UNIVERSIDADE FEDERAL DE UBERLÂNDIA
INSTITUTO DE LETRAS E LINGUÍSTICA

Av. João Naves de Ávila, 2121 – Campus Sta. Mônica, Bl. U - Sala 1U206
CEP: 38408-100 – Telefax: (34) 3239-4162

EXAME DE PROFICIÊNCIA PROFLIN - 21/05/2016

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TEXTO: "IS KNEE PAIN DURING ADOLESCENCE A SELF-LIMITING CONDITION? - PROGNOSIS OF PATELLOFEMORAL PAIN AND OTHER TYPES OF KNEE PAIN"

Questão 1:

Qual foi o objetivo da pesquisa relatada no artigo?

Questão 2:

Descreva, de forma resumida, como foi desenvolvido o estudo?

Questão 3:

O que mostra o estudo em relação à questão investigada? Explicite apenas os resultados principais, que respondem a principal questão investigada.

Questão 4:

Discuta o excerto abaixo, que os autores afirmaram na seção **"Sports Participation and Risk Factors":**

> "Stopping or reducing sports participation during adolescence may have serious lifestyle consequences, leading to a more sedentary lifestyle". (p.1170)

Questão 5:

Cite pelo menos uma das limitações do estudo mencionadas no texto.

PODCAST
5-in-5

Is Knee Pain During Adolescence a Self-limiting Condition?

Prognosis of Patellofemoral Pain and Other Types of Knee Pain

Michael S. Rathleff,*†‡ PhD, Camilla R. Rathleff,§ BSc, Jens L. Olesen,‖¶# PhD, Sten Rasmussen,§# PhD, and Ewa M. Roos,** PhD
Investigation performed at Aalborg University Hospital, Aalborg, Denmark

Knee pain affects 33% of all adolescents, and patellofemoral pain (PFP) alone affects 7% of the adolescent population.[5,9,17] In sports populations, the prevalence may be even higher.[9,11,17] Compared with adolescents without knee pain, adolescents with knee pain have long-standing pain and reduction in health-related quality of life (HRQoL).[14,18,19] Knee pain, often considered a natural part of adolescence, is frequently regarded as self-limiting and as something that will disappear over time.[6,22] However, only 2 population-based studies have investigated the 1-year prognosis of adolescent knee pain. One study investigated general lower limb pain among third graders (aged 10 years) and fifth graders (aged 12 years) and found that 33% still experienced pain after 1 year.[4] Another study showed that 50% of adolescents aged 12 to 16 years still reported knee pain after 1 year.[14]

PFP and chronic knee pain can be disabling and can cause adolescents to reduce their physical activity level. A reduction or cessation of leisure-time physical activity because of knee pain may initiate a cascade effect, in which reduced physical activity leads to poor cardiorespiratory fitness, increased adiposity, and poor health outcomes.[26] Furthermore, adolescents who cease sports participation during adolescence may be at a higher risk of cardiometabolic disorders and inactive lifestyles during adulthood.[10,13,27,28] These findings highlight the need to study adolescent knee pain and to investigate how knee pain may be associated with changes in physical activity level and sports participation.

In 2011, we started the Adolescent Pain in Aalborg 2011 (APA2011) cohort, which is a population-based cohort consisting of 2200 adolescents who, at that time, were between 15 and 19 years of age. In 2011, the prevalence of self-reported knee pain was 33%.[19] From this cohort, 153

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adolescents were diagnosed with PFP by a rheumatologist. This cohort allowed us to explore the 2-year prognosis of knee pain among adolescents with PFP and to compare them with adolescents with other types of knee pain. In addition, it allowed us to investigate how many of the adolescents who did not report knee pain in 2011 had developed knee pain. The purpose of this study was 2-fold: (1) to investigate the 2-year prognosis of knee pain among adolescents and (2) to investigate if adolescents with PFP have a higher risk of knee pain after 2 years compared with adolescents with other types of knee pain.

