

ど毎日」「ときどき」「ほとんどしない」への回答と QOL との関連では、運動習慣があるほど QOL が高いという結果になった (表 8)。一元配置分散分析を行った結果、有意な差が認められたため、Tukey 法で多重比較を行った結果、3 つの間で有意な差が認められた。

課外活動の有無と QOL との関連はみられなかった (表 9)。

通学と QOL との関連は、客観的な通学時間については QOL 得点と関連は認められなかったが (表 10)、主観的な通学の疲れ (ほとんど疲れない、たまに疲れを感じる、よく疲れを感じる、いつも疲れを感じる) と QOL との関連は認められた (表 11)。一元配置分散分析を行った結果、有意な差が認められたため、Tukey 法で多重比較を行った結果、「ほとんど疲れない」「たまに疲れを感じる」との間の QOL 得点には有意な差はなく、「たまに疲れを感じる」「よく疲れを感じる」との間の QOL 得点で有意な差が認められた ($p < 0.1$)。「よく疲れを感じる」と「いつも疲れを感じる」との間の QOL 得点は有意な傾向 ($p < 0.05$) が認められた。

2) 九州大学学生生活チェックカタログの結果

九州大学学生生活チェックカタログ (QOSL 調査票) の結果、QOSL 得点に男女の差は見られなかった (表 12)。領域別の得点を表 13 に示す。

考 察

今回の調査において、QOL については、主観的健康感、主観的ストレス、規則正しい生活、主観的睡眠の質・充足感、1 日の勉強時間、定期的な運動習慣などと QOL が関連していることが明らかになった。これらから、学生生活の質に関しては、基本的な生活習慣の獲得が重要であることが示唆されるし、また QOL の高低を大学が把握する場合に、基本的な生活習慣の把握から学生の QOL 状況を把握することが可能になるかもしれない。また、自主的な勉強時間との関連も認められ

たので、自主的に勉強ができることが QOL を高めるか、QOL の高い学生が勉強を自主的に行っていることが示唆された。

運動習慣との関連も認められたことから、身体活動が QOL と関連していることが明らかになった。身体的活性度を高めることが QOL と高める可能性があり、また QOL を高めていく事でより活動的になることが示唆された。

通学と QOL との間では、客観的な数値と QOL は関連が見られなかったが、主観的疲れなどとは関連がみられたことから、通学の負担をどうとらえているか、という心理的な要因が関わっていることが示唆された。学生の QOL には通学時間の把握だけでなく主観的な指標を用いることも重要になるだろう。

今後の課題として、詳しい分析とその他の指標との関連を明らかにし、学生の QOL と関連している。

謝 辞

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表 1 性別と WHO/QOL 得点

	合計	男子(N=1337)	女子(N=595)	
WHO/QOL 得点平均	3.393(±0.4944)	3.386(±0.5198)	3.409(±0.4318)	n.s.

表 2 主観的健康感と WHO/QOL 得点

	非常に健康である(N=313)	健康である(N=1370)	あまり健康でない(N=236)	全く健康でない(N=8)
WHO/QOL 得点平均	3.77(±0.51)	3.373(±0.431)	3.043(±0.481)	2.575(±0.555)

** $p < 0.001$

表3 主観的ストレスと WHO/QOL 得点

	ほとんどない(N=422)	たまに感じる(N=1165)	よく感じる(N=293)	いつも感じる(N=49)
WHO/QOL 得点平均	3.678(±0.5138)	3.403(±0.4185)	3.057(±0.4046)	2.706(±0.5932)
				**p<.001

表4 規則正しい生活と WHO/QOL 得点

	非常に規則正しい(N=120)	まあまあ規則正しい(N=1086)	あまり規則正しくない(N=603)	非常に不規則(N=121)
WHO/QOL 得点平均	3.783(±0.6392)	3.463(±0.4591)	3.273(±0.4298)	2.981(±0.5047)
				**p<.001

表5 睡眠評価と WHO/QOL 得点

	睡眠評価低	睡眠評価高	
WHO/QOL 得点平均	3.226(±0.4655)	3.539(±0.4724)	**p<.001

表6 主観的睡眠充足感と WHO/QOL 得点

	足りている(N=317)	まあまあ足りている(N=742)	あまり足りていない(N=695)	全く不十分(N=176)
WHO/QOL 得点平均	3.635(±0.5873)	3.485(±0.4259)	3.282(±0.4357)	3.012(±0.5073)
				**p<.001

表7 勉強時間と WHO/QOL 得点

	全くしない(N=300)	1時間未満(N=969)	1~3時間(N=607)	3~5時間(N=33)	5~7時間(N=17)	7時間以上(N=3)
WHO/QOL 得点平均	3.285(±0.5399)	3.389(±0.4796)	3.453(±0.4787)	3.376(±0.6782)	3.429(±0.3981)	3.533(±0.1528)
	*p<.01	**p<.001				

表8 運動習慣と WHO/QOL 得点

	ほとんどしない(N=723)	ときどき(N=985)	ほとんど毎日(N=221)	
WHO/QOL 得点平均	3.313(±0.5067)	3.42(±0.4672)	3.534(±0.5237)	**p<.001

表9 課外活動と WHO/QOL 得点

	課外活動している(N=1571)	課外活動していない(N=360)	
WHO/QOL 得点平均	3.401(±0.4919)	3.363(±0.5051)	n.s.

表10 通学時間と WHO/QOL 得点

	15分未満(N=351)	15~30分(N=505)	30分~1時間(N=445)	1~1時間30分(N=339)	1時間30分以上(N=280)
WHO/QOL 得点平均	3.396(±0.5375)	3.372(±0.4642)	3.415(±0.4922)	3.429(±0.4853)	3.352(±0.5049)

表11 主観的通学の疲れと WHO/QOL 得点

	ほとんど疲れない(N=568)	たまに疲れを感じる(N=739)	よく疲れを感じる(N=395)	いつも疲れを感じる(N=227)
WHO/QOL 得点平均	3.475(±0.5422)	3.424(±0.4367)	3.324(±0.4506)	3.205(±0.5496)

**p<.001

表 12 性別と九州大学学生生活チェックカタログ QOSL 総得点

合計(N=1920)	男子(N=1329)	女子(N=591)	
3,393(±0.4944)	28,8021(±6.99036)	29,3198(±6.3873)	n.s.

表 13 九州大学学生生活チェックカタログの QOSL 領域別の平均値

領域 1: 心身の不調	領域 2: 学業	領域 3: 環境	領域 4: 対人関係	領域 5: 自己効力感	領域 6: 将来展望・生きがい	領域 7: 全体的充実
6.1613(±1.65762)	2.492(±0.875)	4.6653(±1.15958)	3.1446(±1.33592)	5.1463(±2.4868)	3.5539(±1.73204)	3.7838(±1.50222)

— 研究資料 —

疫学的アプローチによる学生のメンタルヘルス支援に向けた システム構築：課題と展望 九州大学 P&P 研究 EQUISITE Study 7

熊谷秋三^{*}、一宮 厚

Epidemiological study toward constructing a mental health care system
on university campus: scemmary and prospects of the study

Shuzo KUMAGAI and Atsushi ICHIMIYA

要 旨

メンタルヘルスに不安を感じる九州大学の学生に対しては、健康科学センターがハイリスクアプローチを行ってきた。ただし、メンタルヘルスの低下した多数の学生へ対処するには限界があるため、ポピュレーションアプローチを導入する必要がある。そこで、我々は疫学的アプローチによる学生のメンタルヘルス支援に向けたシステム構築を本学の P&P の支援を受けて開始した。ベースライン調査より得られた成績に基づき、今後は種々のアウトカム評価を継続予定である。本研究課題の課題と今後の展望について論じる。

キーワード：ポピュレーションアプローチ、システム構築、メンタルヘルス

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1. はじめに

青年期の学生のメンタルヘルス低下に対する対策は重要な課題である。とりわけ間もなく社会に出る大学生の脳を健康に保ち、ひいては社会に出てからも健康脳を維持・向上できるように、学生時代に健康教育や健康支援する取り組みをする必要がある。健康科学センターでは、学生のメンタルヘルスを改善させる取り組みを行ってきた。これは、メンタルヘルスに不安を感じる学生本人が自らあるいは勧められてセンターを

