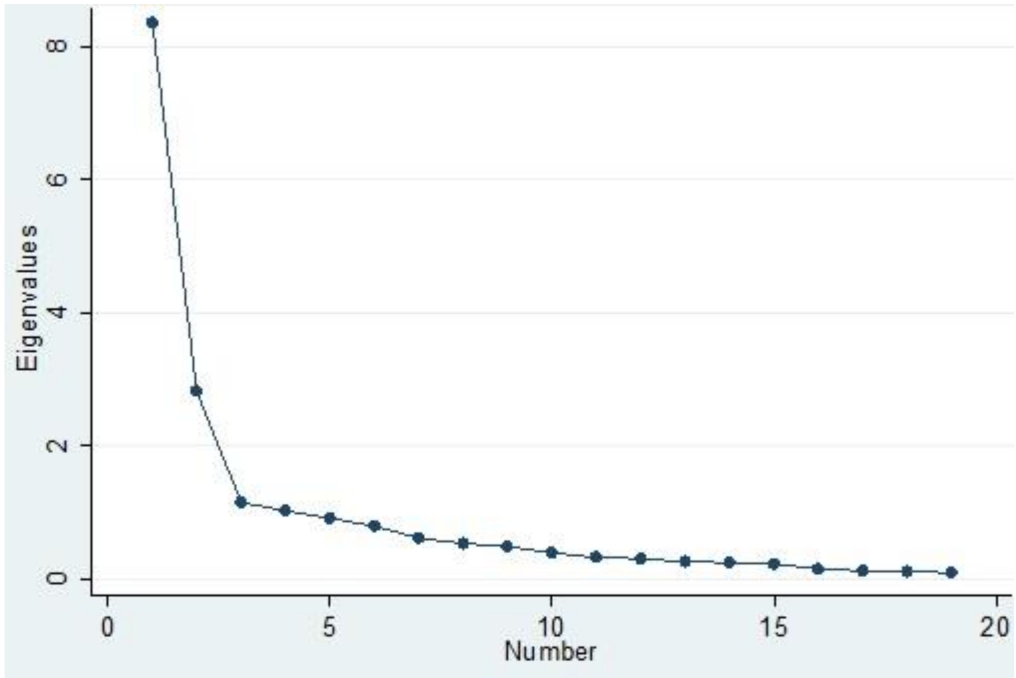

Table 1: Demographic characteristics and summary of data collected

	Frequency/ Mean (SD)
Number of Participants	50
Number of completed NPI Scores	130
Age (Mean/SD)	23.8 (7.0)
Gender (m/f)	28/22
Beighton Hypermobility Score	2.8 (2.9)
Duration since FTPD	26.6 (28.9)
NPI Score	19.9 (20.8)
Lysholm Knee Score (Total Score)	69.0 (28.5)
Lysholm Knee Score (Instability Item)	16.4 (8.2)
Tegner Activity Score	3.9 (2.4)
Isometric knee extension strength at 0˚ flexion (N)	75.5 (55.5)
Isometric knee extension strength at 30˚ flexion (N)	143.9 (80.2)
Isometric knee extension strength at 60˚ flexion (N)	163.3 (83.4)
Isometric knee extension strength at 90˚ flexion (N)	166.2 (88.1)

FTPD – First Time Patellar Dislocation; m – Male; N – Newtons; n – number of participants; NPI Score – Norwich Patellar Instability Score

Table 2: Summary of Convergent Validity Results

	Rho	Rho 95% CI	P-Value
Lysholm Knee Score (Total Score)	-0.63	-0.73, -0.52	<0.001
Lysholm Knee Score (Instability Item)	-0.56	-0.67, -0.44	<0.001
Tegner Activity Score	-0.44	-0.57, -0.28	<0.001
Isometric knee extension strength at 0˚ flexion (N)	-0.27	-0.42, -0.10	<0.002
Isometric knee extension strength at 30˚ flexion (N)	-0.31	-0.46, -0.14	<0.001
Isometric knee extension strength at 60˚ flexion (N)	-0.35	-0.49, -0.19	<0.001
Isometric knee extension strength at 90˚ flexion (N)	-0.41	-0.55, -0.26	<0.001

CI – Confidence Intervals

Table 3: Summary of the responsiveness of the NPI Score, Lysholm Knee Score, Tegner Activity Score and isometric knee extension strength from baseline to 12 months presenting mean difference values and effect sizes for each follow-up interval.