METHODS

This was a population-based prospective cohort study and was approved by the local ethics committee of North Denmark Region (N-20110020). The ethics committee did not require an individually signed consent but did require that the schools informed the parents about the study and that participation in the study be voluntary. The reporting of the study followed the Strengthening the Reporting of Observational Studies in Epidemiology statement.[30]

Recruitment

In September 2011, all students at 4 upper secondary schools in the municipality of Aalborg were invited to answer an online questionnaire and to be part of the APA2011 cohort.[15] The online questionnaire contained demographic questions on age, sex, height, weight, and name of the school. After answering the first demographic questions, the adolescents were shown a pain mannequin, and they were instructed to mark the regions where they currently experienced pain.[29] From 2846 potential responders, 2200 adolescents responded to the questionnaire, corresponding to a response rate of 77% (Figure 1). A total of 670 adolescents reported knee pain at least monthly or more frequently; however, 60 of the adolescents reporting knee pain did not report their telephone numbers in the questionnaire, leaving 610 potential responders. A total of 504 adolescents indicating knee pain at least monthly were successfully contacted (a response rate of 83% of those who reported their telephone numbers) and were asked standardized questions on the telephone. If they reported anterior knee pain with an insidious onset, as opposed to a traumatic onset, they were offered a clinical examination at the local hospital by an experienced rheumatologist to determine the specific knee condition. They were not invited to a clinical examination if they, for example, reported an insidious onset of knee pain isolated to the posterior aspect of the knee.

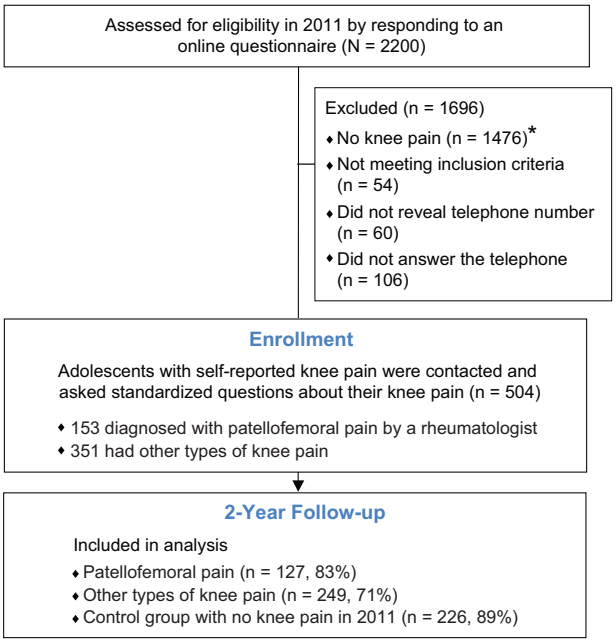

Figure 1. Flowchart of recruitment. *Of the 1476 patients excluded from the knee pain group, a random sample of 252 adolescents were included as a control group at the 2-year follow-up based on the criteria that they did not report knee pain in 2011.

A total of 204 adolescents were invited to a clinical examination and 180 accepted; 8 adolescents did not show up, leaving 172 adolescents who were examined. From these, 153 were diagnosed with PFP, the criteria for which included insidious onset of anterior knee or retropatellar pain for longer than 6 weeks that was provoked by at least 2 of the following: prolonged sitting or kneeling, squatting, running, hopping, or stair climbing; tenderness on palpation of the patella; pain when stepping down; or double-leg squatting.[16] Exclusion criteria were concomitant injury or pain from the hip, lumbar spine, or other knee structures; self-reported patellofemoral instability; or knee joint effusion. From the 153 adolescents with PFP, 121 were enrolled

*Address correspondence to Michael S. Rathleff, PhD, Center for Sensory-Motor Interaction (SMI), Department of Health Science and Technology, Faculty of Medicine, Aalborg University, Hobrovej 18-22, DK-9000 Aalborg, Denmark (email: misr@rn.dk).
†Center for Sensory-Motor Interaction (SMI), Department of Health Science and Technology, Faculty of Medicine, Aalborg University, Aalborg, Denmark.
‡Department of Occupational Therapy and Physiotherapy, Aalborg University Hospital, Aalborg, Denmark.
§Orthopaedic Surgery Research Unit, Aalborg University Hospital, Aalborg, Denmark.
‖Department of Rheumatology, Aalborg University Hospital, Aalborg, Denmark.
¶Institute of Sports Medicine Copenhagen, Copenhagen University Hospital, Bispebjerg, Denmark.
#Department of Clinical Medicine, Aalborg University, Aalborg, Denmark.
**Institute of Sports Science and Clinical Biomechanics, University of Southern Denmark, Odense, Denmark.
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in a randomized trial.[15,16] The 351 adolescents with other types of knee pain (including both traumatic and nontraumatic onset) were not treated in this study.

At 2-year follow-up in September 2013, all 504 adolescents were contacted by telephone and asked to answer the online questionnaire. If they agreed to participate, an e-mail with a link to the questionnaire was sent to them. To allow for a comparison of the primary outcome (knee pain during the last week prior to follow-up) with a group that did not report having knee pain at baseline in 2011, we contacted 252 randomly selected adolescents from the same cohort who did not report knee pain at baseline in 2011.