訪れるものと、入学直後の健診時の調査票を基にした呼び出し面接を行い必要に応じてカウンセリングなどの治療へ移行を促すものがある。ただし、これらの対処の方法つまり調子を崩しかけた学生を対象としたハイリスクアプローチ(高危険因子戦略)では、メンタルヘルスの低下している多数の学生へ対処するには限界がある。そこで、本プロジェクトでは、ポピュレーションアプローチ(集団戦略)として1年生全員を対象として前向き調査を行い、①学生のメンタルヘルスの実態を調査し、②メンタルヘルスと QOL や学力・修学

九州大学健康科学センター, Institute of Health Science, Kyushu University, Kasuga, Japan

^{*}連絡先：九州大学健康科学センター 〒816-8580 福岡県春日市春日公園 6-1 Tel&Fax : 092-583-7853

^{*}Correspondence to: Institute of Health Science, Kyushu University, 6-1 Kasuga-koen, Kasuga Fukuoka, 816-8580, Japan.
Tel. & fax: +81 92 583 7853. Email address: shuzo@ihs.kyushu-u.ac.jp

状況との関連を明らかにし、③これらの心理・精神的な能力を維持・改善させるための生活習慣（運動・食事・睡眠）を明らかにし、今後のメンタルヘルス改善のための支援システム作成の基礎資料を得ること、仮の支援システムを作成してその有用性を調査することを目的とする。また、メンタルヘルスの悪化に付随して生じる修学状況の遅滞や学力低下との関連についても可能な限りの評価を行う予定である。本研究課題のゴ

ールは、九州大学に入学する学生のメンタルヘルス支援に向けた全学的な支援システム（九州大学モデル）の構築を行うことである（図1）。図1には、本学におけるメンタルヘルスサポートシステム（案）と本研究との位置づけを示している。

ここでは、本研究におけるベースライン調査の要約と今後の研究課題に関して展望する。

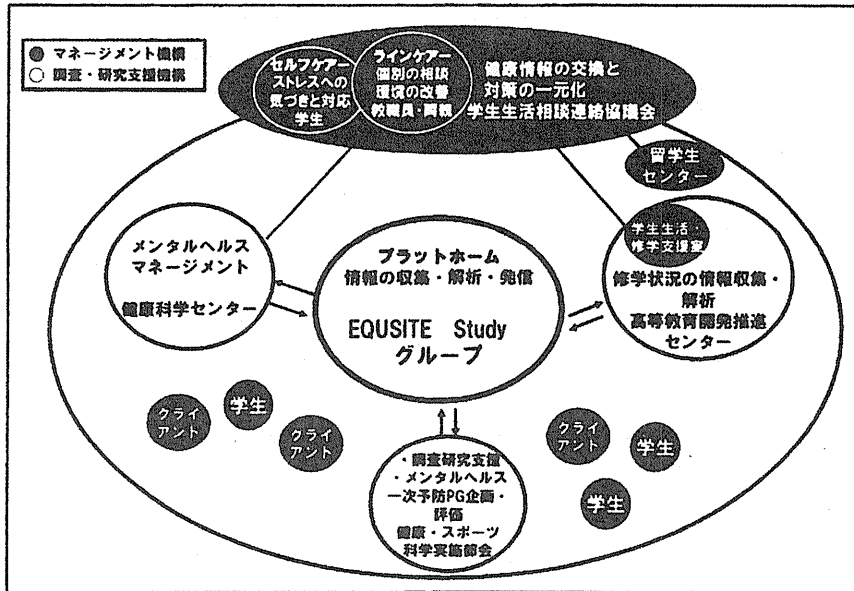


図1. 九州大学サポートシステムの構築と本研究の関係性

2. ベースライン調査の成績

本研究の調査概念図と調査項目を図2に示す。

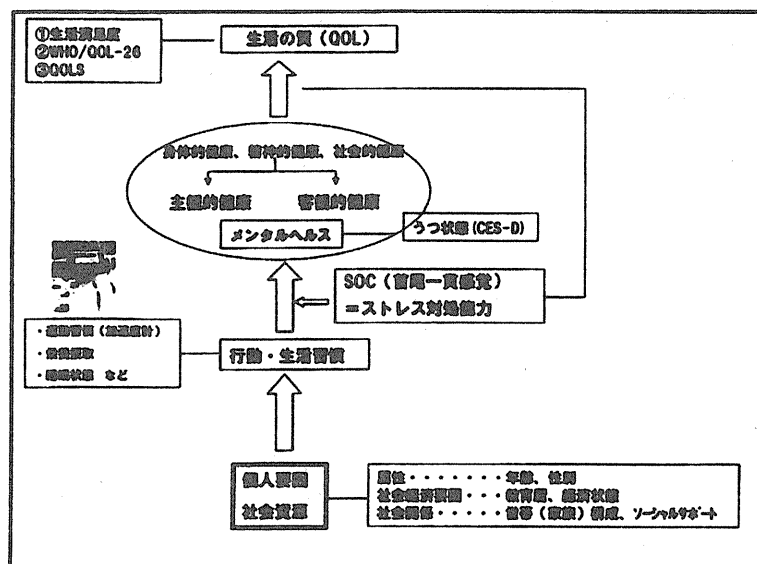


図2. EQUISITE スタディにおける概念図・測定項目

本研究で得られた初年度の研究成果の要約は以下の通りである。

1) 身体活動量, 食物摂取量の実態

1日あたりの歩行数の中央値は, 男性が7,447歩, 女性が7,488歩であった。3METs以上の身体活動量は, 男女ともに4エクササイズ(EX)であった。摂取カロリーは, 男性が1,839kcal(たんぱく質:13.2%, 脂質:26.6%, 炭水化物:60.0%), 女性が1,443kcal(たんぱく質:13.6%, 脂質:30.0%, 炭水化物:56.1%)であった。一人暮らしの学生は実家暮らしの学生と比較して, 全ての栄養素において栄養摂取量が有意に少なかった。

2) うつ症状の実態

うつ症状の自己評価尺度であるCES-Dの得点が16点以上である有症状の割合は男子27.7%(391名), 女子25%(156名)であった。CES-Dの得点は男子 12.29 ± 8.24 (N=1412), 女子 11.83 ± 7.42 (N=623)で男女に差はなかった。主観的健康感やキャンパス生活の満足感が高く, 主観的ストレスが低いほど, うつ症状の自己評価尺度であるCES-D得点の低いことが示唆された。また, 生活習慣項目では, 規則正しい生活を送り, 主観的な睡眠の充足度が高いほどCES-D得点が低いことが示された。朝食の摂取頻度や平日の睡眠時間, 住居形態, 課外活動の有無については, 男女で異なる結果となった。女子は毎日朝食を摂取し, 適度な睡眠時間をとっている者, 男子は自宅に住み, 課外活動をしている者がCES-D得点の低いことが報告された。

3) ストレス対処能力(首尾一貫感覚:SOC)の実態

初年度のストレス対処能力(首尾一貫感覚:SOC)および主観的健康感, 主観的ストレス, 生活習慣との関連性について検討した。その結果, 主観的健康感やキャンパス生活の満足感が高く, 主観的ストレスが低い者ほど, SOC得点の高いことが示唆された。また, 生活習慣項目では, 規則正しい生活をしており, 主観的な睡眠の充足度が高いほどSOC得点の高いことが報告された。

4) QOLの実態

主観的健康感が高く, 主観的ストレスが低いほど, WHO/QOL26の得点が高いことが示唆された。また, 生活習慣項目では, 規則正しい生活を送り, 主観的な睡眠の充足度が高いほどQOL得点が高いことが示された。勉強時間が1時間以上で, 運動習慣のあるものがQOLが高い傾向にあることも認められた。通学に関しては, 通学時間という客観的な指標ではQOL得点に差

はみられなかったが, 主観的な通学の疲労感が高いほどQOL得点が高かった。QOLについて, ライフスタイルや学業, 運動, 通学など環境要因と主観的・心理的指標と関連していることが示唆された。