	Mean Difference/Effect Size	
	MD (SD)	**ES**
NPI Score		
Baseline - 6 Weeks (n=34)	15.5 (28.1)	0.74
Baseline - 6 Months (n=25)	15.5 (28.2)	0.69
Baseline - 12 Months (n=23)	20.9 (29.4)	1.04
6 Weeks – 6 Months (n=24)	1.1 (13.5)	0.01
6 Weeks – 12 Months (n=23)	3.7 (9.1)	0.39
6 Months – 12 Months (n=23)	4.8 (11.2)	0.42
Lysholm Knee Score (Total Score)		
Baseline - 6 Weeks (n=34)	37.3 (2.2)	0.61
Baseline - 6 Months (n=25)	35.0 (42.4)	0.66
Baseline - 12 Months (n=23)	44.0 (26.6)	0.76
6 Weeks – 6 Months (n=24)	10.5 (11.7)	0.18
6 Weeks – 12 Months (n=23)	14.7 (18.8)	0.44
6 Months – 12 Months (n=23)	9.0 (26.1)	0.25
Tegner Activity Score		
Baseline - 6 Weeks (n=34)	1.7 (2.2)	0.35
Baseline - 6 Months (n=25)	1.0 (2.2)	0.54
Baseline - 12 Months (n=23)	0.6 (1.3)	0.70
6 Weeks – 6 Months (n=24)	0.4 (1.6)	0.32
6 Weeks – 12 Months (n=23)	2.2 (2.4)	0.54
6 Months – 12 Months (n=23)	1.0 (2.5)	0.20
Isometric knee extension strength at 0˚ flexion (N)		
Baseline - 6 Weeks (n=34)	59.4 (47.1)	0.54
Baseline - 6 Months (n=25)	79.2 (57.1)	0.63
Baseline - 12 Months (n=23)	79.8 (62.5)	0.59
6 Weeks – 6 Months (n=24)	25.9 (36.9)	0.18
6 Weeks – 12 Months (n=23)	23.6 (41.6)	0.14
6 Months – 12 Months (n=23)	4.3 (28.5)	0.03
Isometric knee extension strength at 30˚ flexion (N)		
Baseline - 6 Weeks (n=34)	77.8 (50.8)	0.53
Baseline - 6 Months (n=25)	96.9 (73.0)	0.57
Baseline - 12 Months (n=23)	111.5 (69.3)	0.62
6 Weeks – 6 Months (n=24)	26.9 (65.1)	0.08
6 Weeks – 12 Months (n=23)	38.7 (60.6)	0.16
6 Months – 12 Months (n=23)	22.6 (35.4)	0.09
Isometric knee extension strength at 60˚ flexion (N)		
Baseline - 6 Weeks (n=34)	67.1 (60.4)	0.48
Baseline - 6 Months (n=25)	111.0 (87.5)	0.60
Baseline - 12 Months (n=23)	105.2 (81.9)	0.59
6 Weeks – 6 Months (n=24)	45.4 (76.1)	0.23
6 Weeks – 12 Months (n=23)	42.2 (66.6)	0.20
6 Months – 12 Months (n=23)	11.7 (52.4)	0.04
Isometric knee extension strength at 90˚ flexion (N)		
Baseline - 6 Weeks (n=34)	79.6 (66.5)	0.43
Baseline - 6 Months (n=25)	114.0 (80.4)	0.30
Baseline - 12 Months (n=23)	123.9 (93.2)	0.25

6 Weeks – 6 Months (n=24)	41.89 (60.3)	0.19
6 Weeks – 12 Months (n=23)	52.9 (49.5)	0.22
6 Months – 12 Months (n=23)	26.2 (34.2)	0.04

ES – Effect Size; MD – Mean Difference; SD – Standard Deviation

Table 4: Summary of Floor-Ceiling Effect results for NPI Score

Item	Minimal Response		Maximal Response	
	Frequency	**%**	**Frequency**	**%**
Twisting or changing direction during Sports or PE activities	27	20.8	3	2.3
Changing direction when running, such as cutting or slalom	29	22.3	3	2.3
Running in a straight line on uneven surfaces	40	30.8	3	2.3
Walking on slippery, wet or icy surfaces	50	38.5	5	3.8
Running sideways	34	26.2	3	2.3
Hopping	38	29.2	3	2.3
Jumping	43	33.1	3	2.3
Running in a straight line on even surfaces	59	45.4	4	3.1
Going down stairs	74	56.9	7	5.4
Squatting	48	36.9	5	3.8
Kneeling	42	32.3	8	6.2
Walking in a straight line on uneven surfaces	74	56.9	3	2.3
Climbing stairs	76	58.5	5	3.8
Stepping onto or over a high step	67	51.5	5	3.8
Crossing my legs when sitting	64	49.2	3	2.3
Walking in a straight line on even surfaces	95	73.1	2	1.5
Getting in and out of a car	76	58.5	5	3.8
Turning a heavy trolley round a supermarket aisle	52	40.0	3	2.3
Turning to look over my shoulder	100	76.9	1	0.8
Total Score	23	17.7	0	0.0

Table 5: Component loadings for the first four factors on Principal Component Analysis

NPI Score Question	Component			
	1	**2**	**3**	**4**
1	0.1988	-0.1999	0.2361	-0.1207
2	0.2094	-0.2514	0.4073	-0.1036
3	0.2452	-0.1996	0.2785	0.2657
4	0.2271	0.1318	0.0794	0.1775
5	0.2358	-0.2379	0.1282	0.1976
6	0.2155	-0.3113	-0.0179	0.0122
7	0.2673	-0.2472	-0.1487	0.0502
8	0.26	-0.186	0.0338	0.1977
9	0.246	0.3102	-0.0115	-0.035
10	0.2479	-0.0968	-0.3563	-0.1657
11	0.2392	-0.167	-0.4502	-0.0546
12	0.2107	0.2905	0.2137	0.1944
13	0.2495	0.3208	0.0112	-0.1623
14	0.2253	0.0509	0.0041	-0.6035
15	0.2485	0.0033	-0.3585	-0.0972
16	0.2502	0.2444	0.0845	-0.0838
17	0.2122	0.3019	0.2752	-0.1967
18	0.2064	0.0819	-0.1276	0.2679
19	0.1237	0.3308	-0.2263	0.4526