Outcomes Assessment

At baseline in September 2011, the adolescents were presented with a mannequin with a frontal and posterior view of the human body. All of the body regions were written next to the mannequin. The adolescents had the option of clicking on the name of the region or pressing the specific body region where they experienced pain; the color of the selected region then changed. Afterward, they were asked separately about frequency of pain in the selected regions: rarely, monthly, weekly, more than once per week, or almost daily.[8] Pain frequency was chosen as a simple measure of pain severity, as higher frequency has been associated with higher pain intensity.[24] After the pain mannequin and pain frequency questions, the adolescents were asked if they participated in leisure-time sport (sports activity besides the mandatory physical education classes during school hours) and, if so, how many times they participated each week. The last page of the questionnaire contained the EuroQoL 5-Dimensions (EQ-5D), which measured HRQoL.[2]

At follow-up in September 2013, they were asked the same questions; in addition, they were asked about their worst pain in the last week as measured on a visual analog scale (VAS) and leisure-time sport participation per week. They were also asked to complete the Knee injury and Osteoarthritis Outcome Score (KOOS), the Physical Activity Scale (PAS), and EQ-5D.

The primary outcome was knee pain during the last week prior to follow-up in 2013 (yes/no). Secondary outcomes included frequency of knee pain, leisure-time sports participation per week, and VAS, KOOS, PAS, and EQ-5D scores.

Sample Size

The sample size of the original cohort of 504 adolescents with knee pain in 2011 determined the sample size of adolescents with knee pain. It was expected that at least 50% of the adolescents who had knee pain in 2011 would still have knee pain, and it was expected that no more than 20% of the adolescents without knee pain in 2011 would have developed knee pain. Using a power of 90%, an alpha level of 5%, and a within-cluster correlation of 0.015, at least 80 adolescents without knee pain in 2011 were needed. To allow for a comparison of secondary outcomes, we chose to increase the sample size to 252 adolescents. In addition, 252 adolescents who did not report having knee pain at baseline in 2011 were included as controls.

Statistical Analyses

The statistical analysis consisted of descriptive statistics, with results expressed as mean and 95% CI or median and interquartile range, depending on the distribution of data. The primary analysis was done using a general linear model for the binomial family with log link function and robust SEs using risk ratio to calculate the risk of knee pain at follow-up in 2013. This analysis was also performed with adjustment for sex, age, and body mass index (BMI).

An explorative analysis was made to investigate which baseline characteristics were associated with knee pain at follow-up in 2013. This was done using the same general linear model as in the primary analysis. All baseline variables that were associated with knee pain in 2013 were entered into a multivariable model that was constructed according to the Hosmer and Lemeshow "purposeful selection of variables."[1] No adjustments were made for multiple comparisons.[23] No cluster effect was found for the four schools that the adolescents originally attended, and therefore, these 2-year analyses were not adjusted for cluster. The dropout analysis compared baseline data from adolescents who completed the 2-year follow-up and adolescents with no available follow-up data. Stata version 11 (StataCorp) was used for all statistical analyses.

RESULTS

Baseline demographics are shown in Table 1. At 2-year follow-up, 602 (79.6%) adolescents completed the questionnaire. The dropout analysis showed no significant or relevant difference between adolescents with PFP or other types of knee pain who completed the 2-year follow-up and those who did not (height <0.2 cm, weight <1.2 kg, sex <10%, pain frequency at baseline <10%).

Of adolescents reporting knee pain at baseline, 55.9% (95% CI, 50.8%-60.9%) also reported knee pain 2 years later (Figure 2); of those without knee pain at baseline, 12.8% (95% CI, 8.4%-17.2%) reported knee pain at follow-up in 2013 (Figure 2). Adolescents diagnosed with PFP at baseline had a higher risk of knee pain after 2 years (unadjusted: relative risk [RR], 1.26 [95% CI, 1.05-1.50]; adjusted for age, sex, and BMI: RR, 1.24 [95% CI, 1.04-1.49]) compared with other types of knee pain. The combined group of adolescents with PFP and adolescents with other types of knee pain had a higher risk of knee pain at follow-up in 2013 compared with adolescents who did not have knee pain at baseline in 2011 (unadjusted RR, 4.51 [95% CI, 3.15-6.45]; adjusted: RR, 4.47 [95% CI, 3.11-6.43]). Among adolescents with knee pain in 2013, a higher proportion of adolescents with PFP reported daily knee pain (33% vs 24%) or knee pain several times per week (22% vs 13%) compared with adolescents with other types of knee pain.