3. 今後の課題と展望

大学時代は, 概ね学部時期が青年期後期に相当し, その後には社会人として社会に適応していく前成年期が続く。現在は大学院進学率も上がっているので前青年期にも社会にでない人が増えている。青年期は精神的な危機を迎える時期の一つであると見なされてきたが, 一方で多くの人々は青年期を特に問題なく過ごすともいわれている。なお思春期(青年期前期)の心性を残す人々があるが, 社会への巣立ちが近づいた青年期後期に至って多くの人々は大きく精神的な成長を遂げていく。しかし近年, 我が国では社会性の低い若者が増えていると憂う見方が強まっている。

大学生(学部生)に精神的な問題が生じる時期として, 入学直後と研究室への配属の時期, そして卒業前の半年を上げることが出来るであろう。今回の調査研究では, 入学後の前期期間中に, 必須科目である「健康・スポーツ科学演習」の授業を通じて全学生の精神状態や生活などについて調査した。これによって, 大学生の初期の精神状態や生活状態について或る程度の詳しさをもった情報を直接把握することができた。この結果から, 大学生生活の初期の適応の良し悪しについて状態を推定することができる。

今後は, この学年の学生達について在学中に追跡調査を行うことで大学生生活のその後の変化について調べ, 入学初期の状態のその後の精神状態の変化や大学生生活への影響を明らかにして, 大学入学後の指導や介入の必要性などについて知見を得ることが出来るだろう。

まず1年後に同様の調査を行って, 大学生生活の初期の状態とその短期的な変化の関係, また初期の修学への影響を明らかにして, 大学入学後早期の指導や介入の必要性などについて知見を得ることが出来るだろう。

追跡調査としては, そのほか従来4月の定期健康診断時に行っているアンケートによる健康調査のデータを使うことが出来る。定期健康診断の際に, 身体計測や診察の前にアンケートによる健康調査をおこなって学生の精神状態や生活習慣について調べている。今回の調査をもとにして, 大学在学中の学生の変化につい

て知見を得ることが可能となるであろう。特に今回の調査では運動量を直接測定しており、このデータを用いて日常的な身体活動の効果（これには健康科学センターで従来調査して指導加入してきた肥満など生活習慣病の萌芽との関係も含まれる）、また学生時代の自由な生活のなかでの身体活動習慣の進展や衰弱への影響について知見が得られると期待される。

今回の調査の主要な部分は、自覚についての調査である。メンタルヘルスの悪化した場合の難しい問題として、本人の自覚と客観的な精神的な状況が一致しない点にある。しかし、病的ではない人々で知的能力が低い人であれば、集団としてそれほどの乖離は見られないと考えられる。

また、その後の修学状況、休学や退学、あるいは卒業の遅延との関係を調べることで、入学後の状況がその後の修学に与える重篤な影響の有無を調べることができるであろう。

大学の学生の全員について調査を行う機会は少ない。大学では個別的な活動が原則であり、入学後に全調査を行うことは難しい。今回は、「健康・スポーツ科学演習」という健康と密接な関係を有する授業で、健康

に関する意識を身につけるための授業の一貫として調査を行うので、全員に調査を行うことが出来た。

今回の調査の結果を踏まえて、健康や精神状態に不安やそのほかの心配される問題がある場合には、専門のカウンセラー、医師など連携して学生の健康支援を行う予定にしている。今後は、こうした支援を合理的で納得のいくものにするための客観的な証拠としての研究成果を得たいと思う。

九州大学の学生のメンタルヘルス支援はこれまで系統的ではなかった。メンタルヘルスの悪化が危惧されるが、全学的な一次予防の充実なしには対策が構築できない状況にある。今後、修学支援とコミットした形で全学的な学生支援システムが構築される予定であるが、今回の調査で行った入学直後からの学生の状態の適切な評価をもとに個々の学生への支援を目指すことになるであろうと期待する。

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Effects of Aerobic Exercise on Lipid Profiles and High Molecular Weight Adiponectin in Japanese Workers

Wei Guo¹, Hiroaki Kawano², Lianhua Piao¹, Nana Itoh³, Koichi Node² and Takeshi Sato⁴

Abstract

Background The metabolic syndrome is characterized by the accumulation of several metabolic risk factors. It is important to improve physical activity and dietary habits to reduce the risk of cardiovascular disease in humans.

Methods The study participants participated in a weekly aerobic exercise program that included a session composed of a brief meeting, warm-up exercises, and primary exercises (low and high impact, stretch, muscle training, and cooling down). To evaluate the effect of this intervention we measured body fat composition, holding power, and quality of life assessment. Blood tests were also carried out before and every 3 months during the study.

Results Of the 37 participants enrolled in the exercise group, 31 (83.8%) completed the 12-week program. The control group consisted of 42 subjects, 36 (85.7%) of whom were available for follow-up at the end of the 12-week study period. In the exercise group, weight, body fat percentage, waist circumference, the World Health Organization quality of life 26 (WHO-QOL 26) score, triglyceride, total cholesterol, high density lipoprotein cholesterol and low density lipoprotein cholesterol had improved significantly at the end of three months. The high molecular weight adiponectin concentration of the participants in the exercise group increased during the 9-month period of the study, although this change did not reach statistical significance compared with pre-exercise.

Conclusion Aerobic exercise led to an improvement in body composition and lipid profiles. High molecular weight adiponectin concentrations tended to improve compared with pre-aerobic exercise levels.

Key words: aerobic exercise, high molecular weight (HMW) adiponectin

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Introduction

The metabolic syndrome is characterized by the accumulation of several metabolic risk factors, such as abdominal obesity, dyslipidemia, hypertension, glucose intolerance, and prothrombotic and proinflammatory states (1-5). It is well known that patients with the metabolic syndrome have an increased risk of cardiovascular disease (6). Recently, the prevalence of patients with the metabolic syndrome has increased in Japanese workers. According to the International Diabetes Federation (IDF) and the National Cholesterol Education Program (NCEP) III criteria, the prevalence of the

metabolic syndrome in Japanese workers is reported to range from 25.8% to 33.0% (7).

It is important to improve physical activity and dietary habits to reduce the risk of cardiovascular disease in humans. Several earlier studies have shown that the beneficial effects of aerobic exercise on blood pressure, cholesterol levels, and insulin sensitivity occur regardless of whether weight loss is achieved or not (8, 9). In fact, the Pawtucket Heart Study group reported there is a close relationship between physical activity and the levels of high density lipoprotein (HDL) cholesterol (10). A study in 3,000 adult Japanese men also showed that the frequency of physical activity correlated positively with HDL cholesterol levels (11).

¹Doctoral Program, Saga University, Japan, ²Department of Cardiovascular and Renal Medicine, Saga University, Japan, ³Master's Program, Saga University, Japan and ⁴Health Care Center, Faculty of Medicine, Saga University, Japan

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Correspondence to Dr. Takeshi Sato, satot@cc.saga-u.ac.jp

The aims of the present study in Japanese workers were to assess the effects of long-term aerobic exercise on lipid profiles, glucose levels, and plasma high molecular weight (HMW) adiponectin, an anti-atherosclerotic adipokine.

Materials and Methods

Participants

Participants were enrolled in the study using newspaper and radio advertisements, and pamphlets. A total of 79 subjects aged 28-76 years (21 men and 58 women) were enrolled in the intervention group.

According to the Japanese diagnostic criteria, the metabolic syndrome is defined as a waist circumference of at least 85 cm in men, or 90 cm in women, plus at least two of the following characteristics: 1) triglycerides ≥ 1.69 mmol/L (150 mg/dL) or HDL cholesterol < 1.03 mmol/L (40 mg/dL), 2) systolic blood pressure ≥ 130 mmHg or diastolic blood pressure ≥ 85 mmHg, and 3) fasting plasma glucose ≥ 6.11 mmol/L (110 mg/dL) (12). The exclusion criteria in this study were a history of cardiovascular diseases, other serious illnesses, and type 1 diabetes mellitus. After the participants were asked about their history of physical and psychiatric illnesses, a physical examination was carried out on each participant.

The consent forms explained the purpose of this study, confidentiality of data, the possibility of declining to participate, and the contact numbers of the researchers. Documents containing explanations and precautions, and consent forms were distributed to the participants to obtain their written permission before the survey. They obtained approval of the written informed consent from 79 subjects in total. The study protocol was submitted to and approved by the Institutional Review Board (IRB) of the Faculty of Medicine at Saga University.

