

厚生労働科学研究費補助金  
長寿科学総合研究事業

高齢者の運動による健康増進に関する学術論文の系統的レビューと  
それに基づく文献データベースの作成

(H17-長寿-一般-020)

平成18年度 総括研究報告書

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平成19(2007)年 3月

## 目 次

I. 総括研究報告	
高齢者の運動による健康増進に関する学術論文の系統的レビューと それに基づく文献データベースの作成 -----	1
田畑 泉	
II. 分担研究報告	
1. 高齢者の運動による健康増進に関する文献データベースの作成 -----	49
増田和茂	
2. 有酸素性運動と内臓脂肪の減少における量反応関係 (システマティックレビュー) -----	59
田中茂穂 高田和子	
3. 死亡リスクの低下(長寿)に及ぼす体力と身体活動量の相互作用 (システマティックレビュー) -----	66
宮地元彦	
III. 研究成果の刊行に関する一覧表 -----	73
IV. 研究成果の刊行物・別刷 -----	77

## I. 総括研究報告

高齢者の運動による健康増進に関する学術論文の系統的レビューと  
それに基づく文献データベースの作成

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研究要旨：本研究の目的は、身体活動・運動による健康増進、さらに健康な長寿達成に関する健康運動指導士等の運動指導者に指導に際して必要な科学的エビデンスをインターネットで提供することであった。科学的エビデンスは、当該分野における専門家による推薦論文（エキスパートレビュー）と内外の文献データベースに対する網羅的検索（システマティックレビュー）の結果である。

エキスパートレビューにより、748本の内外の文献が収集された。システマティックレビューでは、内臓脂肪減少のための運動量として週あたり10メッツ・時/週以上必要であることが明らかになった。また、死亡リスクの低減のための身体活動量・運動量は、死亡リスクに大きな影響を与える最大酸素摂取量の向上を図るための“最大酸素摂取量の60%以上の強度の、1日当たり30分以上、週3回以上実施する運動”が必要であることが示された。また、これらの情報をインターネット上で公開するための方法論に関する研究を行い、実際に公開することが可能となった。

身体活動・運動・体力と長寿・健康増進に関する科学的エビデンスは、蓄積されており、今後もこのデータベースを更新していくことが必要である。

#### A. 研究目的

本研究は、運動や身体活動が高齢者の生活習慣病の危険因子や介護要因に及ぼす影響に関する学術論文をPubMedや医学中央雑誌といった学術論文データベースから系統的に抽出し、内容を学術的観点から精査した上で精読し、その内容をま

とめることを第一の目的とする。さらに、集められた文献とそれらから得られたエビデンスを表に一元化し、今後の高齢者の健康増進研究を推進する基盤を形成することを第二の目的とする。

#### B. 研究方法

### 1. 専門家による重要文献リストの作成 (エキスパートレビュー)

我が国における中堅の体力科学、運動生理学、スポーツ医学専門家に対して、身体活動・運動と健康増進・生活習慣病予防、さらにQOLの向上という観点で重要と考えられる文献リスト提出を依頼し、さらにそれらについてのフォーマットへの記入および要約の邦語訳を依頼した。

本研究の研究協力者は以下の方々である。

相澤勝治、秋間広、江川賢一、福典之、檜垣靖樹、本間俊之、家光素行、井上茂、石井好二郎、片山敬章、北畠義典、久保啓太郎、熊原秀晃、松井健、三浦哉、水野真佐夫、村上晴香、永松俊哉、泉水宏臣、芝崎学、重松良祐、清水静代、菅原順、高石鉄雄、田辺解、飛奈卓郎、上嶋健治、山元健太、安永明智

### 2. 有酸素性運動と内脂肪の減少に おける量反応関係

(システマティック・レビュー)

2006年5月31日までのPubMedを対象に、(“physical activity” OR exercise OR (physical AND training) OR sports OR “physical education” OR “physical fitness”) AND (((abdominal OR abdomen OR visceral) AND (fat OR adipose)) OR ((waist OR abdominal OR abdomen) AND (girth OR circumference)))の検索式を用い、Human and clinical trialと原著論文に限定し、さらに年齢は18歳から65歳を対象とした。肥満の基準はBMIの平均値が25 kg/m<sup>2</sup>未満および25 kg/m<sup>2</sup>以上であっても明らかに内臓脂肪量の少ない対象群は除外した。また、採択基準として、無作為、非無作為にかかわらず臨床試験による研究、少なくとも一つは有