The group with PFP at baseline had 13 mm higher median pain intensity during the last week at follow-up compared with the group with other types of knee pain

TABLE 1
Baseline Demographics[a]

	PFP (n = 153)	Other Types of Knee Pain (n = 351)	No Knee Pain in 2011 (n = 226)
Age, y	17 (16-18)	17 (17-18)	17 (16-18)
Sex, % female, mean (95% CI)	81.2 (75.0-87.4)	68.9 (64.1-73.8)	62
Weight, kg	64.2 ± 11.9	65.6 ± 11.3	64.0 ± 12.8
Height, cm	171.9 ± 8.9	172.2 ± 9.3	172.7 ± 8.8
BMI	21.7 ± 3.0	22.1 ± 3.2	21.4 ± 3.5
Participating in leisure-time sport, %, mean (95% CI)	69.1 (61.7-76.6)	72.5 (67.7-77.2)	66.4 (55.3-77.4)
No. of sport sessions/wk, mean (95% CI)	3 (2-4)	3 (2-4)	3 (2-4)
EQ-5D index	0.78 (0.72-0.82)	0.78 (0.72-0.82)	1 (0.82-1)
EQ-5D VAS	74 (60-85)	75 (60-85)	90 (80-95)
Average pain duration, mo	37.5 (20-63)	24 (12-42)	N/A
Age when the knee pain started, y	14 (12.25-15.75)	15 (14-17)	N/A
Nontraumatic onset, %, mean (95% CI)	100	55.5 (50.3-60.8)	N/A
Pain frequency, mean (95% CI)			
Daily	25.4 (20.8-29.9)	30.7 (23.4-38.1)	N/A
Several times/wk	18.2 (14.2-22.9)	21.6 (15.0-28.1)	N/A
Weekly	29.1 (24.3-33.8)	31.0 (23.4-38.1)	N/A
Monthly	27.4 (22.7-32.0)	16.2 (11.0-23.0)	N/A

[a]Results are reported as median (interquartile range) unless otherwise indicated. BMI, body mass index; EQ-5D, EuroQoL 5-Dimensions; N/A, not applicable; PFP, patellofemoral pain; VAS, visual analog scale.

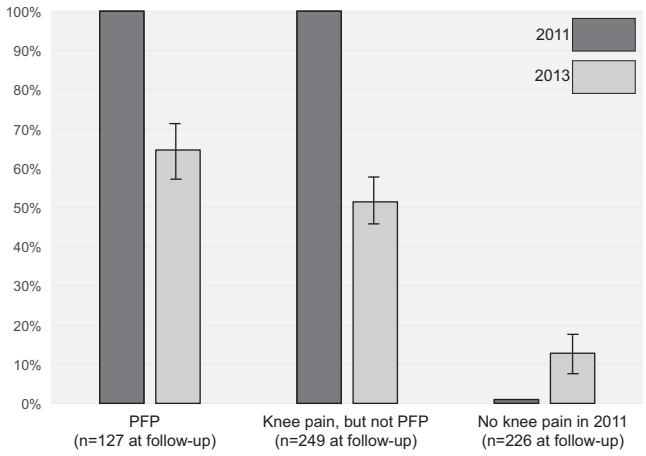

Figure 2. Percentage of adolescents with knee pain during the last week. Dark gray bars show the proportion of adolescents with knee pain during the last week in 2011 (first assessment). Light gray bars show the corresponding values in 2013 (follow-up). Error bars are 95% CIs.

at baseline (P = .03) and 26 mm higher compared with the group without knee pain in 2011 (P < .0001) (Table 2).

Of adolescents with PFP, 71% reduced or stopped being involved in sports from baseline to follow-up, compared with 52% of adolescents with other types of knee pain (a difference of 19% [95% CI, 6%-32%]; P = .004). Of adolescents without knee pain at baseline, 55% reduced or stopped participation in sports during the period. No difference was found in the change in sports participation between adolescents without knee pain at baseline and the entire group of adolescents with knee pain at baseline (a difference of 3% [95% CI, –6% to 13%]; P = .55). Adolescents with PFP participated in less leisure-time sports per week at follow-up compared with adolescents with other types of knee pain (P < .00001) (Table 2).

There were no differences in the EQ-5D index score or the EQ-5D VAS at follow-up between adolescents with PFP and those with other types of knee pain (Table 2). However, both groups had a significantly lower EQ-5D index score and EQ-5D VAS at follow-up compared with adolescents who did not have knee pain in 2011 (Table 2).

Explorative Analysis on Prognostic Factors

The univariate model showed that female adolescents not participating in sports, with low EQ-5D index scores, a high frequency of pain, and long-standing knee pain at baseline were those with the highest risk of knee pain after 2 years (Table 3). Combining the variables in a multivariate model caused only small changes in risk estimates, although the CIs became slightly wider.