Intervention

The exercise program was undertaken 1 day each week for 3 months or more up to a maximum of 18 months. The three-month course therefore consisted of a total of 12 sessions. Each session was of 1.5 hours duration and consisted of a brief meeting (10 minutes), warm-up exercises (5 minutes), primary exercises (30-35 minutes), stretch exercises (10 minutes), muscle training (25 minutes), and cooling down (5 minutes). Participants were assigned training ranges using a pre-established heart rate equivalent to 70% to 85% of their maximum heart rate (13).

Physical assessment

Physical assessment including weight, body mass index (BMI), body fat percentage (% body fat) was performed for each participant before the aerobic exercise program and 3 months later using the TANITA TBF-305 (Tanita, Tokyo, Japan) body fat/composition monitor. Waist circumference was measured at the navel with the subject in the erect position

after relaxed breathing. Duplicate measurements of holding power of the left and right hand were recorded using a grip dynamometer, and the average of the values recorded. During these measurements, the subjects were requested not to move the dynamometer.

QOL assessment

We evaluated the participants' quality of life using the World Health Organization Quality of Life scale (WHO-QOL) (14). The 26-item short form of the WHO-QOL is the brief version of the WHO-QOL 100, which was developed to assess subjects around the world, regardless of culture or local customs. It consists of 26 items classified into the following five domains: physical domain, psychological domain, social relationships, environmental domain, and general QOL. We evaluated the QOL assessment before the course and after three months of aerobic exercise.

Blood tests

The levels of triglyceride, total cholesterol, HDL cholesterol, low density lipoprotein (LDL) cholesterol, and fasting plasma glucose were measured during the study. Plasma HMW adiponectin level was measured using a sandwich ELISA kit (Fujirebio, Tokyo, Japan) that incorporated a monoclonal antibody to human HMW adiponectin, IH7 (15). A working standard of HMW adiponectin was prepared using human HMW adiponectin purified by passage through a Geratin-Cellulofine affinity column (Seikagaku Industrial Co., Tokyo Japan). The sensitivity and upper limit of the working range of HMW adiponectin levels were 0.18 to 22.05 $\mu\text{g/mL}$. The intra- and inter-assay variances were 2.4 to 3.0% and 4.2 to 5.1%, respectively.

Statistical analysis

The data were expressed as the mean \pm standard error (SE). The Chi-square test and Mann-Whitney U test were used to compare the characteristics of the two groups. The Wilcoxon signed-rank test was used to compare the values before the program and after three months of aerobic exercise. A two-way repeated measures analysis of variance (ANOVA) (aerobic exercise duration \times gender) was used to compare the values at 3, 6, 9, 12 and >12 months between the group performing exercises and pre-exercise. Pearson's correlation analysis and multiple regression analysis to examine the relationship between HMW adiponectin and the other factors and the Mann-Whitney U test was used to compare HMW adiponectin concentrations at 3, 6 and 9 months. The Statistical Package for the Social Sciences (SPSS, SPSS Japan Inc., Tokyo, Japan) software version 17 was used for the statistical analyses, with statistical significance being set at p values < 0.05 .

Results

Subjects

Thirty-seven subjects (10 men, 27 women, 73.0% women) who responded to the advertisement for participation in the present study were selected as the intervention group. We include 42 subjects as controls (11 men, 31 women, 73.8% women) who were matched to the subjects in the intervention group.

In the exercise group, 2 participants had a history of depression, 3 were dyslipidemia, and 3 had the metabolic syndrome. In the control group, 2 participants had a history of depression, 3 were dyslipidemia and 2 had the metabolic syndrome. The data were analyzed by the Chi-square test in order to confirm that the two groups were well matched and

that our hypotheses were tenable ($p=0.539$).

Adherence to aerobic exercise

Of the 37 participants in the exercise group, 31 (83.8%) completed the 12-week program (8 men, 23 women, mean age 45.5 ± 2.2 years, 74.2% women, mean BMI 23.5 ± 0.7 kg/m²), while 36 in the control group (85.7%) were available for follow-up at the end of the 12-week study period (10 men, 26 women, mean age 45.8 ± 1.2 years; 72.2% women, mean BMI 22.4 ± 0.4 kg/m²) (Table 1). The attendance rate for the aerobic exercise program ranged between 43% to 84% for each period.

Effect of exercise training on outcome variable

In the exercise group, weight, % body fat, waist circumference, WHO-QOL 26 score, triglyceride, total cholesterol, HDL cholesterol and LDL cholesterol had improved significantly by the end of the third month (Table 2). Of the 12 variables measured in the aerobic exercise group, (5 body composite variables, WHO-QOL 26 score, and 6 blood test variables), 4 variables improved significantly (Fig. 1). The aerobic exercise caused significant improvements in weight (men; $F=3.766$, $p=0.0152$, women; $F=3.834$, $p=0.0083$), waist circumference (men; $F=4.400$, $p=0.0075$, women; $F=2.830$, $p=0.0335$), WHO-QOL 26 score (men; $F=7.080$, $p=0.0005$, women; $F=6.120$, $p=0.0004$), and HDL cholesterol (men; $F=5.840$, $p=0.0017$, women; $F=3.732$, $p=0.0095$).

Correlation with HMW adiponectin

As shown in Table 3, there was a significant negative correlation between HMW adiponectin and body composition (BMI; $r=-0.509$, $p=0.037$), LDL cholesterol ($r=-0.578$, $p=0.015$), and fasting plasma glucose ($r=-0.559$, $p=0.020$). In

Table 1. Baseline Characteristics of Participants

Variables	Exercise group	Control group	p
n	31	36	
Men/Women	8/23	10/26	0.539 ^a
Age (year)	45.5 ± 2.2	45.8 ± 1.2	0.934 ^b
Height (cm)	161.9 ± 1.4	160.4 ± 0.9	0.368 ^b
BMI (kg/m ²)	23.5 ± 0.7	22.4 ± 0.4	0.189 ^b
% body fat (%)	26.0 ± 1.2	26.6 ± 1.1	0.708 ^b
Waist circumference (cm)	84.6 ± 2.0	80.6 ± 1.3	0.095 ^b
Weight (kg)	62.1 ± 2.2	58.5 ± 1.2	0.497 ^b

Values are expressed as means \pm SE, a, using Chi-square test, b, using Mann-Whitney U test, BMI, body mass index, body fat percentage, % body fat.

Table 2. The Effects of Aerobic Exercise on the Exercise Group and Control Group during 3 Months

	Exercise group (n=31)			Control group (n=36)		
	Pre	3 months later	p	Pre	3 months later	p
Weight (kg)	62.1 ± 2.2	60.8 ± 2.1	0.001 *	58.5 ± 1.2	57.5 ± 1.1	0.381
BMI (kg/m ²)	23.5 ± 0.7	23.2 ± 0.7	0.249	22.4 ± 0.4	22.3 ± 0.5	0.825
% body fat (%)	26.0 ± 1.2	25.1 ± 1.2	0.008 *	31.3 ± 0.7	29.5 ± 1.0	0.169
Waist circumference (cm)	84.6 ± 2.0	80.1 ± 1.8	0.001 **	80.6 ± 1.3	81.1 ± 2.0	0.183
Left holding power (kg)	30.6 ± 1.9	31.3 ± 2.0	0.329	30.8 ± 1.7	31.0 ± 1.9	0.945
Right holding power (kg)	33.2 ± 1.9	33.5 ± 1.9	0.455	31.9 ± 1.7	32.1 ± 1.8	0.455
WHO-QOL 26 score	2.9 ± 0.1	3.1 ± 0.1	0.001 **	2.9 ± 0.1	2.9 ± 0.1	0.878
Triglyceride (mg/dL)	135.3 ± 14.5	121.5 ± 19.4	0.019 *	110.1 ± 8.7	107.7 ± 8.7	0.523
Total cholesterol (mg/dL)	210.8 ± 6.3	194.7 ± 5.5	0.002 **	217.1 ± 5.8	217.4 ± 5.9	0.600
HDL cholesterol (mg/dL)	61.0 ± 3.0	71.8 ± 2.9	0.001 **	70.0 ± 2.2	72.3 ± 2.4	0.080
LDL cholesterol (mg/dL)	119.7 ± 5.7	112.9 ± 4.9	0.037 *	122.1 ± 5.1	120.8 ± 5.0	0.768
Fasting plasma glucose (mg/mL)	97.1 ± 4.5	95.2 ± 2.4	0.931	96.9 ± 3.7	102.9 ± 3.7	0.073

Values are means \pm SE. * $p<0.05$ ** $p<0.005$, using Wilcoxon signed-rank test. BMI, body mass index, body fat percentage, % body fat.