酸素性運動のみによる介入群を含んでいる研究有酸素性運動群の対象者が介入中の食事量を介入前と変えていない、または変えないよう指示されている研究、CTまたはMRIによって内臓脂肪量を測定している研究、有酸素性運動群における介入中の運動量をMETs・時/週に、内臓脂肪量(以下VF)の変化を%ΔVF/週に換算できる研究とした。

### 3. 死亡リスクの低下(長寿)に及ぼす 体力と身体活動量の相互作用 (システマティック・レビュー)

運動量・身体活動量・体力が将来の死亡リスクに与える影響について検討した大規模長期観察研究について、2005年までのPubMedと医学中央雑誌の文献を対象にシステマティックレビューを行った。検索式はPubMedでは、“physical activity” OR exercise OR “physical training” OR fitness) AND (mortality\*) AND (follow\* OR observation\* OR prospective OR longitudinal OR retrospective)、医中誌では、上式の和訳、検索制限: humanは対象は原著論文のみ、対象は学童期(6歳以上)から高齢期、選定条件として定量的な情報を得ることが可能な物とした

### 4. 高齢者の運動による健康増進に 関する文献データベースの作成

文献検索システムは、これまで研究者を中心として読まれていた健康づくりに寄与する有益な論文が、現場に携わる運動指導者を含めた多くの国民に対しても簡便に情報提供されるようなものになることをめざして作成した。

対象者は、①研究者 ②運動指導者 ③一般を含めたすべての国民とし、①に対しては学術に関する情報収集として、

②に対しては指導方法に関する情報収集として、③に対しては健康の維持・増進および健康づくりに関する情報収集として位置づけることとした。

文献は、国内外を問わず、中高齢者の運動が健康増進に寄与し、エビデンスが明確に示されている内容のものとした。

文献検索システムは、キーワードの選定、検索画面の作成、文献検索結果詳細画面の作成より構成されるが、1) キーワードの選定は、知識および情報量の個人差を考慮し、指定キーワード（基本検索）および任意キーワード（フリーのキーワード）による2種類の方法を提案した。

## C. 研究結果

### 1. 専門家による重要文献リストの作成 （エキスパートレビュー）

選定された文献は、国内外を含め合計で748本であった。文献一覧を資料1に示す。

### 2. 有酸素性運動と内脂肪の減少における量反応関係 （システマティック・レビュー）

検索式でヒットした件数は255本から、選択基準にしたがって、9つのランダム化比較試験（計13群）と7つの非ランダム化比較試験（計8群）が選ばれた。それらの運動量は、5.9 - 47.1METs・時/週、内臓脂肪の減少量（% $\Delta$ VF/週）は-6.062 - 0.078%/週の範囲にあった。全21群のうちの4群は、介入期間中に有意な内臓脂肪の減少が認められなかった。

全群を対象として分析した場合、METs・時/週と内臓脂肪減少率（% $\Delta$ VF/週）との間に有意な相関関係は認められなかったが、代謝性疾患者に限定した群を除く

と有意な相関関係が認められた。また、代謝性疾患を有さない群のみを対象に、運動量（METs・時/週）で3群に分け、コントロール群を加えて比較してところ、いずれの категорияにおいてもコントロール群と比べて有意な内臓脂肪の減少が認められた。

MET・時/週と体重減少率（% $\Delta$ Weight/週）との間には、代謝性疾患を有さない群のみを対象とした場合に、% $\Delta$ VF/週は% $\Delta$ Weight/週と有意で強い相関性が認められた（ $r = 0.93$ ）。

### 3. 死亡リスクの低下（長寿）に及ぼす 体力と身体活動量の相互作用 （システマティック・レビュー）

採用された文献数は75文献であった。そのうち、死亡リスクを有意に減らすことができる身体活動量と体力（心肺体力）の両方を評価し検討したものは7文献であった。7編すべての研究が、身体活動量と体力がともに死亡リスクの減少に寄与することを示唆していた。

### 4. 高齢者の運動による健康増進に関する文献データベースの作成 検索は、文献検索画面、文献検索結果一覧画面より構成したことにより、対象者が見やすくなるよう設定できた。

検索詳細画面は各項目を太字で示し、文字全体を見やすくすることが可能となった。任意キーワードで検索した際は、情報内に示されたキーワードを赤字で示し、閲覧者がその意味付けを理解することが可能となった。

## D. 考察

1. 専門家による重要文献リストの作成  
（エキスパートレビュー）  
表1にあるように身体活動・運動によ

る健康増進に関する研究報告について、広い観点から多くの貴重な文献が収集されたことは、我が国における身体活動・運動と健康・長寿に関する研究が成熟していることを示している。今後、この分野における研究の成長およびこの文献データを用いて実際の指導をする健康運動指導士、健康運動実践指導者のような人材へ適切な情報提供のために、今後もこの分野におけるエキスパートレビューの更新が必要である。