DISCUSSION

This is the first population-based study to compare the 2-year prognosis of knee pain among adolescents aged 15 to 19 years. The study shows that adolescents with knee pain are at high risk of persistent knee pain after 2 years, but adolescents with PFP are at an even higher risk. Furthermore, adolescent PFP may have associated negative effects as those affected are more likely to reduce or stop sports participation. This study adds important knowledge about adolescent PFP and highlights that adolescent PFP persist in the majority and is associated with reduced sports participation.

TABLE 2
Secondary Outcomes and Between-Group Differences at 2-Year Follow-up[a]

Outcome Measure	Knee Pain in 2011 (n = 376)			Between-Group Difference	
	PFP (n = 127)	Other Types of Knee Pain (n = 249)	No Knee Pain in 2011 (n = 226)	PFP (n = 127) and Other Types of Knee Pain (n = 249)	Adolescents With Knee Pain in 2011 (n = 376) and Those Without Knee Pain in 2011 (n = 226)
Worst pain in final week, mm[b]	26 (0 to 49)	13 (0 to 38)	0 (0 to 2)	13[c]	26[c]
KOOS (0-100, worst to best)					
Pain	79 (76 to 82)	84 (82 to 86)	95 (94 to 96)	–5 (–9 to –2)[c]	–13 (–15 to 11)[c]
Symptoms	80 (77 to 83)	81 (79 to 83)	92 (91 to 93)	–1 (–5 to 2)	–11 (–13 to –9)[c]
ADL	87 (84 to 89)	90 (88 to 91)	97 (96 to 98)	–3 (–6 to 0)[c]	–8 (–10 to 7)[c]
Sports/recreation	69 (64 to 73)	70 (67 to 73)	91 (89 to 93)	–1 (–7 to 4)	–21 (–25 to 18)[c]
QoL	66 (62 to 69)	69 (67 to 72)	91 (89 to 93)	–3 (–8 to 1)	–23 (–26 to 20)[c]
No. of sport sessions/wk[b]	2 (1 to 3)	2 (2 to 3)	2 (2 to 3)	–0.39 (–0.55 to –0.23)[c,d]	–0.11 (–0.22 to 0.00)[d]
Participating in leisure-time sport, %	66.1 (57.9 to 74.4)	74.9 (69.5 to 80.3)	73.9 (62.3 to 85.4)	–8.8 (–18.5 to 0.0)	–1.9 (–9.3 to 5.4)
PAS score[b]	47.6 (45.8 to 49.4)	49.0 (47.6 to 50.4)	47.2 (46.0 to 48.5)	–1.4 (–3.7 to 1.0)	–1.3 (–3.1 to –0.6)
EQ-5D index score[b]	0.82 (0.76 to 1)	0.82 (0.78 to 1)	1 (1 to 1)	0.0	–0.18[c]
EQ-5D VAS score	84 (70 to 90)	85 (75 to 91)	90 (80 to 95)	1	–5[c]

[a]Results are reported as mean (95% CI) unless otherwise indicated. ADL, activities of daily living; EQ-5D, EuroQoL 5-Dimensions; KOOS, Knee injury and Osteoarthritis Outcome Score; PAS, Physical Activity Scale; PFP, patellofemoral pain; QoL, quality of life; VAS, visual analog scale.
[b]Results are reported as median (interquartile range).
[c]$P < .05$.
[d]Coefficient from Poisson regression. The value is the expected increase in log count for one group compared with the other group.

TABLE 3
Prognostic Factors for Knee Pain After 2 Years for Adolescents With PFP and Other Types of Knee Pain at Baseline (n = 376)[a]