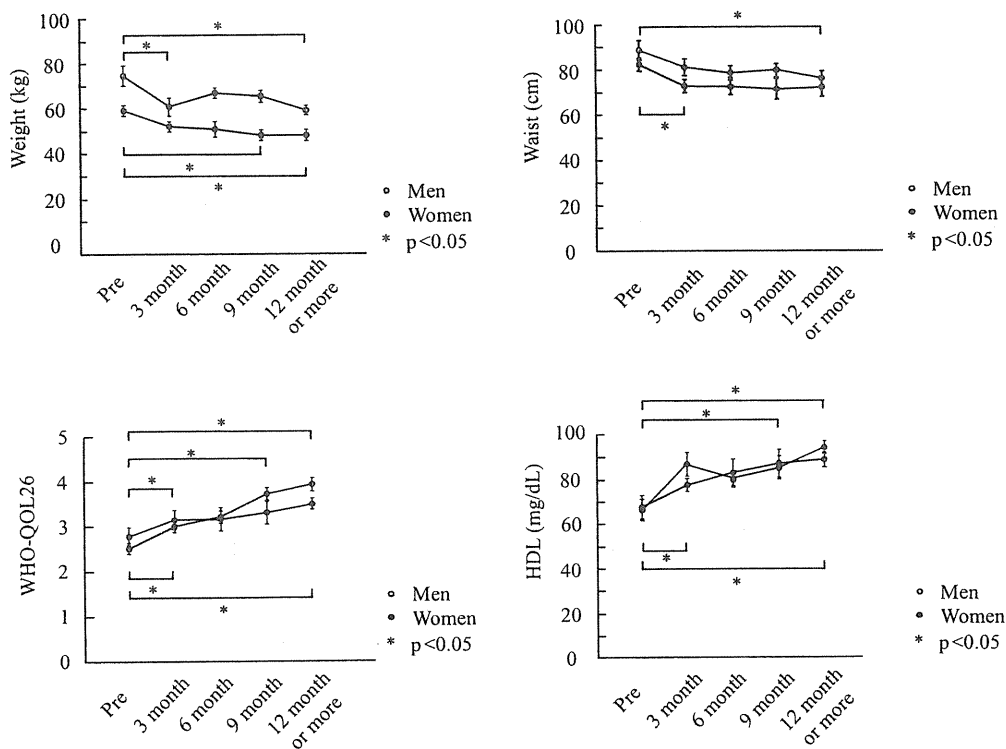


Figure 1. Changes in body composition and blood with the exercise group. Values are means \pm SE. * $p < 0.05$, using two-way repeated measures analysis of variance (ANOVA). Numbers of men were as follows: pre, (n=8) 3 months, (n=8), 6 months, (n=8), 9 months, (n=7), 12 months or more, (n=5). Numbers of women: pre, (n=23), 3 months, (n=23), 6 months, (n=20), 9 months, (n=17), 12 months or more, (n=11).

Table 3. Pearson's Correlation Analysis and Multiple Regression Analysis of HMW Adiponectin and Other Factors

	Pearson's correlation analysis (n=17)		Multiple regression analysis (n=17)	
	Pearson's Y	p	β -values	p
BMI	-0.509	0.037 *	-0.174	0.018 *
% body fat	-0.031	0.907	-0.088	0.453
Waist circumference	-0.180	0.488	0.101	0.244
WHO-QOL26	0.207	0.426	0.040	0.213
Triglyceride	-0.093	0.722	0.024	0.361
Total cholesterol	-0.309	0.228	0.014	0.114
HDL cholesterol	0.665	0.004 **	0.389	0.002 ***
LDL cholesterol	-0.578	0.015 *	-0.443	0.008 *
Fasting plasma glucose	-0.559	0.020 *	-0.306	0.010 *
R ²				0.761
Adjusted R ²				0.454

Values are means \pm SE. * $p < 0.05$, ** $p < 0.005$, using pearson's correlation analysis and multiple regression analysis. R² = coefficient of determination. BMI, body mass index, body fat percentage, % body fat.

contrast, there was a significantly positive correlation between HMW adiponectin and HDL cholesterol ($r=0.665$, $p=0.004$). There was no relationship between HMW adiponectin and WHO-QOL 26 score, triglyceride, total cholesterol levels, % body fat, and waist.

Multiple regression analysis examined the relationship between HMW adiponectin and the other factors. There was a significant correlation between HMW adiponectin and body composition (BMI; $\beta=-0.174$, $p=0.018$), HDL cholesterol ($\beta=0.389$, $p=0.002$), LDL cholesterol ($\beta=-0.443$, $p=0.008$),

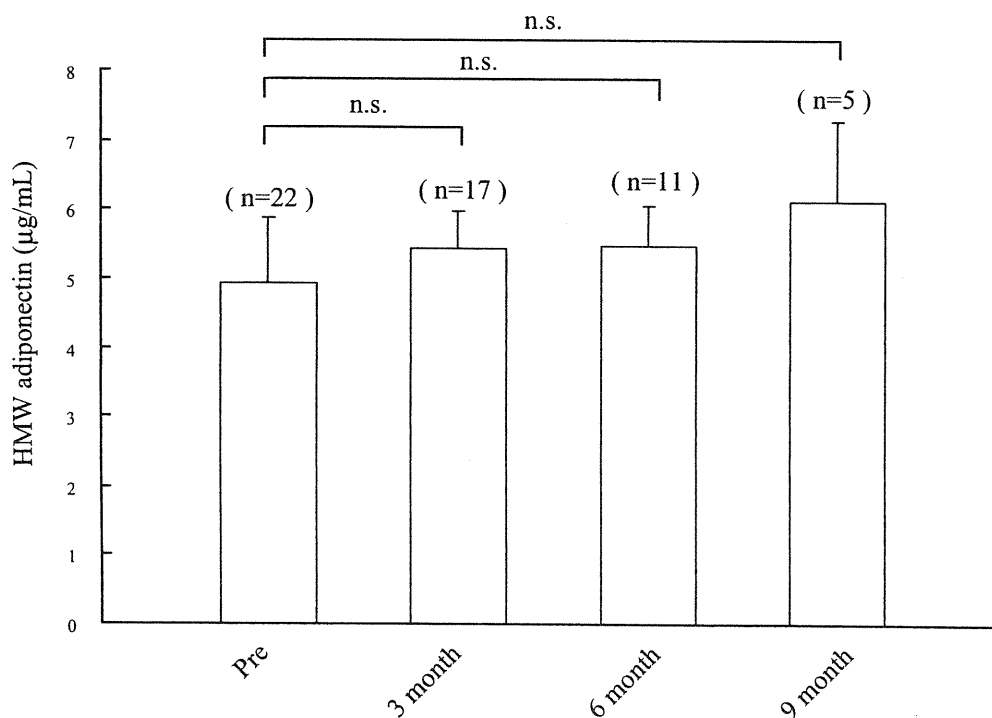


Figure 2. Changes in HMW adiponectin responses with the exercise group during the exercise and post exercise. Values are means \pm SE. n.s., $p > 0.05$, using the Mann-Whitney U test. Numbers of participants were as follows: pre, (n=22), 3 months, (n=17), 6 months, (n=11), 9 months, (n=5).

and fasting plasma glucose ($\beta = -0.306$, $p = 0.010$, Coefficient of determination $R^2 = 0.761$, and adjusted $R^2 = 0.454$). There was still no relationship between HMW adiponectin and WHO-QOL 26 score, triglyceride, total cholesterol levels, % body fat, and waist.

Adiponectin responses

The concentration of HMW adiponectin increased in the exercise group, although the difference between pre- and post-exercise levels did not reach statistical significance (Fig. 2). The HMW adiponectin concentration was increased by 24% after 9 months of exercise compared with pre-exercise levels.