### 2. 有酸素性運動と内脂肪の減少における量反応関係

(システマティック・レビュー)

本研究の結果、代謝性疾患を有さない肥満者を対象とした場合、有酸素性運動と内臓脂肪の減少は量反応関係にあることが示唆された。

有意な内臓脂肪の減少は10 METs・時/週程度かそれ以上の有酸素性運動を実施した介入試験から観察されていた。つまり、内臓脂肪を有意に減少させるには少なくともおよそ10 METs・時/週の有酸素運動が必要であると考えられた。

さらに、本研究の基準をみたしていた日本人を対象とした検討はMiyatake et al. (2002)のみであり、日本人を対象としたさらなる検討が求められよう。

### 3. 死亡リスクの低下（長寿）に及ぼす体力と身体活動量の相互作用

(システマティック・レビュー)

運動生理学的観点からすると、体力を向上させるもしくは加齢による体力低下を抑制するためには比較的高い強度の運動を定期的実施する必要がある。日常の低強度の生活活動量を増加させても体力向上は期待できない。基本的には最大酸素摂取量の60%程度以上、すなわち最

高心拍数の75%程度、6-7METs程度の強度の運動を1日あたり30分以上、週に3回以上の頻度で実施する必要がある。したがって、体力が高いことと高い強度の運動量とは相関があるが、低い強度の身体活動が多くても体力が向上するとは考えられていない。したがって、高い強度の運動量以外の身体活動量が死亡リスクや生活習慣病発症リスクとの関連において、体力と独立しているというこれらの7文献の結果は、生理学的観点から妥当であると考えられる。

### 4. 高齢者の運動による健康増進に

関する文献データベースの作成

選定された文献は、その大半が欧米の雑誌に掲載されているものであり、言語は英語が中心であった。このことから、それらのすべてを平易な日本語に邦訳した概要を作成し、多くの閲覧者が理解し易くなるようになった。

キーワードにおいては、専門性の高い用語を避けたことにより検索しやすい環境が設定できた。さらに、任意のキーワードを自由に投入できるよう設定を加えたことにより、目的となる文献がスムーズに検索可能になると考えられる。特に任意のキーワードは、用語および類義語の画面上への掲載により、目的となる文献へのアクセスがより簡便になると考えられる。

## E. 結論

### 1. 専門家による重要文献リストの作成（エキスパートレビュー）

今後、この分野における研究の成長およびこの文献データを用いて実際の指導をする健康運動指導士、健康運動実践指導者のような人材へ適切な情報提供のため

に、今後もこの分野におけるエキスパートレビューの更新が必要である。

2. 有酸素性運動と内脂肪の減少における量反応関係

(システムティック・レビュー)

本研究で行ったシステムティックレビューにおいて、代謝性疾患を有さない肥満者を対象とした場合、有酸素性運動と内臓脂肪の減少は量反応関係にあることが示唆された。また、有意な内臓脂肪の減少は、少なくとも10 METs・時/週程度かそれ以上の有酸素性運動の実施が必要であると考えられた。

3. 死亡リスクの低下（長寿）に及ぼす体力と身体活動量の相互作用

(システムティック・レビュー)

死亡リスクを減少させるために必要な身体活動量・体力の下限値を明らかにするためにシステムティックレビューを実施し、基準を満たし採用された文献数は75文献で、そのうち生活習慣病による死亡や総死亡リスクを減らすためには、身体活動量を増加するという目標を達成することにより、より大きな利益を得ることができると推測される。

4. 高齢者の運動による健康増進に関する文献データベースの作成

本研究における文献検索システムは、研究者に対する支援としてのツール、指導者に対する資質向上、国民に対する健康増進等に寄与する有益な情報を迅速かつ的確に提供できると考えられる。

## F. 研究発表

### 1. 論文発表

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## G. 知的財産権の出願・登録状況

### 1. 特許取得

なし

### 2. 実用新案登録

なし

### 3. その他

なし

著者(すべて記載)	論文題目	雑誌名	巻・号・頁	発刊年度
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American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons Panel on Falls	Resistance training and insulin action in humans: effects of de-training.	J Physiol	551(Pt 3):1049-58.	2003
Andersen JL, Schjerling P, Andersen LL, Dela F.	Physical activity and clustered cardiovascular risk in children: a cross-sectional study (The European Youth Heart Study).	Lancet	368(9532):299-304.	2006

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