Prognostic Factor	Knee Pain After 2 Years			
	Crude RR (95% CI)[b]	*P* Value, RR	Adjusted RR (95% CI)	*P* Value, Adjusted RR
Diagnosis of PFP (compared with other types of knee pain)	1.26 (1.05-1.50)	.01	1.17 (0.99-1.39)	.07
Age (15 y as referent)[c]	1.03 (0.99-1.07)	.20		
Women (compared with men)	1.29 (1.02-1.63)	.03	1.21 (0.96-1.52)	.10
Participation in sports (compared with no leisure-time sport)				
1-2 times/wk	0.80 (0.62-1.02)	.07	0.80 (0.63-1.02)	.07
≥3 times/wk	0.79 (0.65-0.96)	.02	0.87 (0.71-1.06)	.16
BMI (compared with BMI 18.5-25)[c]				
<18.5	1.09 (0.82-1.44)	.55		
25-30	1.01 (0.75-1.35)	.96		
>30	0.83 (0.45-1.51)	.54		
EQ-5D index score (compared with 75th-100th percentile)				
50th-75th percentile	1.40 (0.87-2.25)	.17	1.39 (0.84-2.31)	.20
25th-50th percentile	1.81 (1.14-2.85)	.01	1.64 (1.00-2.67)	.05
0-25th percentile	2.00 (1.28-3.12)	.002	1.54 (0.95-2.51)	.08
Pain frequency (compared with monthly knee pain)				
Weekly	1.24 (0.90-1.72)	.19	1.17 (0.84-1.62)	.35
Several times/wk	1.58 (1.15-2.17)	.005	1.37 (0.99-1.90)	.06
Daily	1.88 (1.41-2.50)	<.001	1.58 (1.17-2.14)	.003
Pain duration (per 10-mo increase), mo	1.04 (1.01-1.07)	.01	1.02 (0.99-1.05)	.24

[a]BMI, body mass index; EQ-5D, EuroQoL 5-Dimensions; PFP, patellofemoral pain; RR, relative risk.
[b]An RR >1 indicates increased risk of knee pain after 2 years, whereas an RR <1 indicates decreased risk of knee pain after 2 years.
[c]Age and BMI were not associated with knee pain after 2 years in the univariate analysis and are not included in the multivariate model, as they did not change the other estimates.

Comparison With Previous Studies

A previous study on nonspecific self-reported knee pain among 12- to 15-year-olds showed that 50% still reported knee pain after 12 months.[14] These results are from a younger age group, but they are similar to the current results (an overall persistence of 55.9% in those with unspecific knee pain). The even higher persistence among adolescents

diagnosed with PFP is very similar to previous small retrospective studies. Nimon et al followed a group of female participants diagnosed with PFP during adolescence and found that 78% still had pain at follow-up after 14 to 20 years.[12] Similar results were observed by Stathopulu and Baildam, who conducted a similar retrospective follow-up of patients diagnosed with PFP during adolescence and showed that 91% still had symptoms after 4 to 18 years.[25] The findings from this current prospective study support the older retrospective studies and underscore that a very large proportion of adolescents diagnosed with PFP continue to report pain and symptoms and have negative consequences regarding quality of life and sports participation.

Sports Participation and Risk Factors

The current results replicate our previous findings from a large, population-based cohort of 12- to 15-year-old adolescents, which also showed that a high knee pain frequency, female sex, and low EQ-5D index score are risk factors for persistent knee pain.[14]

However, in contrast to our previous results in a younger population, in the present study, participating in sports was associated with a decreased risk of knee pain after 2 years.[14] A plausible explanation for this could be that 12- to 15-year-olds are less likely to reduce or stop sports participation compared with 15- to 19-year-olds with knee pain, as their activity level is much more difficult to control and reduce at this age range. Thus, they continue to aggravate their knee pain through too much sport participation. In the current 15- to 19-year-old population, a large proportion (52% with other types of knee pain and 71% with PFP) reduced or stopped sports participation during the 2 years. If their knee pain was caused by excessive loading through sports participation, it seems plausible that their knee pain would improve if they stopped or reduced their participation in sport, as this would remove the actual cause of their knee pain. This is a speculative explanation of the association between sport and risk of knee pain after 2 years. Future studies are needed to investigate how sports participation may influence the future risk of knee pain among adolescents.

Stopping or reducing sports participation during adolescence may have serious lifestyle consequences, leading to a more sedentary lifestyle.[27] Adolescents with PFP were overrepresented among those reporting reduced participation in leisure-time sport activity. These findings have implications of serious concern, as they highlight the negative effect adolescent knee pain, and especially PFP, may have on overall health in adolescence and later adulthood. In support of this, results from the European Youth Heart Study show that vigorous physical activity is related to lower metabolic cardiovascular disease risk[21] and that high exposure to moderate and vigorous physical activity during adolescence is associated with lower levels of carotid arterial stiffness in adulthood, highlighting the benefits of staying physical active during adolescence.[20]

In summary and in support of previous studies,[4,14] adolescents with a high knee pain frequency, female sex, and low EQ-5D index score have a higher risk of knee pain after 2 years. This suggests that clinicians may need to pay extra attention to this group of adolescents with knee pain and, in particular, those suffering from PFP, as their physical activity levels are seriously threatened by this condition. Future research on adolescents with knee pain, therefore, needs to investigate how simple strategies to modify sports participation and/or physical activity levels may be integrated in the treatment of adolescents with this debilitating and long-standing condition.