Discussion

Aerobic exercise improved body weight, waist circumference, WHO-QOL 26 score, and HDL cholesterol. The concentration of HMW adiponectin increased during the aerobic exercise program, with a significant negative correlation being observed between HMW adiponectin and body composition (BMI). HMW adiponectin also showed a significant positive correlation with HDL cholesterol and a significant negative correlation with LDL cholesterol. We found that the 31 (83.8%) participants who completed the exercise program had significant improvements in weight, % body fat, waist circumference, WHO-QOL 26 score, triglyceride, total cholesterol, HDL cholesterol and LDL cholesterol at the end

of the third month. These findings are in agreement with a previous study on endurance exercise training that reported positive changes in lipid and lipoprotein metabolism (16).

It is generally considered that aerobic exercising has several beneficial effects on health. For example, regular exercise may promote chronic positive effects such as an improvement in lipid profiles, insulin resistance, BMI, and % body fat, as well as basal metabolic state (17). As the metabolism of lipoproteins occurs mainly during the aerobic exercise (18), the positive changes in anthropometric variables observed in the present study indicate that periodical aerobic exercising has the potential to improve the lipid profile. The pathological changes in the lipid and glucose metabolism in metabolic syndrome are closely related to the state of insulin resistance, unfortunately we have no data of fasting insulin concentration (IRI); further studies are needed to rectify the relation between IRI and exercise.

A loss of body mass and fat has also been associated with decreases in total and LDL cholesterol and an increase in HDL cholesterol. The improvement in total cholesterol may result from the exchange of cholesterol esters between tissues and lipoproteins to HDL cholesterol. Furthermore, exercise training usually decreases the concentration of fasting plasma triglycerides. As a consequence, the levels of very low density lipoprotein (VLDL) decrease and HDL cholesterol levels tend to increase (19). It is considered beneficial to increase the clearance of VLDL and triglyceride, in order to decrease the mean residence time of these lipoproteins in

the circulation. The concentration of LDL cholesterol is regulated by the balance between synthesis in the liver and removal from the plasma by lipoprotein receptors, while HDL concentration is determined by both HDL cholesterol and apolipoprotein A-I (apoA-I) concentrations. HDL cholesterol concentration increases frequently in response to a decrease in triglyceride, although in this study exercise training did not change the triglyceride levels. Therefore, another possible mechanism for the exercise-induced rise in HDL cholesterol rise we observed may be induction of apoA-I synthesis. There is further evidence that lecithin and cholesterol acyltransferase (LCAT) activity are changed by exercise training, and may therefore also affect HDL cholesterol levels before and after exercise training (20-22).

In this study we showed that continued exercise training led to further improvements in weight, waist circumference, WHO-QOL 26 score and HDL cholesterol levels (Fig. 1) while the other variables remained stable. We also demonstrated that HMW adiponectin correlated positively with HDL cholesterol, and negatively with LDL cholesterol and fasting plasma glucose. It has been reported that HMW adiponectin is not only the more active form of the adipokine (23, 24), but is also related closely to insulin sensitivity in the metabolic syndrome (25, 26). The present study investigated the role of aerobic exercise and improvement in lipid profiles in relationship to changes in HMW adiponectin concentration. Blüher et al (27) found that HMW adiponectin concentration increased with exercise treatment even in subjects with normal glucose tolerance. In contrast, Bobbert et al (28) showed that HMW adiponectin concentration was similar before and after 6 weeks of marathon training without a reduction in body weight. In the present study, HMW adiponectin concentration increased in the exercise group, although this increase did not reach significance during the aerobic exercise program (Fig. 2). The effect of aerobic exercise on HMW adiponectin concentration therefore remains to be established conclusively. However, HMW adiponectin concentrations tended to be higher than in the pre-exercise period. Further studies are needed to determine whether HMW adiponectin concentration changes significantly during longer periods of aerobic exercise or with different intensity of exercises.

Conclusion

Aerobic exercise leads to an improvement in body composition and lipid profile. The concentration of HMW adiponectin also showed a tendency to improve with regular aerobic exercise compared with pre-exercise levels.

The authors state that they have no Conflict of Interest (COI).

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HIV prevention through extended education encompassing students, parents, and teachers in Japan

Miyuki Nagamatsu · Takeshi Sato ·
Aki Nakagawa · Hisako Saito

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Abstract

Objectives We developed an extended HIV prevention program for students, parents, and school teachers, and then evaluated its effectiveness.

Methods The participants were 490 students, aged 13–14 years, attending four public junior high schools in Saga Prefecture, Japan. They were divided into two groups: control and intervention. All the students received group education by health professionals. In the control group, students received only two group education sessions given by health professionals. In the intervention group, there were three intervention components: parent education, teacher education, and student individual counseling by health professionals. Before and 3 months after the intervention, participants underwent evaluation of their frequency of communication about AIDS with parents or teachers, their knowledge of HIV/AIDS, and attitudes to sexual intercourse, self-esteem, and high-risk behavior.

Results A total of 135 students (80 boys and 55 girls) from the intervention group and 236 students (115 boys and 121 girls) from the control group participated in the evaluation 3 months after intervention. Adolescents in the intervention group showed more positive changes than those in the control group from baseline to follow-up. Intervention had a significant impact on the frequency of

communication about AIDS with teachers ($p = 0.027$) and HIV/AIDS knowledge among females ($p = 0.023$), and intervention also had a significant impact on refusal of sexual activity by males ($p = 0.045$).

Conclusions These findings suggest that effective prevention of HIV might be achieved by an expanded education program for students and teachers such as that described, and individual counseling that takes into consideration the sexual differences of Japanese adolescents.

Keywords HIV prevention · Parent · Teacher · Adolescent · Japan

Introduction

Japan has the most rapidly increasing number of AIDS patients among developed countries. The total number of HIV-infected persons in Japan, including those with AIDS, was 13,894 at the end of 2007, including 1,680 adolescents and young adults aged ≤ 25 years, and the annual number of young persons with new HIV infection has risen from 47 in 1998 to 131 in 2007 [1]. Although individual counseling about prevention is provided at the time of HIV testing, the percentage of teenagers who undergo such testing is low. Based on the results of a 2005 survey by the Japanese Association for Sex Education [2], there has been a sharp increase in the numbers of Japanese teenage boys and girls with sexual experience, from 3.6 and 4.2% among early teenagers (aged 13–15 years) to 26.6 and 30.0% among late teenagers (aged 16–18 years), respectively. Accordingly, preventive education about HIV is important for early teenagers in Japan before they begin sexual activity. However, preventive education about HIV for young people is not carried out proactively in Japan at present.

M. Nagamatsu (✉) · A. Nakagawa · H. Saito
Department of Maternal and Child Nursing,
Faculty of Medicine, Saga University,
5-1-1 Nabeshima, Saga City, Saga 849-8501, Japan
e-mail: nagamatm@cc.saga-u.ac.jp

T. Sato
Health Care Center, Saga University,
1 Honjo, Saga City, Saga 840-8502, Japan

In the United States, the time of starting sexual activity was reported to depend on age, gender, race/ethnicity, socioeconomic status, religion, and the parent–child relationship. A relationship between the initiation of sexual activity by teenagers and parental child-rearing policies has been clarified [3]. In Japan, negative feelings about discussing sexual activity with teenagers and discomfort among Japanese parents and school teachers about taking part in investigations have resulted in fewer studies of teen sexual behavior and parent–adolescent relationships [4]. A survey of Japanese high school students in their late teens showed that parental supervision of children aged 16 or younger, parental disapproval of sexual behavior, and communication with parents about AIDS delayed the start of sexual activity by adolescents [5]. Other surveys performed in Japan have shown that sexual behavior among girls in their late teens is influenced by the “relationship between parents” and the “parent–adolescent relationship”, whereas eating habits, dating partners, friends with sexual experience, and smoking and drinking influence both boys and girls [6]. Based on international and Japanese data for late teenagers, factors influencing the sexual behavior of early teenagers in Japan may include the family, school, friends, and partners.

Saito et al. [7] have pointed out that Japanese parents and teachers did not receive appropriate sex education when they were adolescents and often do not possess accurate knowledge about sexuality. In addition, the opportunities to learn about sexuality are limited during teacher training courses in Japan, although there are some exceptions. This results in a large number of teachers who have insufficient knowledge about sex education [7]. Tanomura [8] has reported that university-level teacher training courses in Japan provide education about sexual psychology, physiology, sexual health, and medical care as a special course, but few instructors who have specialized in sex education are available to provide education on this topic to university students. Therefore, many students receive little sex education when they are at university before becoming teachers, and thus have to acquire sex education skills and implement programs without assistance. Accordingly, sex education is still confused and at the trial-and-error stage in Japan [8].

With regard to preventive education about HIV in particular, students in their early teens receive little information from their families or junior high schools in Japan. A typical HIV education program provides basic knowledge by lecturers given in the third grade of junior high school, and the health and physical education teachers are usually responsible for HIV education. Because these teachers have the primary duty of teaching physical education and health, the time available for sex education is limited and the teachers cannot provide

adequate HIV education. Tanomura [8] has indicated that training workshops for teachers are needed, which should be strengthened by educational support through the local community at each school so that such workshops can play an active role.

In 1999, the Japanese Ministry of Education, Culture, Sports, Science and Technology recommended “Cooperation between Schools and Pertinent Organizations/Community” in “The Concept and Approach of Sex education in Schools”. Since then, junior high schools have often asked medical professionals to provide lectures for their students. However, it has been pointed out that some medical professionals provide education without sufficient understanding of the circumstances of adolescents or are unable to cooperate with the school adequately. In addition, the educational effect of a one-off lecture without evaluation is unknown [9]. Furthermore, Hasuo [10] has stated that sex education should not be managed by a gynecologist alone, and sex education lectures should not be the only method of sex education provided to junior high and high school students. Instead, sex education should involve parents at home; teaching staff at schools; and nurses, midwives, health nurses, gynecologists, and urologists from the medical field [10].

Until now, various HIV education programs have been created based on the Information–Motivation–Behavioral skills model, social recognition theory, and the life skills model. However, Wright [11] has pointed out that uniform group education for students has little effect as a strategy for reducing the incidence of pregnancy and sexually transmitted diseases (STDs). Intervention to prevent HIV and AIDS among adolescents did not achieve the goals of increasing HIV and AIDS knowledge, changing attitudes, improving negotiation and communication skills, or influencing positive behavior such as consistent condom use, abstinence, or reducing the number of sexual partners [12]. Ingram et al. [13] selected five evidence-based HIV prevention programs [14–18]. The programs were similar in a number of ways. Each program: (1) targeted adolescents or preadolescents; (2) focused on reduction of sexual risk behavior; (3) was delivered in small-group formats for 5–30 adolescents; (4) was delivered with ethnic minority populations; and (5) included multiple sessions (from 7 to 20 sessions). All programs were skill-focused and utilized cognitive-behavioral principles. These programs selected safer choices [14] for school-based programs that included HIV prevention. We believe that multiple behavioral interventions based on social recognition theory are necessary for early adolescents to reduce the risk of HIV transmission in Japan.

Of note, some studies have revealed that the risk of contracting STDs is lower for students with a high level of self-esteem. Salazar et al. [19] reported that females with a

higher level of self-esteem participated in frequent communication with their parents and their partners, and that they were able to discuss condom use with their partners when they had sex. In addition, Denny and Young [20] reported that students who attended classes designed to delay sexual activity by focusing on improvement of self-esteem commenced sexual activity at a later age in comparison to those who did not attend such classes. These reports suggest that programs to promote the self-selection of safe behavior may be useful for students with a high risk of pregnancy or STD, in order to improve their self-esteem. Also, recent Japanese studies have shown that young people with someone to consult have higher self-esteem than young people without someone to consult [21]. We consider it essential to recognize the importance of self-esteem and self-protection for selecting safe HIV prevention strategies. However, the frequency of communication with parents decreases among adolescents. In particular, speaking with parents about sex and HIV is rare in Japan, and adolescents also have few people to consult to share their sex-related concerns [4, 5]. Therefore, to improve the self-esteem of young Japanese, we consider it important for intervention to increase their communication with parents and also to provide a chance for them to consult health professionals about concerns which they cannot express to other people. Furthermore, a new public health approach for the prevention of HIV/AIDS in Japan has indicated that HIV should be recognized as “a disease that anyone can catch”. As such, multiple interventions are recommended to promote individual health as well as to contribute to public health [22]. Accordingly, we consider that various HIV prevention programs should be developed as soon as possible in consideration of both overseas findings and the Japanese cultural and educational environment.

The objective of our program is to prevent an increase in the number of Japanese young people with HIV infection. This program was designed to delay the initiation of sexual activity among Japanese junior high school students in their early teens. To achieve this objective, we prepared an education program on the prevention of HIV infection which is provided at school for 2 years to Japanese junior high school students who have not already had sex. This program has been prepared to target factors that influence the sexual behavior of young adolescents through education by parents and school teachers, with support by health professionals. It is based on the concept model of self-esteem and social cognitive theory, and consists of three components, which are parent education, teacher education, and student individual counseling by health professionals. The objective of our study was to evaluate the effectiveness of this extended education program.

Methods

Participants

The participants were students attending four public junior high schools located in Saga Prefecture, Japan, which has a population of 866,000 and an area of 2,439 km². The schools were selected at random, with two schools each for the control group and the intervention group. A survey of all students was conducted anonymously by questionnaire on two occasions between December 2007 and December 2008. The first survey was conducted in December 2007. Intervention involved 2 grades (among junior high schools)—second grade from December 2007 to March 2008 and third grade from April 2008 to July 2008. The follow-up survey was conducted in December 2008. There were a total of 490 students at the four participating schools in the second year of junior high school who were aged 13–14 years. There were 298 students at the schools providing the control group and 192 students at the schools supplying the intervention group.

Program procedure

The schools belonging to the intervention group are listed in Table 1. The procedures for intervention and control schools are outlined in Fig. 1. Group education by health professionals was provided for students in both the intervention and control groups.

Intervention group

The three intervention components (see Table 1) were parent education, teacher education, and student individual counseling by health professionals.

Parent education

The objective of parent education was to improve the self-esteem and self-protection of young people by helping their parents understand the changes affecting their children during puberty and how to cope with them.

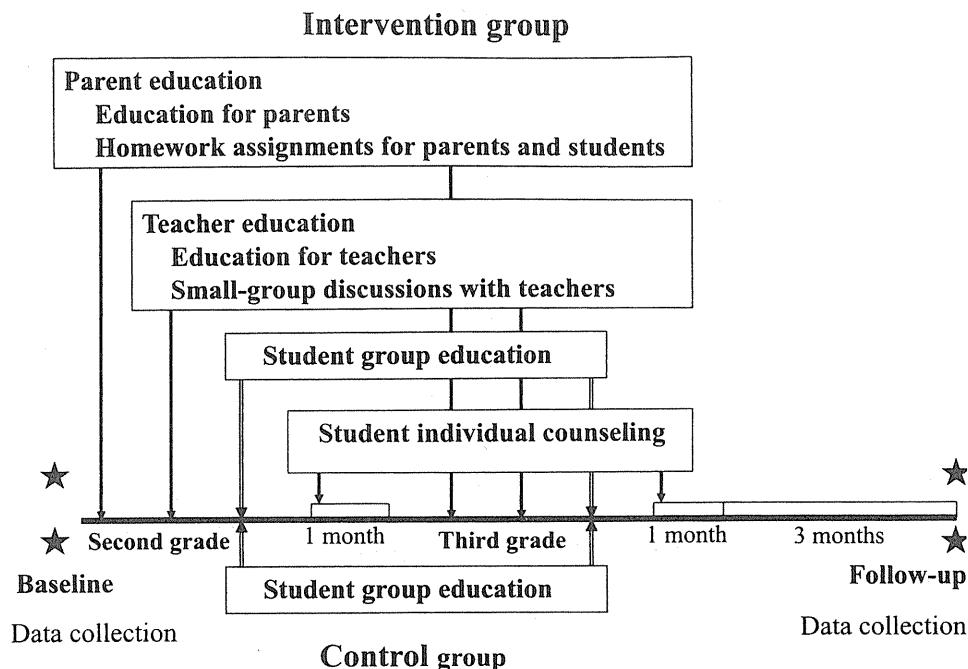
Education for parents A midwife, a gynecologist, and two school nurses provided training for parents/guardians before assigning homework that involved both parents and students.

Homework assignments for parents and students Assignments were completed at home to improve communication between parents and students. School nurses gave the students the homework assignments.