Only 12% of the adolescents without knee pain in 2011 developed knee pain over the next 2 years. Among those who developed knee pain, very few developed knee pain with a high pain frequency, indicating lower pain severity compared with the other 2 groups. This may suggest that the majority of young adults who have knee pain develop it during early teens. Considering the high prevalence and high rate of long-lasting pain, future studies should investigate risk factors for adolescent knee pain and risk factors for developing long-lasting persistent knee pain. This may identify future interventions with a preventive potential of chronic knee pain in adolescents.

Limitations

A total of 121 of the 153 adolescents with PFP were included in a randomized trial to investigate the effect of patient education with or without exercise therapy.[16] Therefore, the 2-year outcome among adolescents with PFP may be influenced by their participation in the randomized trial. Therefore, a sensitivity analysis was performed in which the 62 subjects included in the exercise arm were excluded. Excluding those randomized to exercise increased the relative risk from 1.26 to 1.29, which does not change the interpretation of the results. The physiological age of the participants is unknown, as we recorded only their self-reported chronological age; thus, the association between physiological age and outcome is unknown. Furthermore, we do not know the specific knee condition among the 351 with other types of knee pain, only that approximately half had knee pain with a traumatic onset. However, because we included adolescents from a population-based cohort, the knee conditions seen are representative of the general adolescent population. The recruitment method was a significant strength, suggesting that our results have a high external validity. No clinical examination was performed at the 2-year follow-up. It is, therefore, unknown if the adolescents who still have knee pain are symptomatic with the same condition, symptomatic again with the same knee condition, or symptomatic with a different knee condition. Furthermore, the current study does not report the treatments given to all the adolescents, and it is unknown how treatment would have altered the prognosis.

Clinical Implications

PFP most likely represents several underlying pathologic disorders, and the diagnosis is made as a "diagnosis by exclusion" in the absence of other identifiable disorders, such as meniscal injury, tendinopathy, bursitis, or apophysitis.

When young patients with PFP present in the clinic, they should be taken seriously. They should not be told that PFP is a self-limiting knee condition. The results of this study suggest that adolescent knee pain has a high potential for chronicity. Physicians and physical therapists in primary and secondary care should be aware of the poor prognosis, including the negative effects on physical activity level and quality of life. There is a need for preventive measures to reduce the proportion of adolescents who develop long-lasting severe knee pain through early evidence-based treatment.[3,7]

CONCLUSION

Knee pain in adolescence, and particularly PFP, was present in 55% of the cases after 2-year follow-up and may thus not be self-limiting. Adolescents with PFP had a higher risk of knee pain at 2-year follow-up compared with adolescents with other types of knee pain. Importantly, adolescents diagnosed with PFP participated in less leisure-time sport activity during the 2-year follow-up period compared with adolescents with other types of knee pain. A greater focus on prevention and early treatment is required.