Table 1 Characteristics of the three intervention components (two junior high schools, six classes, $n = 192$)

Purpose	Role	Instructors	Receiver	Grade	Education conditions	
<i>Parent education</i>	Education for parents	Two school nurses	Parents		Two times, one session, 60 min	
		A midwife	(Mother)		Physical and emotional changes during puberty; pregnancy, childbirth, childcare, and HIV/AIDS prevention	
		A gynecologist	$n = 60$	Second		
Improving the self-esteem and self-protection of young people by helping their parents understand the changes affecting their children during puberty and how to cope with them	Homework assignments	Two school nurses	Parents and students			
				$n = 60$	Third	The importance of communication with children and the parent response to inculcating self-esteem among young people
				$n = 159$	Second	① How was your state when you were born or when you were a child? ② What do your parents or guardian like about you? ③ What do you like about yourself? ④ What do you and your parents or guardian like about your friends? ⑤ How do you get along with your friends?
				$n = 153$	Third	① Have your parents felt that your life is important, such as when you were born or when you got sick or hurt, and when have they felt this? ② Let's think about infection routes with your parents ③ An effective drug to eliminate HIV does not exist. How do you and your parents feel about this? ④ What risks are there in associating with someone older than you are?
<i>Teacher education</i>	Education for teachers	Two school nurses	Class teachers		Two times, one session, 60 min	
		A midwife	$n = 12$	Second	Physical and emotional changes during puberty; pregnancy, childbirth, childcare, and HIV/AIDS prevention	
		A gynecologist	$n = 12$	Third	The importance of communication with children and the teacher response to inculcating self-esteem among young people The purpose and method of small-group discussion	
Providing teachers with knowledge about changes and prevention of potential risks during puberty, to understand methods of education for improving self-esteem and rejecting sexual activity	Small-group discussion	Twelve class teachers	Students		Two times, one session 50 min	
				$n = 184$	Second	Sexual relations among students of the same age
				$n = 180$	Third	Sexual relations with an older partner
<i>Student education</i>	Group education	A midwife	Students		Two times, one session 50 min	
		A gynecologist	$n = 185$	Second	Physical and emotional changes during puberty; pregnancy, childbirth, and childcare	
			$n = 182$	Third	HIV/AIDS prevention	
	Individual counseling	Two school nurses	Students		One-two times, 30-20 min	
		A midwife			The students who had questions and worries about education on four forms	
		A gynecologist	$n = 30$	Second	We used the forms filled out after each education session and essays written by students after the education session	
		$n = 32$	Third			

Fig. 1 Process of the intervention and the control



Teacher education

The objective of teacher education was to provide teachers with knowledge about changes and prevention of potential risks during puberty, to understand methods of education for improving self-esteem and rejecting sexual activity, and to teach their students how to improve self-esteem and refuse sexual activity.

Education for teachers A midwife, a gynecologist, and two school nurses provided training for class teachers before small-group discussions.

Small-group discussions with teachers Two small-group discussions were conducted by class teachers after training. The objective was to improve communication skills related to refusal of sexual activity and negotiations with regard to sexual relations. The students also performed role-playing exercises. If examples of dangerous behavior arose during the exercises, the students were asked to think of ways to avoid such behavior and to fill out forms listing their ideas. Students wrote essays about their impressions after each small-group discussion.

Student education

The objective of professional counseling was to provide knowledge about HIV and sex to students, improve their self-esteem by answering questions and alleviating concerns, and to provide them with a careful attitude toward sexual activity.

Student group education A gynecologist or a midwife gave two types of group education to the students, who wrote essays about their impressions after each type of group education.

Student individual counseling Based on data from four sources—(1) the homework assignment, (2) the essay written after group education, (3) the small-group discussion forms, and (4) the essays written after the discussions—school nurses, midwives, and gynecologists selected students who had questions and worries about their education. These students were given individual counseling by a school nurse, midwife, or gynecologist after regular school hours.

Control group

Student group education

A gynecologist or a midwife gave two group education sessions to the students. After the 3-month follow-up survey, information was provided to teachers and parents, and individual counseling was provided for adolescents who requested it.

Study procedure

The authors distributed an explanatory document, the questionnaires, and consent forms to the school teachers. The explanatory document contained instructions on how to distribute and recover the questionnaires. It emphasized

the confidentiality of material in the questionnaires, which were sealed before recovery. The consent form contained a detailed explanation of the objectives of the research, the confidentiality of all information, the freedom to refuse to participate, and contact information for the researchers. Before the survey was conducted, a letter and a consent form were distributed to the parents through the students. For students without parents, we obtained the consent of their guardians [the adult(s) responsible for their upbringing]. Students consented after parental consent. If a student did not want to participate in the survey, the student could refuse to hand the consent form to his/her parents or guardians. The student could refuse to participate in the survey, even if his/her parents or guardians had consented to the participation. The survey was conducted only when both students and their parents or guardian gave consent for the survey. The students could receive the education if they wanted. Students were not made to undergo education if they refused. Students were also not made to provide certain data if they refused.

To all students, including those who had consented to participate in the survey, instructors at the large- and small-group education sessions explained at the beginning that students could leave the classroom if they did not feel like participating. Students were also told that the forms and essay sheets collected at each session would be checked by the instructor, and that a subsequent individual counseling session could be provided for selected students. Students were told that they did not have to submit the forms/essays unless they consented. Parents or students who did not consent did not have to complete or submit the homework forms. Those who agreed to participate signed and submitted the forms at the end of the session. Individual counseling sessions were provided after the school nurses had obtained prior consent from the students. Instructors explained at the beginning of individual sessions that students could leave in the middle if they so wished. The study protocol was approved by the Ethics Committee of Saga University Medical School. The approval of each school principal was also obtained.

Investigations

Frequency of communication about AIDS with parents or teachers

A Japanese study showed that communication by children with their parents about AIDS when the children were 16 or younger delayed the start of sexual activity by adolescents [5]. We asked students about their frequency of communication about AIDS for assessment before intervention and 3 months after intervention. “Did you talk to your parents/guardians about AIDS during the past

Table 2 HIV/AIDS knowledge

- | |
|---|
| 1. The AIDS virus cannot be transmitted by coughing |
| 2. The AIDS virus cannot penetrate healthy skin |
| 3. There is no concern over infection if sexual activity is limited to one specific partner |
| 4. People infected with the AIDS virus look unhealthy |
| 5. Sexual intercourse has the danger of HIV infection |
| 6. The routes of infection are through the blood, from sexual intercourse, and from mother to child |
| 7. There is no possibility of infection if there are no abnormalities in the sexual organs or the surrounding area |
| 8. Sexual intercourse is completely safe if a condom is used |
| 9. The period for the development is long after a person is infected with HIV. While it differs according to the individual, it ranges from five to 15 years, and averages 10 years |
| 10. The onset of AIDS after infection with HIV can be delayed due to advances in treatment with drugs |

3 months?” In addition, we added the question: “Did you talk to any teachers at your school about AIDS in the past 3 months?” For the questions that we devised, students selected one of four alternatives: 1 = never, 2 = seldom, 3 = sometimes, 4 = often.

Knowledge of HIV/AIDS

The scale to evaluate knowledge of HIV/AIDS developed by Kelly et al. consisted of 40 items [23]. In 2003, this scale was translated into Japanese by Matsumoto and Takeda [24]. They excluded 20 items that did not accord with the Japanese culture and created a Japanese version of such a scale that contained 30 items, i.e., 20 items from Kelly’s scale and an additional 10 items regarding current knowledge of HIV and AIDS. They reported that 14 of the 30 items showed a high level of appropriateness in evaluating knowledge of HIV/AIDS (α -coefficient for reliability = 0.67) [24]. We used the scale with permission from the copyright holder. Our preliminary study in 13- to 14-year-old participants showed that the response rate for 4 of the 14 items was low. Therefore, we used a simplified version of the scale, with 10 items. We demonstrated that the scale was appropriate in 13- to 14-year-old students for this study ($\alpha = 0.69$) (Table 2).

Self-esteem

We used the general self-esteem scale ($\alpha = 0.78$) developed by Rosenberg [25] for assessment before intervention and 3 months after intervention. This scale has 10 items. It was translated into Japanese by Hoshino [26], and its suitability has been demonstrated ($\alpha = 0.75$). This scale is commonly used for school education in Japan. It is often used for surveys of high-risk behavior among adolescents