REFERENCES

1. Bursac Z, Gauss CH, Williams DK, Hosmer DW. Purposeful selection of variables in logistic regression. *Source Code Biol Med*. 2008;3:17.
2. Burstrom K, Svartengren M, Egmar AC. Testing a Swedish child-friendly pilot version of the EQ-5D instrument: initial results. *Eur J Public Health*. 2011;21(2):178-183.
3. Collins NJ, Bierma-Zeinstra SM, Crossley KM, van Linschoten RL, Vicenzino B, van Middelkoop M. Prognostic factors for patellofemoral pain: a multicentre observational analysis. *Br J Sports Med*. 2013;47(4):227-233.
4. El-Metwally A, Salminen JJ, Auvinen A, Kautiainen H, Mikkelsson M. Lower limb pain in a preadolescent population: prognosis and risk factors for chronicity—a prospective 1- and 4-year follow-up study. *Pediatrics*. 2005;116(3):673-681.
5. King S, Chambers CT, Huguet A, et al. The epidemiology of chronic pain in children and adolescents revisited: a systematic review. *Pain*. 2011;152(12):2729-2738.
6. Maffulli N, Bruns W. Injuries in young athletes. *Eur J Pediatrics*. 2000;159(1-2):59-63.
7. Mallen CD, Peat G, Thomas E, Dunn KM, Croft PR. Prognostic factors for musculoskeletal pain in primary care: a systematic review. *Br J Gen Pract*. 2007;57(541):655-661.
8. Mikkelsson M, Salminen JJ, Kautiainen H. Non-specific musculoskeletal pain in preadolescents: prevalence and 1-year persistence. *Pain*. 1997;73(1):29-35.
9. Molgaard C, Rathleff MS, Simonsen O. Patellofemoral pain syndrome and its association with hip, ankle, and foot function in 16- to 18-year-old high school students: a single-blind case-control study. *J Am Podiatric Med Assoc*. 2011;101(3):215-222.
10. Myer GD, Faigenbaum AD, Foss KB, et al. Injury initiates unfavourable weight gain and obesity markers in youth. *Br J Sports Med*. 2014;48(20):1477-1481.
11. Myer GD, Ford KR, Barber Foss KD, et al. The incidence and potential pathomechanics of patellofemoral pain in female athletes. *Clin Biomech (Bristol, Avon)*. 2010;25(7):700-707.
12. Nimon G, Murray D, Sandow M, Goodfellow J. Natural history of anterior knee pain: a 14- to 20-year follow-up of nonoperative management. *J Pediatr Orthop*. 1998;18(1):118-122.
13. Penedo FJ, Dahn JR. Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Curr Opin Psychiatry*. 2005;18(2):189-193.
14. Rathleff CR, Olesen JL, Roos EM, Rasmussen S, Rathleff MS. Half of 12-15-year-olds with knee pain still have pain after one year. *Dan Med J*. 2013;60(11):A4725.
15. Rathleff MS, Roos EM, Olesen JL, Rasmussen S. Early intervention for adolescents with patellofemoral pain syndrome: a pragmatic cluster randomised controlled trial. *BMC Musculoskelet Disord*. 2012;13(1):9.
16. Rathleff MS, Roos EM, Olesen JL, Rasmussen S. Exercise during school hours when added to patient education improves outcome for 2 years in adolescent patellofemoral pain: a cluster randomised trial. *Br J Sports Med*. 2015;49(6):406-412.
17. Rathleff MS, Roos EM, Olesen JL, Rasmussen S. High prevalence of daily and multi-site pain: a cross-sectional population-based study among 3000 Danish adolescents. *BMC Pediatr*. 2013;13:191.
18. Rathleff MS, Roos EM, Olesen JL, Rasmussen S, Arendt-Nielsen L. Lower mechanical pressure pain thresholds in female adolescents with patellofemoral pain syndrome. *J Orthop Sports Phys Ther*. 2013;43(6):414-421.
19. Rathleff MS, Skuldbol SK, Rasch MN, Roos EM, Rasmussen S, Olesen JL. Care-seeking behaviour of adolescents with knee pain: a population-based study among 504 adolescents. *BMC Musculoskelet Disord*. 2013;14:225.
20. Ried-Larsen M, Grontved A, Kristensen PL, Froberg K, Andersen LB. Moderate-and-vigorous physical activity from adolescence to adulthood and subclinical atherosclerosis in adulthood: prospective observations from the European Youth Heart Study. *Br J Sports Med*. 2015;49(2):107-112.
21. Ried-Larsen M, Grontved A, Moller NC, Larsen KT, Froberg K, Andersen LB. Associations between objectively measured physical activity intensity in childhood and measures of subclinical cardiovascular disease in adolescence: prospective observations from the European Youth Heart Study. *Br J Sports Med*. 2014;48(20):1502-1507.
22. Rocha ES, Pedreira AC. Common orthopedic problems in adolescents [in Portuguese]. *J Pediatr (Rio J)*. 2001;77(suppl 2):S225-S233.
23. Rothman KJ. No adjustments are needed for multiple comparisons. *Epidemiology*. 1990;1(1):43-46.
24. Stahl M, Mikkelsson M, Kautiainen H, Hakkinen A, Ylinen J, Salminen JJ. Neck pain in adolescence: a 4-year follow-up of pain-free preadolescents. *Pain*. 2004;110(1-2):427-431.
25. Stathopulu E, Baildam E. Anterior knee pain: a long-term follow-up. *Rheumatology (Oxford)*. 2003;42(2):380-382.
26. Stodden DF, Goodway JD, Langendorfer SJ, et al. A developmental perspective on the role of motor skill competence in physical activity: an emergent relationship. *Quest*. 2008;60(2):290-306.
27. Tammelin T, Nayha S, Hills AP, Jarvelin MR. Adolescent participation in sports and adult physical activity. *Am J Prev Med*. 2003;24(1):22-28.
28. Tammelin T, Nayha S, Laitinen J, Rintamaki H, Jarvelin MR. Physical activity and social status in adolescence as predictors of physical inactivity in adulthood. *Prev Med*. 2003;37(4):375-381.
29. van den Hoven LH, Gorter KJ, Picavet HS. Measuring musculoskeletal pain by questionnaires: the manikin versus written questions. *Eur J Pain*. 2010;14(3):335-338.
30. von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *J Clin Epidemiol*. 2008;61(4):344-349.